Udruženje banaka Srbije

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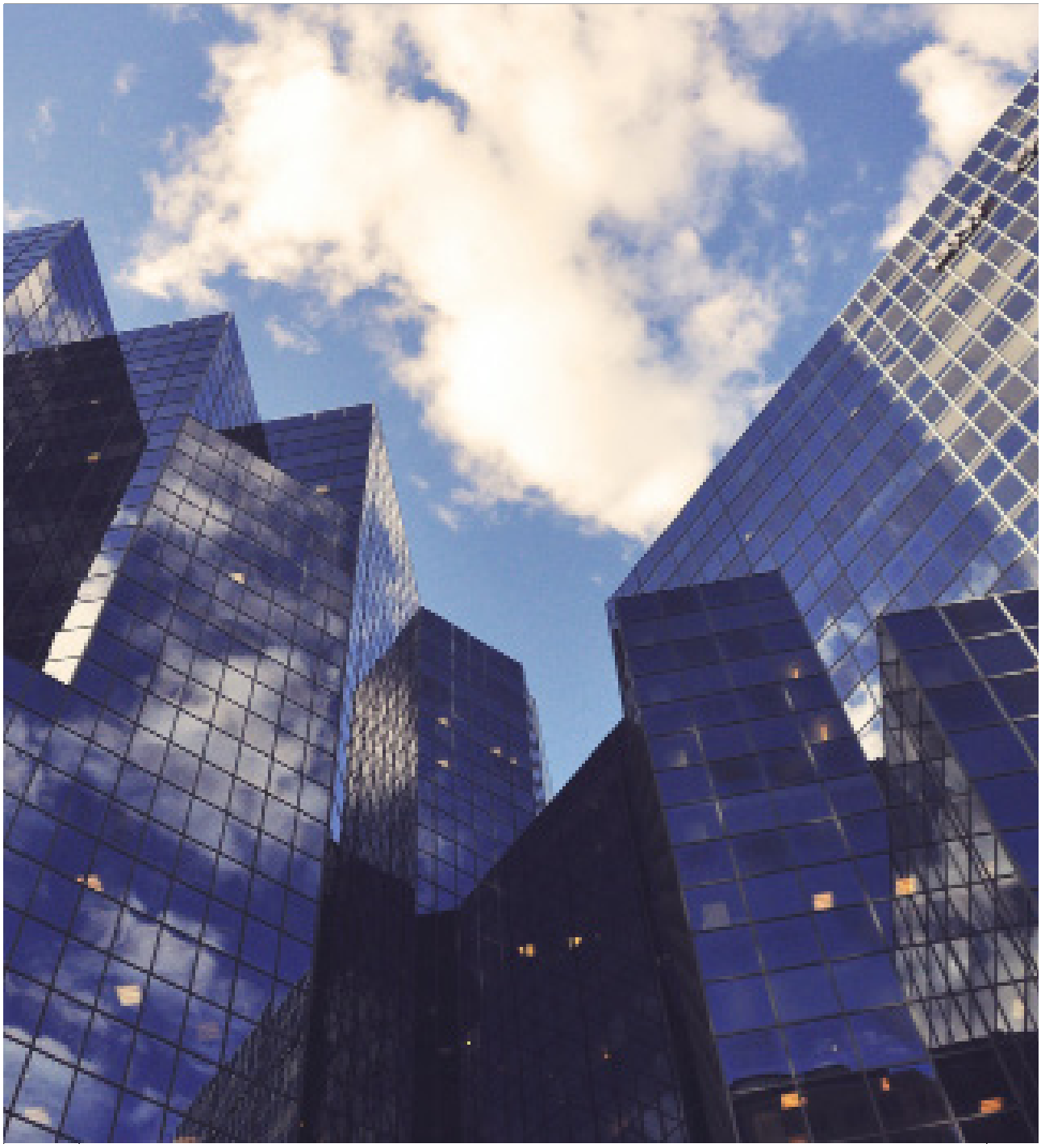

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PROMENE U BANKARSTVU I GDE SE SELI FOKUS?

Marina Papadakis
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Postoji već duži period u kome bankarstvo prolazi kroz snažne promene – baš kao i drugi delovi društva, ekonomije, biznisa. U tradicionalnom rečniku bankarskog biznisa pojavljuju se nove reči, na našim konferencijama dominiraju druge teme. I to je ne samo prirodno, već i jedini način da naš sektor održi korak i ostane konkurentan u očima svojih klijenata.

Danas se ne može govoriti o biznisu, a da se ne dotakne pojam održivog poslovanja. U korporativnom svetu ovo je jedna od važnijih tema, nefinansijsko izveštavanje postalo je jednako važno kao finansijsko. Posebno značajno mesto u ESG segmentu zauzimaju banke. One ne samo da se same okreću principima održivosti, već kao sektor koji finansira poslovanje postaju svojevrsni arbitri odgovornosti realnog sektora i svih drugih potencijalnih klijenata. Naša analiza u ovom broju pokazuje da je uprkos tome pojam ESG nedovoljno poznat, uprkos bar deklarativnom konsenzusu razvijenih, i zemalja u razvoju oko potrebe brige o klimatskim promenama.

Na drugoj strani inovacija u finansijskom svetu, sve češće govorimo o pojmu kriptovaluta, kao i o njihovom uticaju na finansijsko tržište i ekonomiju u celini.

Podaci pokazuju da je u kriznom periodu zbog pandemije kovida cena bitkoina rasla, baš kao i cena zlata. I ne samo to, istraživanjem je utvrđena statistički značajna korelacija između kretanja cene bitkoina i cene zlata. Dolazimo do zaključka koji je do skoro izgledao neverovatan i kontraintuitivan – da se nešto tako neregulisano, kao što je kriptovaluta, pojavljuje kao garant sigurnosti u kriznim vremenima, kao što je tradicionalno zlato.

Sa druge strane, upravo zato što funkcioniše van nacionalnih pravnih sistema, trgovina kripto valutama donosi drugačije rizike. Postavlja se pitanje može li se regulisati ovo rastuće tržište, na način da se smanji netransparentnost transakcija, da se zaštite korisnici, odnosno da se obezbedi sigurnost svim učesnicima. Tema regulative kripto tržišta postavlja se kao važno pitanje za buduće funkcionisanje finansijskog tržišta, odnosno za finansijsku stabilnost.

Nastavak novih tema je i istraživanje kakav je uticaj kripto valuta na ukupnu isplativost portfolija. Testiranje 10 porftolija sa digitalnom i finansijskom imovinom pokazuje da je niska korelacija između bitkoina i drugih oblika finansijske imovine. Pogodnost kriptovalute za optimizaciju portfolija čini ovo saznanje značajnim za procene rizika investitora, menadžera i regulatora.

Časopis „Bankarstvo“ naravno posvećuje pažnju i tradicionalnijim temama u bankarskom sektoru. Jedna od njih je pitanje likvidnosti. Ono što raduje je činjenica da u poslednjim godinama uočavamo blago povećanje likvidnosti banaka, posebno ako se za poređenje uzme 2010. godina, najmanje povoljan period u poslednjih 15 godina. Na ovakav rezultat utiče makroekonomska politika, klima za poslovanje, politika kamata, inflacija i devizni kurs. Sa druge strane mora se odati priznanje i poslovanju banaka, njihovom upravljanju aktivom i pasivom, neto obrtnim kapitalom i rizicima.

CHANGES IN THE BANKING SECTOR AND A SHIFT IN FOCUS

Marina Papadakis
Secretary General

Banking has been undertaking profound changes for a long while – just the same as other parts of society, economy, and business. New words are emerging in the traditional banking jargon, and our conferences are being dominated by different topics. This is not only natural, but the only way for our sector to keep pace and remain competitive in the eyes of our clients.

We can no longer speak of business without raising the issue of sustainability. This is one of the more important topics in the corporate would, as non-financial reporting has become as important as financial reporting. Banks hold a special role in the ESG segment. Not only are they turning to the principles of sustainability, but they are also becoming a kind of mediators of the responsibility of the real sector and other potential clients, as a sector financing business operations. Our analyses in this issue show that ESG terminology is still insufficiently well know, regardless of the declarative consensus of developed and developing countries concerning the need to monitor climate changes.

Additionally, when discussing innovation in the financial world, we increasingly mention cryptocurrencies, and their impact on the financial market, and the economy as a whole.

Data show that the crisis period of the pandemic saw a rise of the cost of bitcoin, as well as gold. Moreover, research determined a statistically important correlation between the movements of the price of bitcoin and gold. The conclusion we can reach has so far seemed unbelievable and counterintuitive – that something as unregulated as cryptocurrency can be a guarantee of security in a time of crisis, in the same way that gold used to be.

On the other hand, due to bitcoin operating outside of national legal systems, cryptocurrency trade comes with different risks. The question is whether this growing market can be regulated so as to reduce the lack of transparency regarding transactions, protect the users, and ensure the safety of all participants. The matter of regulating the crypto market is important for the future functioning of the financial market, and financial stability.

Other new topics include research into the impact of cryptocurrencies on the total profitability of the portfolio. Assessing 10 portfolios with digital and financial assets shows a low correlation between bitcoin and other forms of financial assets. The benefits of cryptocurrencies for portfolio optimisation makes this information important for risk assessments of investors, managers, and regulators.

"Bankarstvo" Journal always pays special attention to more traditional topics in the banking sector. Such is the issue of liquidity. It is optimistic to note that we have seen a slight increase in bank liquidity in the recent years, especially when comparing to 2010, which was the least favourable period in the last 15 years. These results are impacted by macroeconomic policies, the business climate, interest policies, inflation, and the foreign exchange rate. On the other hand, the business operations of banks must be commended, as well, especially for their management of assets and liabilities, net turnover capital, and risk.

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ANALIZA DINAMIKE LIKVIDNOSTI BANKARSKOG SEKTORA U SRBIJI NA BAZI TOPSIS METODE

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Rezime: Problematika analize likvidnosti bankarskog sektora je vrlo izazovna, značajna, kontinuirano aktuelna i složena. Polazeći od toga, u ovom radu se analizira likvidnost bankarskog sektora na bazi TOPSIS metode. Rezultati TOPSIS metode pokazuju da u top pet godina po likvidnosti bankarskog sektora u Srbiji u posmatranom vremenskom periodu 2008 – 2022. god. spadaju po redosledu: 2013, 2020, 2014, 2019. i 2015. god. Najlošija likvidnost zabeležena je u 2010. god. Može se slobodno kazati da se u poslednje vreme blago povećavala likvidnost bankarskog sektora u Srbiji. Na to su pozitivno uticali brojni makro i mikro faktori (ekonomska klima, kamata, inflacija, devizni kurs, privredna aktivnost, upravljanje aktivom i pasivom, upravljanje neto obrtnim kapitalom, upravljanje rizicima i drugi).

Ključne reči: likvidnost, faktori, bankarski sektor, Srbija, TOPSIS metoda

JEL klasifikacija: E41, G21

Uvod

Istraživanje likvidnosti bankarskog sektora je vrlo izazovno, kontinuirano aktuelno, značajno i složeno. Imajući to u vidu, predmet analize u ovom radu je likvidnost bankarskog sektora u Srbiji na bazi TOPSIS metode. Cilj i svrha toga je da se što realnije sagleda likvidnost bankarskog sektora u Srbiji u funkciji unapređenja u budućnosti primenom relevantnih mera.

Literatura posvećena razvoju i značaju primene DEA modela vrlo je bogata (Andersen, 1993; Banker, 1984; Chen, 2021; Chang, 2020; Guo, 2020; Lee, 2011; Lin, 2020; Pendharkar, 2021; Tone, 2002; Podinovski, 2021; Rostamzadeh, 2021; Fenyves, 2020; Tsai, 2021). Oni se vrlo uspešno primenjuju i u analizi efikasnosti banaka i osiguravajućih kompanija (Savić, 2012; Maletić, 2013; Radojičić, 2018; Cvetkoska, 2017, 2020, 2021; Lukić, 2017; 2018a,b, 2021). Isto tako, prilikom analize finansijskih performansi (profitabilnost, likvidnost) i efikasnosti banaka se sve više primenjuju, integralno ili pojedinačno, i različiti metodi više kriterijumskog odlučivanja, uključujući TOPSIS metodu (Ünlü, 2022; Ali,2022, Lukić, 2022a,b; 2023; Demir, 2022). Sva relevantna literatura u ovom radu se koristi kao teorijsko-metodološka i empirijska osnova za analizu dinamike likvidnosti bankarskog sektora u Srbiji pomoću TOPSIS metode.

Istraživačka hipoteza u ovom radu je zasnovana na činjenici da je kontinuirano praćenje faktora dinamike likvidnosti bankarskog sektora, u konkretnom slučaju u Srbiji, osnova za unapređenje u budućnosti primenom relevantnih mera. U tome značajnu ulogu ima i primena TOPSIS metode.

U odnosu na klasičnu racio analizu, TOPSIS metoda pruže realnije informacije o ostvarenoj likvidnosti bankarskog sektora u Srbiji jer se bazira na integrisanju nekoliko pokazatelja. Zato se, pored racio analize, preporučuje u analizi likvidnosti bankarskog sektora u Srbiji.

Potrebni empirijski podaci za analizu likvidnosti bankarskog sektora u Srbiji na bazi TOPSIS metode su prikupljeni od Narodne banke Srbije. Oni su „proizvedeni“ u skladu sa relevantnim međunarodnim standardima. U pogledu međunarodne komparacije rezultata TOPSIS metode ne postoje nikakva ograničenja.

TOPSIS metoda

TOPSIS metoda (Technique for Order Preference by Similarity to Ideal Solution) veoma se uspešno koristi u proceni finansijskih performansi preduzeća. To je tehnika višekriterijumskog odlučivanja koji su prvi razvili i primenili Hwang and Yoon (1981), (Hwang, 1981, 1995; Amin, 2019). Prema ovoj metodi, alternative su definisane sa njihovim distancama od idealne solucije. Cilj je izbor optimalne alternative koja je najbliža optimalnom rešenju, odnosno najudaljenija od negativnog idealnog rešenja (Young, 1994). Pozitivno idealno rešenje maksimizira korisnost, tj. minimizira troškove (u odnosu na dati problem). Nasuprot tome, negativno idealno rešenje maksimizira troškove, odnosno minimalizuje korisnost.

TOPSIS metoda se sastoji iz 6 koraka (Üçüncü et al., 2018):

Korak 1: Kreiranje inicijalne matrice

U prikazanoj inicijalnoj matrici A_{ij} sa "*m*" je označen broj alternative a sa "*n*" broj kriterijuma:

$$A_{ij} = \begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{vmatrix} \quad (1)$$

Korak 2: Formiranje težinske normalizovane matrice odlučivanja

Normalizovana matrica odlučivanja (R_{ij}; $i=1,\ldots,m$; $j=1,\ldots,n$) određuje se jednačinom (2) sa elementima matrice A_{ij}:

$$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{m} a_{ij}^2}}$$

$$t = 1,2,3,\ldots,m \qquad j = 1,2,3,\ldots,n \quad (2)$$

$$R_{ij} = \begin{vmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{vmatrix}$$

U jednačini (3) težinska mera „j" je reprezentovana sa W_{ij}. Težinski normalizovana matrica odlučivanja (V_{ij}; $i=1,\ldots,m$; $j=1,\ldots,n$) je utvrđena korišćenjem jednačine (3) sa elementima normalizovane matrice:

$$V_{ij} = W_{ij} * r_{ij} \quad (3)$$

$$i = 1,2,3,\ldots,m \qquad j = 1,2,3,\ldots,n$$

Korak 3: Određivanje pozitivnog i negativnog-idealnog rešenja

Vrednost pozitivnog-idealnog rešenja (A^+) i negativnog-idealnog rešenja (A^-) se utvrđuje iz vrednosti težinski normalizovane matrice (V_{ij}). A^+ je bolji, a A^- lošiji performansi rezultat (performance score).

Vrednost pozitivnog-idealnog rešenja (A^+) i negativnog-idealnog rešenja (A^-) se određuje na sledeći način (jednačina (4) (5) respektivno):

$$A^+ = \{v_i^+, \dots, v_n^+\} = \left\{\left(\max_i v_{ij}, j \in j\right)\left(\min_i v_{ij}, j \in j'\right)\right\} \; i = 1,2, \dots, m \tag{4}$$

$$A^- = \{v_i^-, \dots, v_n^-\} = \left\{\left(\min_i v_{ij}, j \in j\right)\left(\max_i v_{ij}, j \in j'\right)\right\} \; i = 1,2, \dots, m \tag{5}$$

gde je j u vezi sa benefitnim kriterijumom, i j' u vezi sa troškovnim kriterijumom.

Korak 4: Određivanje posebnih mera (tj. rastojanja alternativa od idealnog i negativno-idealnog rešenja)

Rastojanje od pozitivnog-idealnog rešenja (S_i^+) i negativnog-idealnog rešenja (S_i^-) za svaku alternativu prema datom kriterijumu se utvrđuje korišćenjem jednačina (6) (7):

$$S_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2} \tag{6}$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2} \tag{7}$$

$$i = 1,2,3, \dots, m \qquad\qquad j = 1,2,3, \dots, n$$

Korak 5: Određivanje koeficijenta relativne bliskosti idealnom rešenju

Posebne mere pozitivnog-idealnog rešenja (S_i^+) i negativnog-idealnog rešenja (S_i^-) su korišćene za određivanje relativne bliskosti idealnom rešenju (C_i^+) za svaku tačku odlučivanja. C_i^+ reprezentuje relativnu bliskost idealnom rešenju i uzima vrednost u rasponu $0 \leq C_i + \leq 1$. "C_i^+" $= 1$ pokazuje relativnu bliskost pozitivnom-idealnom rešenju. "C_i^+" $= 0$ pokazuje relativnu bliskost negativnom-idealnom rešenju.

Relativna bliskost idealnom rešenju (C_i^+; i=1,…,m; $j=1,\dots,n$) je utvrđena korišćenjem jednačine (8):

$$C_i^+ = \frac{S_i^-}{S_i^- + S_i^+} \tag{8}$$

$$i = 1,2,3, \dots, m$$

Korak 6: Sortiranje alternativa prema relativnoj superiornosti

Utvrđivanje relativne superiornosti rezultata (score) reprezentuje ostvarene kompanijske performanse. Visoki rezultati korespondiraju sa boljim performansama. Rezultati se mogu koristiti za utvrđivanja ranga kompanije u okviru industrije (Üçüncü et al., 2018).

Metoda analitičkog hijerarhijskog procesa (AHP)

S obzirom na to da se u ovom radu težinski koeficijenti kriterijuma kod primene TOPSIS metode utvrđuju pomoću AHP metode, ukratko ćemo se osvrnuti na njene teorijsko-metodološke karakteristike.

Sam proces primene metode analitičkog hijerarhijskog procesa (AHP) (Analytic Hierarchy Process) sastoji se iz sledećih koraka (Saaty, 2008):

Korak 1: Definisanje matrice parova poređenja

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \quad (9)$$

Korak 2: Normalizacija matrice parova poređenja

$$a_{ij}^{*} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, i, j = 1, \ldots, n \quad (10)$$

Korak 3: Utvrđivanje relativnog značaja, tj. vektora težina

$$w_i = \frac{\sum_{i=1}^{n} a_{ij}^{*}}{n}, i, j = 1, \ldots, n \quad (11)$$

Indeks konzistentnosti - CI (consistency index) predstavlja meru odstupanja n od λmax i može se predstaviti sledećom formulom:

$$CI = \frac{\lambda_{max} - n}{n} \quad (12)$$

Ukoliko je CI < 0,1 procenjene vrednosti koeficijenata a_{ij} su konzistentne, a odstupanje λ_{max} od *n* je zanemarljivo. To znači, drugim rečima, da AHP metoda prihvata nekonzistentnost manju od 10%.

Na bazi indeksa konzistentnosti može se izračunati odnos konzistentnosti CR = CI/RI, pri čemu je RI slučajni indeks.

Rezultati i diskusija

U kontekstu analize likvidnosti bankarskog sektora u Srbiji kao kriterijumi su uzeti najvažniji pokazatelji. Alternative su posmatrane godine. Oni su, kao i inicijalni podaci prikazani u Tabeli 1. (U ovom radu sva izračunavanja i rezultati su autorovi.)

Tabela 1 - Inicijalni podaci

	Likvidna aktiva u užem smislu u odnosu na ukupnu aktivu	Likvidna aktiva u užem smislu u odnosu na kratkoročne obaveze	Likvidna aktiva u odnosu na ukupnu aktivu	Likvidna aktiva u odnosu na kratkoročne obaveze	Depoziti u odnosu na kredite (ne monetarni sektori)	Devizni krediti u odnosu na ukupne kredite	Prosečan mesečni pokazatelj likvidnosti	Prosečan mesečni uži pokazatelj likvidnosti
	C1	C2	C3	C4	C5	C6	C7	C8
A1 2008	47,8	75,7	47,8	75,7	82,7	73,9	1,8	1,2
A2 2009	48,2	73,8	49	75,1	88,3	75,8	1,9	1,2
A3 2010	41,8	67,1	43,7	70,1	80,1	76,8	2	1,3
A4 2011	40,3	67,3	42,3	70,6	83,1	69,8	2,2	1,5
A5 2012	35,2	58,9	38,9	65	84,9	74,1	2,1	1,6
A6 2013	36,1	58,3	41	66,4	92,3	71,6	2,4	1,8
A7 2014	35,7	56,3	42,2	66,7	95,7	70,1	2,2	1,7
A8 2015	32,5	49,3	40,5	61,3	99,7	72,3	2,1	1,7
A9 2016	30,5	44,3	38,9	56,6	108,1	69,4	2,1	1,7
A10 2017	27,5	39,9	35,1	50,9	106,9	67,5	2	1,7
A11 2018	28	39,6	35,7	50,5	110,6	68,5	2	1,7
A12 2019	25,7	36,1	36	50,5	109,2	67,1	2,2	1,8
A13 2020	26,7	36,4	37,3	50,9	116,4	64,7	2,2	1,9
A14 2021	27,9	36,8	37,7	49,6	119,5	63,2	2,1	1,7
A15 2022	24,6	31,9	35	45,4	114,4	66,6	2	1,6

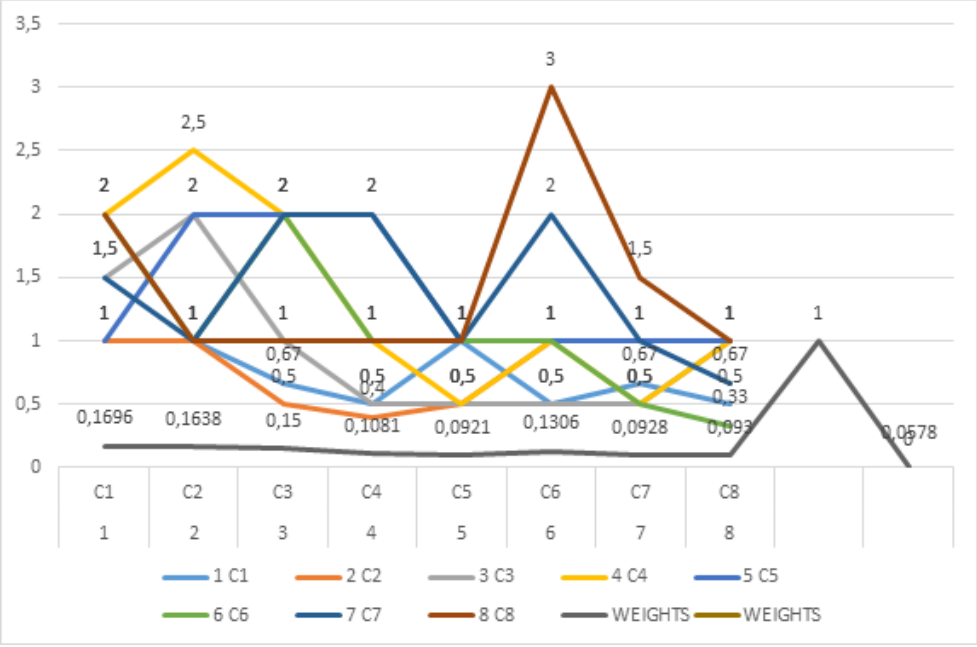
Napomena: Podaci za 2022. su prikazani za III kvartal

Izvor: Narodna banaka Srbije

Težinski koeficijenti kriterijuma su utvrđeni pomoću AHP metode. U Tabeli 2. i na Slici 1. su prikazani težinski koeficijenti kriterijuma.

Tabela 2 - Težinski koeficijenti kriterijuma

$W = \lim_{k\to\infty} \frac{A^k.e}{e^T.A^k.e}$		1	2	3	4	5	6	7	8	**Težinski koeficijenti**	
		C1	C2	C3	C4	C5	C6	C7	C8		
1	C1	1,00	1,00	1,50	2,00	1,00	2,00	1,50	2,00	**0,1696**	
2	C2	1,00	1,00	2,00	2,50	2,00	1,00	1,00	1,00	**0,1638**	
3	C3	0,67	0,50	1,00	2,00	2,00	2,00	2,00	1,00	**0,1500**	
4	C4	0,50	0,40	0,50	1,00	2,00	1,00	2,00	1,00	**0,1081**	
5	C5	1,00	0,50	0,50	0,50	1,00	1,00	1,00	1,00	**0,0921**	
6	C6	0,50	1,00	0,50	1,00	1,00	1,00	2,00	3,00	**0,1306**	
7	C7	0,67	1,00	0,50	0,50	1,00	0,50	1,00	1,50	**0,0928**	
8	C8	0,50	1,00	1,00	1,00	1,00	0,33	0,67	1,00	**0,0930**	
										1,0000	
										Indeks konzistentnosti	**0,0578**



Slika 1 - Težinski koeficijenti kriterijuma

Najznačajniji kriterijumi su likvidna aktiva u užem smislu u odnosu na ukupnu aktivu, likvidna aktiva u užem smislu u odnosu na kratkoročne obaveze, likvidna aktiva u odnosu na ukupnu aktivu i devizni krediti u odnosu na ukupne kredite. Adekvatnim upravljanjem ovim pokazateljima može se i te kako ostvariti ciljna likvidnost bankarskog sektora u Srbiji.

U Tabelama 3 – 6 i na Slici 2. su prikazana izračunavanja i rezultati TOPSIS metode.

Tabela 3 - Inicijalna matrica

Težinski koeficijenti kriterijuma	0,1696	0,1638	0,15	0,1081	0,0921	0,1306	0,0928	0,93
Vrsta kriterijuma	1	1	1	1	1	1	1	1
Inicijalna matrica	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
A1	47,8	75,7	47,8	75,7	82,7	73,9	1,8	1,2
A2	48,2	73,8	49	75,1	88,3	75,8	1,9	1,2
A3	41,8	67,1	43,7	70,1	80,1	76,8	2	1,3
A4	40,3	67,3	42,3	70,6	83,1	69,8	2,2	1,5
A5	35,2	58,9	38,9	65	84,9	74,1	2,1	1,6
A6	36,1	58,3	41	66,4	92,3	71,6	2,4	1,8
A7	35,7	56,3	42,2	66,7	95,7	70,1	2,2	1,7
A8	32,5	49,3	40,5	61,3	99,7	72,3	2,1	1,7
A9	30,5	44,3	38,9	56,6	108,1	69,4	2,1	1,7
A10	27,5	39,9	35,1	50,9	106,9	67,5	2	1,7
A11	28	39,6	35,7	50,5	110,6	68,5	2	1,7
A12	25,7	36,1	36	50,5	109,2	67,1	2,2	1,8
A13	26,7	36,4	37,3	50,9	116,4	64,7	2,2	1,9
A14	27,9	36,8	37,7	49,6	119,5	63,2	2,1	1,7
A15	24,6	31,9	35	45,4	114,4	66,6	2	1,6

Informacije za normalizaciju	**Suma kvadrata**	18079,85	42799,59	24353,41	56116,41	150970,5	73918,96	65,61	39,37
	SQRT	134,4613	206,8806	156,0558	236,8890	388,5492	271,8804	8,1000	6,2746

Tabela 4 - Normalizovana matrica

Težinski koeficijenti kriterijuma	0,1696	0,1638	0,15	0,1081	0,0921	0,1306	0,0928	0,93
Vrsta kriterijuma	1	1	1	1	1	1	1	1
Inicijalna matrica	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
A1	0,3555	0,3659	0,3063	0,3196	0,2128	0,2718	0,2222	0,1912
A2	0,3585	0,3567	0,3140	0,3170	0,2273	0,2788	0,2346	0,1912

A3	0,3109	0,3243	0,2800	0,2959	0,2062	0,2825	0,2469	0,2072
A4	0,2997	0,3253	0,2711	0,2980	0,2139	0,2567	0,2716	0,2391
A5	0,2618	0,2847	0,2493	0,2744	0,2185	0,2725	0,2593	0,2550
A6	0,2685	0,2818	0,2627	0,2803	0,2376	0,2634	0,2963	0,2869
A7	0,2655	0,2721	0,2704	0,2816	0,2463	0,2578	0,2716	0,2709
A8	0,2417	0,2383	0,2595	0,2588	0,2566	0,2659	0,2593	0,2709
A9	0,2268	0,2141	0,2493	0,2389	0,2782	0,2553	0,2593	0,2709
A10	0,2045	0,1929	0,2249	0,2149	0,2751	0,2483	0,2469	0,2709
A11	0,2082	0,1914	0,2288	0,2132	0,2846	0,2519	0,2469	0,2709
A12	0,1911	0,1745	0,2307	0,2132	0,2810	0,2468	0,2716	0,2869
A13	0,1986	0,1759	0,2390	0,2149	0,2996	0,2380	0,2716	0,3028
A14	0,2075	0,1779	0,2416	0,2094	0,3076	0,2325	0,2593	0,2709
A15	0,1830	0,1542	0,2243	0,1917	0,2944	0,2450	0,2469	0,2550

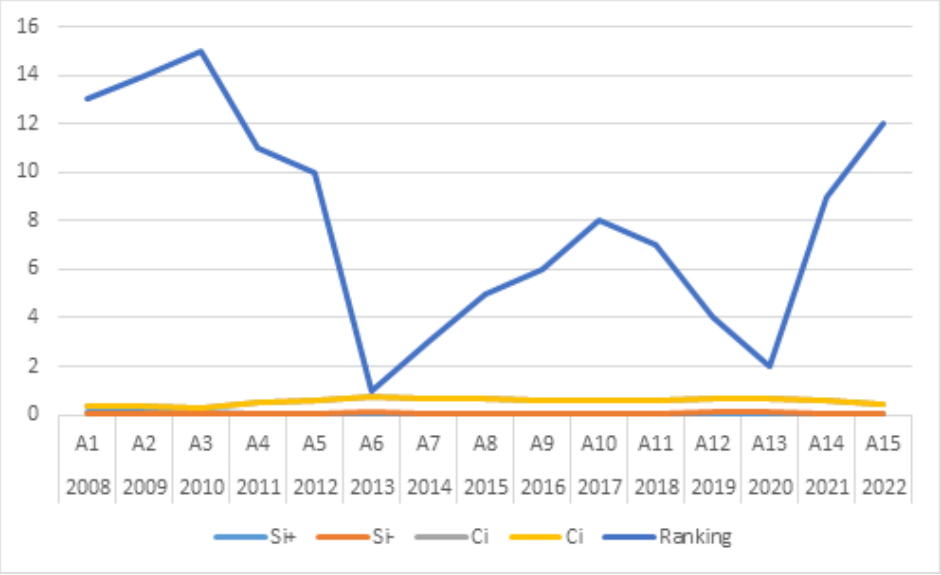
Tabela 5 - Normalizovana težinska matrica

Normalizovana težinska matrica								
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
A1	0,0603	0,0599	0,0459	0,0345	0,0196	0,0355	0,0206	0,1779
A2	0,0608	0,0584	0,0471	0,0343	0,0209	0,0364	0,0218	0,1779
A3	0,0527	0,0531	0,0420	0,0320	0,0190	0,0369	0,0229	0,1927
A4	0,0508	0,0533	0,0407	0,0322	0,0197	0,0335	0,0252	0,2223
A5	0,0444	0,0466	0,0374	0,0297	0,0201	0,0356	0,0241	0,2371
A6	0,0455	0,0462	0,0394	0,0303	0,0219	0,0344	0,0275	0,2668
A7	0,0450	0,0446	0,0406	0,0304	0,0227	0,0337	0,0252	0,2520
A8	0,0410	0,0390	0,0389	0,0280	0,0236	0,0347	0,0241	0,2520
A9	0,0385	0,0351	0,0374	0,0258	0,0256	0,0333	0,0241	0,2520
A10	0,0347	0,0316	0,0337	0,0232	0,0253	0,0324	0,0229	0,2520
A11	0,0353	0,0314	0,0343	0,0230	0,0262	0,0329	0,0229	0,2520
A12	0,0324	0,0286	0,0346	0,0230	0,0259	0,0322	0,0252	0,2668
A13	0,0337	0,0288	0,0359	0,0232	0,0276	0,0311	0,0252	0,2816
A14	0,0352	0,0291	0,0362	0,0226	0,0283	0,0304	0,0241	0,2520
A15	0,0310	0,0253	0,0336	0,0207	0,0271	0,0320	0,0229	0,2371

MIN	0,0310	0,0253	0,0336	0,0207	0,0190	0,0304	0,0206	0,1779
MAX	0,0608	0,0599	0,0471	0,0345	0,0283	0,0369	0,0275	0,2816
A+	0,0608	0,0599	0,0471	0,0345	0,0283	0,0369	0,0275	0,2816
A-	0,0310	0,0253	0,0336	0,0207	0,0190	0,0304	0,0206	0,1779

Tabela 6 - Rezultati TOPSIS metode

	Alternative	Si+	Si-	Ci	Ci	Rangiranje
2008	**A1**	0,1044	0,0493	0,3207	0,321	13
2009	**A2**	0,1042	0,0489	0,3195	0,320	14
2010	**A3**	0,0903	0,0414	0,3141	0,314	15
2011	**A4**	0,0616	0,0580	0,4850	0,485	11
2012	**A5**	0,0512	0,0655	0,5611	0,561	10
2013	**A6**	0,0277	0,0936	0,7716	0,772	1
2014	**A7**	0,0383	0,0791	0,6734	0,673	3
2015	**A8**	0,0431	0,0769	0,6409	0,641	5
2016	**A9**	0,0469	0,0758	0,6180	0,618	6
2017	**A10**	0,0522	0,0748	0,5893	0,589	8
2018	**A11**	0,0518	0,0750	0,5914	0,591	7
2019	**A12**	0,0483	0,0894	0,6495	0,650	4
2020	**A13**	0,0447	0,1044	0,7001	0,700	2
2021	**A14**	0,0529	0,0751	0,5866	0,587	9
2022	**A15**	0,0670	0,0599	0,4722	0,472	12



Slika 2 - Rangiranje alternativa

Prema tome, rezultati TOPSIS metode pokazuju da u top pet godina po likvidnosti bankarskog sektora u Srbiji u posmatranom vremenskom periodu 2008 – 2022. god. spadaju po redosledu: 2013, 2020, 2014, 2019. i 2015. god. Najlošija likvidnost bankarskog sektora u Srbiji u posmatranom vremenskom periodu je bila u 2010. god. U poslednje vreme, može se slobodno kazati, blago se povećavala likvidnost bankarskog sektora u Srbiji.

Faktori likvidnosti bankarskog sektora u Srbiji su makro i mikro prirode. To su: ekonomska klima, kamata, inflacija, devizni kurs, privredna aktivnost, upravljanje aktivom i pasivom, upravljanje neto obrtnim kapitalom, upravljanje rizicima i drugi. Njihovom adekvatnom kontrolom može se ostvariti ciljna likvidnost bankarskog sektora u Srbiji.

Treba posebno naglasiti da su u poslednje vreme na likvidnost bankarskog sektora u Srbiji, kao i u drugim zemljama uticali specifični faktori kao što su globalna politička klima, pandemija korona virusa Covid – 19 i energetska kriza. Oni su prouzrokovali pad privredne, a time i kreditne aktivnosti. U izvesnoj meri banke su se prilagođavale ovoj situaciji sa primenom elektronskog bankarstva i na taj način uložili negativan efekat spomenutih faktora na njihovu profitabilnost i likvidnost.

Zaključak

Dobijeni rezultati TOPSIS metode pokazuju da u top pet godina po likvidnosti bankarskog sektora u Srbiji u posmatranom vremenskom periodu 2008 – 2022. god. spadaju po redosledu: 2013, 2020, 2014, 2019. i 2015. god. Najlošija likvidnost bankarskog sektora u Srbiji je bila u 2010. god. U poslednje vreme blago se povećavala likvidnost bankarskog sektora u Srbiji.

Determinante tome su: ekonomska klima, kamata, inflacija, devizni kurs, privredna aktivnost, upravljanje aktivom i pasivom, upravljanje neto obrtnim kapitalom, upravljanje rizicima i drugi. Njihovom adekvatnom kontrolom može se ostvariti ciljna likvidnost bankarskog sektora.

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ANALYSIS OF THE LIQUIDITY DYNAMICS OF THE BANKING SECTORIN SERBIA BASED ON THE TOPSIS METHOD

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Summary: The problem of analyzing the liquidity of the banking sector is very challenging, significant, continuously updated and complex. Based on that, this paper analyzes the liquidity of the banking sector based on the TOPSIS method. The results of the TOPSIS method show that the top five years in terms of liquidity of the banking sector in Serbia in the observed time period 2008 - 2022 are in the following order: 2013, 2020, 2014, 2019 and 2015. The worst liquidity was recorded in 2010. It can be safely said that recently the liquidity of the banking sector in Serbia has slightly increased. This was positively influenced by numerous macro and micro factors (economic climate, interest rate, inflation, exchange rate, economic activity, asset and liability management, net working capital management, risk management and others).

Keywords: liquidity, factors, banking sector, Serbia, TOPSIS method

JEL classification: E41, G21

Introduction

Banking sector liquidity research is very challenging, continuously topical, significant and complex. Bearing that in mind, the subject of analysis in this paper is the liquidity of the banking sector in Serbia based on the TOPSIS method. The goal and purpose of this is to assess the liquidity of the banking sector in Serbia, as realistically as possible, in order to improve it in the future, by applying relevant measures.

The literature devoted to the development and importance of the application of the DEA model is abundant (Andersen, 1993; Banker, 1984; Chen, 2021; Chang, 2020; Guo, 2020; Lee, 2011; Lin, 2020; Pendharkar, 2021; Tone, 2002; Podinovski , 2021; Rostamzadeh, 2021; Fenyves, 2020; Tsai, 2021). They are also very successfully applied in the analysis of the efficiency of banks and insurance companies (Savic, 2012; Maletić, 2013; Radojicic, 2018; Cvetkoska, 2017, 2020, 2021; Lukic, 2017; 2018a,b, 2021, 2022a,b, 2023). Likewise, when analyzing financial performance (profitability, liquidity) and efficiency, banks increasingly apply, integrally or individually, different methods of multi-criteria decision-making, including the TOPSIS method (Ünlü, 2022; Ali, 2022, Lukic, 2022a,b; Demir, 2022). All relevant literature in this paper is used as a theoretical-methodological and empirical basis for the analysis of the liquidity dynamics of the banking sector in Serbia using the TOPSIS method.

The research hypothesis in this paper is based on the fact that continuously monitoring the factors of liquidity dynamics of the banking sector, in the specific case of Serbia, is the basis for improvement in the future, by applying relevant measures. The application of the TOPSIS method plays a significant role in this.

Compared to the classic ratio analysis, the TOPSIS method provides more realistic information about the realized liquidity of the banking sector in Serbia because it is based on the integration of several indicators. That is why, in addition to the ratio analysis, the TOPSIS methos is recommended in the analysis of the liquidity of the banking sector in Serbia.

The necessary empirical data for the analysis of the liquidity of the banking sector in Serbia based on the TOPSIS method were collected from the National Bank of Serbia. They are "manufactured" in

TOPSIS method

The TOPSIS method (Technique for Order Preference by Similarity to Ideal Solution) is used very successfully in evaluating the financial performance of companies. This is a technique of multicriteria decision-making, first developed and implemented by Hwang and Yoon (1981), (Hwang, 1981, 1995; Amin, 2019). According to this method, alternatives are defined by their distances from the ideal solution. The goal is to choose the optimal alternative that is closest to the optimal solution, that is, the farthest from the negative ideal solution (Young, 1994). A positive ideal solution maximizes utility, i.e., minimizes costs (relative to the given problem). Conversely, a negative ideal solution maximizes costs, i.e., minimizes utility.

The TOPSIS method consists of 6 steps (Üçüncü et al., 2018):

Step 1: Creating the initial matrix

In the displayed initial matrix A_{ij}, the number of the alternative is marked with "*m*" and the number of criteria with "*n*":

$$A_{ij} = \begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{vmatrix} \quad (1)$$

Step 2: Formation of the weighted normalized decision matrix

The normalized decision matrix (R_{ij}; $i=1,\ldots,m$; $j=1,\ldots,n$) is determined by equation (12) with matrix elements A_{ij} :

$$r_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^{m} a_{ij}^2}} \quad (2)$$

$$t = 1,2,3,\ldots,m \qquad j = 1,2,3,\ldots,n$$

$$R_{ij} = \begin{vmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{vmatrix}$$

In equation (3), the weight measure "j" is represented by W_{ij}. The weight-normalized decision matrix (V_{ij}; $i=1,\ldots,m$; $j=1,\ldots,n$) was determined using equation (3) with the elements of the normalized matrix:

$$V_{ij} = W_{ij} * r_{ij}$$

$$i = 1,2,3,\ldots,m \qquad j = 1,2,3,\ldots,n \quad (3)$$

Step 3: Determination of positive and negative-ideal solutions

The value of the positive-ideal solution (A^+) and the negative-ideal solution (A^-) is determined from the value of the weight-normalized matrix (V_{ij}). A^+ is better, and A^- is a worse performance score.

The value of the positive-ideal solution (A^+) and the negative-ideal solution (A^-) is determined as follows (equation (4) and (5) respectively):

$$A^+ = \{v_i^+, \dots, v_n^+\} = \left\{\left(\max_i v_{ij}, j \in j\right)\left(\min_i v_{ij}, j \in j'\right)\right\} \; i = 1,2, \dots, m \tag{4}$$

$$A^- = \{v_i^-, \dots, v_n^-\} = \left\{\left(\min_i v_{ij}, j \in j\right)\left(\max_i v_{ij}, j \in j'\right)\right\} \; i = 1,2, \dots, m \tag{5}$$

where j is related to the benefit criterion, and j′ is related to the cost criterion.

Step 4: Determining special measures (i.e., distance of alternatives from ideal and negative-ideal solution)

The distance from the positive-ideal solution (S_i^+) and the negative-ideal solution (S_i^-) for each alternative according to the given criterion is determined using equations (6) and (7):

$$S_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2} \tag{6}$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2} \tag{7}$$

$i = 1,2,3, \dots, m$ $\qquad$ $j = 1,2,3, \dots, n$

Step 5: Determination of the coefficient of relative closeness to the ideal solution

Separate measures of positive-ideal solution (S_i^+) and negative-ideal solution (S_i^-) were used to determine the relative closeness to the ideal solution (C_i^+) for each decision point. C_i^+ s the relative closeness to the ideal solution and takes a value in the range $0 \le C_i + \le 1$. "C_i^+" $= 1$ shows the relative closeness to the positive-ideal solution."C_i^+" $= 0$ shows relative closeness to the negative-ideal solution.

The relative closeness to the ideal solution (C_i^+; i=1,…,m; $j=1, \dots, n$) was determined using equation (8):

$$C_i^+ = \frac{S_i^-}{S_i^- + S_i^+} \tag{8}$$

$$i = 1,2,3, \dots, m$$

Step 6: Sorting alternatives according to relative superiority

Determining the relative superiority of the score is the achieved company performance. High scores correspond to better performance. The results can be used to determine the company's ranking within the industry (Üçüncü et al., 2018).

Analytical Hierarchy Process (AHP) Method

Considering that in this paper the weighting coefficients of the criteria when applying the TOPSIS method are determined using the AHP method, we will briefly refer to its theoretical and methodological characteristics.

The Analytic Hierarchy Process (AHP) method consists of the following steps (Saaty, 2008):

Step 1: Defining the matrix of comparison pairs

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \quad (9)$$

Step 2: Normalization of the matrix of comparison pairs

$$a_{ij}^{*} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, i, j = 1, \ldots, n \quad (10)$$

Step 3: Determination of relative importance, i.e., vector weights

$$w_i = \frac{\sum_{i=1}^{n} a_{ij}^{*}}{n}, i, j = 1, \ldots, n \quad (11)$$

Consistency index - CI (consistency index) is a measure of the deviation of n from λ_{max} and can be expresesd by the following formula:

$$CI = \frac{\lambda_{max} - n}{n} \quad (12)$$

If CI < 0.1 of the estimated values of the coefficients a_{ij} are consistent, and the deviation of λ_{max} from *n* is negligible. This means, in other words, that the AHP method accepts an inconsistency of less than 10%.

Based on the consistency index, the consistency ratio CR = CI/RI can be calculated, where RI is a random index.

Results and Discussion

In the context of the analysis of the liquidity of the banking sector in Serbia, the most important indicators were taken as criteria. Alternatives are observed years. They, as well as the initial data, are shown in Table 1. (In this paper, all calculations and results are the author's.)

Table 1 - Initial Data

	Liquid assets in the narrower sense in relation to total assets	Liquid assets in the narrower sense in relation to short-term liabilities	Liquid assets in relation to total assets	Liquid assets in relation to short-term liabilities	Deposits in relation to loans (non-monetary sectors)	Foreign currency loans in relation to total loans	Average monthly liquidity indicator	Average monthly narrow liquidity indicator
	C1	C2	C3	C4	C5	C6	C7	C8
A1 2008	47.8	75.7	47.8	75.7	82.7	73.9	1.8	1.2
A2 2009	48.2	73.8	49	75.1	88.3	75.8	1.9	1.2
A3 in 2010	41.8	67.1	43.7	70.1	80.1	76.8	2	1.3
A4 2011	40.3	67.3	42.3	70.6	83.1	69.8	2.2	1.5
A5 in 2012	35.2	58.9	38.9	65	84.9	74.1	2.1	1.6
A6 2013	36.1	58.3	41	66.4	92.3	71.6	2.4	1.8
A7 2014	35.7	56.3	42.2	66.7	95.7	70.1	2.2	1.7
A8 2015	32.5	49.3	40.5	61.3	99.7	72.3	2.1	1.7
A9 2016	30.5	44.3	38.9	56.6	108.1	69.4	2.1	1.7
A10 2017	27.5	39.9	35.1	50.9	106.9	67.5	2	1.7
A11 2018	28	39.6	35.7	50.5	110.6	68.5	2	1.7
A12 in 2019	25.7	36.1	36	50.5	109.2	67.1	2.2	1.8
A13 in 2020	26.7	36.4	37.3	50.9	116.4	64.7	2.2	1.9
A14 in 2021	27.9	36.8	37.7	49.6	119.5	63.2	2.1	1.7
A15 in 2022	24.6	31.9	35	45.4	114.4	66.6	2	1.6

Note: Data for 2022 are shown for the 3rd quarter

Source: National Bank of Serbia

The weighting coefficients of the criteria were determined using the AHP method. Table 2 and Figure 1 show the weighting coefficients of the criteria.

Table 2 - Weight Coefficients of Criteria

$W = \lim_{k\to\infty} \frac{A^k.e}{e^T.A^k.e}$		1	2	3	4	5	6	7	8	WEIGHTS	
		C1	C2	C3	C4	C5	C6	C7	C8		
1	C1	1.00 am	1.00 am	1.50	2.00	1.00 am	2.00	1.50	2.00	**0.1696**	
2	C2	1.00 am	1.00 am	2.00	2.50	2.00	1.00 am	1.00 am	1.00 am	**0.1638**	
3	C3	0.67	0.50	1.00 am	2.00	2.00	2.00	2.00	1.00 am	**0.1500**	
4	C4	0.50	0.40	0.50	1.00 am	2.00	1.00 am	2.00	1.00 am	**0.1081**	
5	C5	1.00 am	0.50	0.50	0.50	1.00 am	1.00 am	1.00 am	1.00 am	**0.0921**	
6	C6	0.50	1.00 am	0.50	1.00 am	1.00 am	1.00 am	2.00	3.00	**0.1306**	
7	C7	0.67	1.00 am	0.50	0.50	1.00 am	0.50	1.00 am	1.50	**0.0928**	
8	C8	0.50	1.00 am	1.00 am	1.00 am	1.00 am	0.33	0.67	1.00 am	**0.0930**	
										1.0000	
										Consistency Ratio	**0,0578**

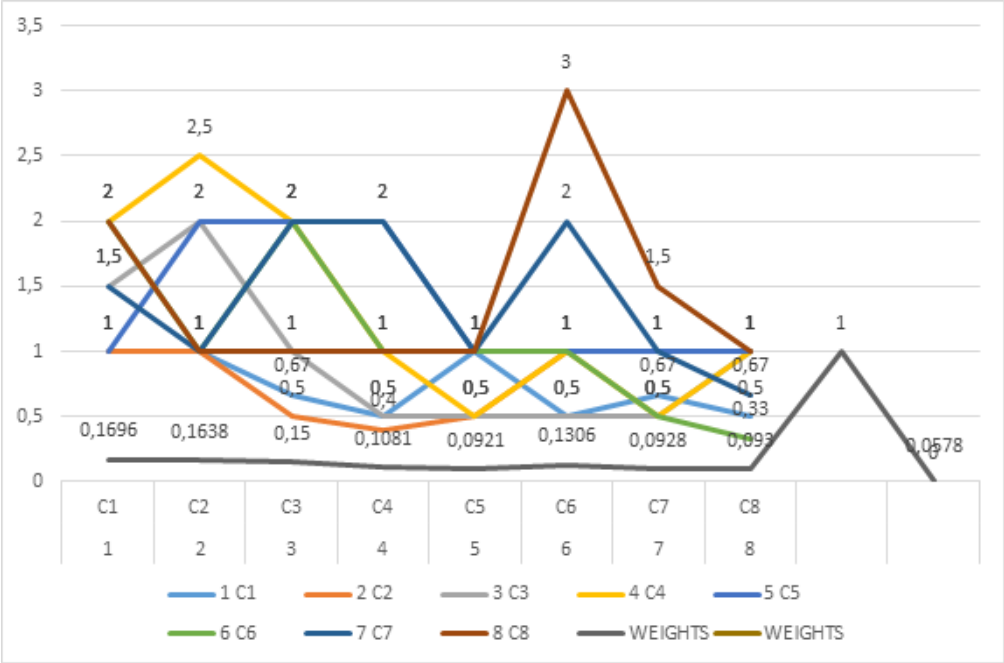

Figure 1 - Weight Coefficients of Criteria

The most important criteria are liquid assets in the narrow sense in relation to total assets, liquid assets in the narrow sense in relation to short-term liabilities, liquid assets in relation to total assets and foreign currency loans in relation to total loans. By adequately managing these indicators, it is possible to achieve the target liquidity of the banking sector in Serbia.

Tables 3 - 6 and Figure 2 show the calculations and results of the TOPSIS method.

Table 3 - Initial Matrix

Weights of criteria	0.1696	0.1638	0.15	0.1081	0.0921	0.1306	0.0928	0.93
Kind of criteria	1	1	1	1	1	1	1	1
INITIAL MATRIX	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
A1	47.8	75.7	47.8	75.7	82.7	73.9	1.8	1.2
A2	48.2	73.8	49	75.1	88.3	75.8	1.9	1.2
A3	41.8	67.1	43.7	70.1	80.1	76.8	2	1.3
A4	40.3	67.3	42.3	70.6	83.1	69.8	2.2	1.5
A5	35.2	58.9	38.9	65	84.9	74.1	2.1	1.6
A6	36.1	58.3	41	66.4	92.3	71.6	2.4	1.8
A7	35.7	56.3	42.2	66.7	95.7	70.1	2.2	1.7
A8	32.5	49.3	40.5	61.3	99.7	72.3	2.1	1.7
A9	30.5	44.3	38.9	56.6	108.1	69.4	2.1	1.7
A10	27.5	39.9	35.1	50.9	106.9	67.5	2	1.7
A11	28	39.6	35.7	50.5	110.6	68.5	2	1.7
A12	25.7	36.1	36	50.5	109.2	67.1	2.2	1.8
A13	26.7	36.4	37.3	50.9	116.4	64.7	2.2	1.9
A14	27.9	36.8	37.7	49.6	119.5	63.2	2.1	1.7
A15	24.6	31.9	35	45.4	114.4	66.6	2	1.6

Information For Normal-ization	Sum of Squares	18079.85	42799.59	24353.41	56116.41	150970.5	73918.96	65.61	39.37
	SQRT	134.4613	206.8806	156.0558	236.8890	388.5492	271.8804	8.1000	6.2746

Table 4 - Normalized Matrix

Weights of criteria	0.1696	0.1638	0.15	0.1081	0.0921	0.1306	0.0928	0.93
Kind of criteria	1	1	1	1	1	1	1	1
NORMALIZED MATRIX	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
A1	0.3555	0.3659	0.3063	0.3196	0.2128	0.2718	0.2222	0.1912
A2	0.3585	0.3567	0.3140	0.3170	0.2273	0.2788	0.2346	0.1912

A3	0.3109	0.3243	0.2800	0.2959	0.2062	0.2825	0.2469	0.2072
A4	0.2997	0.3253	0.2711	0.2980	0.2139	0.2567	0.2716	0.2391
A5	0.2618	0.2847	0.2493	0.2744	0.2185	0.2725	0.2593	0.2550
A6	0.2685	0.2818	0.2627	0.2803	0.2376	0.2634	0.2963	0.2869
A7	0.2655	0.2721	0.2704	0.2816	0.2463	0.2578	0.2716	0.2709
A8	0.2417	0.2383	0.2595	0.2588	0.2566	0.2659	0.2593	0.2709
A9	0.2268	0.2141	0.2493	0.2389	0.2782	0.2553	0.2593	0.2709
A10	0.2045	0.1929	0.2249	0.2149	0.2751	0.2483	0.2469	0.2709
A11	0.2082	0.1914	0.2288	0.2132	0.2846	0.2519	0.2469	0.2709
A12	0.1911	0.1745	0.2307	0.2132	0.2810	0.2468	0.2716	0.2869
A13	0.1986	0.1759	0.2390	0.2149	0.2996	0.2380	0.2716	0.3028
A14	0.2075	0.1779	0.2416	0.2094	0.3076	0.2325	0.2593	0.2709
A15	0.1830	0.1542	0.2243	0.1917	0.2944	0.2450	0.2469	0.2550

Table 5 - Normalized Weight Matrix

NORMALIZED WEIGHTED MATRIX								
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
A1	0.0603	0.0599	0.0459	0.0345	0.0196	0.0355	0.0206	0.1779
A2	0.0608	0.0584	0.0471	0.0343	0.0209	0.0364	0.0218	0.1779
A3	0.0527	0.0531	0.0420	0.0320	0.0190	0.0369	0.0229	0.1927
A4	0.0508	0.0533	0.0407	0.0322	0.0197	0.0335	0.0252	0.2223
A5	0.0444	0.0466	0.0374	0.0297	0.0201	0.0356	0.0241	0.2371
A6	0.0455	0.0462	0.0394	0.0303	0.0219	0.0344	0.0275	0.2668
A7	0.0450	0.0446	0.0406	0.0304	0.0227	0.0337	0.0252	0.2520
A8	0.0410	0.0390	0.0389	0.0280	0.0236	0.0347	0.0241	0.2520
A9	0.0385	0.0351	0.0374	0.0258	0.0256	0.0333	0.0241	0.2520
A10	0.0347	0.0316	0.0337	0.0232	0.0253	0.0324	0.0229	0.2520
A11	0.0353	0.0314	0.0343	0.0230	0.0262	0.0329	0.0229	0.2520
A12	0.0324	0.0286	0.0346	0.0230	0.0259	0.0322	0.0252	0.2668
A13	0.0337	0.0288	0.0359	0.0232	0.0276	0.0311	0.0252	0.2816
A14	0.0352	0.0291	0.0362	0.0226	0.0283	0.0304	0.0241	0.2520
A15	0.0310	0.0253	0.0336	0.0207	0.0271	0.0320	0.0229	0.2371

MIN	0.0310	0.0253	0.0336	0.0207	0.0190	0.0304	0.0206	0.1779
MAX	0.0608	0.0599	0.0471	0.0345	0.0283	0.0369	0.0275	0.2816
A+	0.0608	0.0599	0.0471	0.0345	0.0283	0.0369	0.0275	0.2816
A-	0.0310	0.0253	0.0336	0.0207	0.0190	0.0304	0.0206	0.1779

Table 6 - Results of the TOPSIS Method

	Alternatives	Si+	Si-	Ci	Ci	Ranking
2008	**A1**	0.1044	0.0493	0.3207	0.321	13
2009	**A2**	0.1042	0.0489	0.3195	0.320	14
2010	**A3**	0.0903	0.0414	0.3141	0.314	15
2011	**A4**	0.0616	0.0580	0.4850	0.485	11
2012	**A5**	0.0512	0.0655	0.5611	0.561	10
2013	**A6**	0.0277	0.0936	0.7716	0.772	1
2014	**A7**	0.0383	0.0791	0.6734	0.673	3
2015	**A8**	0.0431	0.0769	0.6409	0.641	5
2016	**A9**	0.0469	0.0758	0.6180	0.618	6
2017	**A10**	0.0522	0.0748	0.5893	0.589	8
2018	**A11**	0.0518	0.0750	0.5914	0.591	7
2019	**A12**	0.0483	0.0894	0.6495	0.650	4
2020	**A13**	0.0447	0.1044	0.7001	0.700	2
2021	**A14**	0.0529	0.0751	0.5866	0.587	9
2022	**A15**	0.0670	0.0599	0.4722	0.472	12

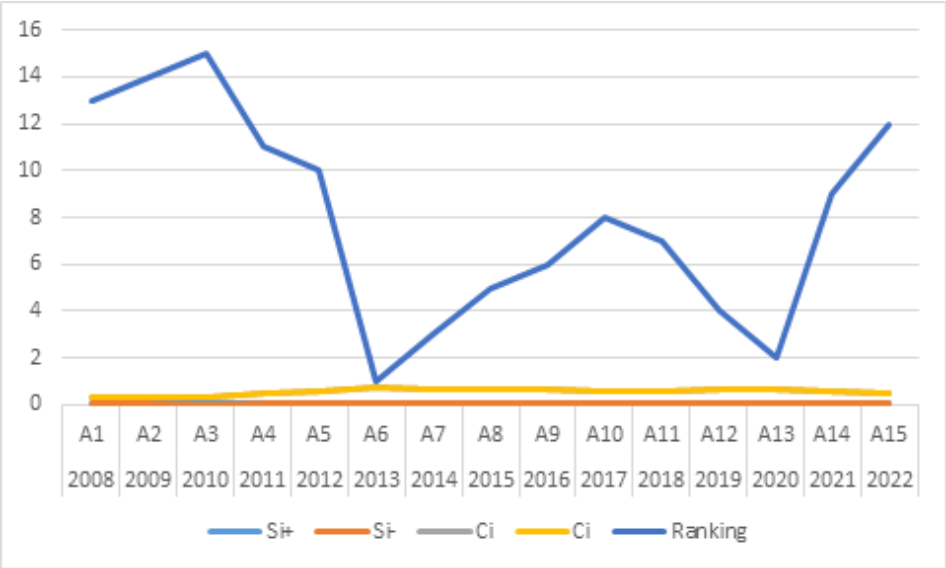

Figure 2 - Ranking of Alternatives

Therefore, the results of the TOPSIS method show that the top five years in terms of liquidity of the banking sector in Serbia in the observed period 2008 - 2022 fall in the following order: 2013, 2020, 2014, 2019 and 2015. The worst liquidity of the banking sector in Serbia in the observed period was in 2010. Lately, it can be said that the liquidity of the banking sector in Serbia has slightly increased.

Liquidity factors of the banking sector in Serbia in macro and micro nature. These are: economic climate, interest rate, inflation, exchange rate, economic activity, asset and liability management, net working capital management, risk management and others. With their adequate control, the target liquidity of the banking sector in Serbia can be achieved.

Conclusion

The obtained results of the TOPSIS method show that the top five years in terms of liquidity of the banking sector in Serbia in the observed period 2008 - 2022 are in order: 2013, 2020, 2014, 2019 and 2015. The worst liquidity of the banking sector in Serbia was in 2010. Lately, the liquidity of the banking sector in Serbia has slightly increased.

Determinants of this are: economic climate, interest rate, inflation, exchange rate, economic activity, asset and liability management, net working capital management, risk management and others. With their adequate control, the target liquidity of the banking sector can be achieved.

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DETERMINANTE DEVIZNIH REZERVI I OPTIMALNI NIVO DEVIZNIH REZERVI U BOSNI I HERCEGOVINI

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Rezime: Istraživanje je dalo odgovor na pitanje šta utiče na bosanskohercegovačke devizne rezerve i koja je donja granica optimalnog nivoa deviznih rezervi Centralne banke Bosne i Hercegovine (CBBH). Višak deviznih rezervi smo definisali kao razliku između stanja deviznih rezervi i donje granice optimalnog nivoa deviznih rezervi. Devizne rezerve su u najvećem dijelu analiziranog perioda značajno iznad donje granice optimalnog nivoa deviznih rezervi. U 2022. godini u scenariju varijabilnog deviznog kursa bez uzimanja u obzir stepena evrizacije bh. bankarskog sektora višak deviznih rezervi je najveći. Višak je najniži u režimu fiksnog deviznog kursa u kojem smo preko novčane mase dopustili visok uticaj evrizacije na optimalne devizne rezerve. Čak i u ovome najkonzervativnijem scenariju višak deviznih rezervi je 1,9 mlrd. KM ili oko 4% nominalnog GDP iz 2022. godine. Izmjene u bh. monetarnom režimu, dopuštanje CBBH da kreditira rezidente i eventualni prelaz na varijabilni devizni kursa, moguće je izvršiti uz zadržavanje zadovoljavajućeg nivoa devizne likvidnosti CBBH.

Ključne reči: politika deviznih rezervi, monetarna politika, valutni odbor, varijabilni devizni kurs

JEL klasifikacija: E52, F31

Uvod

Nakon što je dokazano da Centralna banke Bosne i Hercegovine (CBBH), iako funkcioniše na principima valutnog odbora, ipak vodi diskrecionu monetarnu politiku (Jović, 2020), pri čemu se poslovni ciklus u Bosni i Hercegovini (BH) razlikuje od poslovnog ciklusa u području rezervne valute - zoni evra (Jović, 2021), nastavljamo istraživanja na temu nužnosti transformacije bosanskohercegovačkog monetarnog režima.

Devizne rezerve, služeći kao pokriće za uvoz robe i izmirenje obaveza po ino dugovima, obavljaju funkciju čuvara devizne likvidnosti ekonomskog sistema. Potreba utvrđivanja optimalnog nivoa deviznih rezervi proizilazi iz toga što pored koristi od držanja deviznih rezervi, postoje i troškovi držanja deviznih rezervi. Predmet istraživanja su bosanskohercegovačke devizne rezerve, a cilj nam je da utvrdimo njihov optimalni nivo ili nivo prema kome bi one trebale konvergirati, s obzirom na karakteristike bosanskohercegovačkog ekonomskog sistema.

Mi pretpostavljamo, to je naša radna hipoteza, da su devizne rezerve Centralne banke Bosne i Hercegovine (CBBH), iznad optimalnog nivoa koji je potreban sa aspekta deviznih obaveza bh. nebankarskog i bankarskog sektora. Sa aspekta valutnog odbora, ovakva hipoteza dovodi u sumnju potrebu pune pokrivenosti monetarne pasive sa neto deviznom aktivom, tj. održavanje koeficijenta pokrića monetarne pasive iznad jedan.

U prvom dijelu rada dajemo prikaz razvoja ideje potrebnih ili optimalnih deviznih rezervi u formi kratkog pregleda teorijskih stavova na tu temu i empirijskih istraživanja ovoga problema. Način dokazivanja hipoteze istraživanja i korišćene baze podataka objašnjeni su u metodologiji istraživanja, na koju se nadovezuje prezentovanje rezultata istraživanja i polemika na temu dobijenih rezultata. Glavni metodološki alati istraživanja su višestruki regresioni modeli i metode određivanja adekvatnih rezervi (IMF, 2015). U završnim dijelovima istraživanja razmatramo još jednom dobijene zaključke istraživanja i izvlačimo preporuke za donosioce ekonomskih odluka i za buduća istraživanja na ovu temu.

Literarni pregled

Tradicionalni načini mjerenja prikladnog nivoa deviznih rezervi i odatle njihovih determinanti sljede vrlo jednostavno, linearno i logično pravilo. Zahtjev za tromjesečno pokriće uvoza deviznim rezervama (Krušković, 2014) je među prvim pravilima te vrste (IMF, 2011), kao i prijedog da devizne rezerve budu minimalno jednake kratkoročnom dijelu spoljnog duga. Ovi prijedlozi su nastali u miljeu direktnih ili indirektnih predstavnika zemalja izvoznica kapitala koje su bile zainteresovane prije svega da kroz veličinu deviznih rezervi obezbjede da zemlja dužnik ima dovoljno deviznih resursa za plaćanje njihovih potraživanja. Varijable koje determinišu pokrivenost uvoza deviznim rezervama su stopa rasta realnog GDP, devizni kurs, oportunitetni troškovi držanja deviznih rezervi i vještačka varijabla, koja razdvaja period prije i poslije azijske krize (Hakim, 2013). Od ranih 90-ih dolazi do brzog rasta deviznih rezervi (Rodrik, 2006) i njihovo učešće se povećava na 30% GDP i 8 mjeseci uvoza.

Najsadržajniji pregled determinanti deviznih rezervi zajedno sa njihovom evolucijom pronašli smo u jednom istraživanju Banke za međunarodno poravnanje (Cantu & Yavuz, 2019). Sve do 2000-ih, predostrožnost, u vezi sa deficitom tekućeg računa, veličinom finansijskog sektora i finansijskom otvorenošću, bila je glavna determinanta deviznih rezervi. Veličina deficita tekućeg računa i veličina finansijskog sektora su u direktnoj korelaciji sa veličinom deviznih rezervi. Finansijska otvorenost je statistički signifikantan faktor deviznih rezervi, osim u slučaju razvijenih evropskih zemalja i zemalja izvoznica nafte gdje je uspostavljena inverzna, ali statistički neznačajna veza. Kasnije se glavni motivi držanja deviznih rezervi prenose na varijable koje se tiču deviznog kursa, prije svega njegove stabilnosti i stepena njegove precijenjenosti. Politika monetarnog sidra, koja se najčešće vodi u okviru precijenjenog kursa, zahtjeva viši nivo deviznih rezervi za odbranu ciljanog deviznog kursa. Treća grupa varijabli koja utiče na devizne rezerve tiče se veličine ekonomskog sistema. Veća populacija očekivano vodi ka većim deviznim rezervama, mada ta veza nije jaka u azijskim zemljama i generalno u periodu prije globalne finansijske krize (2007 – 2009). Glavne determinante druge najveće svjetske ekonomije Kine, su promijene u uvozu i kratkoročnom dugu (Misztal, 2021). Istraživanje je pronašlo da je nivo kineskih deviznih rezervi iznad optimalnog nivoa mjereno metodologijom koju je razvio MMF. Ova međunarodna ustanova je u zadnjih četvrt stoljeća nekoliko puta razvijala i unapređivala metodologiju za određivanje optimalnih deviznih rezervi. Odmah u početku, (IMF, 2001) su preovladavali stavovi da stara pravila prsta (poput tri mjeseca pokrivenosti uvoza sa deviznim rezervama) moraju biti odbačena u korist kratkoročnog spoljnog duga, očekivanog odliva kapitala, režima deviznog kursa i razlike u kamatnim stopama. Taj prijedlog se zasniva na podijeli indikatora optimalnog nivoa deviznih rezervi na: indikatore inostranog duga, indikatore trgovine, indikatore novca i makroindikatore (Krušković, 2014, str. 73). Kasnije preporuke (IMF, 2011) (IMF, 2013) (IMF, 2015) išle su u pravcu testiranja i određivanja varijabli i njihovog uticaja (pondera) na nivo deviznih rezervi. Kao najpouzdanije determinante optimalnog nivoa deviznih rezervi izolovani su kratkoročni spoljni dug, ostale obaveze prema nerezidentima, novac u širem smislu (M2) i izvoz (više o ovome u metodološkoj osnovi rada). Istraživanja koja su se bavila deviznim rezervama Bosne i Hercegovine, tj. centralne banke Bosne i Hercegovine, vrlo su rijetka, a u jednom od njih (Šoja & Galijašević, 2017) je istraživan optimalni nivo deviznih rezervi (2005 – 2015), i njihova otpornost na ekstremni interni i eksterni šok. Zaključeno je da je nivo deviznih rezervi iznad optimalnog nivoa, ali da u slučaju ekstremnog šoka devizne rezerve ne bi bile dovoljne.

Metodologija i podaci

MMF je u više navrata predlagao i analizirao načine izračunavanja potrebnog nivoa deviznih rezervi određenih na bazi determinanti deviznih rezervi. U jednom od posljednjih istraživanja ove vrste (IMF, Assessing Reserve Adequacy – Specific Proposal, 2015) za ključne varijable, kratkoročni spoljni dug, ostale obaveze (spoljni dug sa dospjećem iznad godinu dana i akcijski kapital u vlasništvu nerezidenata), M2 i izvoz, predloženi su konačni ponderi zavisno od toga da li je ekonomski sistem u režimu fiksnog ili varijabilnog deviznog kursa i da li je implementirana kontrola kretanja kapitala. Ponderi za ove varijable su generalne prirode i ne moraju odgovarati svakoj zemlji pojedinačno, pa je zato bilo nužno da se upotrebljivost predloženih varijabli za određivanje potrebnog nivoa deviznih rezervi provjeri u slučaj Bosne i Hercegovine.

Vezu između bh. deviznih rezervi sa jedne strane i predloženih varijabli sa druge strane, uključujući i ostale portfolio obaveze i ostale investicije, ocijenili smo i testirali primjenom višestrukog lineranog regresionog modela sa varijablama godišnje i kvartalne frekvencije, kao i pomoću Grejndžerovog testa (Granger test), u kojem je nulta hipoteza predstavljena kao tvrdnja da između varijabli nema kauzaliteta. Vezu između deviznih rezervi i kratkoročnog duga smo dokazivali kvantitativnim i kvalitativnim metodama. U ocijeni deviznih rezervi MMF je ponudio četiri varijable kao glavne determinante deviznih rezervi, koji mogu, ali ne moraju odgovarati tražnji za deviznim rezervama u svakoj zemlji, a pogotovo ne moraju odgovarati optimalnom nivou deviznih rezervi u BH koja funkcioniše kao valutni odbor bez funkcije ustanove krajnjeg utočišta (eng. lender of last resort). U prvom istraživanju IMF 2011, ponderi za kratkoročni dug, ostale portfolio investicije, M2 i izvoz za zemlje sa kontrolom kretanja kapitala bili su 30%, 15%, 10% i 10%, a za varijabilni devizni kurs za iste varijable određeni su ponderi 30%, 15%, 5% i 5%. U pomenutom istraživanju MMF-a predlaže se da se ostale portfolio obaveze zamjene sa ostalim obavezama, a ukazuje se i na veliki uticaj dolarizacije na izbijanje bankarskih kriza i potrebu korigovanja pondera u visoko dolarizovanim ili visoko evrizovanim ekonomijama. Krenuvši od prvobitno preporučenog modela za zemlje sa fiksnim deviznim kursem i bez kontrole kretanja kapitala odredili smo optimalne devizne rezerve (OR) na još tri načina.

Da bismo ocijenili nivo ka kojem bi trebale konvergirati devizne rezerve Bosne i Hercegovine konstruisali smo četiri modela (Tabela 1). Prvi model (ARA I) na osnovu preporuke MMF-a (IMF, 2015, str. 19) za zemlje sa fiksnim deviznim kursom i bez kontrole kretanja kapitala donja granica optimalnih deviznih rezervi se određuje kao zbir ponderisanog iznosa (stranog) kratkoročnog duga, ostalih obaveza, novca u širem smislu (M2) i izvoza, sa preporučenim ponderima od 30%, 20%, 10% i 10% respektivno. Drugi model (ARA II), formiran takođe na bazi IMF, 2015, zadržava pondere za kratkoročni dug (30%) i ostale obaveze (15%), dok ponder za M2 udvostručavamo (20%) zbog visokog stepena evrizacije bh. bankarskih pasiva, a ponder za izvoz (10%) ostaje isti. Uvažavajući visok stepen evrizacije bankarskog sektora BH, u kojem eurski depoziti stanovništva čine 48% ukupnih depozita stanovništa, kao i činjenicu da CBBH nema ugovorenu kreditnu liniju sa ECB, uvećali smo ponder za M2 za duplo, a ostale pondere ostavili na istom nivou i tako formirali drugi model, koji se takođe odnosi na režim fiksnog deviznog kursa, bez kontrole kretanja kapitala. Ova dva modela podrazumijevaju zadržavanje postojećeg monetarnog režima (fiksni devizni kurs, odsustvo LOLR i automatska kupoprodaja konvertibilne marke), dok druga dva modela podrazumijevaju prelazak na varijabilni devizni kurs i pojavljivanje CBBH kao povjerioca (kreditora) bh. rezidenata. Treći (ARA III) i četvrti (ARA IV) model određuju optimalan nivo deviznih rezervi u slučaju da CBBH pređe na režim varijabilnog deviznog kursa, bez kontrole kretanja kapitala. U ARA III su unijeti prijedlozi MMF-a (IMF, 2015, str. 19) po kojem su ponderi u režimu varijabilnog deviznog kursa za kratkoročne obaveze, ostale obaveze, M2 i izvoz 30%, 15%, 5% i 5% respektivno. U zadnjem modelu, ARA IV, koji takođe polazi od varijabilnog deviznog kursa, zadržali smo pondere za kratkoročni dug i ostale obaveze (30% i 15%), a zbog visoke evrizacije i ovisnosti od uvoza (i visokog i hroničnog spoljnotrgovinskog deficita), čija je aproksimacija izvoz, učetvorostručili smo ponder za M2 i postavili ga na 20% (po uzoru na ARA II) i udvostručili ponder za izvoz u odnosu na ARA III (10%). Pondere za kratkoročni dug i ostale obaveze nismo mijenjali jer varijabilni devizni kurs omogućava fleksibilno upravljanje javnim dugom, a pretpostavili smo da se kroz kroz kreditiranje u domaćoj valuti od strane CBBH dodatni dio deviznih rezervi može iskoristiti za otplatu spoljnjeg duga.

Tabela 1 - Modeli za ocijenu donje granice optimalnog nivoa deviznih rezervi

	Ponderi				Devizni kurs
	Kratkoročni dug	Ostale obaveze	M2	Izvoz	
ARA I	30%	20%	10%	10%	Fiksni
ARA II	30%	20%	20%	10%	Fiksni
ARA III	30%	15%	5%	5%	Varijabilni
ARA IV	30%	15%	20%	10%	Varijabilni

Izvor: IMF i Autor, zatamnjeno su označeni ponderi koji su izmjenjeni u odnosu na inicijalni prijedlog MMF-a

Skraćenice korišćene u radu su: A – godišnji nivo, ARA - ocijena adekvatnog nivoa deviznih rezervi (eng. assessing reserve adequacy), BH – Bosna i Hercegovina, bh. – bosanskohercegovački, Centralna banka BH – CBBH, C – konstanta u regresionom modelu, D – prva diferencija, DIR– razlika u stranoj i bh. kamatnoj stopi, E – izvoz, FTP – bh. spoljnotrgovinski partneri (eng. foreing trade partners), GDP – bruto domaći proizvod, I – import, LOLR – institucija posljednjeg utočišta (eng. lender of last resort), M2 - novac u širem smislu (novac izvan banaka, depoziti po viđenju i oročeni depoziti), OI – ostale portfolio investicije, OL - ostale obaveze (eng. other liabilities), OR– optimalne devizne rezerve (eng. optimal reserves), PI - portfolio investicije, Q – kvartalni nivo, REER – realni efektivni devizni kurs, R – devizne rezerve, RM – regresioni model, VOL – volatilnost (standardna devijacija).

Rezultati i diskusija

Pretpostavku o uticaju bh. kratkoročnog stranog duga na devizne rezerve i njihov optimalni nivo ne izvodimo pomoću modela, već iz stručnih prijedloga, koji su dio prakse MMF-a u optimizaciji deviznih rezervi. Italijanski ministar finansija Guidotti je predložio da devizne rezerve trebaju odgovarati jednogodišnjim obavezama po spoljnjem dugu, tj. kratkoročnom dijelu spoljnog duga. Kasnije je ovaj prijedlog dopunio i razradio bivši guverner Federalnih rezervi Alan Greenspan, pa je ovaj pristup određivanju optimalnih rezervi nazvan pravilo Greenspan-Guidotti (IMF, 2011, p. 13).

Zbog načina na koji funkcioniše bh. valutni odbor veza između deviznih rezervi i novčane mase je u nivou i u prvoj diferenciji vrlo jaka, skoro savršena (Tabela 2 i Tabela 3). Kako bh. emisiona banka emituje bh. novac, konvertibilnu marku, samo kroz otkup deviza od banaka primarni novac (monetarna baza) se povećava samo kroz rast deviznih rezervi. Rast likvidnosti u domaćoj valuti povećava kreditni potencijal banaka i svaka promjena u kreditima, kroz proces kreditno depozitne multiplikacije, vodi ka promjenama u novčanoj masi iz čega se izvodi veza između deviznih rezervi i monetarnog agregat M2. Uticaj ide i u suprotnom smjeru jer rast primarnih depozita (polog gotovog novca) i sekundarnih depozita (koji nastaju odobravanjem kredita) povećava direktno tražnju za devizama nebankarskih sektora i indirektno tražnju za deviznim rezervama.

Tabela 2 - Elastičnost deviznih rezervi (R/GDP) u odnosu na novčanu masu u širem smislu (M2/GDP) u nivou, 2000 – 2022. (RM 1)

	Koeficijent	Standardna greška	T-statistika	Vjerovatnoća
C (Konstanta)	0,12	0,016	0,74	0,46
M2/GDP	0,467	0,026	17,45	0,00

Izvor: Autor

Dvosmjerni kauzalitet pokazuje i Grejndžerov test uzročnosti, koji nije moguće odbaciti, za nulte hipoteze da devizne rezerve ne utiču na M2, te da novčana masa ne utiče na devizne rezerve. Vjerovatnoće za dobijenu vrijednost F statistike (3 i 2) su 0,08 i 0,17 za pretpostavku da devizne rezerve ne utiču na novčanu masu, odnosno da novčana masa ne utiče na devizne rezerve. S obzirom da je vrijednost Durbin-Votsonove statistike značajno ispod dva (0,91), što ukazuje na pozitivnu autokorelaciju i potencijalno besmislenu regresiju (eng.spurious regression), iako je uspostavljena veza u skladu sa načinom rada valutnog odbora, razvili smo i jednačine sa stacionarnim varijablama, preko određivanja prve razlike u nivou. Jednačina sa varijablama bez jediničnog korijena I(1) ne pokazuje postojanje autokorelacije (vrijednost Durbin-Votsonove statistike blizu dva), a regresor uz novčanu masu je signifikantan na nivou ispod 1%. Grejndžerov test, u oba slučaja, daje vjerovatnoću za dobijenu F statistiku (0,28 i 0,15) čime je ponovo potvrđen dvosmjerni kauzalitet između varijabli. Prema modelu u prvoj diferenciji prirast novčane mase za 1% u odnosu na GDP povećava devizne rezerve za 0,76% u odnosu na GDP.

Tabela 3 - Devizne rezerve vs. M2, prva diferencija, 2000 – 2022. (RM 2)

Varijabla	Koeficijent	Standardna greška	T-statistika	Vjerovatnoća
C	-0,0057	0,0027	-2,091945	0,0494
D_M2/GDP	0,7646	0,0498	15,33440	0,0000

Izvor: Autor

Statistički signifikantan i visok uticaj novca na devizne rezerve izolovan je i na podacima sa kvartalnom frekvencijom (Tabela 4). Povećanje M2 za 1% GDP vodi ka povećanju deviznih rezervi od 0,49% GDP. Uticaj varijabiliteta (volatilnosti) u REER i GDP najznačajnijih trgovinskih partnera, kao i kamatne diferencije na devizne rezerve je takođe statistički signifikantna i očekivanog znaka, ali je izuzetno niskog intenziteta. Između portfolio investicija (PI/GDP) i deviznih rezervi, nije uspostavljena statistički jaka veza, a međuzavisnost između uvoza i deviznih rezervi je ne samo izrazito signifikantna (na nivou od 1%), već je i izuzetno intenzivna, čak i veća od uticaja M2 na devizne rezerve. Pozitivna korelacija između uvoza i deviznih rezervi samo je djelimično nelogična, jer visok odnos uvoza i deviznih rezervi reflektuje otvorenost privrede (Beaufort & Kapteyen, 2001) i zato se može očekivati čak i pozitivan uticaj rasta uvoza na devizne rezerve (Cooper, 1968) iako se u klasičnim modelima uvijek identifikuje negativna veza (Heller, 1966).

Tabela 4 - Uticaj odabranih varijabli i M2 na devizne rezerve CBBH, 2005 – 2022. godina (RM3)

	RM 3	RM 4
C	-0,56 (-4,44) ***	-0,64 (-4,9)***
I/ GDP (-1)	0,78 (3,96) ***	0,934 (4,5)***

M2/GDP	0,49 (22,81) ***	0,49 (23,5)***
PI/GDP	1,38 (1,55)	
REER_volatilnost	0,05 (3,32)***	0,05 (3,25)***
STP_GDP_volatilnost	0,02 (4,42) ***	0,018 (3,86)***
DIR	-0,08 (-4,16) ***	-0,075 (-4,27)***
Vještačka varijabla za krizu (-1)		0,07 (2,39)**
R2	0,97	0,93

Izvor: Autor

Napomena: Devizne rezerve su predstavljene kao odnos deviznih rezervi i GDP. U zagradi je t statistika. *** signifikantno na nivou od 1%, ** signifikantno na nivou od 5%, * signifikantno na nivou od 10%.

U ARA modelima po metodologiji MMF-a ne postoji varijabla uvoz, a jedan dio uvoza se uvijek koristi za proizvodnju izvoznih proizvoda, pa izvoz može biti dobra aproksimacija uvozne tražnje za deviznim rezervama. Razvijeni regresioni modeli, sa izvozom, ili varijabilitetom izvoza kao nezavisno promjenljivim varijablama u jednačini deviznih rezervi potvrđuju ispravnost ovakvog načina ekonomskog rezonovanja (Tabela 5). Varijable vezane za izvoz u svim jednačinama imaju očekivani pozitivni znak, odnosno negativni znak ako se radi o varijabilitetu izvoza i statistički su signifikante na nivou ispod 1%. Uticaj izvoza na devizne rezerve visok je bez obzir da li se ova varijabla uvodi u model sa, ili bez vremenskog pomaka. Povećanje izvoza i M2 vode ka relativnom rastu deviznih rezervi u odnosu na GDP, pod uslovom da je sve ostalo jednako (RM 4, RM 5 i RM 6). U jednačinama sa izvozom su i sve ostale varijable statistički signifikantne osim portfolio investicija i zato smo ih zamijenili sa ostalim investicijama iz platnog bilansa.

Tabela 5 - Uticaj odabranih varijabli i izvoza na devizne rezerve CBBH, 2005 – 2022. god.

	RM 5	RM 6	RM 7
C	-0,21 (-2,70) ***	-0,26 (-3,27)***	-0,29 (-3,54)***
E/GDP	0,56 (2,20)**		
E/GDP(-1)		0,75 (2,83)***	0,89 (3,25)***
M2/GDP	0,44 (15,48) ***	0,43 (15,10) ***	0,43 (15,02)
REER_VOL	0,06 (3,86) ***	0,76 (0,82) ***	0,07 (4,41)***
PI/GDP		0,07 (4,28)	
STP_VOL_A	0,02 (3,43) ***	0,02 (3,84) ***	0,02 (3,50)***

DIR	-0,07 (-3,37) ***	-0,06 (-3,35) ***	-0,06 (-3,36)***
Kriza (-1)			0,05 (1,15)
R^2	0,91		

Izvor: Ibid

Ostale portfolio investicije (OI) su predložene (IMF, 2015) kao bitna varijabla za tražnju i nivo deviznih rezervi (Tabela 6). Očekivano, njihov uticaj na devizne rezerve je pozitivan i uz to statistički značajan (RM 8 i RM 9). Rast prve diferencije u ostalim investicijama u odnosu na GDP za 1.p.p. povećava devizne rezerve (razliku u količniku deviznih rezervi i GDP) za 0,47 p.p.

Tabela 6 - Uticaj odabranih varijabli i ostalih portfolio investicija na devizne rezerve CBBH, 2016 – 2022. god.

	RM 8	RM 9
C	-0,34 (-2,10)**	-0,12 (-1,39)*
E/GDP	0,48 (2,13) **	0,22 (1,40)
D_M2/GDP	0,48 (17,17)***	0,45 (16,26)***
D_OI/GDP	0,47 (5,14) ***	0,42 (4,41)***
D_REER_VOL	0,03 (1,79)*	
STP_VOL_A	0,01 (2,33) **	0,004 (1,9)*
DIR	-0,04 (-1,69) *	-0,04 (-1,97)**
I_VOL_Q	0,01 (1,68)*	
R^2	0,94	0,93

Izvor: Ibid

U IMF 2015, preporučeno je da se umjesto ostalih portfolio investicija, u određivanju optimalnog nivoa deviznih rezervi, koriste ostale obaveze prema nerezidentima. Grejndžerov test, kao i u slučaju odnosa deviznih rezervi i novčane mase, ne pruža moćnost odbacivanja nulte hipoteze o nepostojanju obostranog uticaja između deviznih rezervi i ostalih obaveza na nivou signifikantnosti od 5%, osim u jednom slučaju.

Za varijable u nivou (R - devizne rezerve, OL – ostale obaveze) za nultu hipotezu, da devizne rezerve ne utiču na ostale obaveze, F statistika testa je 0,21, vjerovatnoća 0,81 čime se demonstrira dvosmjerna veza između varijabli (Tabela 7). Kao što je i očekivano, sa visokim stepenom pouzdanosti (F statistika 2,54, a vjerovatnoća 12%) nije moguće odbaciti nultu hipotezu da ostale obaveze ne utiču na nivo deviznih rezervi. Relativni nivo deviznih rezervi (R/GDP) utiče na ostale obaveze (OL/GDP), ali kod ovako definisanih varijabli, kao što smo prethodno naveli, izostaje uticaj ostalih obaveza na devizne rezerve. Mogući razlog je što ostale obaveze pored srednjoročnog i dugoročnog duga prema nerezidentima sadrži i akcijske udjele nerezidenata u bh. akcionarskim društvima.

Taj kapital, kao kvazi obaveza prema nerezidentima, u BH zbog niske likvidnosti finansijskih tržišta u BH uopšte nije pokretljiv. Zato bi niska mobilnost dioničkog kapitala u ovakvoj vrsti specifikacije Grejndžerov testa mogla objasniti odsustvo uticaja ostalih obaveza prema nerezidentima na devizne rezerve. S druge strane varijable u prvoj diferenciji ponovo potvrđuju dvosmjerni kauzalitet između deviznih rezervi, jer sa visokim stepenom pouzdanosti nije moguće odbaciti nultu hipotezu po kojoj ostale obaveze ne utiču na devizne rezerve (Tabela 8). Iz ovih razloga, iako je akcijski kapital u BH niskog stepena mobilnosti, a finansijsko tržište plitko, ostale obaveze prema nerezidentima smo zadržali u modelima za ocjenu optimalnog nivoa deviznih rezervi.

Tabela 7 - Međuzavisnost između deviznih rezervi (R) i ostalih obaveza prema nerezidentima u nivou (OL), Grejndžerov test

Nulta hipoteza	Broj opservacija	F statistika	Vjerovatnoća
R ne utiču na OL	17	0,21409	0,8103
OL ne utiču na R		2,54967	0,1195
R/GDP ne utiču na OL/GDP		2,38698	0,1341
OL/GDP ne utiču na R/GDP	17	5,64964	0,0187

Izvor: Ibid

Tabela 8 - Međuzavisnost između deviznih rezervi (R) i ostalih obaveza prema nerezidentima u prvoj diferenciji (OL), Grejndžerov test

Nulta hipoteza	Broj opservacija	F statistika	Vjerovatnoća
D_R utiče D_OL		1,2002	0,3377
D_OL ne utiče na D_R	16	1,1856	0,3418
D_R/GDP ne utiče na D_OL/GDP		1,73106	0,222
D_OL/GDP ne utiče na D_R/GDP	16	1,64836	0,2365

Izvor: Ibid

OR dobijene na osnovu četiri ARA modela imaju istu dinamiku, ali i značajnu razliku u nivou optimalnih deviznih rezervi zbog različitih pondera za četiri ključne varijable (Tabela 9). U prosjeku, u periodu 2016 – 2022. god. OR variraju u intervalu od 7,6 mlrd. KM do 14,1 mlrd. KM sa značajnim odstupanjima između modela. Najviši nivo OR (14,1 mlrd. KM) daje model ARA II koji pretpostavlja djelovanje CBBH u režimu fiksnog deviznog kursa i višeg nivoa evrizacije pasiva bh. banaka koji je predstavljen kroz dvostruko veći ponder za novac u odnosu na inicijalnu pretpostavku MMF-a (ARA I). Fleksibilna monetarna politika predstavljena ne samo kroz varijabilni devizni kurs, već i mogućnost pozajmljivanja novca bh. rezidentima od strane CBBH (ova aktivnost je u postojećem modelu valutnog odbora zabranjena) OR spušta na najniži nivo, koji je na kraju 2022. godine 7,6 milijardi KM (ARA III). Između ove dvije krajnosti nalaze se OR u režimu fiksnog deviznog kursa i početno predloženih pondera za M2 i izvoz od 10% (ARA I).

Ekstremna varijanta varijabilnog deviznog kursa (ARA IV) sa značajno uvećanim ponderima i za M2 (učetvorostručen) i za izvoz (udvostručen ponder) se po nivou OR približava modelu sa fiksnim deviznim kursem u kojem je stavljen naglasak na evrizaciju (ARA II). U svim modelima tokom 2013. i 2017. godine zbog uvećanja M2 OR bilježe ekscesivan rast. Najveći doprinos rastu OR u 2020. godini i pored M2 daju ostale obaveze, a u 2021. godini OR su pod uticajem rasta izvoza.

Tabela 9 - Optimalne devizne rezerve CBBH (u mlrd. KM)

	2016.	2017.	2018.	2019.	2020.	2021.	2022.
ARA I	7,4	7,6	8,3	8,6	8,4	9,8	10,8
ARA II	9,4	9,8	10,7	11,2	11,2	13,0	14,1
ARA III	5,2	5,3	5,9	6,1	5,9	6,8	7,6
ARA IV	8,8	9,2	10,2	10,7	10,7	12,4	13,5
Prosjek	7,7	8,0	8,8	9,1	9,1	10,5	11,5

Izvor: Autor

Dobijeni rezultati se naravno odražavaju na višak deviznih rezervi koje CBBH drži iznad optimalnog nivoa deviznih rezervi. Višak je u prosjeku od 2016. do 2022. god. padao u interval od 1,8 mlrd. KM do 5,8 mlrd. KM (Tabela 10). Najviši višak deviznih rezervi ima monetarni režim sa varijabilnim deviznim kursem koji zanemaruje visok stepen evrizacije bh. bankarskog sektora (ARA III). Varijabilni devizni kurs i relativno nizak ponder za M2 (ARA III) višak deviznih rezervi postavljaju na nivo koji je duplo viši od optimalnih deviznih rezervi (Tabela 11). Čak i postojeći režim fiksnog deviznog kursa, bez naglašavanja visoke evrizacije bh. bankarskih pasiva (ARA I) pretpostavlja da su devizne rezerve CBBH za 5,3 mlrd. ili za skoro 50% više od optimalnih deviznih rezervi (2022). Modeli IMF koje u kojima smo stavili mnogo veći naglasak na evrizaciju, od početnog prijedloga MMF-a (ARA II), ili u kojima smo pored evrizacije uzeli u obzir hronični spoljnotrgovinski bh. debalans (ARA IV) daju značajno manji višak rezervi, ali i dalje ukazuju na previsok nivo deviznih rezervi. Višak deviznih rezervi od 1,9 mlrd. KM (ARA III) je 4% nominalnog GDP BH u 2022. godini i sa njim može biti otplaćeno 17% kratkoročnog spoljnog duga. Nalazi istraživanja su u skladu sa jedinim prethodnim ove vrste (Šoja & Galijašević, 2017), koji je primjenom drugačijih metodologija takođe zaključio da je nivo deviznih rezervi CBBH iznad optimalnog nivoa (osim u okolnostima ekstremnog šoka).

Tabela 10 - Višak deviznih rezervi CBBH u odnosu na optimalne devizne rezerve (u mlrd. KM)

	2016.	2017.	2018.	2019.	2020.	2021.	2022.
ARA I	2,2	3,0	3,3	4,0	5,4	6,5	5,3
ARA II	0,2	0,8	0,9	1,4	2,6	3,4	1,9
ARA III	4,3	5,3	5,8	6,5	7,9	9,5	8,5
ARA IV	0,7	1,3	1,4	1,9	3,2	3,9	2,5
Prosjek	1,8	2,6	2,8	3,5	4,8	5,8	4,6

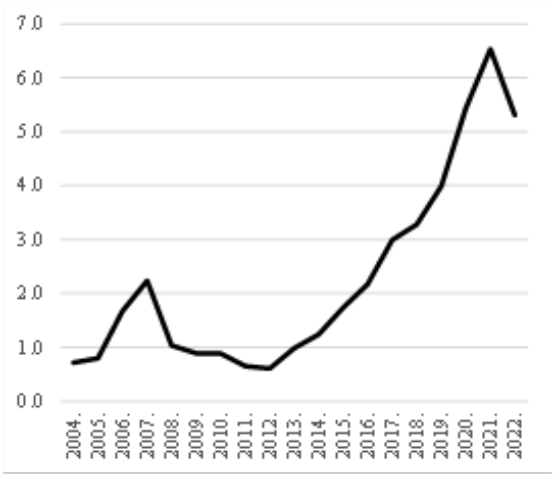
Tabela 11 - Višak deviznih rezervi CBBH u odnosu na optimalne devizne rezerve, u %

	2016.	2017.	2018.	2019.	2020.	2021.	2022.
ARA I	30	40	39	46	64	66	49
ARA II	2	8	8	12	23	26	14
ARA III	83	99	98	108	134	140	113
ARA IV	8	14	14	18	30	32	19
Prosjek	31	40	40	46	63	66	49

Izvor: Autor

Analiza u dužem vremenskom periodu, od 2004, (Grafikoni 1 - 4) pokazuje da je višak deviznih rezervi dostigao minimum u 2012. godini, kao i da su u toj godini u dva od četiri načina modeliranja deviznih rezervi, devizne rezerve bile ispod optimalnih deviznih rezervi (ARA II i ARA IV), te da od te godine započinje trend rasta viška rezervi koji traje bez prestanka sve do 2021. godine. Pad viška deviznih rezervi u 2022. godini prouzrokovan je kao prvo padom tržišne vrijednosti deviznih rezervi uslijed rasta kamatnih stopa. Sa druge strane na višak deviznih rezervi je djelovao rast OR koji se u potpunosti odvija pod uticajem rasta kratkoročnog spoljnog duga. U prosjeku u 2022. god. višak deviznih rezervi je za godinu dana smanjen za petinu.

Grafikon 1 - Višak deviznih rezervi CBBH prema modelu ARA I sa fiksnim deviznim kursom (u mlrd. KM)

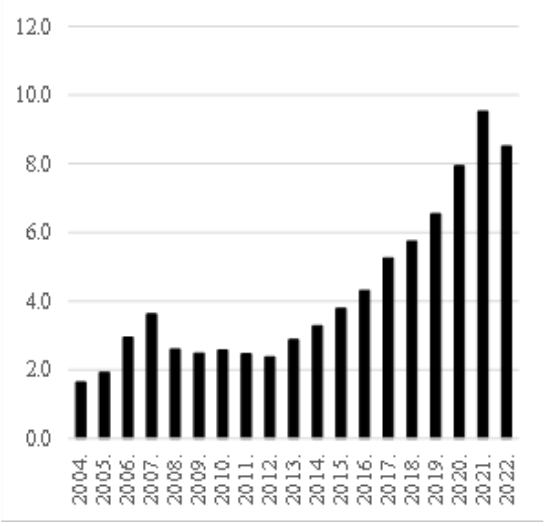


Izvor: Ibid

Grafikon 2 - Višak deviznih rezervi CBBH prema modelu ARA II sa fiksnim deviznim kursom (u mlrd. KM)

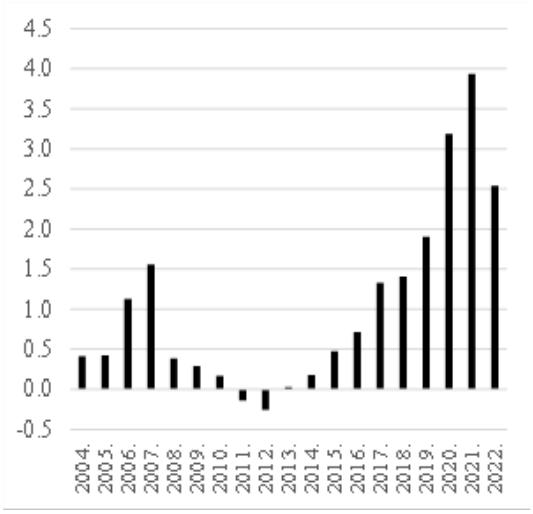
Izvor: Ibid

Grafikon 3 - Višak deviznih rezervi CBBH prema modelu ARA III sa varijabilnim deviznim kursom (u mlrd. KM)



Izvor: Ibid

Grafikon 4 - Višak deviznih rezervi CBBH prema modelu ARA IV sa varijabilnim deviznim kursom (u mlrd. KM)



Izvor: Ibid

Zaključna razmatranja

Troškovi držanja rezervi s jedne strane, i potreban nivo deviznih rezervi sa druge, su glavni motivi za traganje za optimalnim deviznim rezervama (OR). Određivanje OR se kretalo od prostih pravila poput broja mjeseci kojim bi se uvoz trebao finansirati iz deviznih rezervi do vrlo komplikovanih modela koji putem algoritma vrše optimizaciju vrijednosti deviznih rezervi.

Pomoću panel analize MMF je izdvojio ključne varijable koje utiču na nivo deviznih rezervi i zavisno od vrsta monetarnog režima i prisustva, ili odsustva kontrole kretanja kapitala, te stepena dolarizacije tj. evrizacije, predložio udjele (pondere) tih varijabli u određivanju OR. S obzirom da su predloženi modeli generalne prirode i da ne uvažavaju specifičnosti pojedinih zemalja mi smo u ovome istraživanju prvo testirali pouzdanost i jačinu veze odabranih i ostalih varijabli sa deviznim rezervama, nakon čega smo originalne (MMF-ove), i na temelju njih, modifikovane modele upotrijebili za izračunavanje donje granice OR za Bosnu i Hercegovinu.

OR u BH smo odredili kao linearnu kombinaciju kratkoročnog spoljnjeg duga, ostalih obaveza, novčane mase u širem smislu (M2) i izvoza. Pondere smo povećavali zbog visokog stepena evrizacije u BH, kao i zbog nefleksibilnosti bh. monetarne politike (odsustvo LOLR). S druge strane u modelima sa varijabilnim deviznim kursem mogućnost apresijacije deviznog kursa i smanjivanja spoljnog duga izraženog u domaćoj valuti tj. apsorpcija šoka pomoću prilagođavanja deviznog kursa, uticala je na to da ponderi za kratkoročni dug i ostale obaveze ostanu neizmjenjeni.

Zajednička karakteristika svih odabranih modela izračunavanja donje granice OR, u periodu 2016 – 2022. god., pa čak i onih u kojima su ponderi za pojedine varijable povećavani dvostruko, ili čak četvorostruko u odnosu na preporuku MMF-a, je izolovanje značajnog viška rezervi u odnosu na postojeći nivo deviznih rezervi CBBH. U prosjeku tokom ovih sedam godina višak deviznih rezervi u odnosu na donju granicu optimalnih deviznih rezervi bio je 3,7 mlrd. KM. Centralna banka je prosiječno držala 39% više deviznih rezervi nego što je to bilo optimalno.

Najniži višak deviznih rezervi je u režimu fiksnog deviznog kursa (ARA II) sa uvećanim ponderima za M2 (zbog evrizacije) i u režimu varijabilnog deviznog kursa (ARA IV) sa uvećanim ponderima za M2 i izvoz u kojem su devizne rezerve za 14%, odnosno 19% veće od optimalnih (2022). U modelu fiksnog deviznog kursa, sa originalnim ponderima (ARA I), devizne rezerve su za oko 50% više u odnosu OR. Kada bi CBBH prešla na režim varijabilnog deviznog kursa, sa od strane MMF-a predloženim ponderima, OR bi bile najniže, a višak deviznih rezervi najviši (8,5 milijardi KM, ili 113% u odnosu na devizne rezerve sa kraja 2022. god.).

Ovi nalazi u kombinaciji sa nerealizovanim gubicima na portfoliju obveznica nastalim zbog rasta kamatnih stopa (2022) i troškovima negativne kamatne stope na depozite kod ino banaka i aktivu CBBH (2016 - 2021) postojeći, visok, nivo deviznih rezervi dovode u pitanje sa aspekta ekonomičnosti i rentabilnosti. Pored toga u istraživanju je dat vrlo visok ponder ostalim obavezama i time akcijskom kapitalu u vlasništvu nerezidenata, koji uopšte nije mobilan u BH, i kao takav ne predstavlja izraženu prijetnju za devizne rezerve, jer je promet na bh. berzama u poređenju sa tržišnom kapitalizacijom vrlo nizak (10%) i u najvećem djelu se odvija na tržištu dužničkih hartija od vrijednosti.

Nivo deviznih rezervi može biti relaksiran i zbog činjenice da je finansijski sistem u BH izraženo bankocentričan, što ostavlja malo investicionih alternativa bankarskim depozitima. Visok nivo neto strane aktive bh. komercijalnih banaka (oko 9% GDP) dodatno štiti devizne rezerve i predstavlja ekonomsko opravdanje za njihovo smanjenje.

Prema rezultatima istraživanja, a na osnovu svih navedenih razloga, postojeći zakonski, obavezni, minimalni odnos neto devizne aktive i monetarne pasive koje je postavljen na jedan (racio pokrića) predstavlja prepreku dostizanju OR. Pored toga, on smanjuje i rentabilnost bh. emisione banke, ne samo zbog negativnih prinosa na devizne rezerve, nego i zbog nemogućnosti ekonomičnijeg i rentabilnijeg kreditnog angažmana CBBH na bh. tržištu u poređenju sa prinosima na stranom tržištu.

Izračunati interval viška deviznih rezervi od 1,9 mlrd. KM do 8,5 mlrd. KM (2022) zajedno sa višim očekivanim prinosima na domaćem tržištu nego na stranom, i opcijom vođenja monetarne politike značajno većeg stepena diskrecije u poređenju sa postojećem, koja ne podrazumijeva samo kreditiranje rezidenata, već i varijabilni devizni kurs konvertibilne marke, stvara mogućnost, ali i potrebu, promjene bh. monetarnog režima. Ako su principi ekonomičnosti i rentabilnosti ključni ekonomski principi, podređenost deviznih rezervi ovim principima zahtjeva radikalnu ekonomsku transformaciju bh. monetarnog režima, koja bi trebala započeti promjenom vrijednosti koeficijenta pokrića i njegovim značajnim spuštanjem ispod jedan, a kasnije i prelaskom na varijabilni devizni kurs.

Buduća istraživanja OR s obzirom na hroničan bh. spoljnotrgovački deficit, a u vezi činjenice da smo izolovali i vrlo jaku vezu između uvoza i deviznih rezervi, bi kao jednu od determinanti OR trebala uzeti u obzir tražnju za deviznim rezervama po osnovu uvoza. Nova istraživanja na ovu temu bi mogla ići u pravcu komparativne analiza pokrića monetarne pasive sa neto deviznim rezervama u BH i njenom neposrednom okruženju, kao i u zemljama čiji su ekonomski sistemi uzor za BH. Takođe, zanimljiva bi bila i istraživanja koja dovode u vezu koncept optimalnih deviznih rezervi sa troškovima držanja deviznih rezervi.

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DETERMINANTS OF FOREIGN EXCHANGE RESERVES AND THE OPTIMAL LEVEL OF FOREIGN EXCHANGE RESERVES IN BOSNIA AND HERZEGOVINA

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Summary: The research answered the question of what affects BH foreign exchange reserves and what is the lower limit of the optimal level of foreign exchange reserves of the Central Bank of Bosnia and Herzegovina (CBBH). We defined excess foreign exchange reserves as the difference between the balance of foreign exchange reserves and the lower limit of the optimal level of foreign exchange reserves. In most of the analyzed period, foreign exchange reserves are significantly above the lower limit of the optimal foreign exchange reserves. In 2022, the banking sector had the largest excess of foreign exchange reserves in the scenario of a floating exchange rate, without considering the degree of euroization. The excess is the lowest in the fixed exchange rate regime, in which, through the money supply, we allowed a high impact of euroization on optimal foreign exchange reserves. Even under this most conservative scenario, the excess foreign exchange reserves amount to 1.9 billion KM or about 4% of nominal GDP in 2022. Changes in BH monetary regime, enabling the CBBH to lend to residents and a possible transition to a floating exchange rate, are possible while maintaining a satisfactory level of foreign currency liquidity of the CBBH.

Keywords: policy of foreign exchange reserves, monetary policy, currency board, floating exchange rate.

JEL classification: E52, F31

Introduction

After it was proven that the Central Bank of Bosnia and Herzegovina (CBBH), although it operates on the principles of a currency board, nevertheless runs a discretionary monetary policy (Jović, 2020), whereby the business cycle in Bosnia and Herzegovina (BH) differs from the business cycle in the area of the reserve currency - eurozone (Jović, 2021), we continue research on the necessity of transforming the BH monetary regime.

Foreign exchange reserves, serving as a cover for the import of goods and settlement of foreign debt liabilities, perform the function of a guardian of foreign currency liquidity of the economic system. The need to determine the optimal level of foreign exchange reserves arises from the fact that, in addition to the benefits of holding foreign exchange reserves, there are also costs. The subject of this research are foreign exchange reserves in BH, and our goal is to determine their optimal level or the level towards which they should converge, considering the characteristics of the BH economic system.

We assume, according to our working hypothesis, that the foreign exchange reserves of the Central Bank of Bosnia and Herzegovina (CBBH) are above the optimal level required from the aspect of foreign exchange liabilities of Bosnia and Herzegovina's non-banking and banking sectors. From the view of the currency board, this hypothesis casts doubt on the need for full coverage of monetary liabilities with net foreign exchange assets, i.e., maintaining the coverage ratio of monetary liabilities above one.

In the first part of the paper, we present the development of necessary or optimal foreign exchange reserves through a short review of theoretical positions on the subject and empirical research on this problem. The method of proving the research hypothesis and the database used is explained in the research methodology, which is followed by the presentation of the research results and the polemics on the topic of the obtained results. The main methodological research tools are the multiple regression model and methods for determining adequate reserves (IMF, 2015). In the final parts of the research, we again consider the obtained conclusions and draw recommendations for economic decision-makers and future research on this topic.

Literary Review

Traditional ways of measuring the appropriate level of foreign exchange reserves and hence their determinants follow a very simple, linear, and logical rule. The requirement for quarterly coverage of imports with foreign exchange reserves (Krušković, 2014) is among the first rules of its kind (IMF, 2011), as well as the requirement that foreign exchange reserves be equal to the short-term part of external debt. These proposals were created in the milieu of direct or indirect representatives of capital exporting countries who were primarily interested in ensuring, through the size of foreign exchange reserves, that the debtor country has sufficient foreign exchange resources to pay their claims. The variables that determine the coverage of imports with foreign exchange reserves are the growth rate of real GDP, exchange rate, opportunity costs of holding foreign exchange reserves, and the dummy variable, which separates the period before and after the Asian crisis (Hakim, 2013).

Since the early 90s, foreign exchange reserves have rapidly grown (Rodrik, 2006), and their participation has increased to 30% of GDP and eight months of imports. We found the most comprehensive overview of the determinants of foreign exchange reserves and their evolution in a study by the Bank for International Settlements (Cantu & Yavuz, 2019). Until the 2000s, prudence related to the current account deficit, the size of the financial sector, and financial openness were the primary determinants of foreign reserves. The size of the current account deficit and the size of the financial sector are directly correlated with the size of foreign exchange reserves. Financial openness is a statistically significant factor of foreign exchange reserves, except in the case of developed European countries and oil-exporting countries, where an inverse but statistically insignificant relationship was established.

Later, the main motives for holding foreign exchange reserves are transferred to the variables concerning the exchange rate, its stability, and the degree of its overvaluation. The policy of the monetary anchor, which is most often conducted within the framework of an overvalued exchange rate, requires a higher level of foreign exchange reserves to defend the target exchange rate. The third group of variables affecting foreign exchange reserves concerns the size of the economic system. As expected, a larger population leads to more significant foreign exchange reserves, although this connection is not strong in Asian countries and in general in the period before the global financial crisis (2007-2009). The main determinants of the world's second-largest economy (China) are import changes and short-term debt (Misztal, 2021). The research found that the level of Chinese foreign exchange reserves is above the optimal level measured by the methodology developed by the IMF. In the last quarter of a century, this international institution has several times developed and improved the methodology for determining optimal foreign exchange reserves. At the very beginning (IMF, 2001), the prevailing views were that the old rules of thumb (such as three months' coverage of imports with foreign exchange reserves) must be discarded in favor of short-term external debt, expected capital outflows, exchange rate regimes and differences in interest rates. That proposal is based on dividing indicators of the optimal level of foreign exchange reserves into foreign debt, trade, money, and macro indicators (Krušković, 2014, p. 73). Later recommendations (IMF, 2011) (IMF, 2013) (IMF, 2015) went in the direction of testing and determining the variables and their influence (weight) on the level of foreign exchange reserves. As the most reliable determinants of the optimal level of foreign exchange reserves, short-term external debt, other liabilities to non-residents, broad money (M2), and exports are isolated (more on this in the methodological basis of the work). Research that dealt with the foreign exchange reserves of Bosnia and Herzegovina, i.e., are scarce. One of them (Šoja & Galijašević, 2017) investigated the optimal level of foreign exchange reserves (2005 - 2015) and their resistance to extreme internal and external shocks. It was concluded that the level of foreign exchange reserves is above the optimal level but that in case of an extreme shock, the foreign exchange reserves would not be enough.

Methodology and Data

The IMF has repeatedly proposed and analyzed ways of calculating the required level of foreign exchange reserves determined based on the determinants of foreign exchange reserves. In one of the previous studies of this kind (IMF, 2015) for the key variables, short-term external debt, other liabilities (external debt with a maturity of more than one year and share capital owned by non-residents), M2 and exports were proposed final weightings depending on whether the economic system is in the regime of fixed or floating exchange rate and whether capital movement control is implemented.

The weights for these variables are general and do not have to correspond to each country individually, so it was necessary to check the usability of the proposed variables for determining the required level of foreign exchange reserves in the case of Bosnia and Herzegovina. The connection between BH foreign exchange reserves on the one hand, and the proposed variables on the other hand, including other portfolio liabilities and other investments, we assessed and tested using a multiple linear regression model with annual and quarterly frequency variables, as well as using the Granger test, in which null hypothesis presented as the assertion that there is no causality between the variables. Quantitative and qualitative methods proved the connection between foreign exchange reserves and short-term debt. In the assessment of foreign exchange reserves, the IMF offered four variables as the main determinants of foreign exchange reserves, which may or may not correspond to the demand for foreign exchange reserves in each country and especially do not have to correspond to the optimal level of foreign exchange reserves in BH, which functions as a currency board without the function of an institution of final resort (lender of last resort). In the first IMF survey in 2011, the weights for short-term debt, M2 other portfolio investments, and exports for countries with capital controls were 30%, 15%, 10%, and 10%, and for the floating exchange rate, the weights for the same variables were set at 30%, 15%, 5%, and 5%. In the previous IMF research, it was suggested that other portfolio liabilities be replaced with other liabilities, and it also pointed out the great impact of dollarization on the outbreak of banking crises and the need to correct weights in highly dollarized or highly euroized economies. Starting from the initially recommended model for countries with a fixed exchange rate and without control of capital movements, we determined the optimal foreign exchange reserves (OR) in three more ways.

In order to evaluate the level towards which the foreign exchange reserves of Bosnia and Herzegovina should converge, we constructed four models (Table 1). The first model (ARA I) is based on the recommendation of the IMF (IMF, 2015, p. 19) for countries with a fixed exchange rate and without control of capital movements; the lower limit of optimal foreign exchange reserves is determined as the sum of the weighted amount of (foreign) short-term debt, other liabilities, broad money (M2) and exports, with recommended weights of 30%, 20%, 10%, and 10% respectively. The second model (ARA II) formed, also based on the IMF, 2015, keeps the weights for short-term debt (30%) and other liabilities (15%), while the weighting for M2 is doubled (20%) due to the high degree of euroization of BH banking liabilities and the weighting for export (10%) remain the same. Recognizing the high degree of euroization of the banking sector of BH, in which euro deposits of households make up 48% of total deposits of households, as well as the fact that the CBBH does not have a contracted credit line with the ECB, we increased the weighting for M2 by double. We left the other weights at the same level and thus formed the second model, which also refers to the fixed exchange rate regime without controlling capital movements. These two models imply the retention of the existing monetary regime (fixed exchange rate, absence of LOLR, and automatic purchase and sale of the convertible mark), while the other two models imply the transition to a floating exchange rate and the appearance of the CBBH as a creditor of BH residents. The third (ARA III) and fourth (ARA IV) model determine the optimal level of foreign exchange reserves if the CBBH switches to a floating exchange rate regime without controlling capital movements. In ARA III, the proposals of the IMF (IMF, 2015, p. 19) were introduced, according to which the weights in the floating exchange rate regime for short-term liabilities, other liabilities, M2, and exports are 30%, 15%, 5%, and 5%, respectively. In the last model, ARA IV, which is also based on a floating exchange rate, we kept the weights for short-term debt and other liabilities (30% and 15%).

Due to high euroization and dependence on imports (and a high and chronic foreign trade deficit), which is an approximation of export, we have quadrupled the weighting for M2 and set it to 20% (following the example of ARA II) and doubled the weighting for exports compared to ARA III (10%). We did not change the weights for short-term debt and other liabilities because the floating exchange rate enables flexible management of public debt, and we assumed that through lending in local currency by the CBBH, an additional part of foreign exchange reserves can be used to pay off external debt.

Table 1 - Models for Estimating the Lower Bound of the Optimal Level of Foreign Exchange Reserves

	Weights				Exchange rate
	Kratkoročni dug	Ostale obaveze	M2	Izvoz	
ARA I	30%	20%	10%	10%	Fixed
ARA II	30%	20%	20%	10%	Fixed
ARA III	30%	15%	5%	5%	Variable
ARA IV	30%	15%	20%	10%	Variable

Source: IMF and Author. The weights that have changed concerning the initial proposal of the IMF are shaded.

Abbreviations used in the text are A - annual level, ARA - assessment of the adequate level of foreign exchange reserves (assessing reserve adequacy), BH - Bosnia and Herzegovina, Bosnian, Centralna banka BH - CBBH, C – constant in regression model, D - first difference, DIR - a difference in foreign and BH interest rate, E - export, FTP – BH - BH foreign trade partners, GDP - gross domestic product, I-import, LOLR - lender of last resort, M2 – broad money (money outside banks, demand, and time deposits), OI - other portfolio investments, OL - other liabilities, OR - optimal foreign exchange reserves, PI - portfolio investments, Q - quarterly level, REER - real effective exchange rate, R - foreign exchange reserves, RM - regression model, VOL - volatility (standard deviation).

Results and Discussion

The assumption about the influence of BH short-term foreign debt on foreign exchange reserves and their optimal level we do not derive using a model but from expert proposals, which are part of the practice of the IMF in the optimization of foreign exchange reserves. The Italian Minister of Finance, Guidotti, suggested that foreign exchange reserves should correspond to one-year foreign debt liabilities, i.e., the short-term part of external debt. Later, this proposal was supplemented and elaborated by former Federal Reserve Governor, Alan Greenspan, so this approach to determining optimal reserves was called the Greenspan-Guidotti rule (IMF, 2011, p. 13).

Because of how the BH currency board works, the connection between foreign exchange reserves and money supply is extreme, almost perfect, at the level and in the first difference (Tables 2 and 3). Given that CBBH issues money, convertible marks, only through the purchase of foreign currency from banks primary money (monetary base) increases only through the growth of foreign exchange reserves. The growth of domestic currency liquidity increases banks' credit potential, and any change in loans, through credit-deposit multiplication, leads to changes in the money supply, from which the connection between foreign exchange reserves and monetary aggregate M2 is derived.

The impact also goes in the opposite direction because the growth of primary deposits (cash deposits) and secondary deposits (created by granting loans) directly increases the demand for foreign currencies of non-banking sectors and, indirectly, the demand for foreign exchange reserves.

Table 2 - Elasticity of Foreign Exchange Reserves (R/GDP) to Broad Money (M2/GDP) in the Level, 2000-2022 (RM 1)

	Coefficient	Standard error	T-statistics	Probability
C (Konstanta)	0.12	0.016	0.74	0.46
M2/GDP	0.467	0.026	17.45	0.00

Source: Author

Two-way causality is also shown by the Granger causality test, which cannot be rejected for the null hypothesis that foreign exchange reserves do not affect M2, and that the broad money does not affect foreign exchange reserves. The probabilities for the obtained value of the F statistic (3 and 2) are 0.08 and 0.17 for the assumption that foreign exchange reserves do not affect the money supply i.e., that the money supply does not affect foreign exchange reserves. Given that the value of the Durbin-Watson statistic is significantly below two (0.91), which indicates positive autocorrelation and potentially spurious regression, even though the relationship is established following the way the currency board works, we also developed equations with stationary variables, by determining the first difference in level. The equation with variables without unit root I (1) does not show the existence of autocorrelation (the value of the Durbin-Watson statistic is close to two), and the regressor with the money supply is significant at the level below 1%. In both cases, the Granger test gives the probability for the obtained F statistic (0.28 i 0.15), which again confirms the two-way causality between the variables. According to the model in the first difference, an increase in money supply by 1% to GDP increases foreign exchange reserves by 0.76% to GDP.

Table 3 - Foreign Exchange Reserves vs. M2 (first difference) 2000 - 2022 (RM 2)

	Coefficient	Standard error	T-statistics	Probability
C	-0.0057	0.0027	-2.091945	0.0494
D_M2/GDP	0.7646	0.0498	15.33440	0.0000

Source: Author

We have also isolated the statistically significant and high influence of broad money on foreign exchange reserves on data with quarterly frequency (Table 4). An increase in M2 by 1% of GDP leads to an increase in foreign exchange reserves of 0.49% of GDP. The impact of variability (volatility) in the REER and GDP of the most important trade partners and interest differentials on foreign exchange reserves is also statistically significant and of the expected sign, but it is of extremely low intensity. Between portfolio investments (PI/GDP) and foreign exchange reserves, no statistically strong relationship has been established, and the interdependence between imports and foreign exchange reserves is not only highly significant (at the level of 1%) but also extremely intense, even more significant than the influence of M2 on foreign exchange reserves. The positive correlation between imports and foreign exchange reserves is only partially illogical because a high ratio of imports and foreign exchange reserves reflects the openness of the economy (Beaufort & Kapteyen, 2001) and therefore, even a positive impact of import growth on foreign exchange reserves can be expected (Cooper, 1968). However, in classical models, a negative relationship is always identified (Heller, 1966).

Table 4 - Influence of Selected Variables and M2 on Foreign Exchange Reserves of the CBBH, 2005 – 2022

	RM 3	RM 4
C	-0.56 (-4.44) ***	-0.64 (-4.9)***
I/ GDP (-1)	0.78 (3.96) ***	0.934 (4.5)***
M2/GDP	0.49 (22.81) ***	0.49 (23.5)***
PI/GDP	1.38 (1.55)	
REER_volatility	0.05 (3.32)***	0.05 (3.25)***
STP_GDP_volatility	0.02 (4.42) ***	0.018 (3.86)***
DIR	-0.08 (-4.16) ***	-0.075 (-4.27)***
Dummy variable for crisis (-1)		0.07 (2.39)**
R2	0.97	0.93

Source: Author.

Note: Foreign exchange reserves are presented as the ratio of foreign exchange reserves to GDP. In parentheses are the t statistics. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

In ARA models, according to the IMF methodology, there is no import variable, and a part of import is always used to produce export products so that export can be a good approximation of import demand for foreign exchange reserves. Developed regression models, with exports, or the variability of exports as independent variables in the equation of foreign exchange reserves, confirm the correctness of this economic reasoning (Table 5). The variables related to export in all equations have the expected positive sign, i.e., the negative sign if it is about the variability of exports and are statistically significant at the level below 1%. The impact of exports on foreign exchange reserves is high regardless of whether this variable is introduced into the model with or without a time lag. An increase in exports and M2 lead to a relative increase in foreign exchange reserves to GDP, all else equal (RM 4, RM 5, and RM 6). In the equations with exports, all other variables are statistically significant except for portfolio investments, so we replaced them with other investments from the balance of payments.

Table 5 - Influence of Selected Variables and Exports on Foreign Exchange Reserves of the CBBH, 2005 – 2022

	RM 5	RM 6	RM 7
C	-0.21 (-2.70) ***	-0.26 (-3.27)***	-0.29 (-3.54)***
E/GDP	0.56 (2.20)**	0.75 (2.83)***	0.89 (3.25)***
M2/GDP	0.44 (15.48) ***	0.43 (15.10) ***	0.43 (15.02)

M2/GDP	0.44 (15.48) ***	0.43 (15.10) ***	0.43 (15.02)
REER_VOL	0.06 (3.86) ***	0.76 (0.82) ***	0.07 (4.41)***
PI/GDP		0.07 (4.28)	
STP_VOL_A	0.02 (3.43) ***	0.02 (3.84) ***	0.02 (3.50)***
DIR	-0.07 (-3.37) ***	-0.06 (-3.35) ***	-0.06 (-3.36)***
Dummy variable for crisis (-1)			0.05 (1.15)
R^2	0.91		

Source: Ibid

Other portfolio investments (OI) have been proposed (IMF, 2015) as an essential variable for the demand and level of foreign exchange reserves (Table 6). As expected, their impact on foreign exchange reserves is positive and statistically significant (RM 8 and RM 9). Growth of the first difference in other investments to GDP for one ppt increases foreign exchange reserves (difference in the quotient of foreign exchange reserves and GDP) by 0.47 ppt.

Table 6 - Impact of Selected Variables and Other Portfolio Investments on Foreign Currency Reserves of the CBBH, 2016 – 2022

	RM 8	RM 9
C	-0.34 (-2.10)**	-0.12 (-1.39)*
E/GDP	0.48 (2.13) **	0.22 (1.40)
D_M2/GDP	0.48 (17.17)***	0.45 (16.26)***
D_OI/GDP	0.47 (5.14) ***	0.42 (4.41)***
D_REER_VOL	0.03 (1.79)*	
STP_VOL_A	0.01 (2.33) **	0.004 (1.9)*
DIR	-0.04 (-1.69) *	-0.04 (-1.97)**
I_VOL_Q	0.01 (1.68)*	
R^2	0.94	0.93

Source: Ibid

In IMF 2015, it was recommended that other liabilities to non-residents should be used instead of other portfolio investments in determining the optimal level of foreign exchange reserves. The Granger test, as in the case of the relationship between foreign exchange reserves and money supply, does not provide the power to reject the null hypothesis of no mutual influence between foreign exchange reserves and other liabilities at the 5% significance level, except in one case.

For variables at the level (R - foreign exchange reserves, OL - other liabilities) for the null hypothesis, that foreign exchange reserves do not affect other liabilities, the F test statistic is 0.21, the probability is 0.81, which demonstrates a two-way relationship between the variables (Table 7). As expected, with a high degree of reliability (F statistic 2.54 and probability 12%), it is impossible to reject the null hypothesis that other liabilities do not affect the level of foreign exchange reserves. The relative level of foreign exchange reserves (R/GDP) affects other liabilities (OL/GDP), but with variables defined in this way, as we have previously stated, the influence of other liabilities on foreign exchange reserves is absent. The possible reason is that other liabilities, in addition to medium-term and long-term debt to non-residents, also include shares of non-residents in BH joint stock companies. That capital, as a quasi-obligation towards non-residents, in BH due to the low liquidity of the financial markets is not mobile at all. Therefore, the low mobility of share capital in this type of specification of the Granger test could explain the absence of influence of other liabilities towards non-residents on foreign exchange reserves. On the other hand, the variables in the first difference confirm again the two-way causality between foreign exchange reserves because, with a high degree of reliability, it is not possible to reject the null hypothesis according to which other liabilities do not affect foreign exchange reserves (Table 8). For these reasons, even though share capital in BH has a low level of mobility and the financial market is shallow, we have kept other liabilities towards non-residents in the models for evaluating the optimal level of foreign exchange reserves.

Table 7 - Interdependence Between Foreign Exchange Reserves (R) and Other Liabilities to Non-Residents (in level), Granger Test

Null hypothesis	Number of observation	F statistics	Probability
R does not Granger Cause OL	17	0.21409	0.8103
OL does not Granger Cause R		2.54967	0.1195
R/GDP does not Granger Cause OL/GDP		2.38698	0.1341
OL/GDP does not Granger Cause R/GDP	17	5.64964	0.0187

Source: Ibid

Table 8 - Interdependence Between Foreign Exchange Reserves (R) and Other Liabilities Towards Non-Residents (in the first difference), Granger Test

Null hypothesis		F statistics	Probability
D_R does not Granger Cause D_OL		1.2002	0.3377
D_OL does not Granger Cause D_R	16	1.1856	0.3418
D_R/GDP does not Granger Cause D_OL/GDP		1.73106	0.222
D_OL/GDP does not Granger Cause D_R/GDP	16	1.64836	0.2365

Source: Ibid

Optimal foreign exchange reserves (OR) obtained based on four ARA models have the same dynamics, but also a significant difference due to different weights for four key variables (Table 9). On average, in 2016 – 2022, the OR varies in the interval of 7.6 billion KM up to 14.1 billion KM with significant deviations between models. The highest level of OR (14.1 billion KM) is provided by the ARA II model, which assumes the operation of the CBBH in the regime of a fixed exchange rate and a higher level of euroization of BH banks liabilities, which is presented through twice the weighting for broad money compared to the initial assumption of the IMF (ARA I). The flexible monetary policy presented not only through a floating exchange rate but also the possibility of lending money to BH residents by the CBBH (this activity is prohibited in the current model of the currency board) lowers the OR to the lowest level, which at the end of 2022 is 7.6 billion KM (ARA III). Between these two extremes are the OR in the fixed exchange rate regime and the initially proposed weightings for M2 and exports of 10% (ARA I). The extreme variant of the floating exchange rate (ARA IV) with significantly increased weightings for both M2 (quadrupled) and exports (doubled weighting) approaches the level of OR to the model with a fixed exchange rate in which emphasis is placed on euroization (ARA II). In all models during 2013 and 2017, OR recorded excessive growth due to the increase in M2. The most significant contribution to the growth of OR in 2020, in addition to M2, is provided by other liabilities, and in 2021, OR is under the influence of export growth.

Table 9 - Optimal Foreign Exchange Reserves of the CBBH (in billions of KM)

	2016	2017	2018	2019	2020	2021	2022
ARA I	7.4	7.6	8.3	8.6	8.4	9.8	10.8
ARA II	9.4	9.8	10.7	11.2	11.2	13.0	14.1
ARA III	5.2	5.3	5.9	6.1	5.9	6.8	7.6
ARA IV	8.8	9.2	10.2	10.7	10.7	12.4	13.5
Average	7.7	8.0	8.8	9.1	9.1	10.5	11.5

Source: Author

The obtained results are, of course, reflected in the excess of foreign exchange reserves that the CBBH keeps above the optimal level of foreign exchange reserves. On average, since 2016 until 2022, excess fell in the interval of 1.8 billion KM up to 5.8 billion KM (Table 10). The highest excess of foreign exchange reserves has a monetary regime with a floating exchange rate that ignores the high degree of euroization of the BH banking sector (ARA III). The floating exchange rate and the relatively low weighting for M2 (ARA III) set the excess foreign exchange reserves at twice as high as the optimal foreign exchange reserves (Table 11). Even in the case of the existing fixed exchange rate regime, without emphasizing the high euroization of BH of banking liabilities (ARA I), it assumes that the foreign currency reserves of the CBBH are for 5.3 billion, or by almost 50%, more than the optimal foreign exchange reserves (2022). IMF models in which we put a much greater emphasis on euroization than the initial proposal of the IMF (ARA II), or in which, in addition to euroization, we took into account the chronic foreign trade of Bosnia and Herzegovina imbalances (ARA IV) gave a significantly smaller excess of reserves but still indicate an excessively high level of foreign exchange reserves. The foreign exchange reserves excess of 1.9 billion KM (ARA III) is 4% of the nominal GDP of BH in 2022, and 17% of the short-term external debt can be repaid with it. The findings of the research are in line with the only previous one of this kind (Šoja & Galijašević, 2017), which, using different methodologies, also concluded that the level of foreign exchange reserves of the CBBH is above the optimal level (except in circumstances of extreme shock).

Table 10 - Excess of Foreign Exchange Reserves of the CBBH Compared to Optimal Foreign Exchange Reserves (in billions of KM)

	2016	2017	2018	2019	2020	2021	2022
ARA I	2.2	3.0	3.3	4.0	5.4	6.5	5.3
ARA II	0.2	0.8	0.9	1.4	2.6	3.4	1.9
ARA III	4.3	5.3	5.8	6.5	7.9	9.5	8.5
ARA IV	0.7	1.3	1.4	1.9	3.2	3.9	2.5
Average	1.8	2.6	2.8	3.5	4.8	5.8	4.6

Source: Author

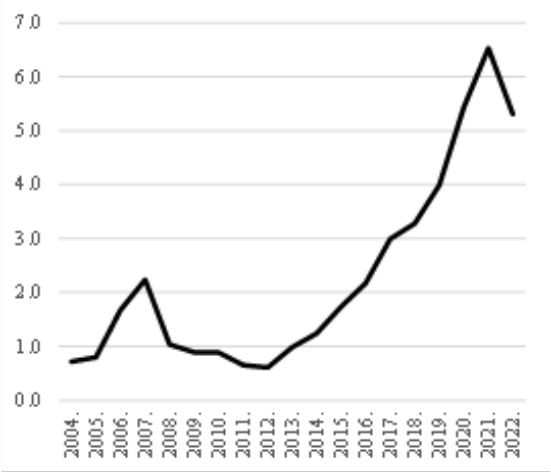
Table 11 - Excess of Foreign Exchange Reserves of the CBBH Compared to Optimal Foreign Exchange Reserves, in %

	2016	2017	2018	2019	2020	2021	2022
ARA I	30	40	39	46	64	66	49
ARA II	2	8	8	12	23	26	14
ARA III	83	99	98	108	134	140	113
ARA IV	8	14	14	18	30	32	19
Average	31	40	40	46	63	66	49

Source: Author

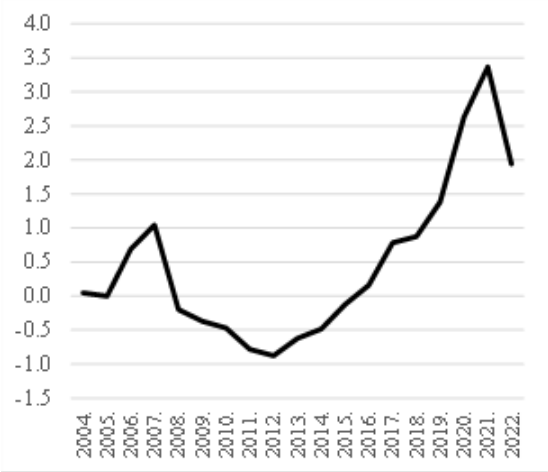
The analysis over a more extended period since 2004 (Graphs 1 - 4) shows that the excess of foreign exchange reserves reached a minimum in 2012 and that in that year, in two of the four ways of modeling foreign exchange reserves, foreign exchange reserves were below the optimal foreign exchange reserves (ARA II and ARA IV). From that year, the trend of growth of excess reserves begins without stopping until 2021. The fall in the excess of foreign exchange reserves in 2022 was caused by the fall in the market value of foreign exchange reserves due to the rise in interest rates on the one hand. On the other hand, the excess of foreign exchange reserves is affected by the growth of OR, which is entirely under the influence of the development of short-term foreign debt. On average, in 2022, the excess of foreign exchange reserves was reduced by a fifth in one year.

Graph 1 - Excess Foreign Exchange Reserves of the CBBH According to the ARA I Model with a Fixed Exchange Rate (in billions of KM)



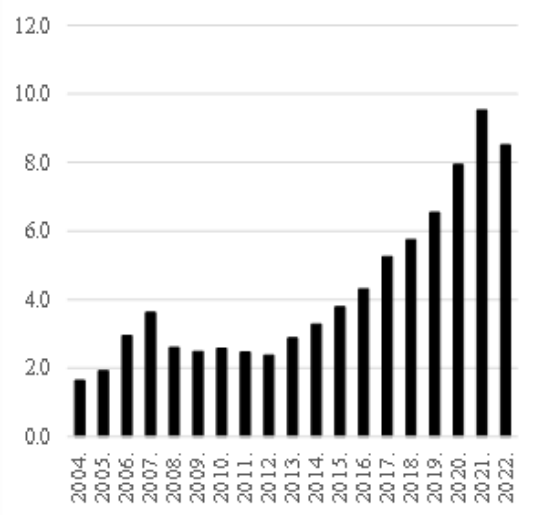
Source: Ibid

Graph 2 - Excess Foreign Exchange Reserves of the CBBH According to the ARA II Model with a Fixed Exchange Rate (in billions of KM)



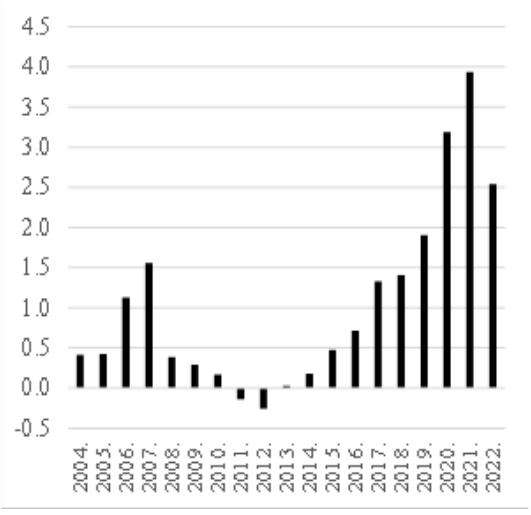
Source: Ibid

Graph 3 - Excess Foreign Exchange Reserves of the CBBH According to the ARA III Model with a Floating Exchange Rate (in billions of KM)



Source: Ibid

Chart 4 - Excess Foreign Exchange Reserves of the CBBH According to the ARA IV Model with a Floating Exchange Rate (in billions of KM)



Source: Ibid

Concluding Considerations

The costs of holding reserves on the one hand and the required level of foreign exchange reserves on the other are the main motives for searching for optimal foreign exchange reserves (OR). The determination of the OR ranged from simple rules such as the number of months in which imports should be financed from foreign exchange reserves to very complicated models that use an algorithm to optimize the value of foreign exchange reserves.

Using a panel analysis, the IMF identified key variables that affect the level of foreign exchange reserves and, depending on the type of monetary regime and the presence or absence of capital control, and the degree of dollarization, i.e., euroization, proposed the shares (weights) of those variables in determining the OR. Given that the proposed models are general and do not take into account the specificities of individual countries, in this research, we first tested the reliability and strength of the connection of selected and other variables with foreign exchange reserves, after which we used the original (IMF's) and, based on them, modified models used to calculate the lower limit of OR for Bosnia and Herzegovina.

We determined OR in Bosnia and Herzegovina as a linear combination of short-term external debt, other liabilities, broad money (M2), and export. We increased the weights due to the high level of euroization in BH, as well as due to the inflexibility of BH monetary policy (absence of LOLR). On the other hand, in models with a floating exchange rate, the possibility of exchange rate appreciation and reduction of external debt expressed in domestic currency, i.e., shock absorption by adjusting the exchange rate, had the effect that the weights for short-term debt and other liabilities remained unchanged.

A common feature of all the selected models for calculating the lower limit of the OR in the period 2016-2022, and even those in which the weights for certain variables were increased twice, or even four times compared to the recommendation of the IMF, is the isolation of a significant excess of reserves compared to the existing the level of foreign exchange reserves of the CBBH. During these seven years, the excess of foreign exchange reserves to the lower limit of optimal foreign exchange reserves was 3.7 billion KM. On average, the central bank held 39% more foreign exchange reserves than was optimal.

The lowest excess of foreign exchange reserves is in the regime of the fixed exchange rate (ARA II) with increased weights for M2 (due to euroization) and in the regime of the floating exchange rate (ARA IV) with increased weights for M2 and exports in which foreign exchange reserves are by 14% and 19% respectively higher than optimal (2022). In the fixed exchange rate model, with the original weighting (ARA I), the foreign exchange reserves are about 50% higher than the OR. If the CBBH switched to a floating exchange rate regime, with the weightings proposed by the IMF, the OR would be the lowest, and the excess foreign exchange reserves would be the highest (8.5 billion KM, or 113% compared to the foreign exchange reserves at the end of 2022).

These findings, in combination with unrealized losses on bonds portfolio caused by the growth of interest rates (2022) and costs of negative interest rates on deposits with foreign banks and assets of the CBBH (2016 - 2021), call into question the current high level of foreign exchange reserves from the aspect of the economy and profitability.

In addition, in the research, we gave very high weighting to other liabilities and, thus, to share capital owned by non-residents, which is not mobile at all in BH, and as such, does not represent a significant threat to foreign exchange reserves because turnover in BH stock market compared to the market capitalization is very low (10%) and mostly takes place on the debt securities market.

The level of foreign exchange reserves can also be relaxed because the financial system in BH is markedly bank-centric, which leaves few investment alternatives to bank deposits. The high net foreign assets of BH commercial banks (about 9% of GDP) additionally protects foreign exchange reserves and represent an economic justification for their reduction.

According to the research results, and based on all the stated reasons, the existing legal, mandatory minimum ratio of net foreign exchange assets and monetary liabilities, set to one (backing ratio), represents an obstacle to achieving the OR. In addition, it reduces the profitability of the BH central bank, not only because of negative returns on foreign exchange reserves but also because of the impossibility of more economical and profitable credit engagement of the CBBH on the BH market compared to returns on the foreign market.

The calculated interval of excess foreign exchange reserves of 1.9 billion KM up to 8.5 billion KM (2022), together with higher expected returns on the domestic market than on the foreign market, and the option of conducting a monetary policy with a significantly higher degree of discretion compared to the existing one, which does not only include lending to residents, but also the floating exchange rate of the convertible mark, creates the possibility, but also the need, of changes BH monetary regime. If the principles of economy and profitability are key economic principles, the subordination of foreign exchange reserves to these principles requires a radical economic transformation of BH monetary regime, which should begin with a change in the value of the backing ratio and its significant drop below one, and later with the transition to a floating exchange rate.

Future research of OR considering chronic BH foreign trade deficit, and in connection with the fact that we have also isolated a very strong connection between imports and foreign exchange reserves, as one of the determinants of the OR should take into account the demand for foreign exchange reserves based on imports. New research on this topic could go in the direction of comparative analysis of coverage of monetary liabilities with net foreign exchange reserves in BH and its environment, as well as in countries whose economic systems are a desired model for BH. Also, research that links the concept of optimal foreign exchange reserves with the costs of holding foreign exchange reserves would be interesting.

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IMPLIKACIJE PO FINANSIJSKU STABILNOST SA TRŽIŠTA KRIPTO-AKTIVE

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„Tržište kripto-aktive se brzo razvija i moglo bi da dođe do tačke u kojoj predstavlja pretnju globalnoj finansijskoj stabilnosti zbog svog obima, strukturne ranjivosti i sve veće povezanosti sa tradicionalnim finansijskim sistemom."

Odbor za finansijsku stabilnost, 16. februar 2022. god.

Rezime: Kripto-aktiva predstavlja deo digitalnih finansija koja je razvijena sa nastojanjem da se smanji upotreba gotovinskih sredstava plaćanja i da se poveća finansijska inkluzija. Značajan rast tržišne kapitalizacije kripto-aktive, uz porast broja različitih instrumenata kripto-aktive i volatilnosti njihove cene doveo je do zabrinutosti za očuvanje finansijske stabilnosti, koja predstavlja, pored cenovne stabilnosti, glavne ciljeve centralnih banaka. Platforme trgovanja kripto-aktive funkcionišu van nacionalnih jurisdikcija, što potencijalno može stvoriti koncentraciju rizika i ukazuje na nedostatak transparentnosti poslovanja. Brži razvoj tržišta kripto-aktive ukazuje na potrebu striktne regulacije tog dela tržišta, prikupljanje podataka kako bi se efikasno pratile transakcije, kao i zaštita korisnika i investitora. Regulativa tržišta kripto-aktive treba da obezbedi sigurnost svim učesnicima, nesmetano funkcionisanje finansijskog tržišta i očuvanje finansijske stabilnosti.

Ključne reči: kripto-aktiva, finansijska stabilnost, digitalizacija, regulativa

JEL klasifikacija: G11, E63

*Za stavove iznete u ovom radu odgovoran je autor i stavovi ne predstavljaju nužno zvaničan stav Narodne banke Srbije

Uvod

Upotreba savremenih tehnologija ima sve značajniju ulogu na globalnom finansijskom tržištu. Nakon svetske ekonomske krize, a naročito tokom pandemije virusa korone, kada su na snazi bile mere zatvaranja zemalja, razvijeni su savremeni oblici plaćanja koji se baziraju na različitim oblicima digitalne finansijske aktive. Investitori danas pored ulaganja u valute, plemenite metale, akcije i obveznice imaju mogućnost da diversifikuju svoj portfolio ulaganjem u kripto-aktivu. Od samog početka emitovanja kripto-aktiva beleži značajnu volatilnost u kretanju cena, visoke nivoe tržišne kapitalizacije i stvaraju potencijalno visok nivo rizika po postizanje i očuvanje stabilnosti finansijskog sistema. U ovom radu analiziraćemo implikacije po finansijsku stabilnost sa tržišta kripto-aktive gde ćemo u prvom delu prikazati pregled literature, nakon čega će uslediti sagledavanje karakteristika kripto-aktive. Treći deo rada je usmeren ka analizi regulatornog okvira kripto-aktive, dok se četvrti bavi sagledavanjem rizika po finansijsku stabilnosti koji dolaze sa tog dela finansijskog tržišta. U zaključku smo sumirali glavne zaključke ovog rada.

Pregled literature

Danas je od presudnog značaja primena digitalnih oblika plaćanja koja su uvedena sa nastojanjem da se postigne veći nivo finansijske inkluzije. Ovakav pristup ima svoje opravdanje imajući u vidu da se smatra da upravo finansijska inkluzija može da dovede do dodatnog ekonomskog rasta i razvoja, kao i društvenog blagostanja. Jedan od digitalnih oblika plaćanja predstavljaju različiti instrumenti tržišta kripto-aktive. Njihovim razvojem stvorene su velike mogućnosti, ali i izazovi za globalni finansijski sistem. Potrebno je ukazati da tržište kripto-aktive može da prouzrokuje značajne rizike po finansijsku stabilnost ukoliko međusobna povezanost sa institucijama tradicionalnog finansijskog sistema (poput banaka, lizing kompanija, osiguravajućih kuća) ne bude regulisana i nadzirana na adekvatan način. Posledično tradicionalan finansijski sistem može da zabeleži visoke gubitke u poslovanju, smanjeno poverenja investitora, ugroženost dobre reputacije poslovanja, ali i visoku izloženost kreditnom riziku i riziku likvidnosti. Upravo ta međusobna povezanost učesnika na finansijskom tržištu može da stvori efekat lanca koji podrazumeva da ako se desi nestabilnost kod jednog učesnika ona se može lako preneti na druge učesnike u sistemu. Time se nestabilnost finansijskog sistema jedne zemlje može preneti na druge zemlje i destabilizovati njihov finansijski sistem porastom sistemskog rizika. Upravo negativan uticaj digitalnih finansija može da prouzrokuje porast sistemskog rizika, koji možemo definisati kao finansijski rizik koji može da pogodi celokupan finansijski sistem, a ne samo pojedinačne institucije (Risman et al., 2021). Koliko uticaj sistemskog rizika može biti veliki najbolje se ogleda u tome da je upravo sistemski rizik imao najveći doprinos finansijskoj krizi iz 2008. godine.

Ne postoji standardna definicija šta zapravo predstavlja finansijska stabilnost ili stabilnost finansijskog sistema. Svetska banka (2020) ukazuje da postoje brojne definicije finansijske stabilnosti i za većinu njih zajedničko je to što se pod pojmom finansijske stabilnosti podrazumeva odsustvo epizoda stresa u kojima finansijski sistem ne ume da funkcioniše, što dovodi do pojave kriza. Takođe, pojam finansijske stabilnosti se odnosi na otpornost finansijskog sistema na prisustvo stresa.

U pogledu glavnih rizika po finansijsku stabilnosti, koji mogu biti prouzrokovani sa tržišta kripto-aktive, Bains et al., (2022) ukazuju na međusobnu povezanost sa svim učesnicima finansijskog sistema, valutnu supstituciju, potom ističu da pružaoci usluga sa tržišta kripto-aktive mogu da generišu značajan nivo sistemskog rizika, zatim ti pružaoci obavljaju veći broj aktivnosti na tom tržištu, a istaknuti su i tržišni rizik i rizik treće strane. Odgovor regulatora na prethodno navedene rizike treba da bude usmeren ka tome da se aktivno prati izloženost svih učesnika finansijskog sistema prema tržištu kripto-aktive, ograničenje u pogledu mogućeg ulaganja u instrumente tog tržišta, potom potrebno je uspostaviti saradnju na globalnom nivou i uspostaviti pokrića za svaku izloženost tim instrumentima. Finansijski regulatori nastoje da odgovore na različite rizike koje mogu da izazovu instrumenti sa tržišta kripto-aktive jer se ti rizike odnose na finansijska tržišta i sisteme. Tu se pre svega misli na finansijsku stabilnost, zaštitu investitora, očuvanje tržišnog integriteta i tržišnu efikasnost (Zetzsche et al., 2020).

Ono što razlikuje instrumente tržišta kripto-aktive je to što za njihovo emitovanje i trgovanje postoji značajno drugačiji set ograničenja nego što je slučaj kod tradicionalnih finansijskih instrumenata. Kripto-aktiva nije pod nacionalnom regulativom, za razliku od tradicionalnih finansijskih instrumenata koji su pod kontrolom vlade i centralne banke i podležu odredbama fiskalne i monetarne politike. Potom kripto-aktiva se bazira na digitalnoj i bezgraničnoj ekonomiji koja funkcioniše bez posrednika. Ovakav pristup izvršenja transakcija u značajnoj meri otežava primenu tradicionalnih regulatornih politika i strategija za kontrolu kripto-aktive (Elliott i De Lima, 2018). Da bismo na pravilan način razumeli različite motive koji stoje iza odluke ulaganja u kripto-aktivu neophodno je da se izvrši adekvatno sagledavanje tih transakcija. Otvorena distribuirana knjiga (eng. open distributed ledgers) daje svakome mogućnost da sagleda celokupan istorijat podataka o svakoj pojedinačnoj transakciji pri čemu je zbog postojanja pseudonima teško povezati svaki otvoren račun trgovanja sa pojedinačnim licima ili preduzećima (Feyen et al., 2022).

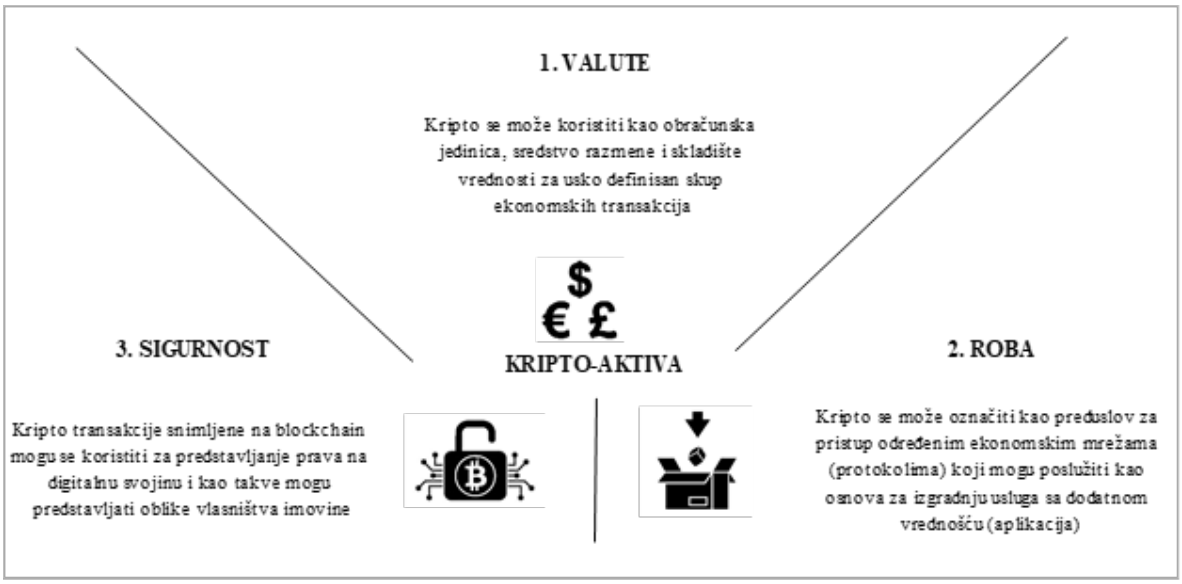
Pored značajnih rizika sa tržišta kripto-aktive potrebno je ukazati i na njihove prednosti. Kripto-aktiva je doprinela značajnoj transformaciji tradicionalnog globalnog finansijskog sistema sa ciljem efikasnijeg izvršenja transakcija, poboljšanja finansijske inkluzije i smanjenje sistemskog rizika u slučaju da je primenjena adekvatna regulativa. Nedavna pandemija virusa korone istakla je prednosti kripto-aktive, jer je ljudima bilo omogućeno da izvrše finansijske transakcije na daljinu i doprinela je smanjenju transakcionih troškova (Ozili, 2023). Dobar regulatorni okvir treba da uspostavi balans između obezbeđivanja zaštite klijenata i investitora, uz pružanje dovoljno podstreka za dalje inovacije na tržištu kripto-aktive kako se ne bi smanjio rast i razvoj tog dela tržišta. Takođe, od podjednakog značaja su i pravilno definisana uputstva kako bi svi učesnici na propisan način primenili regulativu koja treba da obuhvati sve rizike koji mogu da poteknu od tržišta kripto-aktive (Bakken, 2022).

Karakteristike kripto-aktive

Kripto-aktiva je transformisala tradicionalno finansijsko tržište jer se može koristiti kao sredstvo razmene koje se generiše, čuva i transferiše elektronski. Od samog nastanka kripto-aktiva je bila podložna značajnoj volatilnosti u kretanju cena. Time se često kripto-aktiva sa aspekta investitora i regulatora smatra spekulativnim instrumentom (Garcia-Singh, Thomas i Persad, 2021). U praksi svet kripto-aktive se suočava sa hiljadama inovacija svakog meseca, kao i sa emitovanjem novih proizvoda koji su bazirani na kombinaciji kripto tehnologije i tehnologiji distribuirane knjige (Demertzis i Wolff, 2018). U 2008. godini došlo je značajnog rasta obima trgovanja na tržištu kripto-aktive usled pojave bitkoina kao najprepoznatljivije kripto valute. Tada je pod pseudonimom Satoshi Nakamoto objavio rad koji se bavi analizom dizajna elektronskog platnog sistema kroz razvoj nove i revolucionarne blokčejn tehnologije. Do danas nije se saznalo da li se taj pseudonim odnosi na pojedinca ili na grupu ljudi (Martin, 2021).

Evolucija kripto-aktive ukazuje na podjednaku prisutnost mogućnosti, ali i rizika. Primarno, kripto-aktiva je razvijena sa nastojanjem da se izvrši razvoj decentralizovanog oblika plaćanja, ali i nastojanje da se pojavi instrument koji će biti u mogućnosti da izvrši zaštitu od inflacije i depresijacije valuta. Razvoj novih tehnologija, na kojima se bazira kripto-aktiva, uz primenu adekvatne regulacije može da stvori dodatne instrumente u odnosu na one koje nudi tradicionalni finansijski sistem. U pogledu definicije Odbor za finansijsku stabilnost kripto-aktivu definiše kao privatnu aktivu koja primarno zavisi od kriptografije i distribuirane knjige ili slične tehnologije kao deo njihove percipirane ili inherentne vrednosti (FSB, 2018). Ovako definisana kripto-aktiva ne može da se uklopi u definiciju konvencionalnih oblika aktive. Ipak, potrebno je ukazati da različite vrste kripto-aktive mogu da imaju osobine valute, roba ili hartija od vrednosti – Slika 1.

Slika 1: Karakteristike kripto-aktive



Izvor: Elliott, D. i De Lima L. (2018). Crypto-assets: their future and regulation, Oliver Wyman, str. 8

Veliki broj kripto-aktive ima tendenciju da beleži visoku volatilnost cene, što ih čini lošim sredstvima za očuvanje vrednosti i jedinica vrednosti. Ukoliko se sagledaju podaci na globalnom nivou ne postoji jedinstvena taksonomija kripto-aktive. Analiza Bains et al., (2022) ukazuje na četiri kategorije kripto-aktive koja je prihvaćena od strane dugih regulatora poput Banke za međunarodna poravnanja – Tabela 1. Prva kategorija se odnosi na unbacked kripto-aktivu koja je prenosiva, bazirana je na decentralizovanom načinu saldiranja transakcija i prvenstveno je dizajnirana da se koristi kao sredstvo razmene. Najveći deo ove vrste kripto-aktive se koristi za spekulaciju i kao primer se može označiti bitkoin. Uslužni tokeni (eng. utility token) predstavljaju drugu kategoriju i odnose se na tokene gde imaoci ovih tokena imaju pristup postojećem ili potencijalnom proizvodu ili usluzi. U okviru ove kategorije nalazi se tokenizovana kartica za kupovinu u određenoj prodavnici. Treća kategorija se odnosi na bezbednosne tokene (eng. security tokens) koji imaocu omogućava prava kakva imaju imaoci hartija od vrednosti (na primer pravo da dele profit emitenta hartije od vrednosti). Stablecoins se odnose na četvrtu kategoriju kripto-aktive koja u svojoj osnovi imaju stabilnu vrednost aktive na kojoj se zasniva poput jedne aktive ili korpe aktive (na primer konkretna valuta, plemeniti metal). Primeri stablecoins-a su Tether, Binance USD i USD Coin. Prema analizi Bullmann et al., (2019) stablecoins predstavljaju digitalnu jedinicu vrednosti koji ne predstavljaju nijednu specifičnu valutu (ili korpu valuta), ali njihova vrednost se bazira na stabilizovanim instrumentima kako bi se minimalizovale fluktuacija cena tih valuta. U okviru stablecoins-a razlikujemo nekoliko vrsta: (1) fiat-backed – odnosi se na stablecoins koji ima direktnu vezu da postojećim finansijskim sistemom kroz posedovanje tradicionalnih finansijskih instrumenata; (2) crypto-backed – predstavlja mehanizam stabilizacije cena koji je podržan rezervom kripto-aktive koji mogu da uključe unbacked kripto-aktivu kao i druge vrste stablecoins-a. Pošto je unbacked kripto-aktiva najčešće volatilna, crypto-backed stablecoins imaju značajno veći nivo obezbeđenja kako bi se obezbedila zaštita u slučaju pada vrednosti kolaterala. Ova vrsta stablecoins-a često ima mehanizam za likvidiranje kolaterala kripto-aktive ukoliko vrednost kolaterala padne ispod određenog praga, čime se obezbeđuje da stablecoins zadrži solventnost i (3) algoritamski stablecoins –vrsta stablecoins-a koja svoju vrednost nije zasnovala na nekoj rezervnoj aktivi. Ova vrsta stablecoins-a nastoji da ostvari cenovnu stabilnost kroz algoritam koji regulišu odnos ponude i tražnje stablecoins-a (MacDonald i Zhao, 2022).

Pored navedenih kategorija kripto-aktive važno je istaći i digitalne valute centralnih banaka koje, prema definiciji Sistema federalnih rezervi, predstavljaju digitalnu obavezu centralne banke koja je dostupna široj javnosti. Time digitalne valute centralnih banaka (eng. central bank digital currencies – CBDC) omogućavaju digitalna plaćanja. Centralne banke na globalnom nivou aktivno rade na razvoju svojih digitalnih valuta: Evropska centralna banka na uvođenju digitalnog evra, Sistem federalnih rezervi na digitalnom dolaru i Banka Engleske na digitalnoj funti. Te valute bi bile pod kontrolom centralne banke koja bi bila njen emitent, čime bi se stvorio dodatni oblik plaćanja, pored gotovinskog i bezgotovinskog oblika plaćanja (Martin, 2021). Od ključnog je značaja da centralne banke razumeju implikacije uvođenja digitalnih valuta centralnih banaka za finansijsku stabilnost i monetarnu politiku. Takođe, digitalne valute centralnih banaka ne smeju da budu izvor finansijske nestabilnosti koji može da poremeti transmisioni mehanizam monetarne politike (Panetta, 2022). NTF tokeni (eng. non-fungible tokens) ili nezamenljivi tokeni predstavljaju specijalnu vrstu kripto-aktive u kojoj je svaki token jedinstven za razliku od zamenljivih tokena gde svaki ima istu vrednost. Pošto su nezamenljivi tokeni jedinstveni mogu se koristiti za identifikaciju vlasništva na digitalnom aktivom kao što su umetnička dela, snimci ili virtualne nekretnine.

Tabela 1: Taksonomija kripto aktive, NFT i digitalne valute centralnih banaka

NFT tokeni	Bezbednosni tokeni	Uslužni tokeni	Unbacked kripto-aktiva	Stablecoins	Digitalne valute centralnih banaka
-Obično se izdaje centralno -Pravo na vlasništvo nad određenim proizvodom -Kolekcionarski i nezamenljivi	-Izdaje se centralno -Zadovoljava definiciju hartije od vrednosti u svakoj nadležnoj jurisdikciji -U okviru regulatornog perimetra	-Izdaje se centralno -Pravo na proizvod/uslugu -Prihvaćen višestruki ekosistem -Prenosiv -Može se koristiti kao sredstvo razmene	-Obično decentralizovan -Dizajniran da se koristi kao sredstvo razmene -Ograničena prava za vlasnika tokena -Nema pojedinačnog emitenta protiv koga bi se izvršilo pravo -Prenosiv	-Dizajniran da ima stabilnu vrednost -Mehanizam stabilnosti može biti podrška ili kolateralizacija sa robom, fiat valutom, više valuta, kripto sredstvima algoritama	-Izdaje centralne banke -Dizajniran da ima stabilnu vrednost -Mehanizam stabilnosti je obično suverena fiat valuta

Izvor: Bains, P., Ismail, A., Melo, F. and Sugimoto , N. (2022). Regulating the Crypto Ecosystem: The Case of Unbacked Crypto Assets, International Monetary Fund, FinTech Notes No 2022/007, str. 12

Postoji nekoliko faktora koji mogu uticati na porast korišćenja kripto-aktive. Nestabilna makroekonomska situacija u kombinaciji sa neefikasnim platnim sistemom u pojedinim zemljama u razvoju i razvijenim zemljama može da podstakne primenu kripto-aktive. Nizak nivo kredibiliteta centralne banke može da poveća supstituciju aktive jer domaći rezidenti mogu da traže sigurno utočište za očuvanje vrednosti svoje aktive. Ovo je naročito prisutno kod zemalja koje imaju visok nivo dolarizacije. Postojanje kripto sistema može doprineti domaćim rezidentima da konvertuju svoju aktivu u različite vrste instrumenata kripto-aktive. Sledeći faktor koji može da podstakne veće korišćenje kripto-aktive je neefikasan platni sistem i ograničen pristup finansijskim uslugama. Jedan primer predstavlja nedostatak kompatibilnosti između različitih domaćih platnih sistema, što može da stvori problem za priliv doznaka. Pošto kod pojedinih zemalja u razvoju postoji veliko učešće stanovništva koji nemaju otvoren račun u banci dešava se da se doznake šalju gotovinskim putem, poput pošti i drugih operatera prenosa sredstava. U slučaju korišćenja kripto-aktive priliv doznaka može da bude brži i jeftiniji, naročito putem stablecoins-a koji predstavlja stabilnu jedinicu obračuna. Naravno ovakav pristup zahteva pristup internetu i drugim tehnologijama, koje nisu dostupne mnogim zemljama. Treba imati u vidu da se u slučaju upotrebe kripto-aktive za priliv doznaka to može održati u kratkom roku (tokom perioda priliva doznaka), nakon čega primaoci mogu ino priliv da konvertuju u domaću valutu i vrše kupovinu na domaćem tržištu.

Upotreba kripto-aktive može uticati na potencijalne rizike po fiskalnu politiku putem utaje poreza, uz mogući pad prihoda od senioraže usled manjeg prisustva gotovine u opticaju. Ukoliko se desi veća tražnja za kripto-aktivom posledično može doći do odliva kapitala što utiče na devizno tržište. U tom slučaju potrebno je primeniti mere upravljanja kapitalom i druge mere koje se odnose na kripto-aktivu kako bi se postigla tržišna segmentacija (GFSR, 2021).

Regulatorni okvir kripto-aktive

Vodeću ulogu pri donošenju regulativnog okvira za kripto-aktivu imaju centralne banke, nadzorna i regulatorna tela i druga vladina tela. Prve reakcije na potencijalne rizike sa tržišta kripto-aktive su objavile centralne banke publikacijom saopštenja i upozorenja i nakon što su bitkoin i druge kripto valute dobile na svom razvoju. Prema Cuervo, Morozova i Sugimoto (2019) na polju donošenja regulatornog okvira kripto-aktive do sada je urađeno sledeće: (1) objava upozorenja – većina regulatornih tela, poput Komisije u hartije od vrednosti u Sjedinjenim Američkim Državama i Uprave za kontrolu i nadzor finansijskog sektora u Ujedinjenom Kraljevstvu, su objavile saopštenja kojima su upozorili na rizike kripto-aktive; (2) objava zabrana – nekoliko regulatornih tela je odlučilo da uvede zabranu bilo kakve aktivnosti kripto-aktive. Ovakav pristup su primenili Alžir, Bahrein, Bolivija, Kina, Bangladeš, Kolumbija, Dominikanska Republika, Iran, Irak, Indonezija, Maroko, Kuvajt, Maldivi, Nepal, Kirgistan i Katar; (3) objava smernica – pojedina regulatorna tela (poput Uprave za kontrolu i nadzor finansijskog sektora u Ujedinjenom Kraljevstvu, Finansijskog regulatora u Švajcarskoj) su saopštile smernice kojima su klasifikovale kripto-aktivu prema njihovim karakteristikama i podela je izvršena na kripto-aktivu koja se odnosu na hartije od vrednosti, sredstva plaćanja i uslužnu aktivu (eng. utility assets). Smernice su pretežno fokusirane na identifikovanju da li postoji regulativa koja se odnosi na bilo koju od navedenih vrsta kripto-aktive; (4) prilagođavanja regulative – pojedina regulatorna tela (poput Malte i Tajlanda u 2018) su objavile detalje o specifičnim zahtevima koji se mogu primeniti na različite aktivnosti i pružaoce usluga kripto-aktive, uključujući inicijalnu javnu ponudu i sekundarno trgovanje i (5) izvršenje – nekoliko regulatornih tela (poput Komisije u hartije od vrednosti i Komisije za trgovanje robnim fjučersima u Sjedinjenim Američkim Državama) su na pojedinačnoj osnovi uvele opcije izvršenja ili sankcije, kako bi se ograničile aktivnosti vezane za kripto-aktivu.

U januaru 2018. god. Odbor Međunarodne organizacije komisija za hartije od vrednosti objavio je saopštenje u kojem je izrazio zabrinutost koja se odnosi na inicijalnu javnu ponudu novčića (još se naziva prodaja tokena ili prodaja novčića). Saopštenje jasno ukazuje na rizike povezane sa inicijalnom javnom ponudom novčića jer je reč o visoko spekulativnoj investiciji u kojoj investitori rizikuju celokupan uložen kapital. Takođe, saopštenje je ukazalo na zabrinutost zaštite investitora jer je navedena transakcija van nacionalne regulative ili mogu biti predmet ilegalnih operacija koje krše postojeću regulativu (IOSCO, 2018). Nakon toga, u februaru 2020. god. Odbor Međunarodne organizacije komisija za hartije od vrednosti je objavio izveštaj „Pitanja, rizici i regulatorna razmatranja u vezi sa platformama za trgovanje kripto-aktivom“ u kojem je razmatrana kripto-aktiva kao vrsta privatne aktive koja se bazira na kriptografiji ili tehnologiji distribuirane knjige. Kripto-aktiva može da predstavlja aktivu ili vlasništvo nad aktivom poput valute, robe, hartija od vrednosti ili derivata na robi ili hartijama od vrednosti. Principi Međunarodne organizacije komisija za hartije od vrednosti predstavljaju širok okvir za regulisanje kripto-aktive i odnose na (IOSCO, 2020):

(1) saradnju - princip koji se odnose na saradnju obuhvata saradnju između regulatora u pogledu postizanja dogovora pri postavljanju regulatornih ciljeva, supervizije, kao i deljenja informacija sa domaćim i stranim partnerima;
(2) sekundarno trgovanje - princip koji se odnosi na sekundarno trgovanje obuhvata uspostavljanje sistema trgovanja koji će biti predmet prekograničnog nadzora, potom uspostavljanje transparentnog trgovanja, identifikovanje svih praksi nefer trgovanja i adekvatno upravljanje u slučaju velike izloženosti i svake tržišne nestabilnosti;
(3) tržišne posrednike – princip se odnosi na uspostavljanje minimalnih standarda za tržišne posrednike, kao i kapitalnih zahteva, potom definisanje procedura za slučaj lošeg poslovanja posrednika i nadoknada gubitka investitoru;
(4) kliring i poravnanje - sistemi poravnanja hartija od vrednosti treba da podležu regulatornim i nadzornim zahtevima koji su dizajnirani da obezbede pravednost, delotvornost i efikasnost, uz smanjenje sistemskog rizika.

Banka za međunarodna poravnanja je u martu 2019. godine (BIS, 2019) ukazala da ukoliko banka ili neki drugi učesnik na finansijskom sistemu odluči da ima izloženost ka kripto-aktivi da je potrebno da usvoji minimum standarda koji se odnose na due diligence (banka bi trebalo da, pre ulaganja u kripto-aktivu, sprovede sveobuhvatnu analizu rizika koji proizilaze iz kripto-aktive), upravljanje rizikom (svi učesnici finansijskog sistema bi trebalo da upravljanje rizicima kripto-aktive integrišu u sveobuhvatan sistem upravljanja rizicima, uključujući one koji se odnose na borbu protiv finansiranja terorizma i sprečavanje pranja novca), obelodavanje (potrebno je da se javno obelodani svaka materijalna izloženost kripto-aktivi kao deo finansijskih obelodanjivanja) i saradnja supervizora (neophodno je da se informišu supervizori o planiranoj i trenutnoj izloženost ka kripto-aktivi na pravovremen način). Pored toga, kripto-aktiva ne obezbeđuje standardne funkcije novca i nije bezbedna da bi se koristila kao sredstvo razmene ili čuvar vrednosti i nije sredstvo plaćanja, jer toj vrsti aktive nedostaje podrška vlade ili nekog drugog javnog autoriteta. Brojni su rizici kojima kripto-aktiva može da izloži banke – rizik likvidnosti, kreditni rizik, tržišni rizik, operativni rizik (uključujući rizik prevare i sajber rizik), rizik pranja novca i finansiranja terorizma, kao i pravni i reputacioni rizik.

Odbor za finansijsku stabilnost (Financial Stability Board – FSB) je tokom 2019. god. objavio nekoliko izveštaja o regulativi kripto-aktive. U aprilu 2019. god. objavljen je imenik o regulativi kripto-aktive sa ciljem pružanja informacija o relevantnim regulatorima i drugim nadležnim organima koji su pod jurisdikcijom Odbora za finansijsku stabilnost (FSB, 2019) . Tako je na primeru Evropske unije ukazano na nekoliko tela koja su zadužena za regulativu kripto-aktive. U nadležnosti Evropske komisije je priprema planova i regulative na nivou Evropske unije koja se odnosi na finansijski sektor, uključujući i kripto-aktivu, kako bi se razvilo tržište koje je dobro regulisano i globalno konkurentno. Takođe, nadležnost Evropske komisije je nadzor nad efikasnošću primene reforme finansijskog sektora i priprema adekvatnih odgovora na nove rizike po finansijsku stabilnost. Evropsko bankarsko telo nastoji da poboljša funkcionisanje internog tržišta Evropske unije, naročito u pogledu obezbeđenja visokog, efikasnog i konzistentnog nivoa regulative i supervizije koja se odnosi na kreditne institucije, investicione firme, platne institucije i institucije elektronskog novca. Evropsko telo zaduženo za sektor osiguranja i penzijske fondove (eng. European Insurance and Occupational Pensions Authority - EIOPA) nadležno je za monitoring kripto-aktive i za inicijalnu javnu ponudu novčića, dok je misija Evropske agencije za hartije od vrednosti i tržišta (eng. European Securities and Markets Authority - ESMA) da doprinese očuvanju stabilnosti finansijskog sistema Evropske unije obezbeđenjem zaštite za investitore i promovisanjem stabilnih i uređenih finansijskih tržišta.

U maju 2019. god. Odbor za finansijsku stabilnost objavio je dokument koji se bavi regulatornim pristupima kripto-aktive i potencijalnim nedostacima, gde je istaknuto da su regulatorna tela na nacionalnom nivou primenile različite pristupe u regulaciji kripto-aktive, što je opravdano različitim kretanjima na nacionalnom tržištu i razlikama u pravnim okvirima za finansijske sisteme (FSB, 2019a). U izveštaju o regulatornim implikacijama decentralizovanih finansijskih tehnologija, koji je Odbor za finansijsku stabilnost objavio u junu 2019. god., iskazano je da regulativa kripto-aktive predstavlja izazov za regulatore i supervizore finansijskog sistema, naročito one koji su fokusirani na centralizovane finansijske institucije. U slučaju decentralizovanog finansijskog sistema potrebno je ojačati pristup regulacije koja je zasnovana na konkretnim aktivnostima, jer je u tom sistemu teško povezati finansijske usluge sa određenim subjektima i/ili nadležnostima (FSB, 2019b).

Imajući u vidu povećane rizike od sajber napada, Evropska unija nastoji da ojača informacionu sigurnost učesnika na finansijskim tržištima (kao što su banke, investicioni fondovi i osiguravajuće kompanije). Iz tog razloga je Evropski savet u septembru 2020. godine predložio regulativu koja se odnosi na otpornost digitalnih operacija (eng. Digital Operational Resilience Act – DORA) sa ciljem da se očuva otpornost finansijskog sektora u Evropi tokom perioda u kojima je prisutna značajna operativna nestabilnost (EU Council, 2022). Navedena regulativa predstavlja deo paketa regulative digitalnih finansija koja obuhvata regulativu tržišta kripto-aktive i otvorene distribuirane knjige. Savet Evrope je započeo pregovore o usvajanju DORA u novembru 2021. god., dok je dogovor postignut u maju 2022. god. Usvajanjem DORA premošćen je dotadašnji jaz regulatornog okvira Evropske unije time što se usvojena regulativa odnosi na digitalne finansijske instrumente. Time ovaj paket podržava inovacije i uvođenje novih finansijskih tehnologija uz obezbeđenje adekvatnog nivoa zaštite korisnika i investitora. Regulativa tržišta kripto-aktive (eng. Markets in Crypto-Assets Regulations – MiCA), koja je stupila na snagu u junu 2023. god., predstavlja uniformna tržišna pravila na nivou Evropske unije za kripto-aktivu (ESMA, 2023). Ključne odredbe regulative se odnose na emitovanje i trgovanje kripto-aktivom, transparentnost, obelodavanje, autorizaciju i superviziju transakcija na tržištu kripto-aktive. Ovaj regulativni okvir podržava tržišni integritet i finansijsku stabilnost time što reguliše javnu ponudu kripto-aktive i obezbeđuje da korisnici budu bolje informisani o rizicima koji su povezani sa kripto-aktivom. Tokom faze implementacije regulative tržišta kripto-aktive Evropska agencija za hartije od vrednosti i tržišta, zajedno u saradnji sa Evropskim bankarskim telom, Evropskim telom zaduženim za sektor osiguranja i penzijske fondove i Evropskom centralnom bankom, će sprovesti konsultacije o nizu tehničkih standarda koji će biti objavljeni i primenjeni u tri paketa. Prvi paket je objavljen u julu 2023. godine i odnosi se na slanje obaveštenja nacionalnih nadležnih organa uz uspostavljanje obrazaca izveštavanja, postupanje po žalbama, kao i upravljanje i sprečavanje sukoba interesa. Drugi paket biće objavljen u oktobru 2023. godine i obuhvata indikatore održivosti, zahteve za obezbeđenjem kontinuiteta poslovanja, transparentnost podataka o trgovanju, kao i klasifikacija podataka o kripto-aktivi. Treći i finalni paket se očekuje da bude objavljen u prvom kvartalu 2024. godine i obuhvatiće kvalifikaciju kripto-aktive kao finansijskih instrumenata, nadzor i obaveštenja o tržišnoj nestabilnosti, zaštitu investitora i uspostavljanje otpornosti i sigurnosti sistema trgovanja.

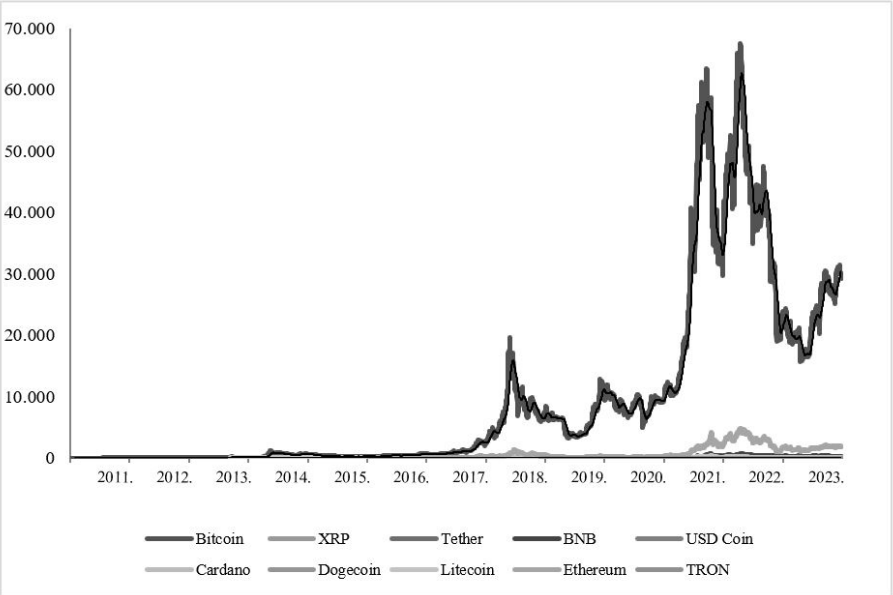
Regulatorni okvir kripto-aktive sa sobom nosi izazove koji se odnose na razvoj nove tehnologije i prisustvo novih transakcija. U tom pogledu je potrebno istaći rizike van nadležnosti regulatora koji se odnose na nadzor, sveukupno obelodanjivanje informacija, kao i kapitalne zahteve i zahteve likvidnosti koji mogu da poboljšaju otpornost učesnika u digitalnom sistemu. Dodatno, potrebno je ukazati na rizike kojima su izloženi imaoci kripto-aktive koji se odražava kroz rad platnog sistema, mogućnost naglog povlačenja sredstava od strane investitora, kao i zabrinutost za postojanje sistemskog rizika (Azar et al., 2022). Upravo dalji razvoj kripto-aktive, pojava novih instrumenata, sistema saldiranja transakcija, kao i potreba zaštite svih učesnika na tom tržištu predstavlja stalni izazov za regulatore ove materije na globalnom nivou.

Rizici po finansijsku stabilnost

Sistem kripto-aktive je međusobno povezan, što je posebno naglašeno nedavnim bankrotstvom mnogih emitenata kripto-aktive. Procikličnost u prodaji može da prouzrokuje ukupnu volatilnost na tržištu kripto-aktive. Ipak, potrebno je ukazati da izloženost kripto-aktive u velikoj meri korespondira onima kojima je izložen tradicionalni finansijski sistem. Cena kripto-aktive u značajnoj meri reaguje na fundamente, poput šokova monetarne politike, koji su posebno prisutni od 2020. godine. U periodima povećanih makrofinansijskih rizika cena naglo pada, što se odražava i na tradicionalne klase aktive poput akcija (Buch, 2023).

Kripto-aktiva predstavlja relativno nov instrument digitalnih plaćanja koji sa sobom, pored velikih mogućnosti, nosi i značajne rizike po postizanje i očuvanje finansijske stabilnosti. Veliki izazov tržišta kripto-aktive predstavlja identifikovanje, monitoring i upravljanje rizicima. To uključuje operativni i finansijski integritet rizika koji potiču od menjačnica kripto-aktive i stvaranje adekvatnog nivoa rezervisanja. Dodatno, na tržištima razvijenih zemalja i zemalja u razvoju može se desiti situacija koja se označava kao „kriptoizacija" koja podrazumeva da kripto-aktiva zameni domaću valutu i time zaobiđe mere koje se odnose na kontrolu deviznih tokova i upravljanja kapitalom (Adrian, He i Narain, 2021). Reč je o klasi aktive koja ima konstantan rast tržišne kapitalizacije, koja prema podacima sajta Coinmarketcap od 26. jula 2023. godine iznosi 1,17 triliona dolara od čega se na učešće bitkoina odnosi 48,4%, a Ethereum 19,0%. Od velikog značaja je ukazati na prisutnu volatilnost cena kripto-aktive. Tako je na primer bitkoin, kao najpoznatija kriptovaluta, sredinom jula 2010. godine imao cenu od svega 0,08 dolara, dok je sredinom jula 2011. god. vredeo 13,6 dolara što predstavlja međugodišnji rast od neverovatnih 157,8%. Na bazi raspoloživih podataka sa sajta Coinmarketcap cena bitkoina u periodu od 18. jula 2010. godine do 25. jula 2023. godine kretala se u rasponu od 0,05 dolara do 67.541,8 dolara. Sličan zaključak o značajnoj volatilnosti cena se mogu izvući i za ostale kriptovalute koje smo prikazali na Grafikonu 1, gde smo pokazali kretanje cena prvih deset kriptovaluta prema visini njihove tržišne kapitalizacije.

Grafikon 1: Kretanje cena izabranih kripto valuta (u USD)



Napomena: Poslednji prikazani podatak za 25 jul 2023.
Izvor: https://coinmarketcap.com/, Pristupljeno: 26.7.2023

Evropska centralna banka je objavila nekoliko analiza koje se bave implikacijama kripto-aktive na finansijsku stabilnost. U Izveštaju o finansijskoj stabilnosti iz maja 2018. godine analiza je pokazala da i pored značajnog rasta vrednosti tržišta kripto-aktive njihova vrednost je i dalje manja u poređenju sa ostalim klasama aktive. Navedeni izveštaj ukazuje da je bitkoin tokom 2018. godine izgubio čak 65% svoje vrednosti, čime je pokazao značajno veću volatilnost u kretanju cene u poređenju sa tradicionalnim klasama aktive. Ovakva kretanja ukazuju da postoje loše mogućnosti da kriptovalute budu pouzdani čuvar vrednosti, sredstvo razmene i jedinica mere. Evropska centralna banka zaključuje da trenutno kripto-aktiva ne predstavlja rizik po finansijsku stabilnost u zoni evra jer je celokupna izloženost tom delu tržišta i dalje skromna, potom postoji niska korelacija sa drugim delovima tržišta i ograničene su veze između finansijskog sistema i realne ekonomije. Ipak analiza ukazuje na nekoliko izvora potencijalne ranjivosti, gde se ističe povećano ulaganje u kripto-aktivu van Evrope i njeno korišćenje kao kolaterala pri kreditiranju. Upravo povezanost finansijskih tržišta na globalnom nivou ukazuje na potencijalnu ranjivost od ulaganja u kripto-aktivu. Evropska centralna banka zaključuje da je potrebno uspostaviti sistem prikupljanja podataka koji će se odnositi na ulaganje finansijskih institucija u kripto-aktivu, upotrebu te aktive kao sredstva obezbeđenja, kao i odobrenje kredita pojedincima i kompanijama koji ulažu u kripto-aktivu, a sve u cilju smanjenje nedostatka podataka koji su potrebni kako bi se ocenilo da li kripto-aktiva predstavlja pretnju od finansijsku stabilnost (ECB, 2018). U analizi iz maja 2019. godine Evropska centralna banka je ukazala da usled nedostatka podataka postoji ograničena mogućnost za procenu sistemskog rizika. Pored toga, navodi se porast brokerskih i svih usluga koje su povezane za institucionalne investitore, što može voditi povećanoj izloženosti kripto-aktivi. U odsustvu navedenih usluga moguće je smanjenje interesovanja institucionalnih investitora za ulaganje u instrumente kripto-aktive usled tehničkih ograničenja (ECB, 2019). U septembru 2020. godine Evropska centralna banka objavljuje radni papir u kojem razmatra potencijalne izvorλ rizika sa tržišta kripto-aktive, a koji mogu imati implikacije po finansijsku stabilnost. Istaknuta su dva rizika: (1) rizik likvidnosti i (2) rizik zaraze (eng. contangion risk). Rizik likvidnosti se odnosi na mogući gubitak investitora usled značajne volatilnosti vrednost kripto-aktive (primer je sajber napad na sistem ili elektronski novčanik), što može da prouzrokuje njihovu odluku o povlačenju investiranih sredstava. Povlačenje ulaganja se može desiti i zbog činjenice da kripto-aktiva ne može da garantuje fiksnu vrednost. U svakom slučaju značajno povlačenje sredstava može da prouzrokuje značajnu volatilnost u kretanju vrednosti kripto-aktive. Rizik zaraze se odnosi na prenosni efekat rizika likvidnosti koji se transferiše na učesnike u finansijskom sistemu usled povezanosti njihovih aktivnosti. Ovakva kretanja bi izazvala značajnu tržišnu volatilnost i priličnu nelikvidnost (ECB, 2020). Istraživanje globalnih regulatora pokazalo je da trenutno kripto-aktiva ne predstavlja pretnju po finansijsku stabilnost, ali zahteva konstantan nadzor i unapređenje regulative, kao i poboljšanje sistema prikupljanja podataka (Follak, 2022).

Edwards et al., (2019) ukazuju na potencijalne rizike sa tržišta kripto-aktive. Ističu da se instrumenti kripto-aktive mogu koristiti za kupovinu nedozvoljenih proizvoda (poput droga), potom ukazuju na mogućnost zloupotrebe anonimnosti pri kupovni kripto-aktive (na primer za finansiranje terorizma), zatim ističu značajnu manipulaciju cenom, što može dovesti do značajnih gubitaka investitora i njihovog poverenja, kao i hakerske napade (samo tokom 2018. godine putem hakerskih napada imaoci kriptovaluta su izgubili skoro jednu milijardu dolara). Rizici kripto-aktive su brojni i uključuju: (1) nedostatak zaštite depozitara; (2) visoku cenovnu volatilnost; (3) dokazano prisustvo da se neke transkacije kripto-aktive koriste za nelegalne aktivnosti, (4) smanjenja kontrola deviznih tokova i kontrole kapitala i (5) u slučaju zemalja u razvoju i razvijenih zemalja postoji rizik od digitalne dolarizacije (Ocampo, 2022).

Prema analizi Evropskog odbora za sistemski rizik potrebno je utvrditi vezu između kripto-aktive i tradicionalnog finansijskog sistema jer je to važan kanal za transmisiju šokova i zahteva dodatnu pažnju kako bi se razumelo prisustvo sistemskog rizika koji kripto-aktiva može da prouzrokuje. Trenutno vrednost kripto-tržišta u poređenju sa tradicionalnim finansijskim tržištem je jako mala, postoji sporadična korelacija između rasta i pada vrednosti kripto-aktive i tradicionalnih finansijskih instrumenata, kao i uključivanje kripto-aktive u postojeći portfolio akcija, obveznica i zlata neće dovesti do značajnijeg poboljšanja odnosa između prinosa i rizika. Ključno pitanje, iz perspektive Evropskog odbora za sistemski rizik, jeste kako tržište kripto-aktive može postati sistemski relevantno. To se može desiti na nekoliko načina. Prvo, značajan rast kripto-aktive može da pokrene naglo povlačenje sredstava, što posledično može da naškodi celokupnom finansijskom sistemu. Drugo, tržište kripto-aktive može da se integriše u tradicionalni finansijski sistem, gde će tradicionalni posrednici imati direktnu ili indirektnu izloženost i svaka veća volatilnost vodiće do sistemske nestabilnosti. Treće, pojava tokena koji bi imali stabilnu vrednost bi mogla da rezultira u stvaranju sredstva razmene koja se obično koriste u platnom sistemu. Takav token bi time delio svaku svaku slabost platnog sistema ukoliko bi se u značajnoj meri koristio (ESRB, 2023).

Rizike kripto-aktive možemo sagledati sa aspekta rizika koji se odnose na investitore i korisnike i na potencijalne rizike po finansijsku stabilnost (Dark et al., 2022). Rizici koji se odnose na investitore i korisnike obuhvataju tržišni rizik i rizik likvidnosti (mogućnost nelikvidnosti kripto-aktive usled značajnog povlačenja sredstva usled visoko spekulativne trgovine) i operativni rizik, uključujući rizik od sajber napada i rizik krađe (navedeni rizici se javljaju usled neregulisanog emitovanja, pružanja usluga i kompleksnosti sistema kripto-aktive. U slučaju sagledavanja potencijalnih rizika za finansijsku stabilnost potrebno je ukazati na sledeće: rizici za banke i druge značajne finansijske institucije (kripto-aktiva je izložena ranjivosti od naglog povlačenja sredstava, posedovanje te imovine kao kolaterala može da donese potencijalne gubitke i postoje pravni, operativni i reputacioni rizici od pružanja usluga poput kastodija), rizik finansiranja (previranja na tržištu mogu da dovedu do značajne prodaje kripto-aktive), rizik buduće upotrebe u plaćanjima (značajnija primena kripto-aktive u plaćanjima bi dovela do pojave rizike, što zavisi od obima i dizajna emitovanja) i klimatski rizici (kontinuirana ili povećana upotreba energetski intenzivne otvorene distribuirane knjige može da pogorša klimatske rizike). Prema istraživanju Saveta za nadzor finansijske stabilnosti (Financial Stability Oversight Council-FSOC) ranjivosti po finansijsku stabilnost sa tržišta kripto-aktive se mogu podeliti na dve kategorije. Prva se odnosi na međuzavisnost između kripto-aktive i tradicionalnog finansijskog sistema. Takva povezanost bi mogla da naglasi efekat šokova koji dolaze sa tržišta kripto-aktive. Druga kategorija pokriva set ranjivosti koji se odnose na tržište kripto-aktive, a uključuju potencijalni pad cene aktive, finansijsku izloženost, operativnu ranjivost, rizik povlačenja sredstava i leveridž. Svaka od navedenih ranjivosti može pojedinačno da se ispolji, ali mogu da deluju interaktivno, kao u slučaju tradicionalnog finansijskog sistema. Na primer spekulacija može da dovede do rasta cene i visokog nivoa leveridža (FSOC, 2022). Prethodno navedeni potencijalni rizici tržišta kripto-aktive zahtevaju pomno praćenje, prikupljanje i obelodanjivanje podataka o transakcijama, kao i stvaranje adekvatnog regulatornog okvira. Sve pobrojano predstavlja izazove za regulatorna i nadzorna tela imajuću konstantan razvoj kripto-aktive.

Zaključak

Globalno finansijsko tržište danas predstavlja osnov za razvoj savremenih tehnologija i primene novih digitalnih instrumenata plaćanja. Digitalizacija plaćanja omogućava povećanje finansijske inkluzije koja posledično dovodi do daljeg ekonomskog rasta i razvoja. Ti instrumenti su dobili na svom značaju i širokoj upotrebi nakon svetske finansijske krize, a naročito tokom pandemije virusa korona, tokom koje je došlo do zatvaranja zemalja. Time su pored upotrebe tradicionalnih finansijskih instrumenata pojedincima i kompanijama na raspolaganju ulaganje u kripto-aktivu, što omogućava diversifikaciju ulaganja. Pojavom kripto-aktive savremeni finansijski sistem je dobio velike mogućnosti na polju digitalizacije plaćanja, ali i značajne izazove i rizike po postizanje i očuvanje finansijske stabilnosti. Od početka emitovanja i trgovanja kripto-aktiva beleži značajnu volatilnost u kretanju cene, konstantan porast tržišne kapitalizacije i povećanje broja novih instrumenata na tom delu tržišta.

Kripto-aktiva se, prema Odboru za finansijsku stabilnost, može definisati kao privatna aktiva koja primarno zavisi od kriptografije i distribuirane knjige ili slične tehnologije kao deo njihove percipirane ili inherentne vrednosti. Pošto se kripto-aktiva može koristiti kao sredstvo razmene koje se elektronskim putem generiše, čuva i transferiše, često se sa stanovišta investitora i regulatora posmatra kao spekulativno sredstvo. Stalni razvoj kripto-aktive doveo je i do povećanja broja instrumenata koji se prema Banci za međunarodna poravnanja mogu podeliti na četiri kategorije - unbacked kripto-aktiva, uslužni tokeni, bezbednosni tokeni i stablecoins. Pored navedenih, potrebno je istaći i digitalne valute centralnih banaka na kojima aktivno rade centralne banke na globalnom nivou. Sama upotreba kripto-aktive zavisi od nekoliko faktora. Makroekonomska nestabilnost u kombinaciji sa neefikasnim platnim sistemom može da podstakne primenu kripto-aktive. Pored toga, nizak nivo kredibiliteta centralne banke može da poveća supstituciju aktive, jer domaći rezidenti mogu da traže sigurno utočište za očuvanje vrednosti svoje aktive, što je prisutno kod zemalja koje imaju visok nivo dolarizacije.

Od velikog značaja je sagledati međusobnu zavisnost tržišta kripto-aktive i instrumenata tradicionalnih finansija (poput akcija i obveznica). Upravo međusobna povezanost učesnika na finansijskom tržištu može da prouzrokuje da se nestabilnost na jednom delu tog sistema prenese na drugi deo i time izazove sistemski rizik koji može da se prenese na celokupan finansijski sistem. Nestabilan finansijski sistem može da zabeleži potencijalno visoke gubitke poslovanja, smanji poverenje investitora, ugrozi dobru reputaciju poslovanja, ali i da stvori visoku izloženost riziku likvidnosti i kreditnom riziku. Iz tog razloga neophodno je aktivno raditi na stvaranju regulatornog okvira kripto-aktive koji treba da omogući globalni nadzor nad svim transakcijama kripto-aktive, potom da pruži punu zaštitu za korisnike i investitore i stvori podstrek za dalji razvoj tog dela tržišta. Pri donošenju regulativnog okvira za kripto-aktivu vodeću ulogu imaju centralne banke, nadzorna i regulatorna tela i druga vladina tela. Tako je Odbor Međunarodne organizacije komisija za hartije od vrednosti ukazao da osnovni princip regulisanja kripto-aktive treba da obuhvati saradnju izmedju regulatora, uspostavljanje sistema sekundarnog trgovanja i minimalnih standarda za tržišne posrednike, kao i rešavanje pitanja koja se odnose na kliring i poravnanje. Banka za međunarodna poravnanja ističe potrebu da se uvede due diligence (sveukupna analiza rizika kripto-aktive), puno obelodanjivanje svake izloženosti kripto-aktivi i obezbeđivanje saradnje između supervizora. Na nivou Evropske unije Evropski savet je u maju 2022. godine usvojio regulativu koja se odnosi na otpornost digitalnih operacija koja je podržala inovacije i uvođenje novih finansijskih tehnologija uz obezbeđenje adekvatnog nivoa zaštite korisnika i investitora. U junu 2023. na snagu je stupila regulativa kripto-aktive čime su usvojena uniformna tržišna pravila na nivou Evropske unije za kripto-aktivu. Dalji razvoj tržišta kripto-aktive, pojava novih instrumenata, sistema saldiranja transakcija, kao i potreba zaštite svih učesnika na tom tržištu predstavlja stalni izazov za regulatore ove materije na globalnom nivou.

Kripto-aktiva, kao relativno nov instrument digitalnih finansija, sa sobom nosi značajne mogućnosti, ali i značajne rizike po postizanje i očuvanje finansijske stabilnosti. Evropska centralna banka je sprovela nekoliko analiza čiji zaključak je da trenutno kripto-aktiva ne predstavlja rizik po finansijsku stabilnost, imajući u vidu da je tržišta kripto-aktive i dalje manje u poređenju sa ostalim klasama aktive. Ipak analiza ukazuje na nekoliko potencijalnih ranjivosti gde je istaknuto da van Evrope postoji povećano ulaganje u kripto-aktivu i njeno korišćenje kao kolaterala pri kreditiranju. Ipak, potrebno je ukazati na potencijalne rizike, koji se prema Evropskoj centralnoj banci odnose na rizik likvidnosti (mogući gubitak investitora usled značajne volatilnosti kripto-aktive) i rizik zaraze (prenosni efekat rizika likvidnosti koji se transferiše na učesnike u finansijskom sistemu usled povezanosti njihovih aktivnosti). Pored navedenih rizika kripto-aktiva predstavlja izvor značajne volatilnosti cena, nedostatak zaštite korisnika, mogućnost korišćenja kripto-aktive za nelegalne aktivnosti, smanjenu kontrolu deviznih tokova i kontrolu kapitala, kao i postojanje rizika od digitalne dolarizacije. Pobrojani rizici mogu da se ispolje na pojedinačnoj osnovi, ali mogu da deluju interaktivno, što otežava njihovo upravljanje. Upravo prisustvo velikog broja potencijalnih rizika kripto-aktiva zahteva adekvatnu reakciju nadzornih organa i primenu odgovarajućeg regulatornog okvira, što je naročito bitno u vremenu stalnog razvoja digitalnih oblika plaćanja.

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FINANCIAL STABILITY IMPLICATIONS FROM THE CRYPTO-ASSET MARKET

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„Crypto-asset markets are fast evolving and could reach a point where they represent a threat to global financial stability due to their scale, structural vulnerabilities and increasing interconnectedness with the traditional financial system."

Financial Stability Board, 16 February 2022

Summary: A component of digital finance that has been developed with an aim to decrease the usage of cash payments and improve financial inclusion is the crypto-asset. Concerns have been raised about the preservation of financial stability, which stands in for one of the primary objectives of central banks - along with price stability - as a result of the significant growth of the market capitalization of crypto-assets, as well as the rise in the variety of crypto-assets instruments and the volatility of their prices. Operating outside of national borders, crypto-asset trading platforms could lead to a concentration of risk and a lack of business transparency. The market for crypto-assets is growing more quickly, which highlights the need for strict regulation of that sector of the market, data collection to effectively monitor transactions, as well as providing protection for consumers and investors. The safety of all partipicants, the efficient operation of the financial system, and the maintenance of financial stability should all be guaranteed by the regulation of the crypto-asset market.

Keywords: crypto-assets, financial stability, digitization, regulation

JEL classification: G11, E63

*The views expressed in this paper are those of the author and do not necessarily represent the official view of the National Bank of Serbia.

Introduction

The usage of modern technologies is becoming more and more significant in the global financial industry. Modern forms of payment based on various types of digital financial assets were established following the global economic crisis, particularly during the Corona virus pandemic when the country's closure measures were in place. Today, investors have the option to diversify their portfolios by purchasing crypto-assets in addition to investing in currencies, precious metals, equities, and bonds. A large amount of price volatility, high market capitalization, and a potentially high level of risk for establishing and maintaining the stability of the financial system have all been present since the beginning of the production of crypto-assets. In this paper, we will examine how the crypto-asset market may affect financial stability. The implications for the market's financial stability will be examined in this essay. We will begin with a review of the literature in the first section before moving on to a description of the characteristics of crypto-assets. The third section of the paper examines the regulatory framework for crypto-assets, and the fourth section evaluates the risks to financial stability posed by that sector of the financial market. We summarize the main findings of this paper in the conclusion.

Literature Review

The use of digital payment methods, which were developed with the goal of achieving greater financial inclusion, remains crucial today. This strategy is justified given that financial inclusion is thought to contribute to further economic growth and development, as well as social well-being. The crypto-asset market has a number of instruments that represent one of the digital payment methods. The global financial system has faced both opportunities and challenges as a result of its development. It is important to note that if the relationship between the institutions of the traditional financial system (including banks, leasing firms, and insurance companies) is not properly regulated and supervised, the crypto-asset market could pose serious risks to financial stability. As a result, the traditional financial system can result in significant corporate losses, undermine investor trust, endanger enterprises' reputation, and expose them to significant credit and liquidity concerns. Because of their interdependence, participants in the financial market have the potential to cause a chain reaction, which makes it simple for one participant's instability to spread to other players in the system. As a result, the financial system instability of a single country can spread to other countries, destabilizing their financial systems through raising systemic risk. In fact, systemic risk - which may be characterized as a financial risk that affects the entire financial system rather than just specific institutions - might increase as a result of the negative effects of digital finance (Risman et al., 2021). The fact that systemic risk was the main cause of the 2008 financial crisis is the best example of how large the impact of systemic risk can be.

The standard definition of financial stability or the stability of the financial system lacks a consensus. The World Bank (2020) indicates that there are numerous definitions of financial stability, and most of them have in common that the term implies the absence of episodes of stress in which the financial system cannot function, which leads to the emergence of crises. The interconnectedness of all financial system participants, currency substitution, and the fact that service providers from the crypto-asset market can generate a significant amount of systemic risk are highlighted by Bains et al. (2022) in their analysis of the main risks to financial stability that can be brought on by the market for crypto-assets.

These service providers also perform a greater number of activities in the market, which highlights market risk and third-party risk. The regulator's response to the risks mentioned above should focus on actively monitoring how much exposure each financial system participant has to the market for crypto-assets, limiting their potential investment in those instruments, and then establishing global cooperation and coverage for each exposure to those instruments. The many risks that crypto-asset market instruments may present in relation to financial markets and systems are something that financial authorities are working to solve. Specifically, this refers to market efficiency, investor protection, market integrity maintenance, and financial stability (Zetzsche et al., 2020).

The fact that traditional financial instruments have a very distinct set of constraints on their issuance and trading from crypto-asset market instruments is what sets them apart. Unlike traditional financial instruments, which are managed by governments and central banks and are governed by fiscal and monetary policy rules, cryptoassets are not subject to national regulation. Crypto-assets are then built on a digital, global economy that runs without intermediaries. This approach to conducting transactions significantly complicates the application of traditional regulatory policies and strategies to control crypto-assets (Elliott and De Lima, 2018). It is important to conduct a thorough analysis of these transactions in order to fully comprehend the numerous factors that investors consider when deciding whether to invest in crypto-assets. Due to the use of pseudonyms, it is challenging to associate each open trading account with specific people or businesses. Open distributed ledgers allow anybody to access the whole history of data on each individual transaction (Feyen et al., 2022).

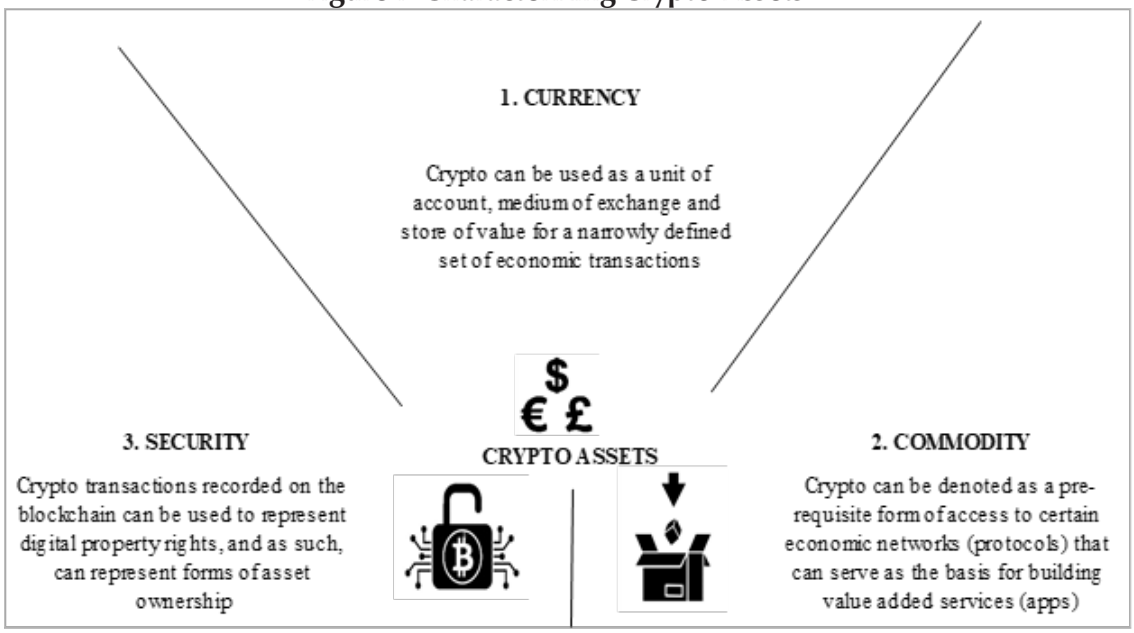
In addition to the enormous risks associated with the crypto-asset market, its benefits must also be highlighted. In circumstances where appropriate regulation is used, the use of crypto-assets has significantly altered the traditional global financial system, resulting in improved financial inclusion, more efficient transaction execution, and a decrease in systemic risk. The advantages of crypto-assets were emphasized during the recent Corona virus outbreak because they enabled for distant financial transactions and helped to lower transaction costs (Ozili, 2023). In order to maintain the growth and development of that segment of the market, a good regulatory framework should strike a balance between maintaining the protection of clients and investors and offering sufficient incentives for additional innovation in the crypto-asset market. Equally crucial are clearly stated guidelines that should cover all potential dangers associated with the crypto-asset market so that everyone applying the regulation does it in accordance with the rules (Bakken, 2022).

Characteristics of Crypto-Assets

Because they may be used as an electronic means of exchange that is generated, held, and transferred, crypto-assets have revolutionized the traditional financial sector. Crypto-assets have experienced tremendous price fluctuation since they were first created. As a result, from the viewpoint of both investors and regulators, crypto-assets are frequently viewed as speculative instruments (Garcia-Singh, Thomas, and Persad, 2021). Every month, thousands of new inventions are made in the field of crypto-assets, and new products based on a distributed ledger and crypto technology are also released (Demertzis and Wolff, 2018). Due to the introduction of Bitcoin as the most well-known cryptocurrency in 2008, there was a considerable increase in trading volume on the market for crypto-assets. Then, using the alias Satoshi Nakamoto, a paper was published analyzing the architecture of an electronic payment system via the creation of novel and ground-breaking blockchain technology. It is still unknown if that pseudonym relates to a specific person or a group of persons (Martin, 2020).

The development of crypto-assets shows that opportunities and threats coexist in an equal measure. In order to build a decentralized method of payment as well as a tool that may guard against inflation and currency depreciation, crypto-assets were initially developed. The development of new technologies, on which crypto-assets are based, with the application of adequate regulation, can create additional instruments compared to those offered by the traditional financial system. A crypto-asset is a private asset that largely relies on cryptography, distributed ledgers, or comparable technologies as part of its perceived or intrinsic worth, according to the Financial Stability Board's definition (FSB, 2018). This definition of a crypto-asset excludes it from the concept of traditional types of assets. However, it should be noted that various crypto-asset types can exhibit features of money, commodities, or securities - Figure 1.

Figure 1: Characterizing Crypto-Assets



Source: Elliott, D. and De Lima L. (2018). Crypto-assets: their future and regulation, Oliver Wyman, p. 8

Numerous crypto-assets frequently undergo severe price volatility, which makes them unreliable as a store of value and a measure of value. A global analysis of the data reveals that there is no unified taxonomy for crypto-assets. According to Brains et al.'s analysis from 2022, there are four categories of crypto-assets that are recognized by recognized regulators like the Bank for International Settlements.- Table 1. Unbacked crypto-assets that are portable, based on a decentralized method of balancing transactions, and primarily intended to be used as a medium of exchange are referred to as the first type. Bitcoin serves as an illustration of how the majority of this type of crypto-asset is used for speculation. Another category of crypto-asset is utility tokens, which are those that grant access to a current or planned good or service. A tokenized card for shopping at a certain store falls under this category. Security tokens are under the third category. They give the holder the same rights as holders of securities, such as the right to a portion of the issuer's profits. The term "stablecoins" refers to the fourth class of crypto-assets, which are based on a stable asset value, which could be a single asset or a collection of assets (such as a particular currency or precious metal). Stablecoins like Tether, Binance USD, and USD Coin are examples.

Bullmann et al.'s (2019) analysis claims that stablecoins are a type of cryptocurrency that don't actually reflect any particular currency (or basket of currencies), but instead base its value on stabilized instruments to lessen the impact of currency volatility. We differentiate several sorts of stablecoins: (1) Fiat-backed stablecoins are those that are directly linked to the current financial system through the ownership of conventional financial instruments; (2) Crypto-backed stablecoins are those that are supported by a reserve of crypto-assets, which may include both backed and other types of stablecoins. Crypto-backed stablecoins have a substantially larger degree of collateral because unbacked crypto-assets are frequently volatile, providing protection in the case of a decline in the value of the collateral. This kind of stablecoin frequently incorporates a mechanism to liquidate crypto-asset collateral if its value drops below a certain level, ensuring the stablecoin's solvency and (3) Stablecoins known as algorithmic stablecoins do not have any reserve assets used to determine their value. Through an algorithm that controls the stablecoins' supply and demand ratios, this kind of stablecoin aims to ensure price stability (MacDonald and Zhao, 2022).

It's crucial to draw attention to the digital currencies of central banks, which, under the Federal Reserve System's definition, are a digital obligation of the central bank that are accessible to the general public in addition to the aforementioned categories of crypto-assets. Digital payments are thus made possible thanks to central bank digital currencies (CBDC). Global central banks are actively developing their digital currencies: the Bank of England is working on the digital pound, the Federal Reserve System is developing the digital dollar, and the European Central Bank is introducing the digital euro. The central bank that issued the currencies would be in charge of them, creating an extra method of payment in addition to cash and non-cash forms of payment (Martin, 2021). Understanding how the adoption of central bank digital currencies will affect monetary policy and financial stability is crucial for central banks. Additionally, central banks' digital currencies must not be a cause of financial instability that could interfere with the way monetary policy is transmitted (Panetta, 2022). Non-fungible tokens, also known as NTF tokens, are a unique sort of crypto-asset, as opposed to fungible tokens, which all have the same value. Non-fungible tokens can be used to prove ownership of digital assets like artwork, music, or virtual properties because each one is unique.

Table 1: Taxonomy of Crypto Assets, NFTs and CBDC

NFT tokens	Securuty tokens	Utility tokens	Unbacked Crypto Asset	Stablecoins	CBDC
-Usually centrally issued	-Centrally issued	-Centrally issued	-Usually decentralised	-Designed to be value stable	-Centrally issued by a state of central bank
-Right to ownership of specific product	-Meets the definition of a security in each respective jurisdiction	-Right to a product/ service	-Designed to be used as a means of exchange	-Stability mechanism can be backing or collateralization with a commodity, fiat currency, multiple currencies, crypto assets of algorithms	-Designed to be value stable
-Collectible and non-substitutable	-Within the regulatory perimeter	-Accepted cross multiple ecosystem	-Limited rights for the token holder		-Stability mechanism is usually sovereign fiat currency
		-Transferable	-No single issuer to enforce right against		
		-Can be used as a means of exchange	-Transferable		

Source: Bains, P., Ismail, A., Melo, F. and Sugimoto , N. (2022). Regulating the Crypto Ecosystem: The Case of Unbacked Crypto Assets, International Monetary Fund, FinTech Notes No 2022/007, p. 12

The increased use of crypto-assets could be influenced by a number of variables. In some developing and developed countries, an ineffective payment system paired with an unstable macroeconomic environment can promote the usage of crypto-assets. As domestic residents look for a safe haven to maintain the value of their assets, a low degree of central bank credibility may boost asset substitution. This is particularly evident in countries with high levels of dollarization. Existence of a cryptosystem may encourage domestic residents to transfer their assets into various kinds of instruments that represent crypto-assets. An ineffective payment system and restricted access to financial services are the next two factors that may promote the use of crypto-assets. One issue that can hinder the flow of remittances is the incompatibility between various domestic payment systems. Remittances are occasionally transferred in cash through the post office and other transmission operators since a sizable portion of the population in some developing nations lacks access to a bank account. Stablecoins, which serve as a stable unit of account, can make the flow of remittances faster and less expensive when using crypto-assets. This strategy obviously involves use of the Internet and other technology, which are not widespread in many nations. It should be kept in mind that when using crypto-assets to receive remittances, they can be held for a short period of time (during the period of receipt), after which the recipients can exchange the foreign inflow for domestic currency and make purchases on the domestic market. The use of crypto-assets may have an impact on potential fiscal policy concerns due to tax evasion, and there may be a decrease in seigniorage income as a result of less currency in circulation. A crypto-asset may see a capital outflow if there is higher demand for it, which would have an impact on the foreign exchange market. Then, in order to achieve market segmentation, it is required to implement capital management measures and other measures relating to crypto-assets (GFSR, 2021).

Regulatory framework for crypto-assets

The establishment of the regulatory environment for crypto-assets is largely driven by central banks, supervisory and regulatory organizations, and other governmental entities. After Bitcoin and other cryptocurrencies gained popularity, the central banks published announcements and cautions as their initial responses to the potential risks from the crypto-asset market. The following has been accomplished so far in terms of establishing the regulatory framework for crypto-assets, according to Cuervo, Morozova, and Sugimoto (2019): (1) warning announcement - the majority of regulatory authorities, including the Financial Conduct Authority in the UK and the Securities and Exchange Commission of the United States, have released statements alerting the public to the risks associated with cryptoassets; (2) announcement of prohibitions - a number of regulatory authorities have made the decision to outlaw all cryptocurrency-related activity. Algeria, Bahrain, Bolivia, China, Bangladesh, Colombia, Costa Rica, the Dominican Republic, Iran, Iraq, Indonesia, Morocco, Kuwait, the Maldives, Nepal, Kyrgyzstan, and Qatar have all adopted this strategy; (3) publication of guidelines - a few regulatory bodies, including the Swiss Financial Market Supervisory Authority and the Financial Conduct Authority in the UK, released guidelines that divided crypto-assets into categories based on their characteristics, such as those related to securities, payment methods, and utility assets. The guidelines are primarily concerned with determining if any of the listed categories of crypto-assets are subject to regulation; (4) regulatory adjustments – some regulatory bodies, including Malta and Thailand in 2018, have published details of specific requirements that may apply to various crypto-asset activities and service providers, including initial public offerings and secondary trading and (5) enforcement – several regulatory bodies, including the Securities and Exchange Commission and the Commodity Futures Trading Commission in the USA, have introduced enforcement or sanction options on a case-by-case basis. Initial public coin offers, also known as token sales or coin sales, are something that the Board of the International Organization of Securities Commissions expressed worry about in a statement that released in January 2018.

Because the initial coin offering is a highly speculative transaction in which investors risk their whole investment, the announcement makes clear the hazards involved. Additionally, the announcement raised the issue of investor protection because the aforementioned transaction falls outside of national law or could be a target of unlawful activities that violate the law as it stands (IOSCO, 2018). The International Organization of Securities Commissions' Board later discussed crypto-assets as a class of private asset based on cryptography or distributed ledger technology in a report titled "Issues, Risks, and Regulatory Considerations Relating to Crypto-Asset Trading Platforms" published in February 2020. An asset or ownership of an asset, such as money, commodities, securities, or derivatives on commodities or securities, can be represented as a crypto-asset. The International Organization of Securities Commissions' (IOSCO's) guiding principles provide a comprehensive framework for managing digital assets and include (IOSCO, 2020):

(1) cooperation - the principle of cooperation covers information sharing with both local and international partners, supervision, and cooperation between regulators in establishing regulatory goals;
(2) secondary trading - the establishment of a trading system subject to international oversight, the development of transparent trading, the detection of all unfair trading practices, and the effective management of high exposure and any market instability are all part of the secondary trading principle;
(3) market intermediaries - the principle entails establishing minimum standards for market intermediaries as well as capital requirements, followed by the definition of procedures for the case of poor performance by intermediaries and compensation of losses to investors;
(4) clearing and settlement – promotion of justice, efficacy, and efficiency while lowering systemic risk, regulatory and supervisory standards should apply to clearing and settlement.

The Bank for International Settlements (BIS, 2019) stated in March 2019 that if a bank or other financial system participant decides to have exposure to crypto-asset, they must adopt minimum standards related to due diligence (the bank should make sure that, prior to investing in crypto-asset, a thorough analysis of the risks arising from crypto-asset is carried out), risk management (all financial system participants should incorporate the risk management of crypto-assets into a comprehensive risk management system, including those related to the fight against the financing of terrorism and the prevention of money laundering), disclosure (it is necessary to publicly disclose any material exposure to crypto-assets as part of financial disclosures), and cooperation of supervisors (it is required to inform supervisors about planned transactions with crypto-assets in order to obtain their cooperation). A crypto-asset also lacks the backing of a government or other public authority, making it unsafe to use as a medium of exchange or store of value and ineligible to be used as payment. As a result, it cannot perform the traditional functions of money. Liquidity risk, credit risk, market risk, operational risk (including fraud and cyber risk), money laundering and terrorist financing risk, as well as legal and reputational risk, are just a few of the risks that crypto-assets might expose banks to.

The Financial Stability Board (FSB) released a number of reports on the regulation of digital assets in 2019. In order to provide information on pertinent regulators and other competent bodies falling under the purview of the FSB, a directory on the regulation of crypto-assets was released in April 2019 (FSB, 2019). Thus, numerous organizations that are in charge of regulating crypto-assets were mentioned, using the European Union as an example. In order to create a well-regulated and internationally competitive market, the European Commission is in charge of creating policies and rules at the level

Additionally, it is within the purview of the European Commission to develop appropriate responses to emerging threats to financial stability and monitor the efficiency with which the financial sector reform is being implemented. By ensuring a rigorous, effective, and uniform level of regulation and oversight of credit institutions, investment firms, payment institutions, and electronic money institutions, the European Banking Authority hopes to enhance the efficiency of the European Union's internal market. While the European Securities and Markets Authority (ESMA) is charged with protecting investors and working to maintain the stability of the European Union's financial system, the European Insurance and Occupational Pensions Authority (EIOPA) is responsible for overseeing crypto-assets and the initial public offering of coins. Regulatory bodies at the national level have applied different approaches to the regulation of crypto-assets, which is justified by different movements in the national market and differences in the legal framework for financial systems, according to a document published by the Financial Stability Board (FSB) in May 2019 that dealt with regulatory approaches to crypto-assets and potential shortcomings (FSB, 2019a). The FSB stated in a report on the regulatory implications of decentralized financial technologies published in June 2019 that regulating crypto-assets presents a challenge for financial system regulators and supervisors, particularly those that focus on centralized financial institutions. Since it is challenging to link financial services to specific companies and/or jurisdictions in a decentralized financial system, it is required to enhance the approach to regulation that is based on concrete activities (FSB, 2019b).

The European Union aims to improve the information security of market participants (including banks, investment funds, and insurance companies) in light of the rising threats of cyberattacks. To preserve the financial sector's resilience in Europe during times of significant operational instability, the European Council proposed a regulation relating to the resilience of digital operations (the Digital Operational Resilience Act, or DORA), in September 2020 (EU Council, 2022). The aforementioned regulations is a component of the package of laws governing digital finance, which also covers an open distributed ledger and the regulation of the market for crypto-assets. In November 2021, the Council of Europe began discussions about adopting DORA; in May 2022, an agreement was reached. Due to the accepted regulation's reference to digital financial instruments, the adoption of DORA filled the previous gap in the EU's legal framework. While maintaining an acceptable level of security for users and investors, this package encourages innovation and the introduction of new financial technologies. The Markets in Crypto-Assets Regulations (MiCA), which became effective in June 2023, represent standardized market regulations for digital assets at the level of the European Union (ESMA, 2023). The main provisions of this rule involve transparency, disclosure, authorisation, and supervision of transactions in the crypto-asset market and are relevant to the creation and trading of crypto-assets. By regulating the public selling of crypto-assets and ensuring that users are properly educated about the risks involved with crypto-assets, this regulatory framework promotes market integrity and financial stability. The European Securities and Markets Authority, along with the European Banking Authority, the European Insurance and Occupational Pensions Authority, and the European Central Bank, will conduct consultations on a number of technical standards that will be published and applied in three packages during the implementation phase of the crypto-asset market regulation. The first package, which was released in July 2023, addresses the construction of reporting forms, the treatment of complaints, the management and prevention of conflicts of interest, as well as the sending of notifications to national competent authorities. The second set of regulations, which will be released in October 2023, will address sustainability indicators, business continuity needs, trade data transparency, and classification of crypto-asset data. The third and final package, which focuses on investor protection, establishing the trading system's resilience and security, and qualifying crypto-assets as financial instruments, is anticipated to be published in the first quarter of 2024.

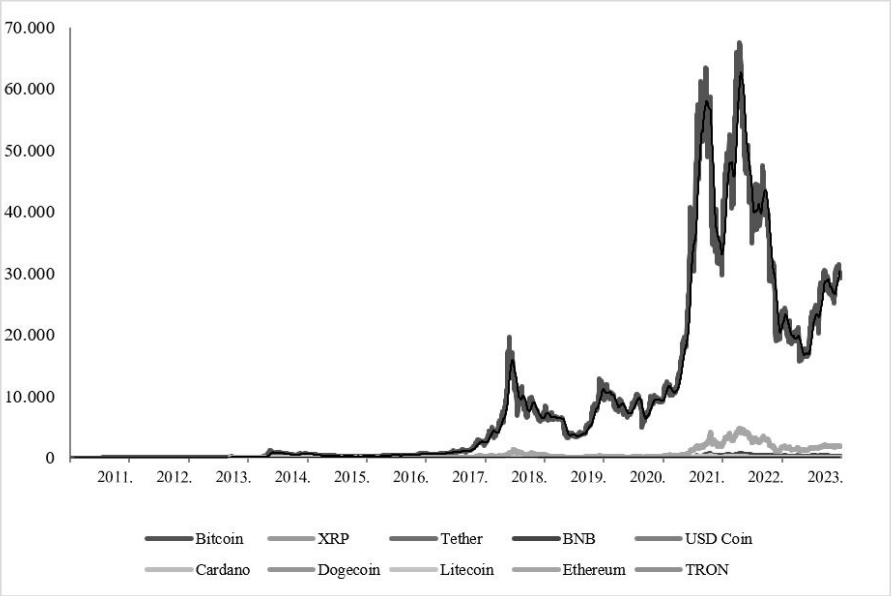
There are issues with the regulatory framework for crypto-assets that are related to the emergence of new technology and the existence of new transactions. In this context, it is important to draw attention to the risks relating to oversight, information disclosure in general, and capital and liquidity requirements that may increase the resilience of system participants and fall outside the authority of the regulator. Furthermore, it is important to draw attention to the risks that owners of crypto-assets face, which are represented in the functioning of the payment system, the potential for investors to withdraw money suddenly, and worries about the existence of systemic risk (Azar et al., 2022). The worldwide regulators of this issue face a continuing challenge due to the continued development of crypto-assets, the emergence of new instruments and transaction settlement mechanisms, as well as the requirement to protect all market participants.

Financial Stability Risks

The recent bankruptcy of numerous crypto-asset issuers serves to highlight the interconnectedness of the crypto-asset system. Procyclicality in sales might lead to market volatility overall for crypto-assets. It should be noted, nonetheless, that the exposure to which crypto-assets are exposed broadly reflects the exposure to which the conventional financial system is exposed. Fundamentals like monetary policy shocks, which have been particularly prevalent since 2020, have a big impact on how much the price of the crypto-asset reacts. The price plummets during times of elevated macro-financial concerns, which is also seen in conventional asset classes like shares (Buch, 2023).

Crypto-assets is a relatively new form of digital payment that offers both huge benefits and serious threats for reaching and maintaining financial stability. Identifying, monitoring, and managing risks is a significant difficulty in the crypto-asset market. This includes the implementation of an acceptable degree of provisioning as well as the operational and financial integrity of risks resulting from crypto-asset exchanges. Additionally, "cryptoization"—a situation where crypto-assets take the place of the national currency and eventually get around controls on capital management and foreign exchange flows—may happen in the markets of developed and developing nations (Adrian, He, and Narain, 2021). According to the Coinmarketcap website, the market value of this asset class reached 1.17 trillion dollars on July 26, 2023, of which 48.4% will be accounted for by bitcoin and 19.0% by Ethereum. It is crucial to draw attention to the current volatility of crypto-asset values. For instance, the most well-known cryptocurrency, bitcoin, only cost 0.08 dollars in mid-July 2010 but was worth 13.6 dollars in mid-July 2011, an astounding increase of 157.8% year over year. According to data from the website Coinmarketcap, the price of bitcoin fluctuated from $0.05 to $67,541.8 between July 18, 2010 and July 25, 2023. For the other cryptocurrencies that we have displayed in Chart 1, where we have shown the price movement of the top 10 cryptocurrencies based on market capitalization, a similar conclusion about considerable price volatility can be formed.

Graph 1: Price movement of selected cryptocurrencies (in USD)



Note: Last observation is for 25 July 2023
Source: https://coinmarketcap.com/, Accessed: 26.7.2023

The effects of crypto-assets on financial stability have been the subject of various analyses issued by the European Central Bank. The study published in the May 2018 Financial Stability Report demonstrated that, despite the market's notable rise, cryptocurrencies still have a lesser value than other asset classes. According to the aforementioned analysis, bitcoin lost up to 65% of its value in 2018, displaying noticeably more volatility in price changes than established asset classes. Such developments point to dim prospects for cryptocurrencies serving as a trustworthy tore of value, medium of exchange, and unit of measure. Since there is currently a low overall exposure to that segment of the market, there is little correlation with other areas of the market, and there are few connections between the financial system and the real economy, the European Central Bank comes to the conclusion that crypto-assets do not currently pose a risk to financial stability in the euro zone. However, the analysis identifies a number of possible areas of vulnerability, with rising crypto-asset investment outside of Europe and its usage as collateral for lending standing out. The global financial markets' interconnectedness serves as a warning about the possible risk of investing in crypto-assets. The European Central Bank comes to the conclusion that, in order to reduce the lack of data required to determine whether cryptoassets pose a threat to financial stability, it is necessary to establish a data collection system that will be related to the investment of financial institutions in cryptoassets, the use of those assets as collateral, as well as the approval of loans to individuals and companies that invest in crypto-assets (ECB, 2018). Additionally, the European Central Bank's examination from May 2019 found that there is no opportunity to evaluate systemic risk because of the lack of data. Additionally, institutional investors are becoming more exposed to crypto-assets due to the growth of brokerage and all connected services. Due to technical restrictions, institutional investors' interest in purchasing crypto-asset securities may decline in the absence of the aforementioned services (ECB, 2019). The European Central Bank publishes a working paper in September 2020 that examines potential sources of risk from the market for crypto-assets that could have an impact on financial stability. There were two risks that were mentioned: (1) liquidity risk and (2) contagion risk. Liquidity risk refers to the possible loss of investors due to significant volatility in the value of crypto-assets (a cyberattack on a system or an electronic wallet is an example), which may lead them to decide to withdraw their invested monies.

Because crypto-assets cannot ensure a steady value, withdrawal of investments may potentially occur. In any case, a sizable withdrawal can result in sizable volatility in the movement of the crypto-asset's value. Liquidity risk that can spread to other participants in the financial system as a result of connections between their activities is referred to as contagion risk. A large increase in market volatility and illiquidity might result from such changes (ECB, 2020). According to research conducted by international regulators crypto-assets do not currently pose a threat to financial stability, but regulation needs to be continually monitored and improved, as well as the data collection system (Follak, 2022).

According to Edwards et al. (2019), there may be risks in the market for crypto-assets. They draw attention to the fact that crypto-asset instruments can be utilized to purchase illicit goods (such as drugs), the potential for abusing anonymity when purchasing crypto-assets (for example, to finance terrorism), significant price manipulation that can result in significant losses for investors and their trust, as well as hacker attacks (in 2018 alone, cryptocurrency holders lost almost one billion dollars as a result of hacker attacks). The risks associated with crypto-assets are numerous and include: (1) a lack of depository protection; (2) high price volatility; (3) the proven existence of some crypto-asset transactions being used for illegal activities; (4) the relaxation of capital and foreign exchange controls; and (5) the possibility of digital dollarization in both developing and developed nations (Ocampo, 2022).

The traditional financial system is an important channel for the transmission of shocks and requires additional attention to understand the presence of systemic risk that crypto-assets can cause, according to the analysis of the European Board for Systemic Risk. For this reason, it is necessary to determine the relationship between crypto-assets and the traditional financial system. The value of the crypto market is currently very small in comparison to the traditional financial market; the value of crypto assets and traditional financial instruments fluctuate at random; and adding crypto-assets to an existing portfolio of stocks, bonds, and gold will not significantly improve the return-to-risk ratio. How the crypto-asset market might become systemically significant is a crucial concern from the standpoint of the European Systemic Risk Board. This may occur in a number of ways. The entire banking system could be affected first by unexpected withdrawals brought on by significant growth in crypto-assets. Second, the market for crypto-assets can be incorporated into the established financial structure, where traditional intermediaries will have direct or indirect exposure and any increased volatility will result in systemic instability. Third, the establishment of tokens with a steady value can lead to the development of a single medium of exchange for the payment system. If such a token were to be used in a substantial manner, it would therefore share every flaw with the payment system (ESRB, 2023).

When considering the risks associated with users, investors, and potential threats to financial stability, one can consider the risks associated with crypto-assets (Dark et al., 2022). Risks related to investors and users include market risk, liquidity risk (possibility of illiquidity of crypto-assets due to a significant withdrawal of funds due to highly speculative trading), and operational risk, including the risk of cyber-attacks and theft risk (the aforementioned risks arise due to unregulated broadcasting, service provision, and the complexity of the crypto-asset system The following should be mentioned when discussing potential risks for financial stability: funding risk (market instability may result in a sizable sale of cryptoassets), risks for banks and other significant financial institutions (cryptoassets are exposed to vulnerability from sudden asset allocation, holding that asset as collateral can bring potential losses, and there are legal, operational, and reputational risks from providing services like custody), funding risk (market turmoil can lead to a significant sale of crypto-assets), risk of future use in payments (more significant use of crypto-assets in payments would lead to the emergence of risks, which depend on the volume and design of the broadcast), and climate risk (continued or increased use of energy-intensive open distributed ledgers can exacerbate climate risks). Financial Stability Oversight Council (FSOC) research has identified two categories of financial stability vulnerabilities coming from the crypto-asset market. The first is related to the interconnectedness between traditional finance and crypto-assets.

Such a link can intensify the impact of shocks coming from the market for crypto-assets. The second group of risks includes a variety of crypto-asset market vulnerabilities, such as possible asset price drops, financial exposure, operational vulnerability, withdrawal risk, and leverage. Although each of the aforementioned vulnerabilities can appear on its own, they can also interact, as in the case of a traditional financial system. For instance, speculation may result in price hikes and significant leverage (FSOC, 2022). The market for crypto-assets needs to be closely monitored, transaction data must be collected and disclosed, and a suitable regulatory framework is required. All of the aforementioned pose difficulties for regulatory and oversight entities that must deal with the ongoing evolution of crypto-assets.

Conclusion

Today's global financial markets serve as the foundation for new digital payment instruments and the advancement of contemporary technologies. Payment digitization makes it possible for more people to use financial services, which subsequently promotes greater economic growth and development. After the global financial crisis, those tools became more significant and frequently used, particularly during the corona virus pandemic when entire nations were shut down. Thus, individuals and businesses can invest in crypto-assets in addition to using traditional financial instruments, allowing for investment diversification. The advent of crypto-assets has provided the modern financial system with many potential for the digitization of payments, but it has also created substantial risks and obstacles for reaching and maintaining financial stability. Since they were first broadcast and traded, crypto-asset have had a high degree of price volatility, a continuous rise in market value, and an increase in the number of new instruments entering that market.

According to the Financial Stability Board, crypto-assets are private assets whose perceived or actual worth principally depends on encryption, distributed ledgers, or related technology. Crypto-assets are frequently seen as speculative assets from the perspectives of investors and authorities because they can be used as a medium of exchange that is electronically generated, stored, and transferred. The number of instruments that fall into the four categories of unbacked crypto-assets, utility tokens, security tokens, and stablecoins has increased as a result of the continuous development of crypto-assets, according to the Bank for International Settlements. In addition to the aforementioned, it is important to draw attention to the central banks' digital currencies, which are currently the subject of active global development. The very use of a crypto-asset depends on a number of variables. The adoption of crypto-assets may be influenced by macroeconomic volatility mixed with a poor payment infrastructure. Furthermore, a low degree of central bank credibility, which is evident in nations with high levels of dollarization, may lead to a rise in asset substitution as local people look for safe havens to maintain the value of their possessions.

It is crucial to consider how the traditional financial markets for stocks and bonds and the cryptoasset market are interdependent. Because financial market participants are tied to one another, instability in one area of the system may spread to another, creating a systemic risk that may affect the entire financial system. An unstable financial system can result in potentially large business losses, erode investor trust, jeopardize a company's good name, and increase vulnerability to credit and liquidity risk.

Because of this, it is essential to work actively on the development of a regulatory framework for crypto-assets that will enable global supervision of all crypto-asset transactions, offer complete protection for users and investors, and encourage further growth of that sector of the market. The establishment of the regulatory environment for crypto-assets is largely driven by central banks, supervisory and regulatory organizations, and other governmental entities. As a result, the International Organization of Securities Commissions Board stated that the fundamental principles of regulating crypto-assets should include cooperation between regulators, the establishment of a secondary trading system and minimum standards for market intermediaries, as well as the resolution of issues related to clearing and settlement. The Bank for International Settlements emphasizes the necessity of implementing due diligence (an overall risk review of crypto-assets), complete disclosure of any exposure to crypto-assets, and guaranteeing supervisory collaboration. The European Council enacted rules pertaining to the resilience of digital operations in May 2022 at the level of the European Union, fostering innovation and the adoption of new financial technologies while maintaining an acceptable level of user and investor safety. The regulation of crypto-assets, which adopted consistent market regulations at the level of the European Union for crypto-assets, went into effect in June 2023. The global regulators of this issue face ongoing problems from the continued growth of the crypto-asset market, the appearance of new instruments and transaction settlement mechanisms, as well as the requirement to safeguard all market participants.

As a relatively new form of digital finance, crypto-assets present both substantial opportunities and threats for achieving and maintaining financial stability. Considering that the market for crypto-assets is currently relatively tiny in comparison to other asset classes, the European Central Bank has done a number of assessments that have come to the conclusion that crypto-assets do not constitute a risk to financial stability. However, the research identifies a number of possible vulnerabilities. It is noted that investments in crypto-assets and their use as loan collateral have grown outside of Europe. However, it is important to draw attention to the potential risks, which the European Central Bank claims are related to liquidity risk (the potential loss of investors due to the high volatility of crypto-assets) and contagion risk (the effect of liquidity risk spreading to participants in the financial system as a result of their interconnected activities). In addition to the risks already mentioned, other risks associated with crypto-assets include high price volatility, a lack of user protection, the potential for using them for illegal activities, a loss of control over capital and foreign exchange flows, and the possibility of digital dollarization. The stated risks might appear individually, but they can also interact with one another, making it challenging to manage them. Because there are so many potential risks connected to crypto-assets, supervisory authorities must respond appropriately and implement an acceptable regulatory framework. This is crucial at a time when digital payment methods are constantly evolving.

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KONVERGENTNOST BANKARSKOG SEKTORA REPUBLIKE SRBIJE U USLOVIMA FINANSIJSKE INTEGRACIJE

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Rezime: Proces finansijske integracije nalazi se u fokusu interesa svih ekonomskih subjekata. Viši nivo finansijske integracije doprinosi poboljšanju performansi nacionalnih ekonomija i to preko smanjenja troškova kapitala i preko poboljšane alokacije finansijskih resursa. Sa trendom globalizacije, još od kraja 80-ih godina XX veka, odvija se i proces finansijske integracije kao posledica uklanjanja barijera za kretanje kapitala između zemalja. U ovom radu su kvalitativno analizirana finansijska integracija i pokazatelji finansijske integracije. S tim u vezi, posebna pažnja u radu se posvećuje integraciji bankarskog sektora Republike Srbije. Sagledana je struktura bankarskog sektora Republike Srbije, kao i vrednosti pokazatelja koncentracije i konkurencije Hiršman – Herfindalov indeks i CR5. Podaci su prikupljeni tokom desetogodišnjeg razdoblja koje obuhvata period nakon svetske ekonomske krize i sve do pojave pandemije COVID-19. Takođe, posmatrane su vrednosti pokazatelja profitabilnosti (ROA i ROE) u zemljama Zapadnog Balkana, u periodu od 2013. do 2020. godine.

Ključne reči: finansijska integracija, pokazatelji, bankarski sektor, Republika Srbija, ROA, ROE

JEL klasifikacija: E36, E50

Uvod

Globalizacija i integracija su značajno uticale na dinamiku promena u ekonomijama širom sveta. Globalizacija predstavlja pojavu, koja podrazumeva ukidanje barijera u svetskoj trgovinskoj razmeni. U ekonomskom smislu, to je proces kojim se smanjuju ili potpuno ukidaju prepreke u međunarodnoj ekonomskoj razmeni i povećava ekonomska integracija među zemljama. Integracija privreda zemalja Zapadnog Balkana, među kojima je Republika Srbija, i njihovo aktivnije uključivanje u globalne lance vrednosti visoko je pozicionirano na agendi EU. Kao posledica finansijske globalizacije, došlo je do finansijskih kriza zemalja u razvoju koje su se proširile na Latinsku Ameriku, Aziju i Afriku, 80-ih i 90-ih godina. U mnogim zemljama bankarski sistemi su doživeli kolaps, privrede koje su se brzo razvijale iznenada su se suočile sa oštrom recesijom, a svi veći međunarodni tokovi kapitala sredinom 1990-ih pali su na još niže nivoe.

Bhagwati, 1998; Rodrik, 1998; Stiglitz, 2002, nameću tvrdnju da finansijska integracija nosi ogromne rizike koji daleko prevazilaze potencijalne koristi za većinu zemalja sa srednjim nivoom dohotka. Takođe, Stiglitz (2000) traži od zemalja u razvoju da stave neka ograničenja na priliv kapitala kako bi ublažili „prekomerne" obrasce rasta i pada na finansijskim tržištima. Iskustva iz dosadašnjih finansijskih kriza su pokazala da je trgovina mehanizam preko kojeg se efekti krize prenose između zemalja, odnosno da je trgovina najočiglednija ekonomska veza između zemalja. (Ahmed et al., 2017). Sa druge strane, Fischer, 1998; Summers, 2000, vide finansijsku globalizaciju kao važan korak za tržišta u nastajanju sa srednjim nivoom dohotka, koja teže nivoima dohotka i stabilnosti poput onih koje postižu napredne industrijske ekonomije.

Mnogi ekonomisti ukazuju na prednosti integracije. Povećavajući dostupnost finansijskih sredstava i omogućavajući diversifikaciju rizika među zemljama, finansijska liberalizacija pomaže u poboljšanju funkcionisanja finansijskih sistema. Stutz (1999) i Mishkin (2001) tvrde da finansijska integracija promovišu transparentnost i odgovornost, smanjujući negativnu selekciju i moralni hazard dok istovremeno smanjuju probleme likvidnosti na finansijskim tržištima. Takođe, ističu da međunarodna tržišta kapitala pomažu da se disciplinuju kreatori ekonomske politike, koji bi mogli biti u iskušenju da iskoriste inače zarobljeno domaće tržište kapitala.

Predmet istraživanja ovog rada su pokazatelji finansijske integracije i uključenost bankarskog sektora Republike Srbije u međunarodno okruženje. Početkom razvoja integracije smatra se 1989. godina, kada je realizovana odluka o slobodnom kretanju kapitala na celoj teritoriji Evropske Unije. Takođe, prvom bankarskom direktivom koja je doneta još davne 1997. godine utvrđen je princip da je matična zemlja (zemlja porekla) nadležna za superviziju i kontrolu svoje banke u drugoj zemlji u kojoj posluje. Nešto više od desetak godina kasnije, doneta je druga bankarska direktiva koja se oslanjala na liberalnije uslove poslovanja banaka na globalnom nivou, koja je predviđala da banka koja ima dozvolu (licencu) za rad u bilo kojoj EU zemlji može da osnuje filijalu ili da posluje u inostranstvu, bez potrebe dobijanja bilo kakvih dozvola donetih od lokalnih regulatornih tela, centralnih banaka. U tom vremenskom periodu, taj princip se nazivao princip „jedinstvenog pasoša".

Finansijska integracija doprinosi razvoju finansijskog sistema tako što podstiče konkurenciju, proširuje tržište i povećava efikasnost finansijskih institucija. Cilj rada jeste da se prikaže uključenost bankarskog sektora kao segmenta finansijskog tržišta Republike Srbije u međunarodno okruženje, pomoću strukture bankarskog sektora i vrednosti odabranih pokazatelja.

Rad je strukturiran iz tri komplementarna dela. U prvom delu će biti definisan pojam i karakteristike finansijske integracije. U ovom delu će biti istaknute prednosti i nedostaci finansijske integracije. U drugom delu rada će biti kvalitativno analizirane mere finansijske integracije. U trećem delu rada će biti prikazan uticaj finansijske integracije na bankarski sektor Republike Srbije. Biće sagledana struktura finansijskog sektora, kao i samog bankarskog sektora i biće prikazane vrednosti određenih finansijskih parametara.

Finansijska integracija

Finansijska integracija je „proces, vođen tržišnim silama, u kome odvojena nacionalna finansijska tržišta postepeno ulaze u konkurenciju jedna sa drugima i na kraju postaju jedno finansijsko tržište, koje karakteriše konvergencija cena i ponuda proizvoda i konvergentna efikasnost/profitabilnost između pružalaca finansijskih usluga“ (Financial Integration Monitor, 2005).

Finansijska integracija, odnosno jedinstveno finansijsko tržište, obezbeđuje mehanizam podele rizika, koji služi kao izvor tržišnog mehanizma izjednačavanja dohotka u slučaju asimetričnih ekonomskih poremećaja. U uslovima diversifikovanog regionalnog portfolija finansijske aktive, prihod od investiranog kapitala u drugim zemljama, koje nisu pogođene ekonomskim šokom, služi kao dodatni izvor dohotka investitorima u zemlji koja je pogođena ekonomskim šokom. Rizik negativnog šoka u jednoj zemlji dele sve druge zemlje. Kao rezultat toga, uticaj negativnog šoka u proizvodnji u jednoj zemlji na dohodak stanovništva te zemlje je ublažen (De Grauwe, 2003).

Jappelli i Pagano (2008) ističu da uklanjanje barijera finansijskoj integraciji može podstaći lokalni finansijski razvoj kroz povišeni nivo konkurencije koju predstavljaju sofisticiranije i bolje organizovane inostrane finansijske institucije. Inostrane finansijske institucije su u stanju da pruže ekonomskim subjektima u zemljama koje se nalaze na nižem nivou finansijskog razvoja finansijske usluge po povoljnijim cenovnim i drugim uslovima, što bi trebalo da doprinese rastu i razvoju lokalnog finansijskog sistema.

Finansijska integracija može da nastane kao ugovorna ili spontana tvorevina. U prvom slučaju, ona nastaje kao odgovor na finansijske poremećaje ili kroz eliminaciju restrikcija u prekograničnim finansijskim operacijama od strane država članica, a takođe i kroz harmonizaciju i regulisanje finansijskog sistema radi potpune unifikacije regionalnog tržišta. U drugom slučaju, ona može nastati spontanom podelom informacija, ulaganjem kapitala ili pozajmljivanjem na finansijskom tržištu (Ho, 2007).

Prednosti finansijske integracije se ogledaju u sledećem:

- Veća mogućnost diversifikacije portfelja (investitor može imati više opcija za plasiranje novca, što utiče na povećanje ne samo broja, već i vrsta dostupnih finansijskih proizvoda);
- Operativni troškovi bi imali tendenciju opadanja, uzimajući u obzir ekonomiju obima koju bi finansijske institucije mogle postići;
- Zbog povećane konkurencije, finansijske institucije bi težile da ponude veće kamate štedišama i investitorima, kao i niže kamate onima koji se prijavljuju za finansiranje.

Finansijska integracija poboljšava prekogranično kretanje kapitala, investicije i finansijske informacije (Beinei i Candelon, 2011). Poboljšava finansijske sisteme i finansijske transakcije unutar regiona. Olakšava efikasnu alokaciju kapitala, regionalnu akumulaciju kapitala i poboljšava produktivnost (Yuhn, 1997; Bai i Zhang, 2012). Štaviše, osigurava slobodno kretanje kapitala što doprinosi dugoročnom rastu realne ekonomije. Prednosti finansijske integracije uključuju efikasnu alokaciju kapitala, bolje upravlja -nje, veće investicije i rast, i podelu rizika. Levine (2001) pokazuje da finansijska integracija pomaže u jačanju domaćeg finansijskog sektora omogućavajući efikasniju alokaciju kapitala i veće mogućnosti ulaganja i rasta. Ako je pristup široj bazi kapitala glavni pokretač ekonomskog rasta, onda je finansijska integracija jedno od rešenja, jer olakšava tokove kapitala iz razvijenih ekonomija sa bogatim kapitalom u ekonomije u razvoju sa ograničenim kapitalom. Ovi prilivi kapitala mogu značajno smanjiti cenu kapitala u ekonomijama siromašnim kapitalom, što dovodi do većih investicija. Finansijska integracija takođe može pomoći da se predvidi volatilnost potrošnje jer potrošači nisu skloni riziku i žele da koriste finansijska tržišta kao osiguranje od rizika prihoda. Tako da se uticaj privremenih idiosinkratičnih šokova na rast prihoda na rast potrošnje može ublažiti. Snažnije povezivanje rasta potrošnje širom sveta takođe može biti rezultat finansijske integracije (Kose et al., 2006). Štaviše, finansijska integracija takođe može pružiti velike koristi za međunarodnu podelu rizika (Levis, 1999; Obstfeld, 1994; van Vincoop, 1999).

Međutim, postoji i niz nedostataka finansijske integracije, a to su:

- Postoji veća složenost finansijskih institucija, jer je uključeno više aktera, kao što su investitori i regulatori. Štaviše, sami finansijski proizvodi postaju sve teže razumljivi;
- Povećava verovatnoću zaraze finansijskim krizama. To je zato što će ono što se dešava na jednom tržištu uticati na drugo sa kojim je ono integrisano;
- Regulatorna tela se suočavaju sa većim izazovom da nadgledaju finansijsko poslovanje. Stoga je teško uspostaviti globalno primenljiva pravila i kontrolisati prekogranične tokove kapitala;
- Postaje teško oporezovati finansijske operacije jer će investitori premestiti svoj kapital na tržišta gde mogu prikupiti manje poreza.

Merenje finansijske integracije

Teško je razviti standardnu meru finansijske integracije. Neke zemlje nameću složen niz kontrola cena i količine širokog spektra finansijskih transakcija, što dovodi do ogromnih prepreka u merenju razlika između zemalja u prirodi, intenzitetu i efektivnost barijera međunarodnim tokovima kapitala (Eichengreen, 2001).

Postoje različiti načini za merenje efekata finansijske integracije. U stvarnosti, značajna je razlika između merenja efekata finansijske integracije de facto i de jure. De jure mere otvorenosti računa kapitala, su odraz pravnih ograničenja (ili nedostatka istih) na kretanja kapitala. Ali kolateralne koristi se najverovatnije bar isto toliko mogu shvatiti kroz de facto integraciju, koja, može biti dosta različita. Mnoge zemlje imaju kontrole kapitala koje su prilično stroge na papiru, ali slabe u praksi, pa je tako njihov de facto nivo integracije meren kapitalnim tokovima ili nivoom inostranih sredstava i obaveza, prilično visok.

Collins (2007) je tvrdila da su, bez obzira na njihove druge zasluge, de facto indikatori najverovatnije endogeni u regresijama rasta, zbog čega je teško ustanoviti uzročne efekte. De jure mere takođe sadrže snažan element endogenosti, kao dodatak raznim drugim nedostacima. Suština je da kako de facto, tako i de jure mere finansijske integracije sadrže važne informacije, ali de facto mere pružaju bolju sliku stepena integracije jedne zemlje u globalna finansijska tržišta, a ova mera je prikladnija za mnoge empirijske primene.

Za merenje stepena finansijske integracije, ili jednostavno, finansijske otvorenosti obično se koriste tri vrste empirijskih analiza. Frankel i MacArthur (1988) koriste razlike u kamatnim stopama i terminsku premiju/diskont da bi procenili stepen mobilnosti kapitala i liberalizacije računa kapitala. Međutim, zbog poteškoća u preciznom odmeravanju veličine i delotvornosti vladinih ograničenja, kao i relativno ograničene pokrivenosti zemalja i vremenskih perioda, ove mere ostaju ubedljiv argument.

Drugi tip je on/off indikator postojanja pravila/ograničenja koja inhibiraju prekogranične tokove kapitala. Jedan reprezentativni rad koji koristi ovaj skup podataka je Grilli i Milesi-Ferretti (1995). Quinn (1977) se fokusira na Međunarodni monetarni fond (MMF) mere ograničenja, čitajući kroz svoje narativne opise ograničenja na kapitalnom računu i dodeljivanjem ocena intenziteta ograničenja kapitala. Druge studije predlažu mere restriktivnosti za ograničen broj zemalja, koje se fokusiraju samo na kontrolu međunarodne prodaje i kupovine akcija. Međutim, može se tvrditi da bi širok spektar faktora, a ne same direktne administrativne barijere, mogao uticati na prekogranično kretanje kapitala. Na primer, to može biti niz politika i okolnosti kao što su stav monetarne ili fiskalne politike, veličina domaće privrede, uslovi u ostatku sveta, itd.

Adam et al. (2002) su predstavili studiju koja je usko posvećena pokazateljima finansijske integracije. Studiju čine tri noseća cilja. Prvo, da se sačini iscrpan pregled aktuelne literature posvećene indikatorima sa svim primenjenim metodološkim pristupima. Drugo, da se metodološki pristupi u obračunu pokazatelja kritički ocene kako bi se izdvojili najpodesniji pokazatelji koji će se u skladu sa dostupnim podacima koristiti za utvrđivanje dostignutog nivoa finansijske integracije. Treće, da se iznesu konkretni predlozi kako da se izvedu poboljšanja u relevantnoj metodologiji kako bi se došlo do optimalnih pokazatelja integracije. U studiji se pokazatelji razvrstavaju na 4 grupe:

- pokazatelji integracije tržišta kredita i tržišta obveznica,
- pokazatelji integracije tržišta akcija,
- pokazatelji integracije zasnovani na ekonomskim odlukama građana i preduzeća,
- pokazatelji institucionalnih razlika koje mogu usloviti segmentaciju finansijskog tržišta.

Baele et al. (2004) u izlaganju pokazatelja integracije ističu da bi preovlađujući uticaj trebalo da imaju pokazatelji koji proističu iz provere važenja zakona jedinstvene cene. Ukazuju da bi najbolji način da se izmeri trenutno stanje finansijske integracije bio da se nabroje sva ograničenja i prepreke finansijskoj integraciji i proveri da li još uvek postoje ili ne. Kako je takvu listu nemoguće sastaviti, umesto toga se meri stanje integracije koristeći ravnotežne cene, pošto ove cene treba da odražavaju sve informacije kojima raspolažu ekonomski subjekti, uključujući moguća ograničenja i prepreke sa kojima se ti agenti suočavaju. Prilikom merenja integracije u ovom kontekstu, oslanjaju se na zakon jedne cene. U njihovoj klasifikaciji izdvajaju se tri grupe pokazatelja:

1. Pokazatelji integracije zasnovane na cenama (price-based measures), uključuje mere zasnovane na ceni, koje mere neslaganja u cenama ili prinosu na sredstva uzrokovana geografskim poreklom sredstava. Ovo predstavlja direktnu proveru zakona jedne cene, koji zauzvrat mora da važi ako je finansijska integracija potpuna. Ako sredstva imaju dovoljno slične karakteristike, ove mere možemo bazirati na direktnim poređenjima cena ili prinosa. U suprotnom, moramo uzeti u obzir razlike u sistematskim (ili nediverzibilnim) faktorima rizika i drugim važnim karakteristikama;

2. Pokazatelji integracije zasnovani na vestima (news-based measures), su dizajnirani da razlikuju efekte informacija od drugih ograničenja ili barijera. Tačnije, portfelji treba da budu dobro diversifikovani. Stoga bi se očekivalo da vesti (tj. dolazak novih ekonomskih informacija) regionalnog karaktera imaju mali uticaj na cene, dok bi uobičajene ili globalne vesti trebalo da budu relativno važnije. Ovo pretpostavlja da je stepen sistematskog rizika identičan u svim sredstvima u različitim zemljama, u meri u kojoj nije, lokalne vesti mogu nastaviti da utiču na cene imovine;
3. Pokazatelji integracije zasnovani na kvantitetima (quantity-based measures). Treća kategorija mera integracije su mere zasnovane na količini, koje mogu kvantifikovati efekte smetnji sa kojima se suočava potražnja i ponuda mogućnosti ulaganja. Drugim rečima, mere se prepreke koje ograničavaju pojedince pri izboru finansijskih opcija, posebno kada se radi o pristupu finansijskim institucijama ili relevantnim tržištima putem prekograničnih aktivnosti. Ovi pokazatelji prate promene u veličinama stoka ili toka povezanim sa finansijskom aktivom, lako su razumljivi i ne zahtevaju posebna tumačenja. Po svojoj prirodi, oni upućuju na stepen internacionalizacije, ili prigodnije rečeno evropeizacije, portfolija ekonomskih učesnika, jer se očekuje da oni naginju njegovoj diversifikaciji primarno u evropskim okvirima.

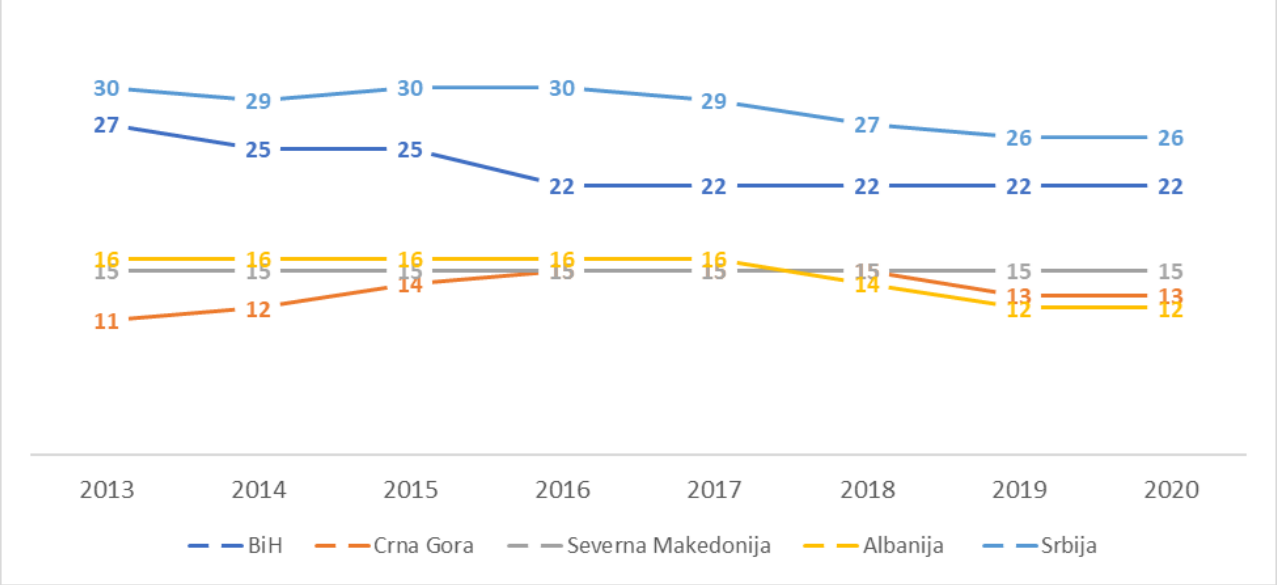
Indikatori, odnosno pokazatelji stepena integracije, mogu biti pokazatelji statike ili dinamike i imati pojedinačnu ili opštu analitičku vrednost. Oni mogu meriti stepen integracije direktno ili indirektno. Osim indikatora vezanih za zakon jedne cene, koriste se i indikatori vezani za difuziju informacija (vesti), kao i indikatori koji izražavaju kvantitativne aspekte integracije, odnosno oblike kretanja finansijske aktive između država članica integracije (pokazatelji odsustva barijera u prekograničnom kretanju aktive). Najzad, za merenje integracije mogu se koristiti i opšti pokazatelji vezani za kreditni sistem, kao i makroekonomski pokazatelji vezani za odnos štednje i investicija. To su metodološki pristupi koji koriste autori u analizama indikatora finansijske integracije u Evropskoj uniji (Adam et. al, 2002).

Integracija bankarskog sektora zemalja Zapadnog Balkana sa fokusom na Republiku Srbiju

Evropska unija je 1990. godine ukinula sva ograničenja kretanju kapitala, kako eksterno, tako i u okviru Unije, stavljajući slobodu kretanja kapitala u rang jedne od osnovne četiri slobode koje čine jedinstveno tržište (sloboda kretanja robe, usluga, kapitala i rada). Integracija je omogućila ulagačima da naprave selekciju profitabilnih investicija, efikasnija je konkurencija finansijskih institucija, takođe je doprinela da cene finansijskih instrumenata adekvatnije odražavaju celinu ponude i tražnje. Nesmetan protok finansijskih sredstava posredstvom instrumenata finansijskog tržišta čini da finansijsko tržište predstavlja najznačajniji i najuticajniji segment finansijskog sistema i privrednog sistema u celini (Furtula, Marković, 2012).

Na Grafikonu 1, je prikazan broj banaka u zemljama Zapadnog Balkana, za posmatrani period uzeta je 2013. godina, kao prva godina nakon oporavka od izbijanja svetske ekonomske krize, do 2020. godine, kao prve godine nakon izbijanja krize izazvane pandemijom COVID-19.

Grafikon 1 - Broj banaka u zemljama Zapadnog Balkana u periodu 2013-2020. godine



Izvor: Prikaz autora na osnovu podataka iz izveštaja centralnih banaka

U analizi Grafikona 1, možemo primetiti promenljiv broj banaka tokom posmatranog vremenskog perioda u zemljama ZB. Najmanje varijacije su zabeležene u Severnoj Makedoniji, gde je broj banaka konstanta, ima ih 15. Najveći broj banka je zastupljen u Republici Srbiji, struktura bankarskog sektora biće sagledana u nastavku rada. Dok Albanija beleži najmanji broj banaka, samo 12, od čega su samo tri banke u potpunom ili većinskom vlasništvu lica koji su poreklom iz Albanije.

Finansijsko tržište Srbije je rezultat tržišnih reformi koje su sprovedene krajem 80- tih godine prošlog veka. Došlo je do pretvaranja društvene svojine u društveni kapital, koji se mogao tržišno valorizovati. To je otvorilo prostor za formiranje tržišta kapitala, odnosno za uspostavljanje mehanizama savremenog finansijskog tržišta. Sa političkim promenama 2000. godine, počinju društvene i ekonomske reforme u Srbiji, koje su dovele do izuzetno dinamičkog razvoja finansijskog tržišta. Kao relativno mala ekonomija, Republika Srbija je još na početku tranzicionog procesa prepoznala značaj većeg uključivanja u svetsku i evropsku privredu, jer do tada je finansijsko tržište Srbije bilo izolovano od evropskih i svetskih tokova.

U pregledu strukture finansijskog sektora Srbije, može se videti da bankarski sektor ima dominantnu ulogu u finansijskom sistemu Srbije.

Tabela 1 - Struktura bankarskog sektora Srbije

	2012			2018			2021		
	Br.	Aktiva (u mlrd RSD)	Aktiva (u %)	Br.	Aktiva (u mlrd RSD)	Aktiva (u %)	Br.	Aktiva (u mlrd RSD)	Aktiva (u %)
Bankarsi sektor	33	2844	100	27	3773,51	90,29	23	5047,96	90,87
Državne banke	9	530	19	5	660,00	15,79	2	368,06	6,63
Privatne domaće banke	3	195	7	2	266,00	6,36	2	290,20	5,22
Strane banke	12	2118	74	20	2847,51	68,13	19	4389,69	79,02
Grčke	4	419	15	1	169,49	4,06	1	290,31	5,23
Italijanske	2	645	23	2	1008,48	24,13	2	1283,65	23,11
Francuske	3	268	9	2	415,07	9,93	1	166,77	3,00
Austrijske	3	457	16	2	494,86	11,84	2	752,25	13,54
Mađarske				2	221,23	5,29	1	665,60	11,98
Slovenačke				1	57,46	1,37	2	573,52	10,32
Ostale	9	329	11	10	480,92	11,51	10	657,59	11,84

Izvor: Narodna banka Srbije

U Tabeli 1, prikazana je struktura bankarskog sektora u posmatranim godinama. Broj banaka poslednjih godina ima tendenciju opadanja sa 33 banaka u 2012. godini, u 2021. godini broji svega 23 banaka. U strukturi bilansa bankarskog sektora Srbije, dominantno učešće upravo imaju strane banke. Tokom posmatranih godina učešće se povećavalo, tako da u 2021. godini one raspolažu sa 79,02% ukupne aktive i 74% kapitala. Na osnovu navedenih pokazatelja, može se smatrati da u bankarskom sektoru Srbije dominantnu poziciju imaju strane banke, čime je narušen nacionalni identitet bankarskog sektora. Upravo iz država članica Evropske unije dolazi i najveći broj stranih vlasnika domaćih banaka. U odnosu na 2012. godinu, kada je najveći procenat banaka bio iz Grčke, Italije, Francuske i Austrije, u 2021. godini struktura je malo drugačija, to su: Italija 23,1%; Austrija 13,09%; Mađarska 12,11% i Slovenija 10,64%.

Tabela 2 - Struktura finansijskog sistema Srbije

	2009.			2014.			2019			2021		
	Br.	Bilansna suma (u mlrd RSD)	Učešće (u %)	Br.	Bilansna suma (u mlrd RSD)	Učešće (u %)	Br.	Bilansna suma (u mlrd RSD)	Učešće (u %)	Br.	Bilansna suma (u mlrd RSD)	Učešće (u %)
Finansijski sektor (ukupno)	87	2378,1	100	76	3225,8	100	70	4532,1	100	66	5555,0	100
(u % BDP-a)					78%			84%			89%	
Bankarski sektor	34	2160,4	90,8	29	2968,9	92,0	26	4084,1	90,1	23	5048,0	90,9
Ostale finansijske institucije	53	217,7	9,2	47	256,9	8,0	44	447,9	9,9	43	506,6	9,1
Sektor osiguranja	26	99,2	4,2	25	167,9	5,2	20	299,8	6,6	20	334,0	6,0
Sektor penzijskih fondova	10	7,2	0,3	6	23,6	0,7	7	45,2	1,0	7	49,1	0,9
Sektor lizinga	17	111,3	4,7	16	65,4	2,0	17	102,9	2,3	16	123,5	2,2

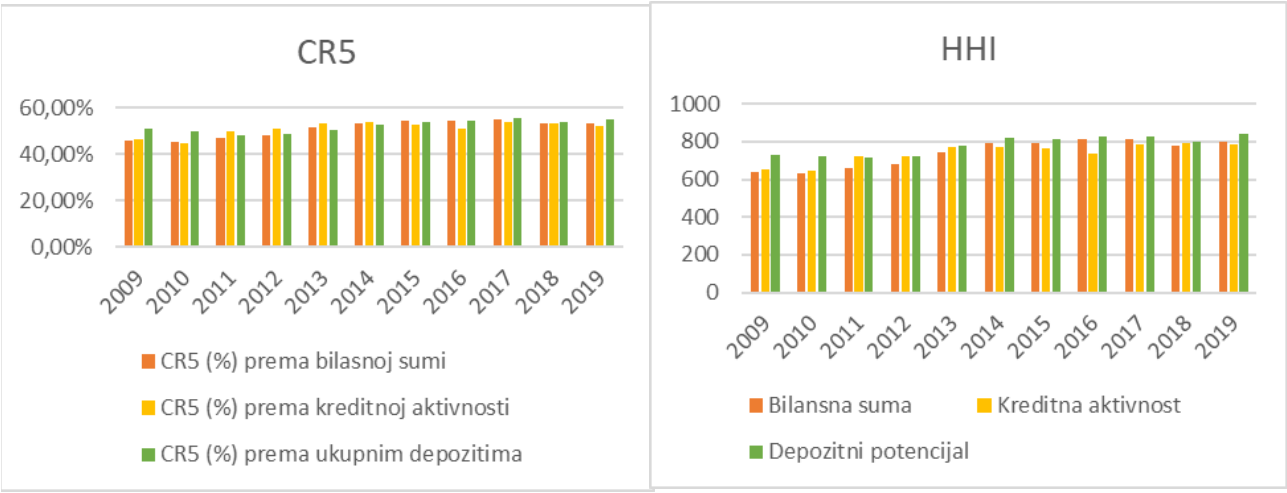
Izvor: Narodna banka Srbije

U Tabeli 2, je prikazana struktura finansijskog sistema, odnosno finansijska aktiva u mrld RSD za posmatrane godine. Ukupna neto bilansna aktiva bankarskog sektora Srbije je u 2009. godini iznosila 2378.1 mlrd RSD, što je skoro upola manje nego na kraju 2021. godine, kada je iznosila 5047,96 mlrd RSD. Bankarski sektor ima primat u učešću u finansijskom sektoru, tokom posmatranih godina, sa oko 90%, dok ostale finansijske institucije imaju znatno manji udeo.

Za prikazivanje pokazatelja koncentracije i konkurencije (CR5 i HHI), uzeti su podaci prikupljeni tokom desetogodišnjeg razdoblja, koje obuhvata period nakon svetske ekonomske krize i sve do pojave pandemije COVID-19.

Vrednosti pokazatelja koncentracije CR5 pokazuju da je bankarsko tržište u Srbiji visoko koncentrisano, sa trendom rasta koncentracije i pretnjom narušavanja konkurencije, što znači da velike domaće banke, koje imaju brojne komparativne prednosti u odnosu na manje banke, prete da zauzmu udeo na tržištu koji u budućnosti može da ugrozi razvoj konkurencije. Podaci Narodne banke Srbije o stepenu konkurencije i koncentracije u bankarskom sektoru (učešće 5 banaka u parametrima poslovanja, Hiršman – Herfindalov indeks koncentracije) pokazuje da HHI indeks u svim kategorijama poslovanja ne prelazi vrednost od 1.000. Vrednosti HHI indeksa, kao potpunijeg pokazatelja koncentracije i konkurencije, svedoče o tome da na tržištu još uvek posluje veliki broj banaka, čija raspodela tržišnog učešća obezbeđuje nisku koncentrisanost bankarskog tržišta Republike Srbije, ukupno posmatrano.

Grafikon 2 - Pokazatelji konkurencije i koncentracije bankarskog sektora Srbije



Izvor: Narodna banka Srbije (2022). Bankarski sektor u Srbiji – Kvartalni izveštaj za period od 2009. godine do 2019. godine (Arhiva)

Na Grafikonu 2, prikazana prosečna vrednost koeficijenta CR5 svedoči da se bankarski sektor u Republici Srbiji može opisati kao umereno koncentrisan. Međutim, počevši od 2009. godine primetan je trend rasta ovog koeficijenta, koji u 2013. godini prelazi granicu od 50%, što domaći bankarski sektor svrstava u rang visoko koncentrisanih sektora. Ovaj trend rasta se nastavlja sve do kraja posmatranog perioda i najveću vrednost CR5 beleži u 2017. godini od 55%. Dakle, može se izvesti zaključak da veliki broj korisnika usluga u najvećih pet banaka preti da ugrozi konkurenciju na tržištu. Međutim, važno je istaći da izračunate vrednosti HHI indeksa nisu u tolikoj meri zabrinjavajuće. Iako je u posmatranom periodu primetan trend rasta, vrednost ovog indeksa ni u jednom slučaju ne prelazi donju graničnu vrednost od 1.000, što bankarski sektor Republike Srbije svrstava u rang nekoncentrisanih tržišta. Smanjenju vrednosti HHI indeksa doprinosi i smanjenje broja banaka na tržištu, koje je pretežno posledica slabog intenziteta razvoja domaće privrede.

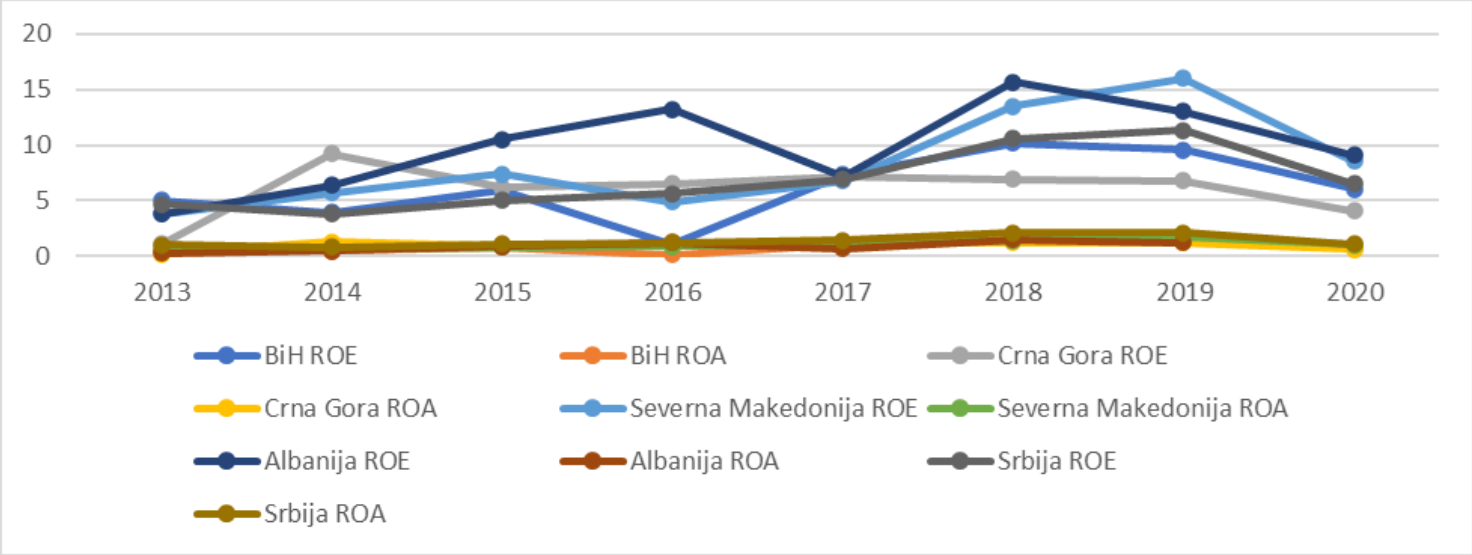
Finansijska racija se za poređenje finansijskih performansi kompanija tokom određenog vremenskog perioda, kao i za poređenje između različitih kompanija, fokusirajući se na sličnosti, razlike i trendove koristi od strane menadžera, finansijskih analitičara, procenitelja, regulatora, investitora, poverilaca i drugih. Racio analiza kao menadžerska tehnika ima široku primenu, ali takođe nosi određena ograničenja. Stoga je važno pažljivo tumačiti rezultate kako bi služili kao osnova za ocenu finansijske performanse i donošenje odluka (Knežević, S., Rakočević, S. B., & Đurić, D., 2011).

Posmatrano u kontekstu ekonomske krize iz 2007-2008. godine, pokazalo se da negativnosti u bankarskom sektoru mogu destabilizovati finansijski sistem pretvarajući se u sistematski rizik, izazivajući usporavanje ekonomske aktivnosti, te povećanje nezaposlenosti. S tim u vezi, determinante poslovanja banke i to posebno profitabilnosti izložene su sve većoj pažnji ne samo akademske javnosti, već i kreatora politike, regulatornih i nadzornih institucija, te posebno rukovodstva banaka koji donose odluke o politici banke (Alihodzić, 2022).

Zato je neophodno posebnu pažnju posvetiti i profitabilnosti banaka, preko prinosa na aktivu (ROA) i prinosa na kapital (ROE). ROA (Return on Assets), prinos na ukupno angažovana sredstva, dobija se tako što se neto dobit podeli sa ukupnom aktivom. Ovaj pokazatelj govori o tome koliko su menadžment banke i zaposleni efikasni u upravljanju ukupnom aktivom, da bi ostvarili što veću dobit. Što je ROA koeficijent viši, to je bolje. Navedeni pokazatelj se može okarakterisati kao najbolje merilo za efikasnost banke kod većine regulatornih tela koja su nadležna za kontrolu banaka.

ROE (Return on Equity), prinos na kapital, dobija se tako što se neto dobit podeli sa trajnim kapitalom. On pokazuje koliki prinos mogu očekivati na knjigovodstvenu vrednost investiranog kapitala u datu banku, odnosno koliki profit mogu prisvojiti na osnovu odabrane kombinacije prinos - rizik, svojstvene akcijama date banke. Posledično, ovaj pokazatelj pokazuje koliko banaka može računati u budućnosti na mobilizaciju kapitala kroz nove emisije akcija, odnosno koliko će u tom pogledu biti konkurentna u odnosu na druge banke (Stojanović, Stanojević, 2017).

Grafikon 3 - ROE i ROA u zemljama ZB (%) u periodu 2013–2020.



Izvor: Prikaz autora

Grafikon 3, prikazuje vrednosti najčešće korišćenih parametara za ocenu uspešnosti poslovanja bankarskog sektora, a to su ROA (prinos na imovinu) i ROE (prinos na kapital), za zemlje ZB. U bankarskom sektoru Albanije ROA je bio najviši 2016. i 2019. godine iznoseći 1,2%. 2019. god. U bankarskom sektoru BiH ROA od 2014. do kraja 2019. godine beleži postepeno povećanje. U bankarskom sektoru CG ROA je ubedljivo sa najlošijim rezultatima. Ipak, od 2016. god. zabeleženo je poboljšanje ovog parametra. U bankarskom sektoru Severne Makedonije ROA je, s druge strane, u rasponu 0,3–1,7%, a najviše prinosa na aktivu ostvarivale su banke u Srbiji. Iako je bio na relativno niskom nivou ovaj parametar je u 2018. godini prešao vrednost od 2%, što je dobar rezultat jer govori da su banke sposobne da same zarađuju više, uz manje investiranja.

Može se videti da se ROA i ROE približno kreću sličnim putanjama. Ono što je karakteristično za sve zemlje je da pokazatelj ROE beleži trend rasta u posmatranom periodu. U bankarskom sektoru BiH najveća vrednost je zabeležena u 2018. godini, a najmanja u 2016. godini. U CG najveća vrednost je zabeležena u 2014. godini, zatim beleži blag pad. U Severnoj Makedoniji je najveća vrednost zabeležena u godini izbijanja krize (2019. godina), a najmanja u prvoj godini stabilizacije nakon svetske ekonomske krize (2013. godine). Albanija beleži najbolje rezultate čak 15,7% u 2018. godini. U Srbiji su prisutne varijacije kada je ovaj pokazatelj u pitanju u rasponu od 3%-11%.

Pet najboljih godina ostvarene profitabilnosti u bankarskom sektoru u Srbiji u periodu 2008 – 2022. god. po redosledu su: 2018, 2017, 2008, 2019. i 2022. god. Najlošija profitabilnost je zabeležena u 2013. godini. U poslednje vreme poboljšala se profitabilnost bankarskog sektora u Srbiji (Lukić, 2023).

Zaključak

Stvaranje jedinstvenog finansijskog tržišta, kao rezultat finansijske integracije, donosi državama članicama, kako koristi, tako i troškove. Finansijski integracija smanjuje asimetričnost informacija, povećava kompletnost tržišta, smanjuje transakcione troškove, povećava konkurenciju i samim tim pozitivno utiče na ekonomski rast zemalja. S druge strane, utiče na povećanu ranjivost zemlje na spoljne makroekonomske šokove i finansijske krize, što doprinosi većoj volatilnosti proizvodnje i potrošnje i često se smatra najozbiljnijim nedostatkom finansijske integracije.

Jedinstveno finansijsko tržište Evropske unije složenim transmisionim mehanizmima privlači nacionalna finansijska tržišta država u okruženju, kao što su finansijska tržišta zemalja Zapadnog Balkana, među kojima je tržište Srbije, što doprinosi njihovom razvoju i konvergenciji, ali prenosi i impulse kriza. U Republici Srbiji, finansijsko tržište je pretežno bankarski orijentisano, u ukupnom obimu finansijske aktive, učešće banaka iznosi preko 90%. Postoji visok stepen evroizacije bankarskog sistema i u bankarskom sektoru dominiraju banke iz Evropske unije. Na taj način se sprečava rast i razvoj realnog sektora privrede, jer zastupljenost evropskih banaka otežava adekvatnu mobilizaciju kapitala na nacionalnom nivou. Bankarski sektor u Srbiji će na duži rok ostati fragmentisan, jer nema unutrašnji potencijal za konsolidaciju. Doprinos visokog učešće evropskih banaka, u našem bankarskom sektoru se ogleda u efikasnijoj selekciji plasmana, takođe zdraviji kreditni portfolio povećava finansijsku stabilnost i smanjuje šansu za izbijanje lokalne finansijske krize. Problem koji se javlja usled usled velikog udela stranih banaka jeste da, ukoliko njihove matične banke pretrpe velike gubitke, koji su uzrokovani lošim plasmanima u matičnoj zemlji ili na drugim inostranim tržištima na kojima su aktivne, će uzrokovati smanjenja kreditnih plasmana u Srbiji. Sa ovom opasnošću Srbija se suočila 2008. godine, kada je zahvaljujući uključivanju međunarodnih institucija i zaključivanju Bečke inicijative sprečen ovakav razvoj događaja.

Istraživanje sprovedeno u radu ima svoja ograničenja. U tom kontekstu, buduća istraživanja će biti usmerena na proširenje istraživanja u vidu empirijskih rezultata. Naime, ova studija je prevashodno kvalitativnog karaktera, te ne pruža empirijske dokaze integraciji finansijskog tržišta Republike Srbije. Stoga bi buduća istraživanja trebalo usmeriti na proučavanje najvažnijih pokazatelja finansijske integracije finansijskog tržišta Srbije.

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CONVERGENCE OF THE BANKING SECTOR OF THE REPUBLIC OF SERBIAIN THE CONDITIONS OF FINANCIAL INTEGRATION

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Summary: The process of financial integration is at the center of interest for all economic entities. A higher level of financial integration contributes to the improvement of the performance of national economies by reducing capital costs and improving the allocation of financial resources. With the trend of globalization since the late 1980s, the process of financial integration has been taking place as a result of the removal of barriers to the movement of capital between countries. This paper qualitatively analyzes financial integration and financial integration indicators. In this context, special attention in the paper is devoted to the integration of the banking sector of the Republic of Serbia. The structure of the banking sector of the Republic of Serbia is examined, as well as the values of concentration and competition indicators - the Herfindahl-Hirschman Index and CR5. The data was collected during a ten-year period that spans from the aftermath of the global economic crisis and continues until the onset of the COVID-19 pandemic. Additionally, profitability indicators (ROA and ROE) in Western Balkan countries were observed from 2013 to 2020.

Keywords: financial integration, indicators, banking sector, Republic of Serbia, ROA, ROE

JEL classification: E36, E50

Introduction

Globalization and integration have significantly influenced the dynamics of changes in economies worldwide. Globalization is a phenomenon that involves the removal of barriers in global trade. In economic terms, it is a process by which obstacles in international economic exchange are reduced or completely eliminated, leading to increased economic integration among countries. The integration of the economies of Western Balkan countries, including the Republic of Serbia, and their active involvement in global value chains, hold a high position on the EU's agenda. As a result of financial globalization, financial crises in developing countries spread to Latin America, Asia, and Africa in the 1980s and 1990s. In many countries, banking systems collapsed, rapidly growing economies suddenly faced severe recessions, and all major international capital flows plummeted to even lower levels by the mid-1990s.

Bhagwati, 1998; Rodrik, 1998; Stiglitz, 2002, argue that financial integration carries significant risks that far outweigh potential benefits for most middle-income countries. Additionally, Stiglitz (2000) calls on developing countries to impose some restrictions on capital inflows to mitigate "excessive" patterns of boom and bust in financial markets. Experiences from previous financial crises have shown that trade is the mechanism through which the effects of a crisis are transmitted between countries, making trade the most apparent economic link between nations (Ahmed et al., 2017). On the other hand, Fischer, 1998; Summers, 2000, view financial globalization as an important step for emerging markets with middle-income levels, as they aim to achieve income levels and stability similar to those of advanced industrial economies.

Many economists point to the advantages of integration. By increasing the availability of financial resources and enabling risk diversification among countries, financial liberalization helps improve the functioning of financial systems. Stutz (1999) and Mishkin (2001) argue that financial integration promotes transparency and accountability, reducing adverse selection and moral hazard while simultaneously mitigating liquidity problems in financial markets. They also emphasize that international capital markets help discipline policymakers who might be tempted to exploit an otherwise captive domestic capital market.

The subjects of this research are the indicators of financial integration and the involvement of the banking sector of the Republic of Serbia in the international environment. The beginning of the integration process is considered to be 1989 when the decision to allow free movement of capital throughout the European Union territory was implemented. Furthermore, the first banking directive, adopted back in 1997, established the principle that the home country is responsible for supervising and controlling its banks operating in other countries. A little over a decade later, the second banking directive, which relied on more liberal operating conditions for banks on a global scale, was introduced. It allowed a bank that holds a license to operate in any EU country to establish branches or operate abroad without the need to obtain any permits from local regulatory bodies or central banks. During that period, this principle was referred to as the "single passport" principle.

Financial integration contributes to the development of the financial system by stimulating competition, expanding markets, and increasing the efficiency of financial institutions. The aim of this paper is to demonstrate the involvement of the banking sector as a segment of the financial market of the Republic of Serbia in the international environment, using the structure of the banking sector and the values of selected indicators.

The paper is structured into three complementary sections. In the first section, the concept and characteristics of financial integration will be defined. This part will highlight the advantages and disadvantages of financial integration. The second section of the paper will qualitatively analyze the measures of financial integration. In the third section of the paper, the impact of financial integration on the banking sector of the Republic of Serbia will be presented. The structure of the financial sector, as well as the banking sector itself, will be examined, and the values of certain financial parameters will be displayed.

Financial Integration

Financial integration is "a process, driven by market forces, in which separate national financial markets gradually enter into competition with each other and eventually become a single financial market characterized by the convergence of prices, product offerings, and the efficiency/profitability of financial service providers" (Financial Integration Monitor, 2005).

Financial integration, or a single financial market, provides a mechanism for risk sharing, serving as a source of market mechanism for income equalization in the case of asymmetric economic disturbances. In the context of a diversified regional portfolio of financial assets, income from invested capital in other countries unaffected by economic shocks serves as an additional source of income for investors in the country affected by economic shocks. The risk of a negative shock in one country is shared by all other countries. As a result, the impact of a negative shock in production in one country on the income of that country's population is mitigated (De Grauwe, 2003).

Jappelli and Pagano (2008) emphasize that the removal of barriers to financial integration can promote local financial development through increased competition introduced by more sophisticated and better-organized foreign financial institutions. Foreign financial institutions are capable of providing economic entities in lower-level financial development countries with financial services at more favorable prices and conditions, which should contribute to the growth and development of the local financial system.

Financial integration can arise as a contractual or spontaneous creation. In the first case, it occurs in response to financial disturbances or through the elimination of restrictions on cross-border financial operations by member states. It can also occur through the harmonization and regulation of the financial system to achieve complete unification of the regional market. In the second case, it can arise from the spontaneous sharing of information, capital investment, or borrowing in the financial market (Ho, 2007).

The advantages of financial integration include the following:

- Greater portfolio diversification opportunities (investors have more options for deploying their funds, increasing not only the number but also the types of available financial products).
- Operating costs would tend to decrease, considering the economies of scale that financial i nstitutions could achieve.
- Due to increased competition, financial institutions would strive to offer higher interest rates to savers and investors, as well as lower interest rates to those applying for financing.

Financial integration enhances cross-border capital flows, investments, and financial information (Beine and Candelon, 2011). It improves financial systems and transactions within a region, facilitating efficient capital allocation, regional capital accumulation, and enhancing productivity (Yuhn, 1997; Bai and Zhang, 2012). Furthermore, it ensures the free movement of capital, contributing to long-term real economic growth. The benefits of financial integration include efficient capital allocation, improved management, increased investment and growth, and risk sharing. Levine (2001) demonstrates that financial integration helps strengthen the domestic financial sector by enabling more efficient capital allocation and greater opportunities for investment and growth. If access to a broader capital base is a key driver of economic growth, then financial integration is one of the solutions as it facilitates capital flows from developed economies with abundant capital to developing economies with limited capital. These capital inflows can significantly reduce the cost of capital in capital-scarce economies, leading to higher investments. Financial integration can also help predict consumption volatility because risk-averse consumers may want to use financial markets as income risk insurance. Thus, the impact of temporary idiosyncratic shocks on income growth on consumption growth can be mitigated. Stronger connections in consumption growth worldwide can also be an outcome of financial integration (Kose et al., 2006). Furthermore, financial integration can provide significant benefits for international risk sharing (Levis, 1999; Obstfeld, 1994; van Wincoop, 1999).

However, there are also a number of disadvantages of financial integration, namely:

- Increased Complexity of Financial Institutions: There is greater complexity in financial institutions due to the involvement of multiple actors, such as investors and regulators. Moreover, financial products themselves are becoming harder to understand.
- Higher Likelihood of Contagion: Financial integration increases the risk of contagion during financial crises. This is because events in one market can affect another integrated market.
- Challenges for Regulatory Bodies: Regulatory bodies face greater difficulties in overseeing financial operations. Establishing globally applicable rules and effectively monitoring cross-border capital flows is challenging.
- Taxation Challenges: Taxing financial transactions becomes complicated because investors may relocate their capital to markets with lower tax rates.

Measuring Financial Integration

It is difficult to develop a standard measure of financial integration. Some countries impose a complex set of price and quantity controls on a wide range of financial transactions, making it challenging to measure differences between countries in the nature, intensity, and effectiveness of barriers to international capital flows (Eichengreen 2001).

There are various ways to measure the effects of financial integration. In reality, there is a significant difference between measuring the effects of financial integration de facto (in practice) and de jure (by law). De jure measures of capital account openness reflect legal restrictions (or the absence thereof) on capital movements. However, collateral benefits are likely to be at least as significant through de facto integration, which can vary significantly. Many countries have capital controls that are quite strict on paper but weak in practice, so their de facto level of integration, measured by capital flows or the level of foreign assets and liabilities, may be quite high.

Collins (2007) argued that, despite their other merits, de facto indicators are likely to be endogenous in growth regressions, making it difficult to establish causal effects. De jure measures also contain a strong element of endogeneity, in addition to various other shortcomings. The essence is that both de facto and de jure measures of financial integration contain valuable information, but de facto measures provide a better picture of the degree of a country's integration into global financial markets, and this measure is more suitable for many empirical applications.

To measure the degree of financial integration or financial openness, three types of empirical analyses are commonly used. Frankel and MacArthur (1988) utilize differences in interest rates and forward premiums/discounts to assess the mobility of capital and capital account liberalization. However, due to difficulties in precisely measuring the size and effectiveness of government restrictions, as well as the relatively limited coverage of countries and time periods, these measures remain a persuasive argument.

The second type involves an on/off indicator of the existence of rules/restrictions inhibiting cross-border capital flows. One representative study that uses this dataset is Grilli and Milesi-Ferretti (1995). Quinn (1977) focuses on International Monetary Fund (IMF) measures of capital account restrictions by reading through their narrative descriptions of capital controls and assigning ratings of the intensity of capital controls. Other studies propose measures of restrictiveness for a limited number of countries focusing only on controls on international sales and purchases of equities. However, it can be argued that a broad range of factors, not just direct administrative barriers, could influence cross-border capital movements. For example, these factors could include a range of policies and circumstances such as monetary or fiscal policy stances, the size of the domestic economy, global conditions, and so on.

Adam et al. (2002) presented a study that is closely focused on financial integration indicators. The study has three main objectives. Firstly, to create an exhaustive review of the current literature concerning indicators, encompassing all applied methodological approaches. Secondly, to critically evaluate the methodological approaches in calculating indicators to identify the most suitable ones that will be used in line with available data to determine the level of financial integration achieved. Thirdly, to provide specific suggestions on how to make improvements in the relevant methodology to arrive at optimal integration indicators. The study classifies indicators into four groups:

- Indicators of credit market and bond market integration,
- Indicators of stock market integration,
- Indicators of integration based on economic decisions of individuals and firms,
- Indicators of institutional differences that could lead to the segmentation of financial markets.

Baele et al. (2004), in their presentation of integration indicators, emphasize that the prevailing influence should come from indicators derived from testing the law of one price. They suggest that the best way to measure the current state of financial integration is to list all restrictions and barriers to financial integration and check whether they still exist or not. Since it is impossible to compile such a list, the state of integration is instead measured using equilibrium prices because these prices should reflect all information available to economic agents, including possible constraints and barriers they face. When measuring integration in this context, they rely on the law of one price. In their classification, three groups of indicators are distinguished:

1. Price-Based Integration Indicators include measures based on prices, which assess discrepancies in prices or yields on assets due to their geographical origin. This represents a direct test of the law of one price, which, in turn, must hold if financial integration is complete. If assets have sufficiently similar characteristics, these measures can be based on direct price or yield comparisons. Otherwise, we must take into account differences in systematic (or non-diversifiable) risk factors and other important characteristics;

2. News-Based Integration Indicators are designed to distinguish the effects of information from other constraints or barriers. Specifically, portfolios should be well-diversified. Therefore, it would be expected that news (i.e., the arrival of new economic information) of regional significance has a small impact on prices, while common or global news should be relatively more important. This assumes that the degree of systematic risk is identical across assets in different countries, and to the extent that it is not, local news may continue to influence asset prices;

3. Quantity-Based Integration Indicators: The third category of integration measures consists of quantity-based measures that can quantify the effects of impediments faced by the demand and supply of investment opportunities. In other words, we are assessing the barriers that hinder individuals in choosing financial options, particularly when it comes to accessing financial institutions or relevant markets through cross-border activities. These indicators track changes in the size of stock or flow related to financial assets, are easy to understand, and do not require special interpretation. By their nature, they indicate the degree of internationalization or, more appropriately, Europeanization of economic participants' portfolios, as they are expected to lean towards diversification primarily within European boundaries.

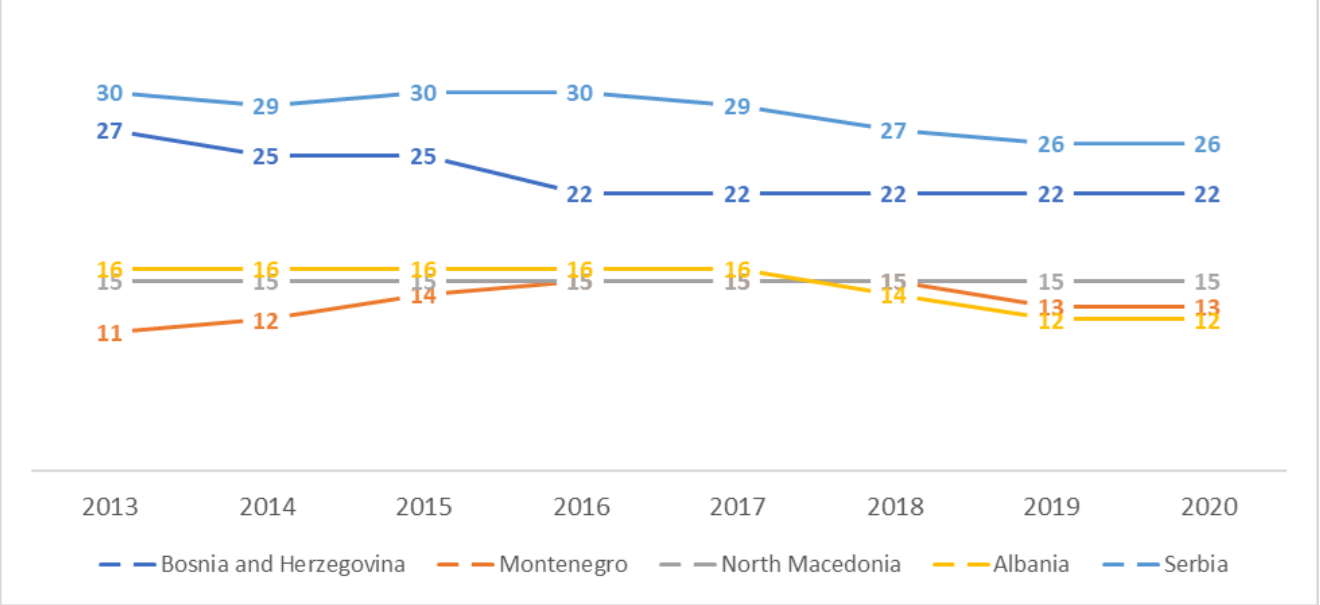
Indicators, or measures of the degree of integration, can be static or dynamic indicators and have individual or general analytical value. They can measure the degree of integration directly or indirectly. In addition to indicators related to the law of one price, indicators related to the diffusion of information (news) are used, as well as indicators that express quantitative aspects of integration, such as the patterns of financial asset movement between member states of integration (indicators of the absence of barriers to cross-border asset movement). Finally, general indicators related to the credit system and macroeconomic indicators related to the savings and investment ratio can also be used for measuring integration. These are the methodological approaches used by authors in the analysis of indicators of financial integration in the European Union (Adam et al., 2002).

Integration of the Banking Sector in Western Balkan Countries with a Focus on the Republic of Serbia

In 1990, the European Union abolished all restrictions on the movement of capital, both externally and within the Union, placing the freedom of capital movement among the four fundamental freedoms that make up the single market (freedom of movement of goods, services, capital, and labor). This integration allowed investors to select profitable investments, promoted more efficient competition among financial institutions, and contributed to ensuring that the prices of financial instruments more accurately reflected the overall supply and demand. The smooth flow of financial resources through financial market instruments makes the financial market the most significant and influential segment of the financial system and the overall economy (Furtula, Marković, 2012).

Graph 1 shows the number of banks in Western Balkan countries for the observed period, ranging from 2013, which marks the first year after the recovery from the global economic crisis, to 2020, which is the first year after the outbreak of the crisis caused by the COVID-19 pandemic.

Graph 1 - Number of Banks in Western Balkan Countries from 2013 to 2020



Source: Author's representation based on data from central bank reports

In the analysis of Graph 1, we can observe a variable number of banks during the observed time period in the Western Balkan countries. The least variation was recorded in North Macedonia, where the number of banks remained constant at 15. The highest number of banks is present in the Republic of Serbia; the structure of the banking sector will be discussed further in the paper. Meanwhile, Albania had the lowest number of banks, only 12, with only three of them being fully or mostly owned by individuals of Albanian origin.

The financial market of Serbia is the result of market reforms implemented in the late 1980s. This period saw the transformation of social property into social capital, which could be market-valued. This created opportunities for the formation of the capital market and the establishment of mechanisms for a modern financial market. With political changes in 2000, social and economic reforms in Serbia began, leading to a highly dynamic development of the financial market. As a relatively small economy, the Republic of Serbia recognized the importance of greater integration into the global and European economy early on, as its financial market had been isolated from European and global trends until then.

In the overview of the structure of the financial sector in Serbia, it can be observed that the banking sector plays a dominant role in Serbia's financial system.

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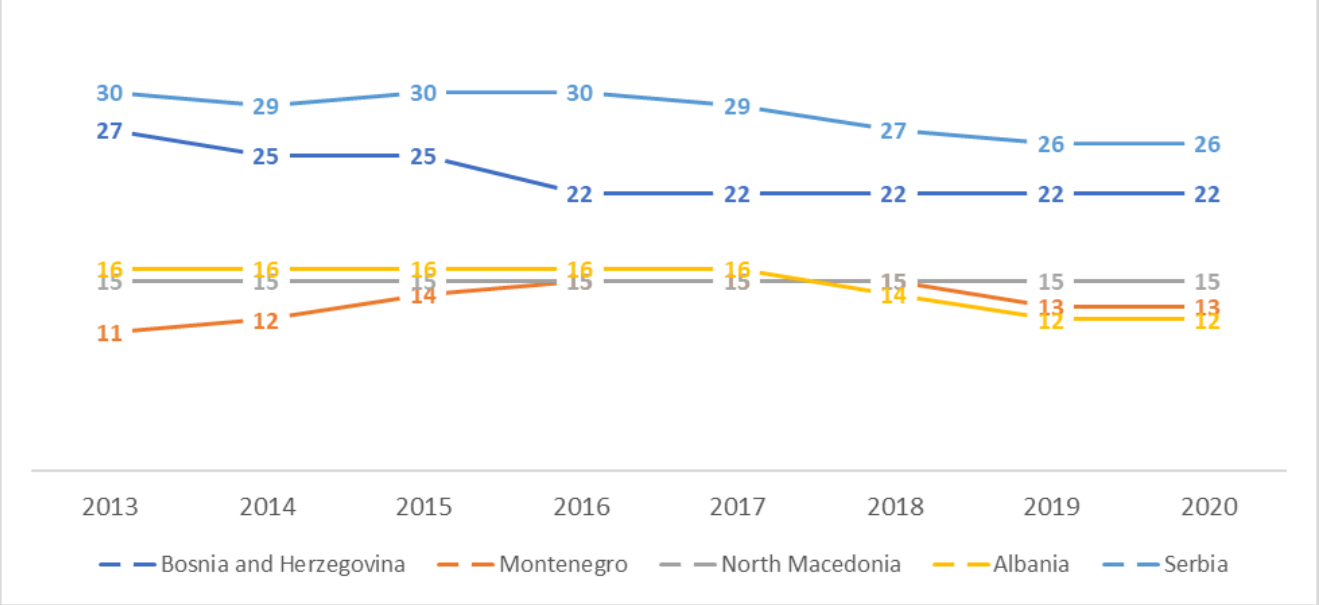

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Table 1 - Structure of the Serbian Banking Sector

	2012			2018			2021		
	No.	Assets (in billion RSD)	Assets (in %)	No.	Assets (in billion RSD)	Assets (in %)	No.	Assets (in billion RSD)	Assets (in %)
Banking sector	33	2844	100	27	3773,506	90,28809	23	5047,959	90,87235
State banks	9	530	19	5	660	15,79172	2	368,0597	6,625737
Private domestic banks	3	195	7	2	266	6,36454	2	290,2046	5,224206
Foreign banks	12	2118	74	20	2847,506	68,13184	19	4389,695	79,02241
Greece	4	419	15	1	169,4897	4,055353	1	290,3113	5,226126
Italian	2	645	23	2	1008,475	24,12963	2	1283,649	23,10799
France	3	268	9	2	415,0711	9,93134	1	166,7679	3,002123
Austrian	3	457	16	2	494,8563	11,84035	2	752,2534	13,54192
Hungary				2	221,2346	5,293446	1	665,5989	11,98198
Slovenian				1	57,4596	1,374827	2	573,5225	10,32444
The rest	9	329	11	10	480,9196	11,50689	10	657,5915	11,83783

Source: National Bank of Serbia

In Table 1, the structure of the banking sector in the observed years is presented. The number of banks in recent years has been declining, with 33 banks in 2012 and only 23 banks in 2021. In the balance sheet structure of Serbia's banking sector, foreign banks have a dominant share. Their participation has been increasing over the observed years, reaching 79.02% of total assets and 74% of capital in 2021. Based on these indicators, it can be considered that foreign banks have a dominant position in Serbia's banking sector, which has eroded the national identity of the banking sector. The majority of foreign owners of domestic banks also come from EU member states. Compared to 2012 when the highest percentage of banks came from Greece, Italy, France, and Austria, the structure is slightly different in 2021, with Italy at 23.1%, Austria at 13.09%, Hungary at 12.11%, and Slovenia at 10.64%.

Table 2 - The Structure of the Financial System of Serbia

	2009.			2014.			2019			2021		
	No.	Balance sheet amount (in billion	Participation (in %)	No.	Balance sheet amount (in billion	Participation (in %)	No.	Balance sheet amount (in billion	Participation (in %)	No.	Balance sheet amount (in billion	Participation (in %)
Financial sector (total)	87	2378,1	100	76	3225,788	100	70	4532,081	100	66	5555	100
(in % of GDP)					78%			84%			89%	
Banking sector	34	2160,4	90,8	29	2968,901	92,03645	26	4084,136	90,11612	23	5047,959	90,87235
Other financial institutions	53	217,7	9,2	47	256,8871	7,963546	44	447,9455	9,88388	43	506,6	9,119712
Insurance sector	26	99,2	4,2	25	167,8823	5,204382	20	299,8	6,615062	20	334	6,012601
Sector of pension funds	10	7,2	0,3	6	23,5653	0,730529	7	45,2455	0,998338	7	49,1	0,883888
The leasing sector	17	111,3	4,7	16	65,4395	2,028636	17	102,9	2,27048	16	123,5	2,223222

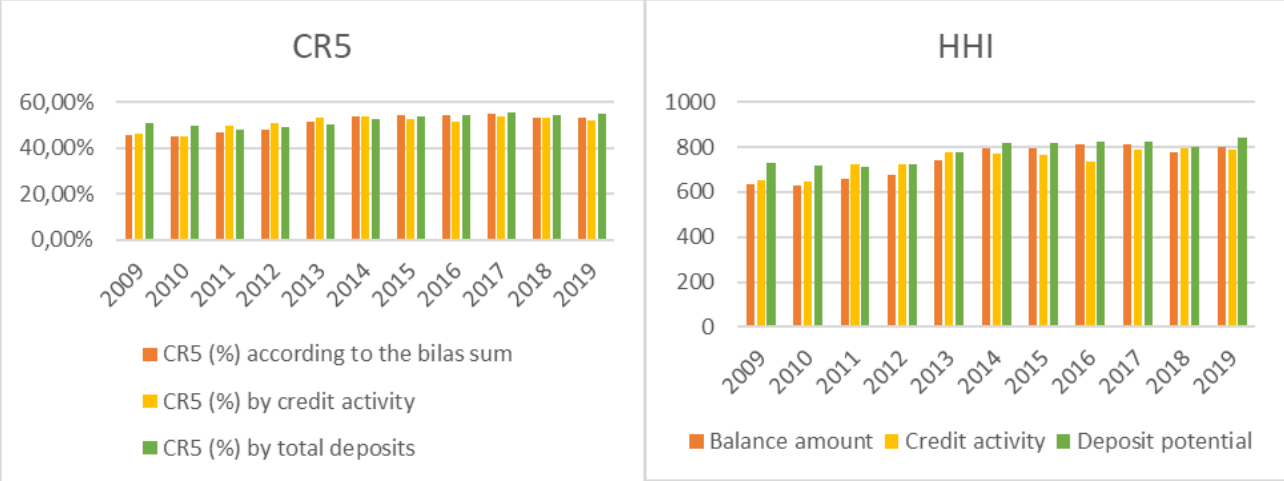
Source: National Bank of Serbia

Table 2 presents the structure of the financial system, specifically financial assets in billions of RSD for the observed years. The total net assets of the banking sector in Serbia were 2,378.1 billion RSD in 2009, which is nearly half of what it was at the end of 2021, when it reached 5,047.96 billion RSD. The banking sector has a predominant share in the financial sector, accounting for approximately 90% during the observed years, while other financial institutions have a significantly smaller share.

Data collected over a ten-year period, which encompasses the time following the global economic crisis and extends until the onset of the COVID-19 pandemic, have been used to illustrate concentration and competition indicators (CR5 and HHI).

The values of the CR5 concentration indicators indicate that the banking market in Serbia is highly concentrated, with a trend of increasing concentration and a threat to competition. This means that large domestic banks, which have numerous comparative advantages compared to smaller banks, are poised to capture a market share that could jeopardize future competition. Data from the National Bank of Serbia on the degree of competition and concentration in the banking sector (the participation of the top 5 banks in business parameters, the Herfindahl-Hirschman Index) show that the HHI index in all business categories does not exceed a value of 1,000. The values of the HHI index, as a more comprehensive indicator of concentration and competition, indicate that there are still a large number of banks operating in the market, whose distribution of market share ensures low concentration in the banking market of the Republic of Serbia, when viewed in its entirety.

Graph 2 - Indicators of competition and concentration in the banking sector of Serbia



Source: National Bank of Serbia (2022). Banking sector in Serbia - Quarterly report for the period from 2009 to 2019 (Archive)

On Graph 2, the displayed average value of the CR5 coefficient indicates that the banking sector in the Republic of Serbia can be described as moderately concentrated. However, starting from 2009, there is a noticeable trend of increasing this coefficient, which exceeds the 50% threshold in 2013, categorizing the domestic banking sector as highly concentrated. This trend of growth continues until the end of the observed period, with the highest CR5 value recorded in 2017 at 55%. Therefore, it can be concluded that a large number of service users in the top five banks are posing a threat to competition in the market. However, it is important to note that the calculated values of the HHI index are not as concerning to the same extent. Although there is a trend of growth during the observed period, the value of this index does not exceed the lower threshold of 1,000 in any case, which classifies the banking sector of the Republic of Serbia as non-concentrated markets. The reduction in the HHI index values is also influenced by the decrease in the number of banks in the market, mainly due to the low intensity of domestic economic development.

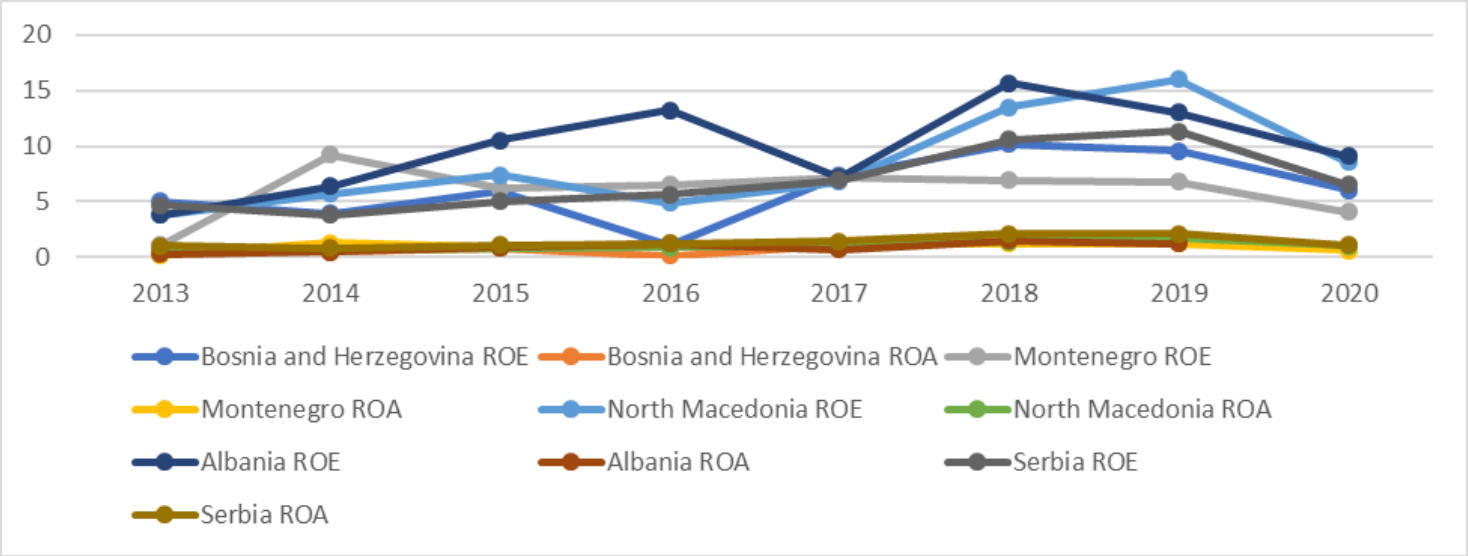
Financial ratios are used for comparing the financial performances of companies over a specific time period and for making comparisons between different companies, focusing on similarities, differences, and trends. They are utilized by managers, financial analysts, appraisers, regulators, investors, creditors, and others. Ratio analysis, as a managerial technique, has a wide range of applications, but it also comes with certain limitations. Therefore, it is crucial to interpret the results carefully so that they can serve as a basis for evaluating financial performance and decision-making (Knežević, S., Rakočević, S. B., & Đurić, D., 2011).

Viewed in the context of the economic crisis of 2007-2008, it became evident that issues in the banking sector could destabilize the financial system, potentially transforming into systematic risk, causing economic slowdown and increased unemployment. In this regard, the determinants of a bank's operation, especially its profitability, have gained increased attention not only from the academic community but also from policymakers, regulatory and supervisory institutions, and, notably, the bank's leadership that makes decisions regarding the bank's policies (Alihodzić, 2022).

This is why it is essential to pay special attention to the profitability of banks, through metrics like Return on Assets (ROA) and Return on Equity (ROE). ROA (Return on Assets), which represents the return on total assets, is calculated by dividing net profit by total assets. This indicator reflects how efficient a bank's management and employees are in managing the total assets to generate the highest profit. The higher the ROA coefficient, the better. This indicator is often considered the best measure of a bank's efficiency by most regulatory bodies responsible for overseeing banks.

ROE (Return on Equity) is calculated by dividing net profit by shareholders' equity. It indicates the return that can be expected on the book value of invested capital in a given bank, or how much profit can be earned based on the chosen combination of return and risk inherent to the bank's shares. Consequently, this indicator shows how much a bank can rely on capital mobilization through new share issuances in the future and how competitive it will be in that regard compared to other banks (Stojanović, Stanojević, 2017).

Graph 3 - ROE i ROA in WB Countries (%) in 2013–2020



Source: Author's representation

Graph 3 displays the values of the most commonly used parameters for assessing the performance of the banking sector, which are ROA (Return on Assets) and ROE (Return on Equity), for the Western Balkan countries. In the banking sector of Albania, ROA was the highest in 2016 and 2019, reaching 1.2%. In the banking sector of Bosnia and Herzegovina (BiH), ROA gradually increased from 2014 until the end of 2019. In the banking sector of Montenegro (CG), ROA had the weakest results, but there was an improvement in this parameter from 2016. In the banking sector of North Macedonia, ROA ranged from 0.3% to 1.7%, with the highest returns on assets achieved by banks in Serbia. Although it was relatively low, this parameter exceeded 2% in 2018, which is a good result because it indicates that banks are capable of earning more on their own, with less investment.

The ROA and ROE indicators show similar trends in all countries. What is characteristic for all countries is that the ROE indicator shows a growing trend over the observed period. In the banking sector of Bosnia and Herzegovina (BiH), the highest value was recorded in 2018, while the lowest was in 2016. In Montenegro (CG), the highest value was recorded in 2014, followed by a slight decline. In North Macedonia, the highest value was recorded in the year of the crisis outbreak (2019), and the lowest in the first year of stabilization after the global economic crisis (2013). Albania achieved the best results, reaching 15.7% in 2018. In Serbia, there are variations in this indicator, ranging from 3% to 11%.

The five most profitable years in the banking sector in Serbia for the period 2008-2022, in chronological order, are: 2018, 2017, 2008, 2019, and 2022. The lowest profitability was recorded in 2013. Recently, there has been an improvement in the profitability of the banking sector in Serbia (Lukić, 2023).

Conclusion

The creation of a single financial market through financial integration brings both benefits and costs to member states. Financial integration reduces information asymmetry, increases market completeness, lowers transaction costs, enhances competition, and positively impacts the economic growth of countries. On the other hand, it increases a country's vulnerability to external macroeconomic shocks and financial crises, contributing to higher production and consumption volatility, often seen as the most significant drawback of financial integration.

The European Union's single financial market, through complex transmission mechanisms, attracts the national financial markets of neighboring countries, such as the financial markets of Western Balkan countries, including Serbia's market. This contributes to their development and convergence but also transmits crisis impulses. In the Republic of Serbia, the financial market is predominantly banking-oriented, with banks accounting for over 90% of the total financial assets. There is a high degree of euroization in the banking system, and European Union banks dominate the banking sector. This situation hinders the growth and development of the real sector of the economy because the presence of European banks makes it challenging to mobilize capital at the national level. The banking sector in Serbia is expected to remain fragmented in the long term, as there is no internal potential for consolidation. The contribution of a high share of European banks in our banking sector is reflected in more efficient loan selection, as well as a healthier credit portfolio that increases financial stability and reduces the chance of a local financial crisis. The problem that arises due to the significant presence of foreign banks is that if their parent banks incur significant losses, caused by bad loans in their home country or in other foreign markets where they operate, it can lead to a reduction in credit lending in Serbia. Serbia faced this danger in 2008 when, thanks to the involvement of international institutions and the conclusion of the Vienna Initiative, such a development was prevented.

The research conducted in this paper has its limitations. In that context, future research will focus on expanding the study with empirical evidence. This study is primarily qualitative in nature and does not provide empirical evidence of the integration of the financial market of the Republic of Serbia. Therefore, future research should aim to investigate the most important indicators of financial integration in the Serbian financial market.

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VOLATILNOST BITKOINA I RIZIČNOST FINANSIJSKOG PORTFOLIJA

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Rezime: Osnovni cilj ovog istraživanja je procena prinosa i rizika sledećih oblika imovine: bitkoina, EUR Stoxx 50, zlata, obveznica: državne obveznice ICE Bof A 1-10 Year isključujući Italiju i Grčku i korporativnog indeksa obveznica ICEBof A 1-10 Year AA. U radu su testirana ukupno deset portfolija prema različitim scenarijima za digitalnu i finansijsku imovinu. Takođe, u radu su proračunate veće mere rizika i prinosa sa ciljem formiranja optimalnog portfolija sa minimalnim rizikom. Rezultati ovog istraživanja su otkrili da je korelacija između Bitkoina i drugih oblika finansijske imovine uglavnom niska i negativna, što može biti dobar instrument za diversifikaciju portfolija, te da pozitivno utiče na performanse portfolija. Takođe, rezultati ove studije su pokazali da je u pogledu volatilnosti i mere povrata od ukupno deset portfolija drugi portfolio (čiju strukturu čine Bitkoin, Euro Stoxx 50, zlato, državne obveznice ICE Bof A 1-10 Year - isključujući Italiju i Grčku i korporativni indeks obveznica ICEBof A 1-10 Year AA) najoptimalniji portfolio. Nalazi ovog istraživanja mogu da posluže u procenama rizika i gubitaka portfolio menadžera, investitora i regulatora.

Ključne reči: rizična vrednost, VaR, tržišni rizik, bitkoin, efikasan portfolio, optimizacija portfolija.

JEL klasifikacija: G11, G32

Uvodna razmatranja

Nastanak moderne portfolio teorije vezuje se za čuveni tekst koji je 1952. godine objavio Harry Markowitz, a u kojem je razvio model očekivane stope prinosa i očekivanog rizika portfolija. Markowitz je pokazao da je varijansa stope prinosa portfolija ujedno i mera rizika portfolija pod određenim pretpostavkama. Tokom razvijanja matematičkog modela varijanse prinosa portfolija, Markowitz je ukazao ne samo na presudan značaj diversifikacije investicija sa ciljem redukcije ukupnog rizika portfolija, već i na način na koji se diversifikacija efikasno izvodi i koristi. Jedno od najvećih unapređenja investicionih analiza proteklih decenija krije se dakako u saznanju da kreiranje optimalnog portfolija hartija od vrednosti nije prost posao investiranja u hartije od vrednosti na osnovu poželjnih, tj. ciljanih karakteristika prinosa i rizika svake pojedinačne hartije od vrednosti. Nasuprot, teorija dokazana u praksi ukazuje na potrebu razmatranja i analize međusobnih odnosa karakteristika prinosa i rizika svake pojedinačne hartije od vrednosti uključene u investicioni portfolio (Krneta, 2006).

Koncept rizika je u velikoj meri korišćen u finansijama. Postoje značajne razlike u tačnoj definiciji ovog pojma, što otežava davanje zajedničkog odgovora na naizgled jednostavno pitanje: šta je rizik? Upravljanje i merenje rizika je postalo ključno pitanje za mnoge portfolio analitičare i investitore. U zadnjih nekoliko godina finansijska literatura se fokusirala na sam segment upravljanja rizikom. Pri ulaganju u pojedinu hartiju od vrednosti, rizik portfolija predstavlja mogućnost da se ne ostvari planirani prinos, odnosno da investirana sredstva donesu manju dobit od očekivane ili čak ostvare i gubitak (Alihodžić, 2011).

U pogledu investitora, uvek se postavljalo još jedno važno pitanje, a to je: koji je maksimalni gubitak koji moram da podnesem ako postoji? Koncept rizične vrednosti je predložen 1996. godine, da bi se sugerisali odgovori na ovo pitanje. Sastoji se u jednostavnom određivanju rizika dajući mu tačnu vrednost. Jorion (1996) navodi da VaR opisuje najgori očekivani scenario, odnosno gubitak za dati horizont i nivo poverenja. Menadžeri rizika, regulatori i trgovci treba da budu svesni određenih karakteristika volatilnosti kada procenjuju buduću volatilnost.

Poslednjih godina, oblast pokrivena kriptovalutama, odnosno virtuelnim valutama u platnim sistemima se ubrzano širi, gde su ove valute privukle pažnju investitora na finansijskim tržištima iz celog sveta. Takođe, kriptovalute privlače pažnju programera, rizičnog kapitala i investitora svojim inovativnim tehnologijama, visokobezbedonosnim arhitekturama, te sposobnošću da budu investicioni instrumenti (Klein i ostali, 2018). Bitkoin je najranije objavljena valuta među kriptovalutama i takođe je najpopularnija jer ima najveću tržišnu vrednost. Iako se navodi da je bitkoin uvela osoba po imenu Satoši Nakamoto 2009. godine, ostaje misterija da li je ova osoba ili pseudonim koji koriste neki ljudi i grupe koje su kreirale bitkoin. Različiti pogledi na kriptovalute i budućnost kriptovaluta i dalje su pokretačka snaga i pored ekstremne volatilnosti na ovim tržištima. Ova situacija je dovela do povećanog interesovanja istraživača na ovu temu kako bi se razotkrila misterija složenog sveta kriptovaluta, koja je i dalje nejasna i zbunjujuća za većinu učesnika na tržištu (Guesmi i ostali, 2019).

U svetlu ovih razmišljanja i studija sprovedenih na ovu temu u ovom radu, glavni cilj će biti usmeren na revidiranju postojanosti volatilnosti za odabranu digitalnu i finansijsku imovinu, odnosno proračun očekivanog rizika i prinosa digitalne i finansijske imovine, kao i odabir najoptimalnijeg portfolija od ukupnog seta portfolija.

Ovo istraživanje je dizajnirano iz pet delova. Prvi deo odnosi se na uvodnu problematiku sa fokusom na kratak opis definicije moderne portfolio teorije i značaja rizične vrednosti. Drugi deo opisuje pregled dosadašnjih istraživanja u pogledu značaja metodologije rizične vrednosti za procenu rizika i gubitaka za različite oblike digitalne i finansijske imovine, te formiranja optimalnog portfolija. Treći deo opisuje izabranu metodologiju istraživanja, sa posebnim akcentom na neophodne formule za proračun očekivanog prinosa portfolija, standardne devijacije portfolija, varijanse i proračuna rizične vrednosti. Četvrti deo odnosi se na podatke i varijable potrebne za analizu. Peti deo predstavlja dobijene rezultate istraživanja, kao i određena zapažanja i preporuke.

Pregled relevantne literature

VaR analizom se meri maksimalan gubitak vrednosti portfolija tokom unapred određenog vremenskog perioda za dati nivo poverenja. Metodologija rizične vrednosti (VaR) se koristi za tumačenje izloženosti finansijskom riziku od 1995. godine. VaR je zaista mera koja objašnjava koliko su promenljivi finansijski instrumenti. Zajednička lekcija iz različitih finansijskih kriza i katastrofa je da milijarde dolara mogu biti izgubljene zbog lošeg nadzora i upravljanja finansijskim rizicima. Rizična vrednost (VaR) razvijena je kao odgovor na finansijske katastrofe 1990-tih, i dobija sve važniju ulogu u upravljanju tržišnim rizikom. VaR je sumirao najgori gubitak u ciljnom horizontu za dati nivo poverenja. VaR je pre svega popularan pristup jer daje jednu količinu koja sumira ukupan rizik sa kojim se institucija suočava (Gencay i Selcuk, 2004). Popularnost VaR-a je zasnovana na njegovoj sposobnosti da objedini nekoliko komponenti tržišnog rizika preduzeća u jedan broj. Šta više, fokusira se na veliku zabrinutost viših menadžera, kao i potencijal za značajan gubitak u portfoliju imovine preduzeća. U svojim različitim oblicima, VaR je takođe dobio snažnu podršku industrije i regulatornih tela kao što su Grupa 30 (G30, 1993), Banke za međunarodna poravnanja i Evropske unije.

Tržišni rizik se obično kvantifikuje korišćenjem metodologije Value-at-Risk (VaR). Pomoću date metodologije se procenjuje vrednost tržišnog rizika pri datim nivoima poverenja. U praksi se obično koriste nivoi poverenja od 99% ili 95%. Može se slobodno reći da se pomoću VaR-a meri verovatnoća nastanka gubitka po osnovu aktivnosti koje se registruju u knjizi trgovanja, kako na strani kapitala, tako i na strani prihoda, pri datom nivou poverenja (Đukić, 2011).

Procena vrednosti portfolija metodom VaR je predmet opsežnog istraživanja koji još ima rastuću popularnost. Dostupno je nekoliko analitičkih tehnika, kao i tehnika zasnovanih na simulacijama, u zavisnosti od stepena nelinearnosti instrumenata u portfoliju i spremnosti da se naprave stroge pretpostavke o osnovnim statističkim distribucijama. VaR je jedina metrika rizika koja se redovno koristi i koja se može primeniti na skoro svaku klasu imovine, što je jedan od razloga zašto je postala toliko popularna.

Markowitz (1952) i tri meseca kasnije Roy (1952) su nezavisno objavili VaR mere koje su bile iznenađujući slične. I Markowitz i Roy su radili na razvoju načina odabira portfolija, koji bi na neki način optimizovao nagradu za dati nivo rizika. U tu svrhu svaka predložena VaR mera koja je uključivala kovarijanse između faktora rizika imala je za cilj efekte zaštite i diversifikacije. Iako su ove dve mere bile matematički slične one su podržavale različite VaR metrike. Markowitz je koristio varijansu jednostavne metrike povrata. Roy je koristio metriku rizika od manjka koja predstavlja gornju granicu verovatnoće da bruto prinos portfolija bude manji od nekog specificiranog „katastrofalnog“ prinosa.

Rockafellar i Uryasev (2000) definisali su rizičnu vrednost kao gubitak tržišne vrednosti tokom vremenskog horizonta t koji je prevaziđen sa verovatnoćom 1-p za određeni vremenski horizont t i nivo poverenja p. Banka za međunarodna poravnanja (engl. The Bank for International Settlements – BIS) je finansijska institucija sa sedištem u Švajcarskoj, koja je za potrebe izračunavanja adekvatnosti kapitala banaka postavila p na 99 procenata i t na deset dana, iako bi to omogućilo ograničeno korišćenje prednosti statističke diversifikacije u različitim periodima.

Hendricks (1996) nasumično bira 1.000 portfolija valutnih opcija da bi testirao efikasnost VaR modela. Cilj njegove studije je bio da demonstrira i uporedi sličnost broja rizika merenog VaR metodom i realnog rizika. Jedan faktor koji on razmatra je tržišni rizik uporedo sa korišćenjem tri fundamentalne metode, i to: a) jednako ponderisani pokretni prosek, b) eksponencijalno ponderisani pokretni prosek, i c) metod istorijske simulacije. Na osnovu datih metoda zaključio je da se dobijaju različiti VaR brojevi. Ipak konačno on ne može zaključiti da je jedan metod superiorniji od drugih. U svom testu on takođe pokazuje da 95% i 99% nivo poverenja proizvodi različite VaR brojeve.

Jorion (1997) ima slične kritike o VaR-u, da on nije savršen alat za merenje. Dakle, VaR jednostavno ilustruje različite brzine rizika koji su ugrađeni u derivatne finansijske instrumente. VaR je dobar alat kojeg menadžeri rizika treba da budu svesni kako bi delovali na zaštiti svojih rizičnih pozicija. Takođe, VaR se prihvata kao standardno merenje za određivanje regulatornog kapitala od strane BIS-a (Karelse, 2001). Mnoge strane na finansijskim tržištima kao što su institucije, bogati investitori, vlasti, revizori i rejting agencije u mogućnosti su da redovno prate tržišni rizik i prihvataju različite nivoe poverenja za svoje VaR proračune (Culp i ostali, 1999).

Yamai i Yoshiba (2002) pokazuju da su VaR i očekivani manjak oslobođeni od rizika kada su dobitak i gubitak normalno raspoređeni. Posmatrano sa druge strane, VaR može pokazati rizičnu vrednost ako dobitak i gubitak nisu normalno raspoređeni. Glavni uzročnik neravnomerne raspodele dobitka i gubitka je nelinearnost pozicija portfolija, ili nelinearnost cena osnovne imovine.

Woods i ostali (2008) su definisali VaR kao statistički indikator finansijskog rizika koji predstavlja najveći verovatni gubitak portfolija tokom određenog vremenskog perioda. Kao rezultat toga, iznos VaR-a zavisi od dva proizvoljna parametra: perioda zadržavanja ili vremenskog horizonta i verovatnoće poznate kao nivo poverenja. Primera radi, VaR banke u njenom trgovačkom portfoliju može biti 20 miliona funti sa nivoom poverenja od 95% i rokom držanja sledećeg trgovačkog dana. To znači da banka veruje da ima 95% šanse da ostvari profit ili da izgubi ne više od 20 miliona funti sledećeg trgovačkog dana.

Bouri i ostali (2016) su ispitivali odnos između prinosa na cene i promene volatilnosti na tržištu Bitkoina u različitim valutama (američki dolar, australijski dolar, kanadski dolar, britanska funta, evro i japanski jen). Studija je podeljena na dva perioda s obzirom na kolaps cene Bitkoina u decembru 2013. godine. Prema nalazima studije, dok nije bilo dokaza o asimetričnom odnosu prinosa i volatilnosti na tržištu Bitkoina za ceo period posmatranog uzorka, utvrđeno je da postoji značajna inverzna veza između volatilnosti i prošlih šokova pre pada cene u decembru 2013. godine, ali tada nije bio značajan odnos. Autori su ovaj nalaz koji je bio suprotan očekivanjima, objasnili kao efekat sigurnog utočišta, sličan ulaganju u zlato. Štaviše, samo rezultati perioda pre kolizije su pokazali značajnu negativnu vezu između nesigurnosti na berzi u SAD-u i promenljivosti Bitkoina.

Dyhrberg (2016) je ispitao sposobnost finansijske imovine Bitkoina koristeći GARCH model. Rezultati analize su pokazali da Bitkoin ima mnogo sličnosti sa zlatom i dolarom, gde je prema opštem rezultatu studije konstatovano da je Bitkoin negde između novca i robe zbog svoje decentralizovane strukture i ograničene veličine tržišta.

Carrick (2016) je ispitivao da li se bitkoin može smatrati dopunskom ili zamenskom valutom razvijenih zemalja i zemalja u nastajanju, te kako bi uključivanje bitkoina u korpu valuta uticalo na prinose prilagođene riziku već diversifikovanog portfolija valuta. U istraživanju su korišćeni podaci koji se odnose na vrednost i volatilnost glavnih valuta (austrijski dolar, britanska funta, kanadski dolar, euro, japanski jen i švajcarski franak) i valuta tržišta u razvoju (brazilski real, čileanski pezo, kineski juan, kolumbijski pezo, indonežanska rupija, indijska rupija, malezijski ringit, meksički pezo, filipinski pezo, poljski zlot, ruska rublja, južnokorejski von, tajlandski baht i turska lira) sa kojima su upoređena vrednost i volatilnost bitkoina. Posmatrani period istraživanja je trajao od 01. januara 2011. godine, do 31. decembra 2015. godine. Utvrđeno je da je bitkoin u negativnoj korelaciji na statistički značajnom nivou sa svim glavnim valutama u analiziranom periodu, osim švajcarskog franka, i svim valutama tržišta u razvoju osim kineskog juana. Negativna korelacija između valuta tržišta u nastajanju i bitkoina zanimljiv je nalaz jer je valutni rizik glavni problem kod valuta za tržišta u nastajanju. Valute tržišta u nastajanju postale su uobičajen način za diversifikaciju rizika i balansiranja valutnog i investicionog portfolija. Zbog negativnih korelacija između bitkoina i većine valuta, uključivanje bitkoina u korpe valuta moglo bi biti od koristi za portfolio menadžere da smanje rizik i povećaju prinose prilagođene riziku. Stoga, se bitkoin može smatrati dopunom drugim valutama, posebno valutama zemalja u razvoju.

Nam (2017) je imao za cilj da pronađe odgovore na pitanja poput: „Može li Bitkoin poboljšati efikasnost portfolija"? i „Koja strategija optimizacije portfolija može da stvori najbolji profil rizika i prinosa u koji je uključen Bitkoin"? U svojoj metodologiji Nam je koristio Sharpe Ratio, VaR, i CVaR, da ispita odnos Bitkoin-a, Eura, Britanske funte, Švajcarskog franka, Japanskog jena, Australijskog dolara, Kanadskog dolara i Zlata za period: 2010-2016. Rezultati istraživanja su pokazali da Bitkoin ima potencijal da poboljša performanse portfolija.

Byström i Krygier (2018) su se fokusirali na odnos između promenljivosti na Bitkoin tržištu i drugim tradicionalnim tržištima. Pronađena je značajna korelacija između promenljivosti Bitkoina i obima pretrage na Google. Pored toga, pošto se smatralo da aktivnost pretraživanja interneta pretežno kreiraju maloprodajni investitori i šira javnost, zaključeno je da su promenljivost Bitkoina prouzrokovali maloprodajni investitori, a ne institucionalni investitori.

Klein i ostali (2018) su svoje istraživanje podelili u tri celine. Prvo, istraženo je volatilno ponašanje kriptovaluta u poređenju sa indeksima akcija i robom. Drugo, mogućnosti zaštite i bezbednost utočišta kriptovaluta u poređenju sa zlatom su istražene dinamičkom korelacionom analizom. Konačno, primenjena je analiza portfolija koja naglašava ponašanje zlata i bitkoina u teškim vremenima. Prema rezultatima, postojale su razlike u strukturama bitkoina i zlata u pogledu svojstava uslovne varijanse. Takođe, dok je zlato imalo važnu ulogu u teškim vremenima na finansijskim tržištima sa prelaskom na kvalitet , bitkoin je bio upravo suprotno. Zaključeno je da su bitkoin i zlato imali različite karakteristike uglavnom kao veze sa imovinom i berzama. Dok je efekat asimetrije bio značajan za bitkoin, sa druge strane nije bio značajan za zlato.

Kajtazi i Moro (2019) su ispitali da li Bitkoin pruža prednosti u kontekstu diversifikacije portfolija. Kao rezultat, došli su do zaključka da su performanse portfolija povećane dodavanjem Bitkoina, ali ne treba zanemariti da je ova situacija uglavnom posledica povećanja prinosa, a ne smanjenja volatilnosti i da je ovo povećanje performansi povezano sa performansama Bitkoina u 2013. godini. Generalno, u ovom okviru oni su naveli da iako je Bitkoin spekulativan, on može igrati važnu ulogu u diversifikaciji portfolija.

Symitsi i Chalvatzis (2019) istraživali su učinak Bitkoina u portfolijima. Koristeći podatke od septembra 2011. godine, do jula 2017. godine, došli su do zaključka da Bitkoin pruža statistički značajne prednosti diversifikacije, te može dodati vrednost portfolijima.

Soyaslan (2020) je analizirao korelaciju između Bitkoin-a i BIST Banke, BIST Tehnologije i BIST 100 indeksa dnevnih podataka između 2011., i 2020. god., koristeći metode analize vremenskih serija. Kao rezultat studije, postoji dugoročna korelacija između Bitkoin-a i BIST 100 indeksa, ali ne postoji korelacija između BIST banke i BIST Tehnologije u kratkom roku.

Papafotis (2021) je istraživao ponašanje cena, fluktuacije, potencijalne vrhove, minimalne vrednosti kriptovaluta, te postojanje koherentnosti i veza između ponašanja jednih u odnosu na druge kriptovalute. Autor je izvršio korelacione analize i Johansen kointegracionu analizu dnevnih cena Bitkoina-a (BTC), Litecoin-a (LTC), Ethereum-a (ETH), Ripple (XRP) i Monero (XMR) za period od 2013., do 2020. Rezultati analize su se razlikovali za i pre 2017. godine. Istraživanje je pokazalo da je pet kriptovaluta pre 2017. godine imalo nestabilan model, ali je s druge strane sličan i stabilan model primećen među kriptovalutama nakon 2017. godine.

Metodologija istraživanja

Rizična vrednost (engl. Value at Risk – VAR) se definiše kao maksimalni gubitak tokom datog vremenskog horizonta i za dati nivo poverenja. Široko se koristi za merenje potencijalnog rizika od ekonomskih gubitaka na finansijskim tržištima. U kontekstu predviđanja obično se portfolio menadžeri, investitori i trgovci fokusiraju na duže horizonte. Value at Risk se izračunava na jednodnevnom nivou pouzdanosti od 95% i 99%. Takođe, obično se signalizira da je gubitak veći od prijavljene vrednosti pod rizikom portfolija u samo 5% i 1% slučajeva. Pri odabiru nivoa pouzdanosti treba voditi računa da što je manji nivo pouzdanosti to je tačnija procena i suprotno, što je veći nivo pouzdanosti veći je iznos proračunatog maksimalnog gubitka što konsekventno vodi do većih troškova rezervisanja, tj. većih potrebnih iznosa za pokrivanje potencijalnih gubitaka. Portfolio menadžeri, trgovci i investitori moraju da procene ne samo dugu trgovačku poziciju, već i kratke trgovačke pozicije. U slučaju duge trgovačke pozicije (levi rep distribucije) rizik od gubitka se javlja kada se cena imovine kojom se trguje smanji. S druge strane, u slučaju kratke trgovačke pozicije (desni rep distribucije) rizik od gubitka se javlja kada cena imovine kojom se trguje raste (Demiralay i Ulusoy, 2014).

Kao što je Fama naveo 1970. godine, cene na finansijskim tržištima bi bile sigurne pod hipotezom da u potpunosti odražavaju sve dostupne finansijske informacije. Činjenica da se informacije na finansijskim tržištima neprestano menjaju otežava korišćenje informacija u procesu donošenja odluka i otežava efikasnost tržišta. Ovakva situacija omogućava bolje informisanim investitorima da ostvare visok profit (Fama, 1970). Teorija implicira da je u normalnim uslovima tržište efikasno, što znači da su investitori pravilno informisani i da racionalno donose odluke.

Ali nedostatak odlučnog okvira ili modela za kriptovalute otežava predviđanje vrednosti tržišta i utiče negativno na karakteristike slabe forme efikasnosti (Naeem i ostali, 2021). Sa ove tačke gledišta, da bi se razumele osnove finansijskih tržišta i kriptovaluta trebalo bi testirati hipotezu efikasnosti tržišta. Volatilnost je jako važno pitanje u finansijama, jer se smatra glavnim inputom za proces donošenja odluka u različitim oblastima kao što su cene hartija od vrednosti, trgovanje, upravljanje rizikom i monetarna politika. Dakle, procena volatilnosti je suštinska oblast istraživanja koja ima nekoliko teorijskih i praktičnih zaključaka (Naimy i Hayek,2018).

S obzirom da postoji nekoliko metoda za izračunavanje VaR-a, to otežava odabir najprikladnijeg koji predviđa rizik za određena finansijska sredstva, imovinu ili portfolio finansijskih sredstava. Najčešće korišćene metode izračunavanja VaR- a su sledeće: istorijska metoda, metoda varijanse-kovarijanse i Monte Carlo metoda. Istorijska metoda bazira se na istorijskim podacima, dok metoda varijanse-kovarijanse i Monte Carlo metoda koriste istorijske podatke za procenu statističkih parametara. Očekivani prinos portfolija se izračunava kao ponderisana suma prinosa pojedinih hartija od vrednosti koje čine portfolio. Udeo pojedine hartije od vrednosti u portfoliju služi kao ponder:

$$E(R_{port}) = \sum_{i=1}^{N} X_i \, E(R_i) \tag{1}$$

gde je: $E(R_{port})$ – očekivani prinos na portfolio, X_i – procentni udeo hartije od vrednosti (i) u portfoliju, $E(R_i)$ – očekivani prinos hartije od vrednosti (i). Varijansa portfolija se izračunava na sledeći način:

$$\sigma^2 = \sum_{i=1}^{N} X_i^2 \, \sigma_i^2 + \sum_{i=1}^{N} \sum_{j=1}^{N} X_i X_j \sigma_i \sigma_j \rho_{ij} \tag{2}$$

gde je: σ_i^2 – varijansa i-te hartije od vrednosti, σ_i – standardna devijacija i-te hartije od vrednosti, ρ_{ii} - koeficijent korelacije između prinosa hartija od vrednosti (i) i (j). Poslednji deo jednačine (2) $(\sigma_i \sigma_j \rho_{ij})$, može se zameniti statističkim izrazom $Cov_{i,j}$ (kovarijansa), kako bi se pojednostavila jednačina, budući da je:

$$\rho_{ij} = \frac{Cov_{i,j}}{\sigma_i \sigma_j} \tag{3}$$

Kovarijansa se dobija iz sledeće formule (Berenson i Levine, 1996):

$$Cov_{i,j} = \frac{1}{N-1} \sum_{i=1}^{N} [(x_i - \bar{x})(y_i - \bar{y})] \tag{4}$$

Investitor koji je diversifikovao svoje ulaganje ne vodi računa o pojedinačnom riziku neke imovine, već o njenom učinku na rizičnost ukupnog portfolija (Bawa i ostali, 1979). Kako standardna devijacija i varijansa mere rizik neke imovine kada se ona posmatra izolovano, potrebno je u proceni korporacijskog rizika koristiti mere koje vezuju jednu imovinu za drugu. Utvrđivanje očekivanog prinosa i standardne devijacije prinosa, omogućava formiranje krive distribucije verovatnoće prinosa. Putem krive distribucije verovatnoće prinosa posmatraju se verovatnoće odstupanja od očekivanog prinosa. VaR pokazatelj se dobija kao proizvod standardne devijacije portfolija (σ_p) i koeficijenta pouzdanosti standardizovane normalne distribucije (Z_α), odnosno izražava se pomoću sledeće formule (Megla i ostali, 2017):

$$VaR = \sigma_P \cdot P \cdot Z_\alpha \tag{5}$$

gde je:

P- inicijalna tržišna vrednost portfolija.

Postoje određeni parametri koje analitičar treba da odredi pre nego što pređe na izračunavanje VaR-a. Parametri su sledeći: vremenski interval, nivo poverenja, vrednost portfolija i standardna devijacija. Vremenski interval ulaganja varira od investicije do investicije. Može biti jedan dan, mesec dana, godina ili duže. Vremenski interval ulaganja je generalno povezan sa lakoćom likvidnosti investicije. Iako se koriste dnevni ili mesečni periodi, period zavisi od ulaganja. Prilagođeno vreme se koristi za izračunavanje VaR-a. Nivo poverenja kod VaR-a proračunat je parametar koji daje pouzdanost proračuna. Bazelski komitet zahteva nivo poverenja od 99% i jednostrani interval poverenja. Što je veći interval poverenja, to će biti veći rezultujući iznos VaR-a (Kayahan i Topal, 2009). Vrednost portfolija predstavlja ukupan iznos uložen u hartiju od vrednosti ili portfolio. Standardna devijacija se izračunava prema fluktuacijama cena hartija od vrednosti. Takođe, standardna devijacija se izračunava procentom promene cena hartija od vrednosti. Za izračunavanje dnevne standardne devijacije koristi se najmanje 250 podataka i to predstavlja period uzorkovanja (Irs, 2017).

Najslabiji aspekt metode izračunavanja VaR-a je to što ne pokazuje „najgori slučaj". Kao što je poznato distribucije verovatnoće predstavljaju opseg unutar navedenog intervala poverenja. Međutim, iako je verovatnoća u stvarnom životu veoma mala, postoje neki događaji van ove oblasti. Iako je verovatnoća veoma mala, ne može se reći da se takav događaj nikada neće dogoditi. Još jedno važno pitanje je da VaR modeli ne pokazuju potpuni gubitak. Na primer, VaR pokazuje da je milion dolara u opasnosti na dan trgovanja, i ne može da pruži informaciju o gubicima u drugom, trećem i narednim danima. Debeli rep distribucije može biti glavni faktor rizika za investitore. Debeli rep jednostavno znači iznenadna i velika povećanja/smanjenja vrednosti hartija od vrednosti ili druge finansijske imovine. Činjenica je da se fluktuacije u velikim količinama ne mogu predvideti VaR metodom je jedan od nedostataka koji metod čini neadekvatnim (Demireli i Taner, 2009).

Podaci za analizu

U radu su istraživani dnevni istorijski podaci o kretanju sledeće digitalne i finansijske imovine: Bitkoin-a, EUR Stoxx 50, zlata, obveznica: državne obveznice ICE Bof A 1-10 Year isključujući Italiju i Grčku i korporativni indeks obveznica ICEBof A 1-10 Year AA. Kao izvor dnevnih istorijskih podataka poslužila je široka Bloomberg baza podataka za period od 28 februara 2013. godine, do 20. aprila 2023. godine, što obuhvata ukupno 10 godina i 51 dan. Međutim, nedostatak analize na dnevnoj osnovi su bili nedostajući podaci, koji ukazuju na činjenicu da se pojedinim oblikom finansijske i digitalne imovine nije trgovalo jedan ili više dana. U tom kontekstu podaci su nadopunjeni ili prosečnom vrednošću ili cenom trgovanja iz prethodnog dana, što je i implementirano u ovom istraživanju. Takođe, u ovom istraživanju procena dobijenih portfolija kao i VaR pokazatelja zasniva se na dnevnim prinosima posmatranih oblika imovine.

Tabela 1 - Kratki opis analiziranih varijabli

Digitalna i finansijska imovina	Kratka definicija	Očekivani efekat
Bitkoin	Bitkoin je originalna kriptovaluta bazirana na blokovima. Stvoren 2009. godine, od strane pseudonimnog Satoshi Nakamota. Od tada Bitkoin je privukao milione investitora, da bi postao najveća kriptovaluta merena po tržišnoj kapitalizaciji.	-
Euro Stoxx 50	Predstavlja neke od najvećih kompanija u evrozoni u kontekstu tržišne kapitalizacije u slobodnom prometu. Indeks obuhvata oko 60% tržišne kapitalizacije u slobodnom prometu, što zauzvrat pokriva oko 95% free float tržišne kapitalizacije predstavljenih zemalja.	(+)
Zlato	Zlato je oduvek imalo tradicionalnu ulogu u deviznim rezervama zemlje. Takođe, zlato se smatralo krajnjim utočištem sigurnosti, odnosno osnovom jačanja domaće valute, posebno u slučajevima finansijske nestabilnosti i neizvesnosti.	(-)
Državne obveznice ICE Bof A 1-10 Year (isključujući Italiju i Grčku)	Indeks državnih obveznica koji prati učinak korporativnog duga denominiranog u eurima ispod investicionog ranga koji je javno emitovan na domaćem tržištu evra ili na tržištu evroobveznica.	(+)
Korporativni indeks obveznica ICEBof A 1-10 Year AA	Indeks koji prati isto učinak korporativnog duga denominiranog u američkim dolarima koji je javno objavljen na domaćem tržištu SAD-a.	(+)

Izvor: Autor

Bitkoin - kao jedna od najvažnijih finansijskih inovacija poslednjih godina je digitalna kripto valuta koja je privukla veliko interesovanje javnosti, ali i investitora i finansijskih institucija. Prvi i najvažniji po tržišnoj kapitalizaciji je Bitkoin. Prvi put je predstavljen 2008. godine, kao peer-to-peer elektronski gotovinski sistem od strane misteriozne osobe ili grupe koja koristi nadimak Satoši Nakamoto, čiji identitet još nije poznat. U povezanom članku, elektronska valuta je definisana kao „lanac digitalnih potpisa" (Nakamoto, 2008). U centru Bitkoina nalazi se globalna knjiga ili bilans stanja koji se zove blockchain (Kelly, 2014). Blockchain tehnologija je zasnovana na logici stvaranja lanca od ovih blokova zatvaranjem podataka koji se žele čuvati u „blokovima". Dakle, transakcije se beleže hronološki na blok lancu i podaci se ne mogu menjati retrospektivno (Aksoy, 2018).

EURO Stoxx 50 - je berzanski indeks akcija eurozone koji je dizajnirao STOXX dobavljač indeksa u vlasništvu Deutsche Börse Group. EURO STOXX 50 je počeo da se kotira tek od 1998. godine, ali su njegove cene izračunate retroaktivno do 1986. godine. Bazna vrednost indeksa je 1.000 poena na dan 31. decembar 1991. godine. Indeks se sastoji od 50 akcija iz 11 zemalja eurozone. Dakle, EURO STOXX 50 predstavlja kompanije iz eurozone koje se smatraju liderima u svojim sektorima. Fjučersi i opcije na posmatrani indeks EURO STOXX 50 kojima se trguje na Eurex-u spadaju među najlikvidnijim proizvodima u Evropi i svetu (en.wikipedia.org).

Zlato – je od davnina služilo kao sredstvo razmene i skladištenja bogatstva. Cena zlata je uglavnom povezana sa ekonomskom i političkom nestabilnošću, jer nema suvereni kreditni rizik. Zlato je jedinstvena imovina sa sigurnim utočištem i svojstvima zaštite, jer je u slaboj korelaciji sa drugim finansijskim investicijama (Hillier i ostali, 2006).

Državne obveznice ICE Bof A 1-10 Year (isključujući Italiju i Grčku) – ovaj indeks prati učinak korporativnog duga denominiranog u eurima ispod investicionog ranga, koji je javno emitovan na domaćem tržištu evra ili na tržištu evroobveznica. Kvalifikovane hartije od vrednosti moraju imati rejting ispod investicionog ranga (na osnovu proseka Moody's, S&P i Fitch). Kvalifikovane hartije od vrednosti moraju imati najmanje godinu dana preostalog roka do dospeća, fiksni raspored kupona i minimalni iznos od 100 miliona evra (https://fred.stlouisfed.org).

Korporativni indeks obveznica ICEBof A 1-10 Year AA – ovaj indeks prati takođe učinak korporativnog duga denominiranog u američkim dolarima koji je javno objavljen na domaćem tržištu SAD-a. Ovaj indeks uključuje sve hartije od vrednosti sa datim investicijskim rejtingom od AAA. Hartije od vrednosti koje ulaze u sastav ovog indeksa moraju imati najmanje godinu dana do konačnog dospeća, fiksni raspored kupona i minimalni iznos od 250 miliona dolara (https://www.doubleline.com).

Rezultati i diskusija

Sa nedavnim rastom tržišta kripto valuta, neki su tvrdili da se kripto valute mogu posmatrati kao nova vrsta investicionog alata (Corbet i ostali, 2018). Kada je u pitanju viđenje kriptovaluta kao novog investicionog alata ili alternativne imovine, postoje dva pitanja koja investitori treba da razmotre. Prvi od njih su rizici specifični za ulaganja, drugi su odnosi kripto valuta sa drugom imovinom što je još važnije u kontekstu prednosti diversifikacije i hedžing sposobnosti kriptovaluta (Feng i ostali, 2018). Uklanjanje digitalne imovine iz investicionih alternativa biće jednako restriktivno, kao i uklanjanje svih drugih sredstava (Elender i ostali, 2018). Modeliranje volatilnosti je takođe važno za upravljanje rizikom. Štaviše, kriptovalute se uglavnom koriste kao imovina umesto valuta, uprkos tome što je tržište prilično špekulativno. Isto tako, promenljivije je od drugih valuta i podložnije špekulativnim balonima. S tim u vezi, kriptovalute imaju važno mesto na finansijskim tržištima i u upravljanju portfoliom. Samim tim je analiza njihove volatilnosti izuzetno značajna. Tabela u nastavku teksta ilustruje tendenciju kretanja mera povrata i rizika digitalne imovine (Bitkoin) i ostalih predstavnika finansijske imovine (EUR 50 Stoxx 50, Zlato, Državne obveznice ICE Bof A 1-10 Year, Korporativni indeks obveznica ICE Bof A 1-10 Year AA) za period: 28.02.2013.- 20.04.2023. godine.

Tabela 2 - Mere povrata i rizika digitalne (Bitkoin) i finansijske imovine za period: 28.02.2013.- 20.04.2023. godine (u%)

Mere povrata i rizika	Bitkoin	EURO Stoxx 50	Zlato	Državne obveznice ICE Bof A 1-10 Year (isključujući Italiju i Grčku)	Korporativni indeks obveznica ICEBof A 1-10 Year AA
Srednja vrednost	11,57	0,51	0,24	0,03	0,05
Standardna devijacija	49,30	4,84	4,22	0,87	0,93
Freq<0	43,90	44,72	52,03	42,28	41,46
Parametarski VaR	-69,52	-7,45	-6,70	-1,41	-1,49
Empirijski VaR	-29,48	-6,79	-6,14	-1,25	-1,44
Parametarski CVaR	-90,13	-9,47	-8,46	-1,77	-1,88
Empirijski CVaR	-34,50	-9,12	-7,62	-2,19	-2,48

Izvor: Autor

Iz prethodne tabele se da primetiti da je najveću rizičnost u pogledu prve mere rizika tj. standardne devijacije ostvario Bitkoin od oko 49,30% kao i najveći povrat od 11,57%. Takođe, i u kontekstu ostvarivanja potencijalnog gubitka merenog putem parametarske i empirijske VaR vrednosti pri nivou pouzdanosti od 95% Bitkoin je ostvario visoke vrednosti od 69% (parametarska VaR metoda) i 29% (empirijska VaR metoda).

Povećanje i fluktuacija cena Bitkoina poslednjih godina privuklo je veliku pažnju. Naročito povećanje cene Bitkoina u poslednjih pet godina dalo je primer super (eksponencionalnog) rasta koji se obično ne vodi ni u jednom finansijskom polju osim na tržištu kriptovaluta (Pichl i Kaizoji, 2017). Cena Bitkoina, kojom se trgovalo na 1.000 dolara početkom 2017. godine, značajno je porasla na 15.000 dolara u decembru 2017. godine. Međutim, neki događaji su doprineli povećanju volatilnosti Bitkoina. Monetarne restrikcije kineske Vlade od 01. jula 2017. godine, prekomerno su povećale cene Bitkoina zbog sve veće potražnje, a zabrana trgovine digitalnom valutom u avgustu 2017. godine, takođe je uticala na prekomerno smanjivanje cene Bitkoina (Aksoy, 2018).

Drugo mesto po visini rizičnosti merene preko standardne devijacije pripada berzanskom indeksu EURO Stoxx 50 (4,84%) i zlatu (4,22%). Najmanju rizičnost su ostvarile državne i korporativne obveznice. Za razliku od digitalne imovine volatilnost zlata i tržišta akcija i obveznica se povećava tokom perioda političkih i ekonomskih previranja. Osim u drugom periodu u 2008. godini (kriza hipotekarnih kredita) visoka volatilnost finansijskih oblika imovine je zabeležena pred kraj 2011. godine, kao i sredinom 2013. godine. Kraj 2011. godine je obeležen krizom evropskog državnog duga, koja je izazvala kolaps finansijskih institucija i visokog državnog duga u nekim evropskim zemljama dok su debate o odlukama FED-a o monetarnoj politici planule sredinom 2013. godine. Visoka volatilnost kriptovaluta otežava investitorima da zauzmu pravu poziciju i razviju strategije ulaganja. Ulaganja u kripto tržište novca svakako da uključuje visoke rizike. Glavni među ovim rizicima su operativni rizici i sajber rizici. Posmatrano sa druge strane, i danas se vidi da investitori i dalje ozbiljno veruju u glasine i špekulacije o kriptovalutama. Određene studije u literaturi ističu da Bitkoin i druge kriptovalute treba posmatrati kao „špekulativnu" imovinu. Rano istraživanje dinamike cena Bitkoina navodi da Bitkoin ima izuzetno špekulativnu prirodu (Brauneis i Mestel, 2019).

Tabela 3 - Korelaciona matrica između digitalne (Bitkoin) i finansijske imovine za period: 28.02.2013.- 20.04.2023. godine

	Bitkoin	EURO Stoxx 50	Zlato	Državne obveznice ICE Bof A 1-10 Year (isključujući Italiju i Grčku)	Korporativni indeks obveznica ICEBof A 1-10 Year AA
Bitkoin	1,00				
EURO Stoxx 50	0,34	1,00			
Zlato	-0,04	0,03	1,00		
Državne obveznice ICE Bof A 1-10 Year (isključujući Italiju i Grčku)	0,26	0,27	-0,08	1,00	
Korporativni indeks obveznica ICEBof A 1-10 Year AA	0,40	0,63	-0,10	0,78	1,00

Izvor: Proračun autora na bazi Bloomberg baze podataka

Prethodna tabela ilustruje kretanje koeficijenata korelacije između kriptovalute (Bitkoin) i finansijske imovine koju reprezentuju određeni berzanski indeksi i imovina (EUR 50 Stoxx 50, Zlato, Indeks državnih obveznica, korporativni indeks obveznica). Najjača pozitivna korelacije je zabeležena između Bitkoina i indeksa korporativnih obveznica ICEBof A 1-10 Year AA (0.40), zatim i sa berzanskim indeksom akcija EUR50 Stoxx 50 je takođe ostvarena pozitivna korelacija (0,34). Nizak stepen rizičnosti portfolija rezultat je obrnutog odnosa između performansi portfolija.

Dakle, u recesiji i usporenom ekonomskom rastu cene akcija padaju, ali zato obveznice ostvaruju dobre rezultate. Suprotno tome, nakon naglog privrednog uspona cene obveznica padaju, ali cene akcija rastu (Bodie i ostali, 2009). Na osnovu datih koeficijenata korelacije i odnosa se može zaključiti da su jako niske vrednosti koeficijenata korelacije što pruža dobru priliku za diversifikaciju uključivanjem kriptovaluta. S druge strane, najviše kritikovani aspekt moderne portfolio teorije je povećanje korelacije između imovine u portfoliju u vremenima krize i gubitka koristi od diversifikacije kada je to najpotrebnije (AlKulaib i Almudhaf, 2011). Tvrdi se da sredstva niske korelacije koja se uzimaju u portfolio da obezbede koristi od diversifikacije povećavaju korelaciju između njih u kriznim periodima i ne pružaju stvarnu korist od diversifikacije (Baur i Lucey, 2010).

Posmatrano sa druge strane, najjača negativna kauzalnost je zabeležena između Bitkoin-a i zlata (-0,04). Ekstremna volatilnost kriptovaluta je temeljno dokumentovana, ali investitori i finansijski profesionalci na datu volatilnost različito gledaju u zavisnosti od njihovog stava prema Bitkoin-u. Investitori koji su prihvatili meteorski uspon Bitkoin-a u poslednjih nekoliko godina prihvatili su prekomernu volatilnost, dok sagovornici i Bitkoin medvedi ukazuju na visoku volatilnost kao goreću crvenu zastavu i razlog da se izbegnu ulaganja. Do kraja prvog kvartala 2018. godine, Bitkoin je pao za skoro 50%, a zlato je poskupelo za 7,5%. Dakle, Bitkoin se naziva alternativom zlata i shodno tome, hedžingom od inflacije zbog ograničene ponude i nedostatka centralizovane regulacije. U vremenima neizvesnosti, investitori će hrliti da ulažu u zlato i plemenite metale kao sigurno utočište da bi se držali dalje od valuta koje reguliše Vlada. Iako Bitkoin i zlato možda nisu „konkurenti" kao zaštita od inflacije, oni bi možda mogli biti komplementarni u nečijem portfoliju (http://www.cmegroup.com).

Mogućnosti za diversifikacijom portfolija na tržištima u razvoju mogu se sagledati i kroz moguće efekte ulaganja u različita sredstva iz različitih segmenata finansijskih tržišta, na primer ulaganja u akcije različitih industrija, diversifikovanih različitih fondova tržišta u razvoju, EFT fondova na tržištima kapitala, zlato, različite strane valute i bitkoin. U ovom istraživanju tokom analize korišćeni su statistički programi Microsoft Excel i MATLAB 7.1. Takođe, u ovoj studiji kreirano je deset portfolija prema različitim scenarijima za digitalnu i finansijsku imovinu, i izračunate su vrednosti kao što su prinos i standardna devijacija portfolija. Dodavanjem kriptovalute u ove portfolije ispitano je kako Bitkoin valuta utiče na portfolije i da li može eventualno da doda vrednost portfoliju.

Tabela 4 - Efikasan set portfolija – digitalne (Bitkoin) i finansijske imovine: prosečan prinos i rizik za period: 28.02.2013.- 20.04.2023. godine

	PORTFOLIO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Prosečan povrat	0,03	0,05	0,10	0,15	0,20	0,25	0,27	0,30	0,35	0,40
Standardna devijacija	0,86	0,88	0,94	1,05	1,17	1,32	1,38	1,47	1,64	1,81
Sharpe ratio	0,04	0,06	0,11	0,14	0,17	0,19	0,20	0,20	0,21	0,22
Bitkoin	0,00	0,11	0,49	0,84	1,18	1,53	1,67	1,88	2,22	0,02
EURO Stoxx 50	0,00	0,00	0,65	2,15	4,63	5,15	6,18	7,07	8,78	0,10
Zlato	0,27	1,28	2,65	4,04	5,61	6,83	7,50	8,34	9,78	0,11
Državne obveznice ICE Bof A 1-10 Year (isključujući Italiju i Grčku)	76,85	70,77	68,32	66,66	88,43	63,36	73,63	72,65	76,14	0,74
Korporativni indeks obveznica ICEBof A 1-10 Year AA	22,87	0,28	0,28	26,31	0,15	23,13	11,02	10,06	3,08	0,01

Izvor: Proračun autora na bazi Bloomberg baze podataka

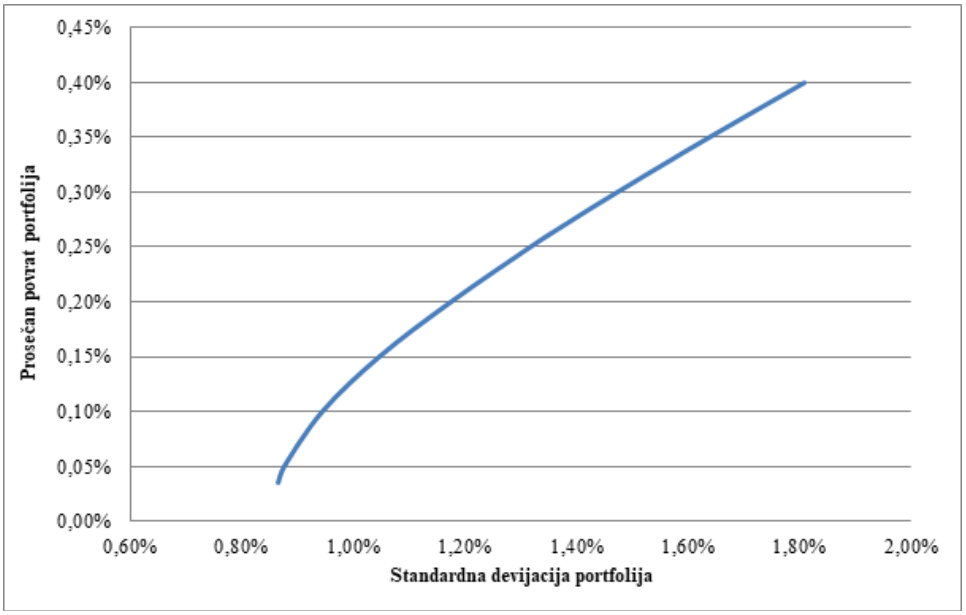
U svom ključnom članku iz 1952. godine, Harry Markowitz je izjavio da je svrha selekcije portfolija da se odredi alokacija sredstava u portfoliju kako bi se dobio maksimalni očekivani prinos s obzirom na određeni rizik, ili minimalni rizik portfolija kada se datom portfoliju da očekivani prinos (Johnson, 2014). Takođe, Harry Markowitz osnivač moderne portfolio teorije utvrdio je da je odnos sredstava među sobom važniji od njihovih pojedinačnih rizika i utvrdio da se rizik portfolija može smanjiti dodavanjem sredstava koja nisu u visokoj međusobnoj korelaciji. Što je niži odnos između sredstava u kontekstu korelacije koja su uključena u portfoliju, to je manji ukupan rizik portfolija (Markowitz, 1952).

Iz prethodne tabele se može zaključiti da je od svih posmatranih deset portfolija, drugi portfolio najoptimalniji u kontekstu rizika, tj. standardne devijacije jer minimizira rizik portfolija. S obzirom na to, da su korelacije između kriptovalute (Bitkoin) i drugih oblika finansijske imovine niske ili negativne, data situacija može da utiče na povećanje prednosti u smislu diversifikacije. Takođe, se da primetiti da se sa povećavanjem Sharpe racia povećava i prosečan povrat i standardna devijacija portfolija.

Jedna od uobičajenih ideja koje se iznose da bi se objasnilo interesovanje investitora za kriptovalute su moguće koristi koje ovi digitalni novčići mogu pružiti u diversifikaciji portfolija. Smatra se da prinosi kriptovaluta imaju nisku ili negativnu korelaciju upoređujući ih sa prinosima tradicionalnih finansijskih sredstava, kao što su obveznice ili akcije. Stoga, kao rezultat uključivanja pomenutih kriptovaluta u portfolije, očekuje se da će se očekivani prinosi portfolija koji odgovaraju svakoj jedinici rizika povećati (Anyfantaki i ostali, 2018). Koristeći Markowitz-ov model srednje varijanse Brauneis i Mestel (2019) su iskoristili podatke za period od januara 2015. godine, do decembra 2017. godine, kako bi otkrili efikasnost portfelja kriptovaluta. Kao rezultat toga, oni su naveli da portfelji kreirani od različitih kriptovaluta imaju značajan potencijal za smanjenje rizika. Takođe, Guesmi i ostali (2019) analizirali su dinamiku odnosa između Bitkoina i druge finansijske imovine koju su posmatrali sa podacima za period: januar 2012 – januar 2018. godine. Cilj im je pre svega bio da utvrde da li Bitkoin pruža prednosti investitorima u kontekstu diversifikacije portfolija i upravljanja rizikom. Kao rezultat sprovedenog istraživanja, došli su do zaključka da bi Bitkoin mogao da pruži prednosti investitorima u smislu zaštite od rizika i diversifikacije portfolija.

Efikasna granica je skup svih portfolija koji se nalaze u uzlaznom delu grafičkog prikaza 1. Uzlazno kretanje znači kako portfoliji na efikasnoj granici sadrže odabire povećanja očekivanog prinosa portfolija i povećanja standardne devijacije portfolija. Za uspešno izračunavanje efikasne granice treba naći njenu početnu tačku, odnosno portfolio sa minimalnom standardnom devijacijom prinosa. U finansijama ovaj portfolio naziva se portfolio minimalne varijanse, što znači da ima minimalnu varijansu i minimalnu standardnu devijaciju (Vukičević i ostali, 2010). Grafik u nastavku teksta ilustruje tendenciju kretanja efikasne granice digitalne imovine (u našem slučaju Bitkoina) i finansijske imovine za period: 28.02.2013 – 20.04.2023. godine.

Grafik 1 - Efikasan set digitalne (Bitkoin) i finansijske imovine za period: 28.02.2013 - 20.04.2023. godine



Izvor: Proračun autora na bazi Bloomberg baze podataka

Kao što se može i primetiti sa povećanjem nagiba i prve mere rizika tj. standardne devijacije portfolija dolazi i do povećanja prosečnog povrata portfolija, ali ne u istoj meri, odnosno prosečni povrat raste u blažoj meri zbog različite strukture izabranog portfolija.

Zaključak

Finansijske vremenske serije često pokazuju stilizovane činjenice kao što su asimetrija, jaka volatilnost, karakteristike debelog repa itd. Stoga se literatura o finansijskoj ekonometriji fokusira na distributivna i statistička svojstva serija finansijskih prinosa. Predviđanje volatilnosti je važan zadatak za većinu investitora na finansijskim tržištima. VaR donosi standardizaciju kada se porede rizični portfoliji. Poslednjih godina, prednosti VaR-a čine ga savremenim alatom za upravljanje rizikom. Volatilnost se obično dešava u klasterima. Pretpostavka je da volatilnost koja ostaje konstantna u svakom trenutku može biti fatalna. Volatilnost se menja tokom vremena, posebno tokom finansijske krize kada ima tendenciju da se značajno poveća.

U ovom istraživanju je bio fokus da se proračuna volatilnost za različite oblike finansijske imovine, kao i za digitalnu imovinu tj. Bitkoin, te da se pronađe optimalni portfolio s minimalnim rizikom za period: 28.02.2013.- 20.04.2023. godine. Rezultati istraživanja su pokazali da je najveća volatilnost i fluktuacija u kontekstu prve mere rizika tj. standardne devijacije ostvarena kod Bitkoina, drugo mesto pripada berzanskom indeksu EURO Stoxx 50, zatim zlatu i indeksima obveznica na poslednjem mestu. Takođe i u kontekstu parametarske i empirijske VaR vrednosti prvo mesto u pogledu verovatnoće ostvarivanja ekonomskog gubitka pripada digitalnoj imovini tj. Bitkoinu, zatim berzanskom indeksu EURO Stoxx 50, zlatu, korporativnom indeksu obveznica i državnom indeksu obveznica isključujući Italiju i Grčku. U kontekstu formiranja optimalnog portfolija od ukupno 10 portfolija drugi portfolio se pokazao najoptimalniji u pogledu povrata i standardne devijacije.

Iako proces formiranja digitalne imovine, konkretno Bitkoina, još u potpunosti nije shvaćen, visoka cena i preterano nestabilna struktura počele su da privlače pažnju investitora. Modeliranje strukture volatilnosti cena Bitkoina je važno za one koji razmišljaju o ulaganju u Bitkoin. Pored svoje visoke volatilnosti Bitkoin može da posluži kao odličan oblik digitalne imovine u kombinaciji sa ostalim oblicima finansijske imovine zbog svoje niske korelacije i ostvarivanja prednosti diversifikacije. Ovo istraživanje bi trebalo da doprinese povećanju postojećeg korpusa znanja o finansijskim istraživanjima primenom VaR tehnike i modeliranja za procenu iznosa potencijalnog gubitka izabrane digitalne i finansijske imovine. Nadalje, moguće je razviti i proširiti ovo istraživanje korišćenjem različitih sredstava i različitih strategija portfolija. Na ovaj način će se dobiti sveobuhvatnije informacije o upotrebljivosti kriptovaluta u diversifikaciji portfolija. Međutim, treba imati u vidu da je ovo istraživanje rađeno na osnovu istorijskih podataka, gde ne treba zaboraviti da situacije koje su se desile u prošlosti možda nisu ogledalo budućnosti, jer je budućnost puna neizvesnosti.

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THE VOLATILITY OF BITCOIN AND THE RISKINESS OF THE FINANCIAL PORTFOLIO

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Summary: The main goal of this research is to evaluate the returns and risks of the following types of assets: Bitcoin, EUR Stoxx 50, gold, bonds: government bonds ICE Bof A 1-10 Year excluding Italy and Greece and the corporate bond index ICEBof A 1-10 Year AA. The paper tested a total of ten portfolios according to different scenarios for digital and financial assets. Also, in the paper, greater measures of risk and return were calculated with the aim of forming an optimal portfolio with minimal risk. The results of this research revealed that the correlation between Bitcoin and other forms of financial assets is generally low and negative, which can be a good instrument for portfolio diversification, and positively affect portfolio performance. Also, the results of this study showed that in terms of volatility and return measure of a total of ten portfolios, the second portfolio (whose structure consists of Bitcoin, Euro Stoxx 50, gold, government bonds ICE Bof A 1-10 Year - excluding Italy and Greece and the corporate index bond ICEBof A 1-10 Year AA) is the most optimal portfolio. The findings of this research can serve in risk and loss assessments of portfolio managers, investors, and regulators.

Keywords: Value at risk, VaR, market risk, Bitcoin, efficient portfolio, portfolio optimization.

JEL classification: G11, G32

Introduction

The origin of modern portfolio theory is linked to the famous text published in 1952 by Harry Markowitz, in which he developed a model of the expected rate of return and expected portfolio risk. Markowitz showed that the variance of a portfolio rate of return is also a measure of portfolio risk under certain assumptions. During the development of the mathematical model of portfolio return variance, Markowitz indicated not only the crucial importance of diversification of investments to reduce the overall risk of the portfolio but also how diversification is effectively performed and used. One of the biggest improvements in investment analysis in the past decades is certainly hidden in the knowledge that creating an optimal portfolio of securities is not a simple job of investing in securities based on desirable ones, i.e., target return and risk characteristics of each security. On the other hand, the theory proven in practice indicates the need to consider and analyze the mutual relations of the return and risk characteristics of each security included in the investment portfolio (Krneta, 2006).

The concept of risk has been used extensively in finance. There are significant differences in the exact definition of this term, which makes it difficult to give a common answer to a seemingly simple question: what is risk? Managing and measuring risk has become a key issue for many portfolio analysts and investors. In the last few years, financial literature has focused on the segment of risk management. When investing in an individual security, portfolio risk represents the possibility that the planned return will not be achieved, that is, that the invested funds will bring a lower profit than expected or even result in a loss (Alihodžić, 2011).

From the point of view of investors, another important question has always been asked, namely: what is the maximum loss I have to bear if it exists? The concept of value at risk was proposed in 1996 to suggest answers to this question. It consists of simply determining the risk by giving it an accurate value. Jorion (1996) states that VaR describes the worst expected scenario, i.e., the loss for a given horizon and confidence level. Risk managers, regulators, and traders should be aware of certain volatility characteristics when assessing future volatility.

In recent years, the area covered by cryptocurrencies, i.e., virtual currencies in payment systems, has been rapidly expanding, and these currencies have attracted the attention of investors in financial markets from all over the world. Also, cryptocurrencies attract the attention of developers, venture capitalists, and investors with their innovative technologies, high-security architectures, and their ability to be investment instruments (Klein et al., 2018).

Bitcoin is the earliest published currency among cryptocurrencies and is also the most popular because it has the highest market value. Although it is stated that Bitcoin was introduced by a person named Satoshi Nakamoto in 2009, it remains a mystery whether this is a person, or a pseudonym used by some people and groups that created Bitcoin. Differing views on cryptocurrencies and the future of cryptocurrencies continue to be a driving force despite extreme volatility in these markets. This situation has led to an increased interest of researchers in this topic to unravel the mystery of the complex world of cryptocurrencies, which is still unclear and confusing for most market participants (Guesmi et al., 2019).

In light of these thoughts and the studies conducted on this topic, the main goal of this paper will be revising the persistence of volatility for selected digital and financial assets, i.e. calculating the expected risk and return of digital and financial assets, as well as selecting the most optimal portfolio from the total set of portfolios.

This research is designed in five parts. The first part refers to the introductory issue with a focus on a brief description of the definition of modern portfolio theory and the significance of value-at-risk. The second part describes an overview of previous research regarding the significance of the value-at-risk methodology for assessing risks and losses for various forms of digital and financial assets, and the formation of an optimal portfolio. The third part describes the selected research methodology, with a special emphasis on the necessary formulas for the calculation of the expected return of the portfolio, the standard deviation of the portfolio, the variance, and the calculation of the value-at-risk. The fourth part refers to the data and variables needed for the analysis. The fifth part presents the obtained research results, as well as certain observations and recommendations.

Review of Relevant Literature

VaR analysis measures the maximum loss of portfolio value during a predetermined period for a given confidence level. The Value at Risk (VaR) methodology has been used to interpret financial risk exposure since 1995. VaR is a measure that explains how volatile financial instruments are. A common lesson from various financial crises and disasters is that billions of dollars can be lost due to poor oversight and management of financial risks. Value at Risk (VaR) was developed in response to the financial disasters of the 1990s and is gaining an increasingly important role in market risk management. VaR summarized the worst loss over the target horizon for a given confidence level. VaR is primarily a popular approach because it provides a single quantity that summarizes the total risk the institution is facing (Gencay and Selcuk, 2004). The popularity of VaR is based on the ability to combine several components of a company's market risk into a single number. Moreover, it focuses on the major concerns of senior managers, as well as the potential for significant loss in the company's asset portfolio. In its various forms, VaR has also received strong support from industry and regulatory bodies such as the Group of 30 (G30, 1993), the Bank for International Settlements, and the European Union.

Market risk is usually quantified using the Value-at-Risk (VaR) methodology. Using the given methodology, the value of the market risk is estimated at the given confidence levels. In practice, confidence levels of 99% or 95% are usually used. It is safe to say that VaR measures the probability of loss based on activities registered in the trading book, both on the capital side and on the income side, at a given level of confidence (Đukić, 2011).

Valuation of the portfolio using the VaR method is a subject of extensive research that is still growing in popularity. Several analytical techniques as well as simulation-based techniques are available, depending on the degree of non-linearity of the instruments in the portfolio and the willingness to make strict assumptions about the underlying statistical distributions. VaR is the only regularly used risk metric that can be applied to almost any asset class, which is one of the reasons why it has become popular.

Markowitz (1952) and three months later Roy (1952) independently published VaR measures that were surprisingly similar. Both Markowitz and Roy worked to develop ways of selecting portfolios that would somehow optimize the reward for a given level of risk. For this purpose, each proposed VaR measure included covariances between risk factors aimed at hedging and diversification effects. Although these two measures were mathematically similar, they supported different VaR metrics. Markowitz used the variance of a simple return metric. Roy used a shortfall risk metric that represents an upper bound on the probability that a portfolio gross return will be less than some specified „catastrophic" return.

Rockafellar and Uryasev (2000) defined value at risk as the loss of market value during a time horizon t that is exceeded with probability 1-p for a certain time horizon t and confidence level p. The Bank for International Settlements (BIS) is a financial institution based in Switzerland, which to calculate the capital adequacy of banks has set p at 99 percent and t at ten days, although this would allow limited use of the advantages of statistical diversification in different periods.

Hendricks (1996) randomly selects 1,000 portfolios of currency options to test the effectiveness of the VaR model. His study aimed to demonstrate and compare the similarity of the risk number measured by the VaR method and the real risk. One factor he considers is market risk along with the use of three fundamental methods, namely: a) equally weighted moving average, b) exponentially weighted moving average, and c) historical simulation method. Based on the given methods, he concluded that different VaR numbers are obtained. Ultimately, however, he cannot conclude that one method is superior to the others. In his test, he also shows that the 95% and 99% confidence levels produce different VaR numbers.

Jorion (1997) has similar criticisms about VaR, that it is not a perfect measurement tool. Therefore, VaR simply illustrates the different rates of risk that are embedded in derivative financial instruments. VaR is a good tool that risk managers should be aware of to, in order to act towards protecting their risk positions. Also, VaR is accepted as a standard measurement for determining regulatory capital by BIS (Karelse, 2001). Many parties in financial markets such as institutions, wealthy investors, authorities, auditors, and rating agencies can regularly monitor market risk and accept different confidence levels for their VaR calculations (Culp et al., 1999).

Yamai and Yoshiba (2002) show that VaR and expected shortfall are free from risk when profit and loss are normally distributed. On the other hand, VaR can show value at risk if profit and loss are not normally distributed. The main cause of the uneven distribution of profit and loss is the non-linearity of portfolio positions or the non-linearity of underlying asset prices.

Woods et al. (2008) defined VaR as a statistical indicator of financial risk that represents the largest probable loss of the portfolio during a certain period. As a result, the amount of VaR depends on two arbitrary parameters: the holding period or time horizon and a probability known as the confidence level. For example, a bank's VaR in its trading portfolio might be £20 million with a confidence level of 95% and a holding period of the next trading day. This means that the bank believes it has a 95% chance of making a profit or losing no more than £20 million on the next trading day.

Bouri et al. (2016) examined the relationship between price returns and volatility changes in the Bitcoin market in different currencies (US dollar, Australian dollar, Canadian dollar, British pound, Euro, and Japanese yen). The study is divided into two periods considering the collapse of the Bitcoin price in December 2013. According to the findings of the study, while there was no evidence of an asymmetric relationship between returns and volatility in the Bitcoin market for the entire period of the observed sample, it was determined that there was a significant inverse relationship between volatility and past shocks before the price drop in December 2013, but then there was no significant relationship. The authors explained this finding, which was contrary to expectations, as a haven effect, similar to investing in gold. Moreover, only the results of the pre-collision period showed a significant negative relationship between US stock market uncertainty and Bitcoin volatility.

Dyhrberg (2016) examined the financial asset performance of Bitcoin using a GARCH model. The results of the analysis showed that Bitcoin has many similarities with gold and the dollar, where, according to the general result of the study, it was concluded that Bitcoin is somewhere between money and commodity due to its decentralized structure and limited market size.

Carrick (2016) examined whether Bitcoin can be considered a complementary or replacement currency of developed and emerging countries, and how the inclusion of Bitcoin in a basket of currencies would affect the risk-adjusted returns of an already diversified portfolio of currencies. The research used data related to the value and volatility of the main currencies (Austrian dollar, British pound, Canadian dollar, Euro, Japanese yen, and Swiss franc) and developing market currencies (Brazilian real, Chilean peso, Chinese yuan, Colombian peso, Indonesian rupiah, Indian rupiah, Malaysian ringgit, Mexican peso, Philippine peso, Polish zloty, Russian ruble, South Korean won, Thai baht, and Turkish lira) against which the value and volatility of Bitcoin were compared. The observed research period lasted from January 1, 2011, to December 31, 2015. It was found that Bitcoin is negatively correlated at a statistically significant level with all major currencies in the analyzed period, except for the Swiss franc, and with all emerging market currencies except for the Chinese yuan. The negative correlation between emerging market currencies and Bitcoin is an interesting finding because currency risk is a major concern with emerging market currencies. Emerging market currencies have become a common way to diversify risk and balance currency and investment portfolios. Due to the negative correlations between Bitcoin and most currencies, including Bitcoin in a basket of currencies could be beneficial for portfolio managers to reduce risk and increase risk-adjusted returns. Therefore, Bitcoin can be considered as a complement to other currencies, especially the currencies of developing countries.

Nam (2017) aimed to find answers to questions such as: Can Bitcoin improve portfolio efficiency? Which portfolio optimization strategy can create the best risk-return profile involving Bitcoin? In his methodology Nam used Sharpe Ratio, VaR, and CVaR, to examine the relationship of Bitcoin, Euro, British Pound, Swiss Franc, Japanese Yen, Australian Dollar, Canadian Dollar, and Gold for the period: 2010-2016. The research results have shown that Bitcoin has the potential to improve portfolio performance.

Byström and Krygier (2018) focused on the relationship between volatility in the Bitcoin market and other traditional markets. A significant correlation was found between Bitcoin volatility and Google search volume. Additionally, since Internet search activity was thought to be predominantly generated by retail investors and the general public, it was concluded that Bitcoin volatility was caused by retail investors, not institutional investors.

Klein et al. (2018) divided their research into three parts. First, the volatile behavior of cryptocurrencies compared to stock indices and commodities was investigated. Second, the hedging capabilities and haven of cryptocurrencies compared to gold are explored through dynamic correlation analysis. Finally, a portfolio analysis was applied that highlights the behavior of gold and Bitcoin in difficult times. According to the results, there were differences in the structures of Bitcoin and gold in terms of conditional variance properties. Also, while gold played an important role in the difficult times in the financial markets with the transition to quality, Bitcoin was the exact opposite. It was concluded that Bitcoin and gold had different characteristics mainly related to assets and stock markets. While the asymmetry effect was significant for Bitcoin, on the other hand, it was not significant for gold.

Kajtazi and Moro (2019) examined whether Bitcoin provides advantages in terms of portfolio diversification. As a result, they concluded that the performance of the portfolio increased by adding Bitcoin, but it should not be ignored that this situation is mainly due to an increase in return, not a decrease in volatility and that this increase in performance is related to the performance of Bitcoin in 2013. In general, in this framework, they stated that although Bitcoin is speculative, it can play an important role in portfolio diversification.

Symitsi and Chalvatzis (2019) investigated the performance of Bitcoin in portfolios. Using data from September 2011 to July 2017, they concluded that Bitcoin provides statistically significant diversification benefits and can add value to portfolios.

Soyaslan (2020) analyzed the correlation between Bitcoin and BIST Bank, BIST Technology, and BIST 100 index daily data between 2011 and 2020, using time series analysis methods. As a result of the study, there is a long-term correlation between Bitcoin and the BIST 100 index, but there is no correlation between BIST Bank and BIST Technology in the short term.

Papafotis (2021) investigated price behavior, fluctuations, potential peaks, minimum values of cryptocurrencies, and the existence of coherence and connections between the behavior of some cryptocurrencies in relation to other cryptocurrencies. The author performed correlation analysis and Johansen cointegration analysis of the daily prices of Bitcoin (BTC), Litecoin (LTC), Ethereum (ETH), Ripple (XRP), and Monero (XMR) for the period from 2013 to 2020. The results of the analysis differed for and before 2017. The research showed that five cryptocurrencies had had an unstable model before 2017, but on the other hand, a similar and stable model was observed among cryptocurrencies after 2017.

Research Methodology

Volatility is a statistical measurement of asset price movements. The higher the volatility implies the possibility of higher returns or losses. However, in real life, volatility and correlations change over time. Value at Risk is defined as the maximum loss over a given time horizon and for a given confidence level. It is widely used to measure the potential risk of economic losses in financial markets. In terms of forecasting, portfolio managers, investors, and traders usually focus on longer horizons. Value at Risk is calculated at a one-day confidence level of 95% and 99%. Also, the loss is usually signaled to be greater than the reported value at risk of the portfolio in only 5% and 1% of cases.

When choosing a confidence level, it should be taken into account that the lower the confidence level, the more accurate the assessment, and vice versa, the higher the confidence level, the higher the amount of calculated maximum loss, which consequently leads to higher provisioning costs, i.e., larger amounts needed to cover potential losses. Portfolio managers, traders, and investors must evaluate not only long trading positions but also short trading positions. In the case of a long trading position (left tail of the distribution), the risk of loss occurs when the price of the traded asset decreases. On the other hand, in the case of a short trading position (right tail of the distribution), the risk of loss occurs when the price of the traded asset rises (Demiralay and Ulusoy, 2014).

As Fama stated in 1970, prices in financial markets would be safe under the hypothesis that they fully reflect all available financial information. The fact that information in financial markets is constantly changing makes it difficult to use information in the decision-making process and hinders market efficiency. This situation allows better-informed investors to make high profits (Fama, 1970). The theory implies that under normal conditions the market is efficient, which means that investors are properly informed and make rational decisions. However, the lack of a deterministic framework or model for cryptocurrencies makes it difficult to predict market value and adversely affects weak-form efficiency features (Naeem et al., 2021).

From this point of view, to understand the fundamentals of financial markets and cryptocurrencies one should test the market efficiency hypothesis. Volatility is a very important issue in finance because it is considered a major input to the decision-making process in various areas such as security prices, trading, risk management, and monetary policy. Therefore, volatility estimation is an essential field of research that has several theoretical and practical implications (Naimy and Hayek,2018).

Since there are several methods for calculating VaR, it is difficult to choose the most appropriate one that predicts the risk of a particular financial asset, asset, or portfolio of financial assets. The most commonly used methods of calculating VaR are the following: historical method, variance-covariance method, and Monte Carlo method. The historical method is based on historical data, while the variance-covariance method and the Monte Carlo method use historical data to estimate statistical parameters. The expected return of the portfolio is calculated as a weighted sum of the returns of individual securities that make up the portfolio. The share of individual security in the portfolio serves as a weight:

$$E(R_{port}) = \sum_{i=1}^{N} X_i \, E(R_i) \tag{1}$$

where is: $E(R_{port})$ - expected portfolio return; X_i - the percentage share of the security (i) in the portfolio, $E(R_i)$ - the expected return of the security (i). The portfolio variance is calculated as follows:

$$\sigma^2 = \sum_{i=1}^{N} X_i^2 \, \sigma_i^2 + \sum_{i=1}^{N} \sum_{j=1}^{N} X_i X_j \sigma_i \sigma_j \rho_{ij} \tag{2}$$

where is: σ_i^2 - the variance (i) of the security, σ_i – standard deviation i- of the security, ρ_{ij} – the coefficient of correlation between securities returns (i) and (j). The last part of equation (2) $(\sigma_i \sigma_j \rho_{ij})$ can be replaced by a statistical expression $Cov_{i,j}$ (covariance), in order to simplify the equation, since:

$$\rho_{ij} = \frac{Cov_{i,j}}{\sigma_i \sigma_j} \tag{3}$$

The covariance is obtained from the following formula (Berenson and Levine, 1996):

$$Cov_{i,j} = \frac{1}{N-1} \sum_{i=1}^{N} [(x_i - \bar{x})(y_i - \bar{y})] \tag{4}$$

An investor who has diversified their investment does not take into account the individual risk of an asset, but rather its effect on the riskiness of the overall portfolio (Bawa et al., 1979). As the standard deviation and variance measure the risk of an asset when viewed in isolation, it is necessary to use measures that link one asset to another in the assessment of corporate risk. Determining the expected return and the standard deviation of the return enables the formation of the return probability distribution curve. Probabilities of deviation from the expected return are observed through the return probability distribution curve. The VaR indicator is obtained as the product of the standard deviation of the portfolio (σ_p) and the coefficient of reliability of the standardized normal distribution (Z_α), that is, it is expressed using the following formula (Megla et al., 2017):

$$VaR = \sigma_P \cdot P \cdot Z_\alpha \tag{5}$$

where is:

P- the initial market value of the portfolio.

There are certain parameters that the analyst needs to determine before proceeding to VaR calculation. The parameters are as follows: time interval, confidence level, portfolio value, and standard deviation. The investment time interval varies from investment to investment. It can be a day, a month, a year, or longer. The time interval of the investment is generally related to the ease of liquidity of the investment. Although daily or monthly periods are used, the period depends on the investment. Adjusted time is used to calculate VaR. The confidence level in VaR is a calculated parameter that gives the reliability of the calculation. The Basel Committee requires a 99% confidence level and a one-sided confidence interval. The larger the confidence interval, the higher the resulting amount of VaR will be (Kayahan and Topal, 2009). The value of the portfolio is the total amount invested in a security or portfolio. The standard deviation is calculated according to the price fluctuations of the securities. Also, the standard deviation is calculated as a percentage of the change in the prices of securities. At least 250 data points are used to calculate the daily standard deviation, and this corresponds to the sampling period (Irs, 2017).

The weakest aspect of the VaR calculation method is that it does not show the "worst case scenario". As is known, probability distributions represent the range within the given confidence interval. However, although the probability in real life is very small, as there are some events outside this area. Although the probability is very low, it cannot be said that such an event will never happen. Another important issue is that VaR models do not show a complete loss. For example, VaR shows that $1 million is at risk on a trading day, and cannot provide information about losses on the second, third, and subsequent days. The fat tail of the distribution can be a major risk factor for investors. A fat tail simply means sudden and large increases/decreases in the value of securities or other financial assets. The fact that fluctuations in large quantities cannot be predicted by the VaR method is one of the shortcomings that makes the method inadequate (Demireli and Taner, 2009).

Data for Analysis

The paper investigated daily historical data on the movement of the following digital and financial assets: Bitcoin, EUR Stoxx 50, gold, bonds: government bonds ICE Bof A 1-10 Year excluding Italy and Greece and corporate bond index ICEBof A 1-10 Year AA. A broad Bloomberg database served as the source of daily historical data for the period from February 28, 2013, to April 20, 2023, covering a total of 10 years and 51 days. However, the lack of analysis on a daily basis was missing data, which indicates the fact that a certain form of financial and digital asset was not traded for one or more days. In this context, the data were supplemented with either the average value, or the trading price from the previous day, which was implemented in this research. Also, in this research, the assessment of the obtained portfolios, as well as the VaR indicators, is based on the daily returns of the observed forms of assets.

Table 1 - Brief Description of the Analyzed Variables

Digital and financial assets	Short definition	Expected effect
Bitcoin	Bitcoin is the original blockchain-based cryptocurrency. Created in 2009, by the pseudonymous Satoshi Nakamoto. Since then, Bitcoin has attracted millions of investors, becoming the largest cryptocurrency by market capitalization.	-
Euro Stoxx 50	It represents some of the largest companies in the Eurozone in terms of market capitalization in free circulation. The index covers about 60% of the market capitalization in free circulation, which in turn covers about 95% of the free float market capitalization of the represented countries.	(+)
Gold	Gold has always had a traditional role in the country's foreign exchange reserves. Also, gold was considered the ultimate refuge of safety, that is, the basis of strengthening the domestic currency, especially in cases of financial instability and uncertainty.	(-)
Government bonds ICE Bof A 1-10 Year (excluding Italy and Greece)	Government bond index that tracks the performance of corporate debt denominated in euros below investment grade that was publicly issued on the domestic euro market or on the eurobond market.	(+)
Corporate Bond Index ICEBof A 1-10 Year AA	An index that tracks the performance of US dollar-denominated corporate debt publicly traded in the US domestic market.	(+)

Source: Author

Bitcoin - one of the most important financial innovations in recent years is digital cryptocurrencies that have attracted great interest from the public, but also from investors and financial institutions. The first and most important market capitalization is Bitcoin. It was first introduced in 2008 as a peer-to-peer electronic cash system by a mysterious person or group using the alias Satoshi Nakamoto, whose identity is still unknown. In a related article, electronic currency is defined as a "chain of digital signatures" (Nakamoto, 2008). At the center of Bitcoin is a global ledger or balance sheet called the blockchain (Kelly, 2014). Blockchain technology is based on the logic of creating a chain of these blocks by enclosing the data to be stored in "blocks". Therefore, transactions are recorded chronologically on the blockchain, and data cannot be changed retrospectively (Aksoy, 2018).

EURO Stoxx 50 - is a Eurozone stock index designed by STOXX, an index provider owned by Deutsche Börse Group. The EURO STOXX 50 began to be listed only in 1998, but its prices were calculated retroactively until 1986. The base value of the index is 1.000 points on December 31, 1991. The index consists of 50 stocks from 11 eurozone countries. Therefore, the EURO STOXX 50 represents companies from the eurozone that are considered leaders in their sectors. Futures and options on the observed EURO STOXX 50 index traded on Eurex are among the most liquid products in Europe and the world (en.wikipedia.org).

Gold - has long served as a means of exchange and storage of wealth. The price of gold is mostly related to economic and political instability, as it has no sovereign credit risk. Gold is a unique asset with a safe haven and protection properties, as it is weakly correlated with other financial investments (Hillier et al., 2006).

Government bonds ICE Bof A 1-10 Year (excluding Italy and Greece) – this index tracks the performance of corporate debt denominated in euros below investment grade that was publicly issued on the domestic euro market or the Eurobond market. Qualifying securities must be rated below investment grade (based on an average of Moody's, S&P, and Fitch). Qualifying securities must have at least one year remaining to maturity, a fixed coupon schedule, and a minimum amount of €100 million (https://fred.stlouisfed.org).

Corporate Bond Index ICEBof A 1-10 Year AA - this index also tracks the performance of corporate debt denominated in US dollars publicly announced in the US domestic market. This index includes all securities with a given investment rating of AAA. Securities included in this index must have at least one year to maturity, a fixed coupon schedule, and a minimum principal amount of $250 million (https://www.doubleline.com).

Results and Discussion

With the recent growth of the cryptocurrency market, some have argued that cryptocurrencies can be seen as a new type of investment tool (Corbet et al., 2018). When it comes to seeing cryptocurrencies as a new investment tool or alternative asset, there are two questions that investors should consider. The first of them are investment-specific risks, the second are the relationships of cryptocurrencies with other assets, which is even more important in terms of the diversification benefits and hedging capabilities of cryptocurrencies (Feng et al., 2018).

The removal of digital assets from investment alternatives will be as restrictive as the removal of all other assets (Elender et al., 2018). Volatility modeling is also important for risk management. Moreover, cryptocurrencies are mostly used as assets instead of currencies, even though the market is quite speculative. It is also more volatile than other currencies and more subject to speculative bubbles. In this regard, cryptocurrencies have an important place in financial markets and portfolio management. Therefore, the analysis of their volatility is extremely important. The table below illustrates the tendency of the return and risk measures of digital assets (Bitcoin) and other representatives of financial assets (EUR 50 Stoxx 50, Gold, Government bonds ICE Bof A 1-10 Year, Corporate bond index ICE Bof A 1-10 Year AA) for the period: 28.02.2013 - 20.04.2023.

Table 2 - Measures of Return and Risk of Digital (Bitcoin) and Financial Assets for the Period: 28.02.2013 - 20.04.2023 (in%)

Measures of return and risk	Bitcoin	EURO Stoxx 50	Gold	Government bonds ICE Bof A 1-10 Year (excluding Italy and Greece)	Corporate Bond Index ICEBof A 1-10 Year AA
Mean	11.57	0.51	0.24	0.03	0.05
Standard deviation	49.30	4.84	4.22	0.87	0.93
Freq<0	43.90	44.72	52.03	42.28	41.46
Parametric VaR	-69.52	-7.45	-6.70	-1.41	-1.49
Empirical VaR	-29.48	-6.79	-6.14	-1.25	-1.44
Parametric CVaR	-90.13	-9.47	-8.46	-1.77	-1.88
Empirical CVaR	-34.50	-9.12	-7.62	-2.19	-2.48

Source: Calculation by the author based on the Bloomberg database

From the previous table, it can be noted that Bitcoin achieved the highest risk in terms of the first measure of risk, i.e., the standard deviation of about 49.30%, as well as the highest return of 11.57%. Also, in terms of achieving potential loss measured by parametric and empirical VaR values at a confidence level of 95%, Bitcoin achieved high values of 69% (parametric VaR method) and 29% (empirical VaR method).

The increase and fluctuation of Bitcoin prices in recent years have attracted a lot of attention. In particular, the increase in the price of Bitcoin in the last five years has provided an example of super (exponential) growth that is not usually seen in any financial field except the cryptocurrency market (Pichl and Kaizoji, 2017). The price of Bitcoin, which was trading at $1,000 in early 2017, rose significantly to $15,000 in December 2017. However, some events have contributed to the increase in the volatility of Bitcoin. The monetary restrictions of the Chinese Government since July 1, 2017, excessively increased the price of Bitcoin due to the increasing demand, and the ban on trading in digital currency in August 2017 also affected the excessive decrease in the price of Bitcoin (Aksoy, 2018).

The second place in terms of riskiness, measured by standard deviation, belongs to the EURO Stoxx 50 stock index (4.84%) and gold (4.22%). Government and corporate bonds achieved the lowest risk. Unlike digital assets, the volatility of gold and the stock and bond markets increases during periods of political and economic turmoil. Except for the second period in 2008 (mortgage credit crisis), high volatility of financial forms of assets was recorded towards the end of 2011, as well as in the middle of 2013. The end of 2011 was marked by the European sovereign debt crisis, which caused the collapse of financial institutions and high sovereign debt in some European countries while debates about the FED monetary policy decisions flared up in mid-2013. The high volatility of cryptocurrencies makes it difficult for investors to take the right position and develop investment strategies. Investing in the crypto money market certainly involves high risks. Chief among these risks are operational risks and cyber risks. On the other hand, even today it can be seen that investors still seriously believe in rumors and speculations about cryptocurrencies. Certain studies in literature point out that Bitcoin and other cryptocurrencies should be viewed as "speculative" assets. Early research into Bitcoin price dynamics indicates that Bitcoin has a highly speculative nature (Brauneis and Mestel, 2019).

Table 3 - Correlation Matrix Between Digital (Bitcoin) and Financial Assets for the Period:28.02.2013 - 20.04.2023

	Bitcoin	EUR50 Stoxx 50	Gold	Government bonds ICE Bof A 1-10 Year (excluding Italy and Greece)	Corporate Bond Index CEBof A 1-10 Year AA
Bitcoin	1.00				
EURO Stoxx 50	0.34	1.00			
Gold	-0.04	0.03	1.00		
Government bonds ICE Bof A 1-10 Year (excluding Italy and Greece)	0.26	0.27	-0.08	1.00	
Corporate Bond Index ICEBof A 1-10 Year AA	0.40	0.63	-0.10	0.78	1.00

Source: Calculation by the author based on the Bloomberg database

The previous table illustrates the movement coefficients of correlation between cryptocurrency (Bitcoin) and financial assets represented by certain stock indices and assets (EUR 50 Stoxx 50, Gold, Government Bond Index, Corporate Bond Index). The strongest positive correlation was recorded between Bitcoin and the index of corporate bonds ICEBof A 1-10 Year AA (0.40), then with the stock exchange index EUR50 Stoxx 50, a positive correlation was achieved (0.34). The low level of portfolio risk is the result of an inverse relationship between portfolio performance.

Therefore, in a recession and slow economic growth, share prices fall, but on the other hand, bonds achieve good results. Conversely, after a sharp economic upswing, bond prices fall, but stock prices rise (Bodie et al., 2009). Based on the given coefficients of correlation and ratios, it can be concluded that the values of the coefficients of correlation are very low, which provides a good opportunity for diversification by including cryptocurrencies. On the other hand, the most criticized aspect of modern portfolio theory is the increase in correlation between portfolio assets in times of crisis and the loss of diversification benefits when it is most needed (AlKulaib and Almudhaf, 2011). It is argued that low-correlation assets taken into a portfolio to provide diversification benefits increase the correlation between them in crisis periods and provide no real diversification benefit (Baur and Lucey, 2010).

On the other hand, the strongest negative causality was observed between Bitcoin and gold (-0.04). The extreme volatility of cryptocurrencies has been thoroughly documented, but investors and financial professionals view a given volatility differently depending on their attitude toward Bitcoin. Investors who have embraced Bitcoin meteoric rise over the past few years have embraced excessive volatility, while bullies and Bitcoin bears point to high volatility as a burning red flag and a reason to avoid investing. By the end of the first quarter of 2018, Bitcoin had fallen by almost 50%, and gold had risen by 7.5%. Therefore, Bitcoin is called an alternative to gold and consequently, a hedge against inflation due to its limited supply and lack of centralized regulation. In times of uncertainty, investors will flock to invest in gold and precious metals as a haven to stay away from government-regulated currencies. While Bitcoin and Gold may not be competitors as inflation hedges, they may be complementary in one portfolio (http://www.cmegroup.com).

Opportunities for portfolio diversification in developing markets can also be seen through the possible effects of investing in different assets from different segments of the financial markets, for example investing in shares of different industries, diversified different funds in developing markets, EFT funds in capital markets, gold, different countries' currencies, and Bitcoin. In this research, the statistical programs Microsoft Excel and MATLAB 7.1 were used during the analysis. Also, in this study, ten portfolios were created according to different scenarios for digital and financial assets, and values such as return and standard deviation of the portfolio were calculated. By adding cryptocurrency to these portfolios, it was examined how the Bitcoin currency affects the portfolios and whether it can possibly add value to the portfolio.

Table 4 - Efficient Portfolio Set - Digital (Bitcoin) and Financial Assets: Average Return and Risk for the Period: 28.02.2013 – 20.04.2023

	PORTFOLIO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Average return	0.03	**0.05**	0.10	0.15	0.20	0.25	0.27	0.30	0.35	0.40
Standard deviation	0.86	**0.88**	0.94	1.05	1.17	1.32	1.38	1.47	1.64	1.81
Sharpe ratio	0.04	**0.06**	0.11	0.14	0.17	0.19	0.20	0.20	0.21	0,22

Bitkoin	0.00	**0.11**	0.49	0.84	1.18	1.53	1.67	1.88	2.22	0.02
EURO Stoxx 50	0.00	**0.00**	0.65	2.15	4.63	5.15	6.18	7.07	8.78	0.10
Gold	0.27	**1.28**	2.65	4.04	5.61	6.83	7.50	8.34	9.78	0.11
Government bonds ICE Bof A 1-10 Year (excluding Italy and Greece)	76.85	**70.77**	68.32	66.66	88.43	63.36	73.63	72.65	76.14	0.74
Corporate Bond Index ICEBof A 1-10 Year AA	22.87	**0.28**	0.28	26.31	0.15	23.13	11.02	10.06	3.08	0.01

Source: Calculation by the author based on the Bloomberg database

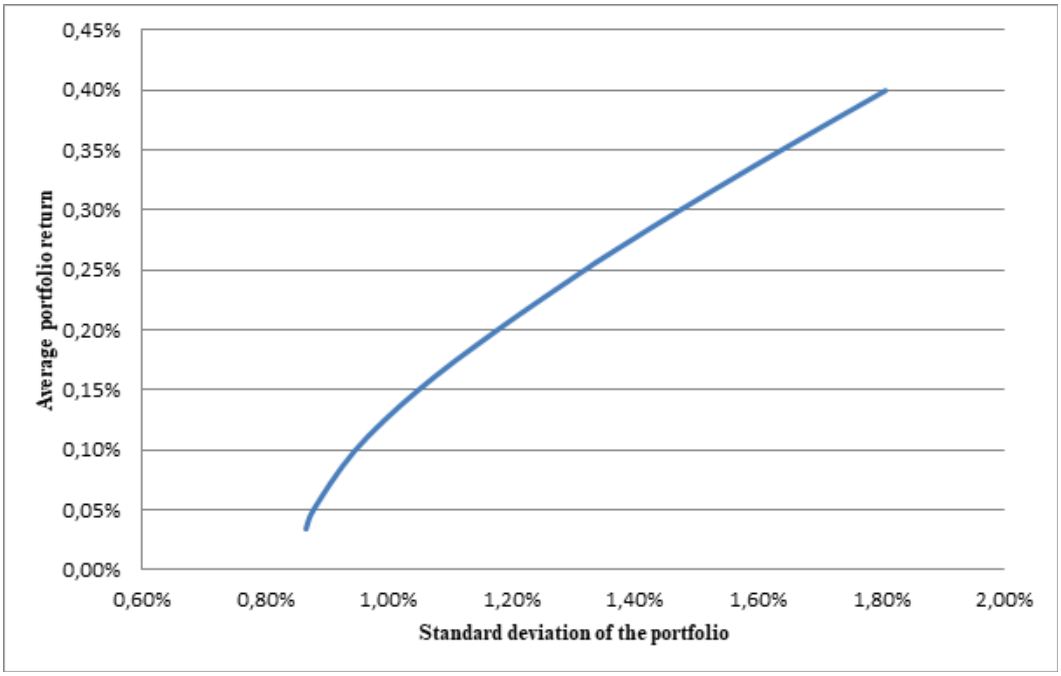
In his seminal article from 1952, Harry Markowitz stated that the purpose of portfolio selection is to determine the allocation of assets in a portfolio to obtain the maximum expected return given risk, or the minimum risk of a portfolio given a portfolio expected return (Johnson, 2014). Also, Harry Markowitz, the founder of modern portfolio theory, determined that the relationship between assets is more important than their risks and determined that portfolio risk can be reduced by adding assets that are not highly correlated. The lower the relationship between assets in terms of correlation that are included in the portfolio, the lower the total risk of the portfolio (Markowitz, 1952).

From the previous table, it can be concluded that out of all the ten portfolios observed, the second portfolio is the most optimal in terms of risk, i.e., standard deviations, because it minimizes portfolio risk. Considering that the correlations between cryptocurrency (Bitcoin) and other forms of financial assets are low or negative, this situation can have the effect of increasing the advantages in terms of diversification. Also, it should be noted that with an increase in the Sharpe ratio, the average return and the standard deviation of the portfolio also increase.

One of the common ideas put forward to explain investor interest in cryptocurrencies is the possible benefits these digital coins can provide in portfolio diversification. Cryptocurrency returns are considered to have a low or negative correlation when compared to the returns of traditional financial assets such as bonds or stocks. Therefore, as a result of the inclusion of the mentioned cryptocurrencies in portfolios, expected portfolio returns corresponding to each unit of risk are expected to increase (Anyfantaki et al., 2018). Using the Markowitz mean-variance model, Brauneis and Mestel (2019) used data for the period from January 2015 to December 2017 to reveal the efficiency of cryptocurrency portfolios. As a result, they stated that portfolios created from different cryptocurrencies have significant risk reduction potential. Also, Guesmi et al. (2019) analyzed the dynamics of the relationship between Bitcoin and other financial assets that they observed with data for the period: January 2012 - January 2018. Their primary goal was to determine whether Bitcoin provides benefits to investors in terms of portfolio diversification and risk management. As a result of the research conducted, they concluded that Bitcoin could provide benefits to investors in terms of risk protection and portfolio diversification.

The efficient frontier is the set of all portfolios that are in the ascending part of graphic representation 1. The upward movement means that portfolios on the efficient frontier contain selections that increase the portfolio expected return and increase the portfolio standard deviation. To successfully calculate the efficient frontier, its starting point should be found, i.e., the portfolio with the minimum standard deviation of returns. In finance, this portfolio is called a minimum variance portfolio, which means that it has minimum variance and minimum standard deviation (Vukičević et al., 2010). The graphic below illustrates the trend of the effective frontier of digital assets (in our case Bitcoin) and financial assets for the period: 28.02.2013 - 20.04.2023.

Graph 1 - Effective set of Digital (Bitcoin) and Financial Assets for the Period: 28.02.2013 - 20.04.2023



Source: Calculation by the author based on the Bloomberg database

As can be seen with the increase in slope and the first measure of risk i.e., of the standard deviation of the portfolio, there is also an increase in the average return of the portfolio, but not to the same extent, that is, the average return increases to a lesser extent due to the different structure of the chosen portfolio.

Conclusion

Financial time series often exhibit stylized facts such as skewness, high volatility, fat tail characteristics, etc. Therefore, the literature on financial econometrics focuses on the distributional and statistical properties of financial return series. Forecasting volatility is an important task for most investors in financial markets. VaR brings standardization when comparing risky portfolios. In recent years, the advantages of VaR have made it a modern risk management tool. Volatility usually occurs in clusters. The assumption is that volatility that remains constant at all times can be fatal. Volatility changes over time, especially during financial crises when it tends to increase significantly.

In this research, the focus was to calculate volatility for different forms of financial assets as well as for digital assets, i.e., Bitcoin, and to find the optimal portfolio with minimum risk for the period: 28.02.2013 - 20.04.2023. The results of the research showed that the highest volatility and fluctuation in terms of the first measure of risk, i.e., the standard deviation, was recorded with Bitcoin, the second place belongs to the EURO Stoxx 50 stock index, followed by gold and bond indices in last place.

Also, in the context of the parametric and empirical VaR value, the first place in terms of the probability of economic loss belongs to digital assets, i.e., Bitcoin, followed by the EURO Stoxx 50 stock index, gold, the corporate bond index, and the government bond index excluding Italy and Greece. In the context of forming an optimal portfolio out of a total of 10 portfolios, the second portfolio proved to be the most optimal in terms of return and standard deviation.

Although the process of formation of the digital asset, specifically Bitcoin, is not yet fully understood, the high price and excessively unstable structure have begun to attract the attention of investors. Modeling the volatility structure of Bitcoin prices is important for those considering investing in Bitcoin. In addition to its high volatility, Bitcoin can serve as an excellent form of digital asset in combination with other forms of financial assets due to its low correlation and the realization of diversification benefits. This research should contribute to increasing the existing body of knowledge on financial research by applying VaR techniques and modeling to estimate the amount of potential loss of selected digital and financial assets. It is further possible to develop and extend this research using different assets and different portfolio strategies. In this way, more comprehensive information about the usability of cryptocurrencies in portfolio diversification will be obtained. However, it should be kept in mind that this research was done based on historical data, where we should not forget that the situations that happened in the past may not be a mirror of the future, as the future is full of uncertainty.

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BITKOIN I ZLATO KAO "SAFE HAVEN ASSET" U GODINAMA PANDEMIJE

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Rezime: Pandemija koja je zadesila svet 2020. godine ostavila je za sada nesagledive posledice po celokupnu svetsku ekonomiju. Bitkoin i zlato su valute čije su cene rasle uprkos kriznom periodu. Rezultati istraživanja upotrebom Spirmanovog koeficijenta korelacije, pokazali su statistički značajnu vezu između kretanja cene bitkoina i cene zlata, što može biti osnov za predviđanje kretanja cene zlata u budućnosti na osnovu kretanja cene bitkoina. Utvrđena je signifikantna veza između kretanja cene bitkoina i porasta broja korisnika bitkoin novčanika, što jasno ukazuje na povećanje obima trgovine i široj zastupljenosti ove valute. Teorijsko istraživanje osnova bihevioralne ekonomije ukazalo je na potvrdu hipoteze da kada je finansijski sistem izložen krizi, bitkoin i zlato će imati karakteristike „safe haven asset", što se može objasniti principima bihevioralne ekonomije.

Ključne reči: bitkoin, zlato, "safe haven asset", bihevioralna ekonomija

JEL klasifikacija: E71, G41

Uvod

U 2020. godini svet se suočio sa zdravstvenom krizom koja je ostavila za sada nemerljive zdravstvene, socijalne i ekonomske posledice. Pandemija izazvana virusom COVID-19 ozbiljno je promenila svet, ugrozila nacionalne ekonomije i izvršila udar na bezbednost stanovništva.

Poslednjih godina sve više se koriste internet valute. Najznačajnija internet valuta koja funkcioniše u sistemu elektronskog novca je bitkoin. Bitkoin je digitalna valuta, koja se koristi i distribuira elektronski. Zbog svog konstantno promenljivog kursa, bitkoin postaje odlična prilika za investiranje. Bitkoin je relativno nov i prilično složen proces plaćanja. Zato je prirodno što su potrošačke opcije i dalje ograničene, ali svakog dana sve više preduzeća, od malih, lokalnih kafića do industrijskih giganata, prihvata plaćanje u bitkoinu.

Uprkos tome što je nestabilna i ne baš sasvim priznata valuta, vrednost joj je tokom pandemije porasla. S druge strane zlato je od davnina najsigurniji instrument za očuvanje vrednosti novca. Imajući u vidu karakteristike ovih valuta, interesantno je istražiti kretanje njihovih cena tokom pandemije COVID-19.

Predmet rada je komparativna analiza kretanja cene bitkoina i cene zlata, kao i utvrđivanje postojanja veze između kretanja ove dve varijable, sa posebnim osvrtom na uticaj shvatanja bihevioralne ekonomije na kretanje bitkoina u doba pandemije COVID -19.

Naučni cilj se ogleda u deskripciji, kako teorijske, tako i empirijske analize kretanja posmatranih varijabli. U teorijskom smislu naučni cilj se zasniva na analizi savremenih pogleda na bitkoin i zlato kao valute, dok u empirijskom smislu, komparativnom analizom kretanja ovih varijabli, istražuje se i razmatra stepen i uticaj kretanja cene bitkoina na kretanje cene zlata, korelacija između kretanja cene bitkoina i broja korisnika bitkoin novčanika, kao i korišćenje uticaja bihevioralne ekonomije za objašnjenje kretanja cene bitkoina u doba krize izazvane pandemijom COVID -19.

Sa aspekta društvenog cilja, istraživanje treba da prikaže trenutnu poziciju i predvidi kretanje ove dve valute imajući u vidu utvrđenu volatilnost njihovih tržišta, prikaže komparativnu analizu nivoa cena, cenovni uticaj jedne valute na drugu, a kako bi se predvidela buduća kretanja.

Imajući u vidu definisan predmet i cilj istraživanja, u radu će se poći se od sledećih hipoteza:

H1: Postoji visoka korelisanost između kretanja cene bitkoina i broja korisnika bitkoin novčanika u posmatranom periodu.

H2: Postoji visoka korelisanost između kretanja cene bitkoina i kretanja cene zlata u posmatranom periodu.

H3: Ukoliko je finansijski sistem izložen krizi, onda će bitkoin i zlato imati karakteristike „safe haven asset", što se objašnjava principima bihevioralne ekonomije.

Metodologija i podaci

Za predmetna istraživanja biće uzet vremenski period od 2013. do 2021. godine. Za prikupljanje podataka biće korišćene reprezentativne međunarodne baze podataka (World Gold Council, Yahoo Finance, Bloomberg Business itd.) i sva relevantna domaća i strana literatura. Za testiranje postavljenih hipoteza i dolaska do rezultata istraživanja biće korišćen statistički alat SPSS - The Statistical Package for the Social Sciences i u okviru njega za statistiku zaključivanja korelaciona analiza. Za analizu veze između kretanja cene bitkoina i broja korisnika bitkoin novčanika, kao i za analizu kretanja cene bitkoina i zlata koristiće se Spirmanov koeficijent korelacije. Spirmanov koeficijent predstavlja neparametarski test i može da se primeni kod bilo koje kombinacije varijabli ordinalnog ili višeg nivoa merenja. Spirmanov koeficijent korelacije prikladan je za veličine koje se mogu rangirati i posebno za manje serije podataka (Biljan-August, Pivac, Štambuk, 2007). Koeficijenti korelacije se kreće u opsegu od -1 do 1, pri čemu predznak pokazuje da li je reč o negativnoj ili pozitivnoj korelaciji ili pak imamo odsustvo korelacije (0) (http://psihologija.ff.uns.ac.rs/viz/koeficijenti-korelacije-za-rangirane-podatke). Formula za izračunavanje:

$$r_S = 1 - 6\sum_{i=1}^{n} \frac{{d_i}^2}{n(n^2-1)}$$

gde je: d razlika vrednosti rangova dve posmatrane varijable, a n broj različitih serija.

Dobijanje odgovora na postavljene hipoteze, zahteva određivanje vremenskog okvira, izbora metoda istraživanja i elemenata koji će biti korišćeni.

Tabela 1 - Elementi korišćeni u analizi

Naziv varijable	Izvor podataka	Period
Cena bitkoina u dolarima	Statista; Coin desk, YahooFinance	2013- 2021. godina
Broj korisnika bitkoin novčanika u milionima	Statista; Coin desk, YahooFinance	2013- 2021. godina
Cena zlata u dolarima	Business insider, World Gold Council, Yahoo Finance,	2013- 2021. godina

Izvor: Autor

Posmatrani period je pogodan za analizu zato što obuhvata dovoljno dug vremenski period za praćenje trenda, a takođe i period svetske pandemije. U istraživanju su korišćeni sekundarni podaci iz baze podataka sajtova o kretanju cena posmatranih valuta na tržištima. U tabeli 2 dati su podaci koji će biti korišćeni kao elementi za ocenu korelacije.

Tabela 2 - Kretanje bitkoina i zlata u periodu 2013- 2021. godina

Godina	Cena bitkoina u dolarima	Broj korisnika bitkoin novčanika u milionima	Cena zlata u dolarima
2013[1]	744,17	0,89	1.205,90
2014	309,90	2,71	1.225,40
2015	424,96	5,34	1.072,40
2016	952,46	10,69	1.138,85
2017	13.062,15	21,51	1.264,50
2018	3.689,57	31,91	1.267,05
2019	7.251,28	44,51	1.469,50
2020	28.768,84	63,48	1.839,80
2021	47.128,47	73,00	1.814,95

Izvor: https://www.statista.com/statistics/326707/bitcoin-price-index/; https://www.coindesk.com/price/bitcoin; https://www.statista.com/statistics/647374/worldwide-blockchain-wallet-users/; https://finance.yahoo.com/topic/crypto/; https://markets.businessinsider.com/commodities/gold-price; https://www.gold.org/goldhub

Cena jednog bitkoina se tokom vremena menjala, u zavisnosti od stanja na tržištu. U prvim godinama se za manje od 1 dolara mogao kupiti 1 bitkoin, da bi se rast cene ove valute beležio od 2009. godine. Sve do kraja 2016. godine za jednu jedinicu bitkoina bilo je potrebno izdvojiti manje od hiljadu dolara. Već krajem 2017. bilo je potrebno izdvojiti preko 13.000 dolara za jednu jedinicu ove decentralizovane kriptovalute (https://www.coindesk.com/price/). Tokom 2018. godine zabeležen je pad na 3.689 dolara. Kada je izbila pandemija, bitkoin je mogao da se kupi za oko 7.200 dolara. Danas košta više od 47.000 dolara - zapanjujući rast od preko 500 procenata. Na početku krize sa COVID-19, porast ukupnog broja slučajeva pozitivno je povezan sa tržišnom kapitalizacijom i obimom trgovanja kriptovalutama. Međutim, oko sredine februara, efekat se preokrenuo: porast broja ukupnih slučajeva postao je negativno povezan sa aktivnošću na tržištu kripto valuta (Jabotinsky, Sarel, 2020). Međutim, ovaj uzlazni trend nije nužno očigledan sa teorijskog stanovišta, jer postoji nekoliko sila koje su mogle da pokreću potražnju nagore ili naniže kao odgovor na krizu, zbog čega rast bitkoina postaje dodatno zanimljiv za analizu. Neke kompenzacione snage mogle su da potisnu potražnju. Bitkoin je mogao da postane usko povezan sa tradicionalnim finansijskim tržištem u vreme krize, čak i ako takve korelacije nema u uobičajeno vreme, tako da korist od prelaska na bitkoin postane zanemarljiva. Još gore, haos izazvan pandemijom mogao je dovesti do najmanje dve opasne aktivnosti koje su mogle prouzrokovati znatne gubitke. Prvo, sofisticirani investitori mogli su manipulisati cenom bitkoina veštačkim povećavanjem potražnje kako bi namamili nesofisticirane investitore, a zatim odustati od svog ulaganja kada cena bude dovoljno visoka. Ovo je moguće kada se ima u vidu da ljudi demonstriraju tzv. pastirsko ponašanje, odnosno kupuju bitkoin samo zato što posmatraju druge. Drugo, čak i pre pandemije, za bitkoin se sumnjalo da omogućava kriminalne aktivnosti. Imajući ovo u vidu, ljudi se mogu plašiti da bi ih upotreba kriptovaluta izlagala krivičnim prijavama za pranje novca, pa stoga izbegavaju trgovanje (https://clsbluesky.law.columbia.edu/2021/03/26/how-the-covid-19-pandemic-affected-the-cryptocurrency-market/).

[1] *Stanje na dan: 31.12.*

Neki od racionalnih objašnjenja rasta cena bitkoina u doba pandemije je činjenica da se bitkoinom može trgovati bilo gde u svetu, što donekle ublažava potencijalna ograničenja likvidnosti koja mogu nastati ako države ograniče trgovinske aktivnosti kao deo zaključavanja. Kao rezultat, bitkoin postaje privlačniji u poređenju sa alternativama. Dalje, investitori koji su se plašili da će kriza dovesti do toga da se centralne banke ili politički akteri mešaju na tržište, preferirali su da svoje investicije prebace u decentralizovani bitkoin. Drugim rečima, s obzirom da bitkoinom ne upravlja centralni entitet, već posluju automatski, oni mogu omogućiti investitorima da se zaštite od nekih političkih rizika i da tako postanu privlačniji.

S obzirom da novčanici omogućavaju korisnicima kreiranje neograničenog broja računa, ne može se sa sigurnošću znati koliki je stvarni broj korisnika, ali se može primetiti da je broj novčanika, kao i cena bitkoina, zabeležio početak rasta tek u januaru 2013. godine, dok je bitkoin nastao 2009. godine. U periodu jul 2016 - jul 2017. godine porastao je velikom brzinom. U julu 2016. godine broj registrovanih novčanika je iznosio preko 7, 8 miliona, a u julu 2017. godine preko 14,9 miliona. Od početka pandemije, od januara 2020. do juna 2021. godine broj korisnika bitkoin novčanika narastao je sa 45,45 na 73 miliona. Ako se analizira kretanje cene zlata nakon 2013. godine uočava se stabilan trend sa rasponom vrednosti između 1.072 i 1.267 dolara. Osetniji rast beleži se u 2019. godini. Finansijska javnost fokusirala se na zlato kao sigurno utočište u vremenima stresa, posebno pre i tokom ranih dana krize COVID-19. Rast cena beleži se tokom celokupnog trajanja pandemije sa izuzetkom marta 2020. godine, i zaustavljanjem trenda rasta od februara 2021. godine, koje prati podatke o smirivanju pandemije i početkom vakcinacije.

Pregled literature

U poslednjih nekoliko godina kao sredstvo plaćanja koriste se različite internet valute. Internet valuta predstavlja sredstvo elektronskog plaćanja koje je zasnovano na čuvanju vrednosti na hardverskoj osnovi ili na softverskoj osnovi. Najznačajnija internet valuta koja funkcioniše u sistemu elektronskog novca je bitkoin. Dizajn sistema plaćanja, ali i još neke okolnosti na koje ni sami kreatori nisu mogli da utiču, uslovile su da ovaj sistem elektronskog novca potraje duže od prethodnih, ali i da zavredi više pažnje, kako stručne javnosti, tako i korisnika. Bitkoin je zapravo softverski elektronski novac jer se njime može raspolagati uz instaliranje odgovarajućeg softvera na hard disk računara (Selgin, 2014). Ukupna veličina tržišta kriptovaluta čini bitkoin apsolutno dominantnim. Početkom 2020. godine bitkoin je činio preko 2/3 ukupne kapitalizacije i oko 1/3 ukupnog dnevnog obima trgovine na tržištu kriptovaluta (Tomić, 2020).

Bitkoin adresa je nalik bankovnom računu, preko kojeg korisnik može da prima, šalje i čuva bitkoin. Umesto čuvanja u fizičkom obliku u trezoru, bitkoini su osigurani putem kriptografije javnim ključem. Svaka adresa sadrži javni ključ, koji je dostupan svima, i privatni ključ, koji se mora držati u tajnosti. Bilo ko može poslati bitkoin bilo kom javnom ključu, ali samo osoba sa određenim privatnim ključem ih može potrošiti.

Sistem za procesiranje plaćanja u bitkoin valuti naziva se BitPay. Ovo je privatna mreža, koja nije vlasnički povezana sa menjačkim berzama, niti se bavi održavanjem međuklijentske mreže, već privlači kompanije da otpočnu prihvatanje plaćanja u bitkoin valuti (https://bitpay.com).

Korisnici počinju da koriste bitkoin upotrebom programa nazvanog bitkoin novčanik i jedne ili više bitkoin adresa, koje služe za prijem bitkoina, na isti način kao što se imejl adrese koriste za prijem mejlova. Prilikom slanja novca novčanik kreira transakciju koja sadrži adresu primaoca i iznos koji se šalje, uz potpisivanje transakcije. Bitkoin novčanik omogućava čuvanje raspoloživog iznosa i izvršavanje plaćanja putem interneta. Transakcija se ne može verifikovati sve dok se ne uključi u bitkoin blockchain. Svaka transakcija sadržana u blockchain–u (sajt za trgovanje) se smatra važećom i eliminiše mogućnost dvostrukog trošenja. Blockchain obezbeđuje svakom korisniku uvid u istoriju izvršenih transakcija. Jednom stečeni i pravilno obezbeđeni, bitkoini ne mogu biti oduzeti od njihovih vlasnika, bilo od strane lopova, banke ili vlade. Takođe, nijedan entitet ne može zamrznuti račun, niti sprečiti vlasnika da sprovede (besplatne) transakcije na bitkoin mreži (Đoršević, 2018).

Sistem je dizajniran da bude siguran, ne nužno anoniman. U teoriji je moguće pratiti bilo koju transakciju svakog korisnika. „Rudarenje" (mining) je osnovna funkcija bitkoina, koji je istovremeno i valuta i način plaćanja. Svaka transakcija je predmet obrade svakog u mreži ko je uključio svoje računare u izračunavanje komplikovanih problema, sa zajedničkim ciljem da obezbede sigurnost transakcija, (kao i njihovu anonimnost i neopozivost) (http://marketingitd.com/2013/sta-je-bitcoin-i-kako-da-ga-koristite-u-naplati/). Problem sa ovom idejom je što se sve transakcije stapaju u jedan decentralizovani blockchain koji se distribuira svuda. Ovo ujedno znači da se nigde ništa ne može sakriti (Baxter – Reynolds, 2013). Da bi se osigurala sigurnost plaćanja i onemogućile različite zloupotrebe, koristi se sama mreža kao sistem koji će kontrolisati regularnost transakcija. Bitkoin je zasnovan na R2R mrežama. Peer–to–peer predstavlja mrežu koja nije zasnovana na „klijent - server" arhitekturi, već su svi računari ravnopravni članovi mreže. Obično se koristi za deljenje informacija na taj način što kada jedan računar „podeli" neki sadržaj, svi ostali računari u mreži će imati pristup tom fajlu (Dinić, 2014).

Bitkoin nije prvi, a verovatno ni poslednji sistem elektronskog novca. Ranija operativna rešenja nisu uspela da potraju duži vremenski period, najčešće jer nisu garantovala bezbednost svojim korisnicima, niti su uspela da prodru do šireg kruga privatnih korisnika i poslovnih entiteta koji bi ih prihvatili kao sredstvo plaćanja. Imajući u vidu moguće probleme, postavlja se pitanje kako je bitkoin uspeo da preživi kao internet novac? Period trajanja bitkoina još uvek nije dovoljno dug, ali je svakako duži od perioda trajanja drugih eksperimenata ove vrste novca (Miladinović, Smigić, 2018).

Postoji više karakteristika bitkoin sistema koji ga čine različitim od ostalih sistema elektronskog novca. Pre svega, iza bitkoina ne stoji kompanija koja je vlasnica sistema, ne stoji ni jedna banka kao pokretač, niti neka centralna banka kao operator sistema. To dalje implicira da ne postoji poslovni entitet koji namerava da servisiranjem sistema zarađuje na proviziji, tako da je sa te strane bitkoin oslobođen ekonomskog pritiska za opstanak. Kada je tek počela upotreba internet valuta, usled malog broja korisnika i male količine novca u opticaju bilo je lako proveriti istinitost i napraviti izveštaj o svakoj transakciji. Sa porastom broja novčića i broja korisnika postalo je složenije vršiti proveru i potvrđivanje, pa je sada potrebno više vremena. Takođe, obični računari, naročito laptopovi postali su hardverski preslabi da podnesu opterećenje ovog ekstenzivnog rada (Raskin, 2013).

Centralna banka ne kontroliše postojanje i upotrebu ovog oblika novca. Najočigledniji problem nedostatka centralne vlasti je nestabilnost kriptovaluta, među kojima je i bitkoin. Za razliku od nacionalnih valuta, gde centralne banke imaju na raspolaganju čitav niz alata kojima valutu održavaju koliko-toliko stabilnom, kriptovalute su potpuno prepuštene tržištu, to jest, zakonu ponude i potražnje. Kriptovalute, kao globalne i decentralizovane, nisu pod kontrolom nijedne države i samim tim su manje osetljive na politička dešavanja (https://www.barrons.com/articles/why-bitcoin-is-the-best-investment-opportunity-post-pandemic-heres-what-will-drive-the-price-higher-51607134443).

Iako je prvobitno bitkoin zamišljen kao eksperimentalni platni sistem, trenutno je široko rasprostranjen i privlači medijsku pažnju u velikoj meri. Pristalice tvrde da se radi o prvoj pravoj globalnoj valuti koja ne diskriminiše svoje korisnike po osnovu državljanstva ili lokacije, uvek je dostupna, jednostavno je osigurati uz vrlo niske troškove korišćenja, nema zaduženja, i sl. Sa druge strane, kritičari tvrde da se široko zloupotrebljava za kupovinu ilegalnih stvari i za „pranje" velikih suma novca i da je izuzetno lako ukrasti bitkoin u slučaju sajber napada (Ron, Shamir, 2013).

Iako primarno dizajniran za plaćanje usluga i kupovinu dobara, bitkoin još uvek nema široku primenu. Iako je interesantan kao investiciona mogućnost, bitkoin nije postao prihvatljiv na najvećim svetskim prodajnim sajtovima. Amazon i eBay ne primaju ovu valutu, a na društvenim mrežama nije dozvoljeno sredstvo plaćanja. Pored toga, najveći broj kompanija koje prihvataju plaćanja u bitkoinu su firme koje su poslovanjem vezane za pružanje usluga na internetu (hosting kompanije), 3D modelari i digitalni dizajneri, kompanije za masovno slanje SMS-a, firme koje nude smeštajni prostor za dokumenta na internetu, proizvođači softvera i online kladionice. Međutim najveći broj ponuđača proizvoda su novoformirani sajtovi za prodaju i aukciju osnovanih upravo za poslovanje sa bitkoin valutom. Veliki problem kod denominacije cena na prodajnim sajtovima u bitkoinima je velika promenljivost vrednosti ovih novčića (https://www.marketwatch.com/story/the-pandemic-showed-theres-a-need-for-digital-currencies-especially-bitcoin-11607031312).

Ipak, u dosadašnjim istraživanjima primećuje se jasan trend rasta cene bitkoina svaki put kada se dogodi neka politička ili finansijska kriza u svetu, pa čak i kada samo postoji naznaka da bi moglo biti krize. Cena je rasla tokom kiparske krize, grčke krize, nakon Bregzit referenduma i predsedničkih izbora u Americi i nakon najnovije pandemije. Dakle, kad god je poverenje u postojeći sistem poljuljano, određeni broj ljudi alternativu vidi u kriptovalutama (http://www.societegenerale.rs/kako-je-nastao-bitcoin/). Za bitkoin se vezuje nestabilnost i visoki stepen volatilnosti, pri čemu ovaj instrument nudi slabe osnove očuvanja vrednosti i pre služi kao sredstvo razmene za novac nego kao stvarni medijum razmene. U takvim okolnostima, uključivanje većeg udela bitkoina u strukturu portfolija značajno pojačava rizik portfolija, što investitori imaju u vidu, zbog čega je interesantan rast vrednosti ove valute tokom svetske pandemije (Šoja, Senerathne, 2019).

Poslednjih godina došlo je do velikog interesovanja za kombinacijom psihologije i ekonomije, koja je u relevantnoj literaturi poznata pod nazivom bihevioralna ekonomija. Reč je o disciplini koja povećava eksplanatornu snagu ekonomske nauke, kombinujući je sa realističnijim psihološkim postavkama i koristeći socijalne, emocionalne i kognitivne faktore u pokušaju da objasni ekonomske odluke pojedinaca i institucija. Belsky, Gilovich (2010) definišu bihevioralnu ekonomiju kao kombinaciju psihologije i ekonomije kako bi objasnio zašto i kako ljudi donose iracionalne ili nelogične odluke kada troše, investiraju, štede i posuđuju novac (Belsky, Gilovich, 2010). U centru ove subdiscipline u okviru ekonomske nauke je ideja da će povećanje realističnosti psiholoških osnova ekonomske analize poboljšati standardni ekonomski model u pogledu generisanja teorijskih saznanja, stvaranja dobrih predviđanja o različitim fenomenima i kreiranja bolje ekonomske politike. Bihevioralna ekonomija predstavlja relativno novi i perspektivni pravac istraživanja koji u značajnoj meri utiče na stanje i budućnost ekonomske nauke. Fundamentalna istraživanja iz oblasti bihevioralne ekonomije su jasno pokazala da bi psihološke ideje mogle da se formalizuju u alternativni model i iskoriste za formiranje predviđanja koja bi dalje mogla da se upotrebe u realnom ekonomskom okruženju (Krstić, Radivojević, 2019). Bihevioralne finansije pretpostavljaju ograničenu racionalnost učesnika na tržištu, dok standardne finansije polaze od koncepta savršene racionalnosti. Bihevioralne finansije ukazuju na pojavu i ponavljanje iracionalnosti, dok standardne finansije polaze od principa savršeno racionalnog finansijskog odlučivanja.

Finansijska teorija je prošla dug put od opšteprihvaćenosti hipoteze efikasnog tržišta (Efficient Market Hypothesis – EMH) koja se nalazi u osnovi standardne finansijske teorije, do pojave bihevioralnih finansija i bihevioralne kritike EMH. Veliki broj tržišnih anomalija je doveo u pitanje validnost EMH i stvorio prostor za razvoj jednog novog pristupa u finansijama u čijem fokusu je izučavanje ponašanja i psihologije ljudi (Leković, 2020). Kako tvrdi Águila (2009), rastuće interesovanje za bihevioralne finansije je rezultat upravo akumulacije empirijskih anomalija, a zadatak bihevioralnih finansija je da integracijom psihologije sa finansijama i ekonomijom obezbedi njihovo bolje razumevanje. U bihevioralnom finansiranju, mikro pristrasnost ponašanja investitora prema Baker, Nofsinger (2002) je grupisana u način na koji investitori razmišljaju (osnovna pravila/heuristika) i kako se osećaju investitori (emocije), dok prema Pompian (2006) i Hirschei, Nofsinger (2008) pristrasnost investitora grupisana je u kognitivnu pristrasnost i emocionalnu pristrasnost. Ova pristrasnost u ponašanju utiče na ljude u donošenju odluka prema Zahera, Bansal (2018). Kognitivna pristrasnost je donošenje odluka korišćenjem osnovnog pravila za informacije ili činjenice. Kognitivna psihologija se odnosi na način razmišljanja ljudi i ima važnu ulogu u bihevioralnim finansijama, jer su brojna istraživanja pokazala da ljudi prave sistemske greške u načinu razmišljanja: previše su samouvereni, pridaju preveliki značaj skorašnjim iskustvima, koriste mentalne prečice, izbegavaju promene (Ritter, 2003). Iracionalnosti prisutne u složenom svetu finansija, bihevioralne finansije nastoje da objasne putem kognitivnih predrasuda kao što su: 1) preterano samopouzdanje, 2) uokviravanje ili formulacija, 3) mentalno računovodstvo, 4) reprezentativnost, tj. dostupnost ili pristrasnost sećanja, 5) konzervatizam, tj. sklonost ka izbegavanju promena ili „usidrenje", 6) odbojnost prema gubitku, 7) izbegavanje kajanja, 8) ponašanje krda, tj. mentalitet stada ili psihologija mase, 9) potvrđivanje ili samopotvrđivanje, 10) kasno uviđanje, 11) kognitivna disonanca i 12) prokletstvo pobednika. Emocionalna pristrasnost je odlučivanje zasnovano na osećanjima.

Prednost bihevioralnih finansija se, između ostalog, ogleda upravo u objašnjavanju tržišnih anomalija i uzroka tržišne neefikasnosti. Prema standardnoj teoriji cena aktive zavisi od pristiglih informacija, dok prema bihevioralnim finansijama cena aktive zavisi od reakcije tržišnih učesnika na pristigle informacije (Fakhry, 2016).

U polju bihevioralne ekonomije, s obzirom na prirodu predmeta, kvalitativne analize su dominantne. Prostor za kvantitativna istraživanja je uzak. Savremena ekonomija ponašanja naglašava da ljudska iracionalnost često ima važan uticaj na donošenje odluka, što uzrokuje značajne ekonomske posledice. Naučnici pokušavaju da razviju modele rizika u ponašanju i njihovo stvaranje bi uskoro moglo postati stvarnost zahvaljujući velikim podacima, razvoju bihevioralnih i društvenih nauka i upravljanju ljudskim resursima. Kvalitativna istraživanja mogla bi obuhvatiti različite egzogene faktore (politički sistem, propise, običaje, kulturu), kao i endogene faktore koji utiču na proces donošenja odluka u investiranje. Dalji razvoj i kvantitativnih i kvalitativnih istraživanja u kombinaciji sa velikim podacima mogao bi dovesti do razvoja novih modela ponašanja i objašnjenja ekonomskih pojava (Petronijević, 2018).

Cena zlata ima tendenciju rasta uvek kada finansijskom sistemu prete ozbiljni problemi, potresi, finansijski rizici, krize. Posebno je atraktivno u periodima visoke inflacije, kada se javlja kao aktiva koja čuva vrednost novca od daljeg erodiranja izazvanog inflacijom. Zaraditi na zlatu se može samo ukoliko ga prodamo po višoj ceni čime ostvarujemo tzv. kapitalnu dobit. Periodi u kojima realne kamatne stope padaju ili su negativne, često su povoljni za ulaganje u zlato, jer investitori, u takvim situacijama, „beže" u sigurnije aktive kako bi se zaštitili od nepovoljnih kretanja na tržištu. Ovakvo kretanje cene zlata daje širok spektar mogućnosti investitorima da se zaštite od rizika nestabilnosti cena, smanjenja prinosa na aktivu, inflacije i sl. Let do zlata tokom ekonomskog stresa rezultirao je uvreženim uverenjem da investitori preusmeravaju ulaganja na zlato kada su zabrinuti zbog pada tržišta; odnosno na zlato se gleda kao na sigurno utočište.

Sarkodie, Ahmed, Owusu (2021) u istraživanjima koje su sproveli u toku pandemije bavili su se vezom između kretanja rasta bitkoina i obolelih od korona virusa. Utvrdili su vezu između ove dve varijable. Zato je interesantno posmatrati kretanje u uslovima pandemije budući da bi se očekivalo da će kriza uticati na smanjenje trgovine ovom valutom. Čini se da se učesnici na tržištu kriptovaluta ponašaju iracionalno. Studija koju su sproveli Keller, Scholz (2019) je imala za cilj da identifikuje tipove investitora, uključujući i bihevioralne principe i njihov uticaj. Identifikovali su šest tipova investitora koji postavljaju ponude i četiri tipa investitora koji potražuju (Keller, Scholz, 2019). Cheung, Roca, & Su (2015) navode da je bitkoin mehur - balon. Shiller (2000) je definisao balon kao situaciju u kojoj vesti o povećanju cena podstiču entuzijazam investitora, koji se širi psihološkom zarazom od osobe do osobe, pojačavajući priče koje bi mogle opravdati rast cena i dovodeći sve veću i veću klasu investitora, uprkos sumnjama u stvarnu vrednost investicije. Prema Baker, Nofsinger (2002), bihevioralne finansije nastoje da izraze iracionalnost investitora uopšte i pokazuju ljudske greške na tržištima kriptovaluta. Na osnovu literature o kognitivnoj i emocionalnoj pristrasnosti koja je uticala na donošenje odluka i koja bi se mogla primeniti u kriptovaluti, uviđa se konceptualni model za razumevanje pristrasnosti u ponašanju koji utiče na investiranje u kriptovalutu. Predrasude su pastirstvo, optimizam, prekomerno samopouzdanje, pristrasnost potvrde, averzija prema gubicima i zabluda kockara. Pastirstvo je tendencija nekoga ko više voli da sledi druge ili imitira grupno ponašanje u donošenju odluka, a ne samostalno da odlučuje. Pristrasnost optimizma je težnja nekoga da preceni mogućnost da se dogode pozitivne stvari i potceni potencijal za neprijatne događaje. Prekomerno samopouzdanje je verovanje nekoga ko misli da zna i da ima bolje informacije. Predrasuda ili podudarnost u potvrdi mogu se desiti u fazi kada cene padnu, ali privremeno ponovo porastu. Averzija prema gubitku je pristrasnost koja se može objasniti teorijom prospekta. Teorija prospekta koristi se za opisivanje načina na koji ljudi donose odluke između različitih izbora ili izgleda, posebno u uslovima neizvesnosti. Zabluda kockara je verovanje da će se korekcija dogoditi u poštenoj kocki (Hidajat, 2019). Rezultati Almansour (2020) pokazuju da bihevioralna ekonomija ima značajan uticaj na ponašanje investitora na tržištu kriptovaluta, a to sa druge strane značajno pogađa kretanje cena ovih valuta.

Inverzni odnos između zlata i zaliha mnogi navode u popularnoj literaturi. Međutim, neki su primetili da se odnos promenio 2020. god. Na primer, Mark DeCambre je primetio u MarketWatch-u u avgustu 2020. da je „zlato u istorijskom nagibu". Pozitivna korelacija između zlata i zaliha primećena je rano u periodu COVID -19. Na primer, Zhang (2020) tvrdi da „kada zlato i akcije postanu pozitivno povezani, to obično signalizira tržišni režim vođen likvidnošću i promenom stvarnih prinosa". Choudhri (2015) napominje da zlato nije bilo sigurno utočište tokom finansijske krize 2007–2009. god. zbog jednosmernog odnosa između prinosa zlata i prinosa na tržištu (vraćanje zlata na deonice), ali ne i dvosmernog. Takođe, primećuje da postoji nelinearna uzročnost, tvrdeći da se zlato možda koristilo kao zaštitna ograda pre finansijske krize, ali ne i tokom kriznog perioda. Al Ameer (2018) uočava različitu korelaciju za periode pre, tokom i nakon finansijske krize 2007–2008. godine. Svrha studije koju je Drake sprovela 2020. god. je da istraži odnos zlata i berze, s obzirom na nedavnu recesiju usled COVID-19 i ulogu kamatnih stopa. Rezultati ukazuju da inverzni odnos primećen u prošlosti nije podržan u dve najnovije recesije i da na taj odnos utiču stvarne kamatne stope i volatilnost berze. Kada su realne kamatne stope negativne, postoji pozitivna veza između zlata i prinosa na tržištu (Drake, 2020).

Poslednjih godina tržište bitkoina prilično je promenljivo, te postoji potreba da se analiziraju načini predviđanja kretanja cena bitkoina. Budući da je poslednjih godina tržište zlata takođe bilo pod znatnim interesovanjem, pre svega zbog svoje kolebljivosti i odražavanja globalnih ekonomskih trendova, ne samo onih koji se odnose na ekonomske i finansijske tokove, već i širih, društveno-političkih, vrlo je zanimljivo razmotriti mogućnost korišćenja podataka o kretanju cene bitkoina na globalnom tržištu u kontekstu mogućnosti predviđanja kretanja cene zlata.

Ovo je posebno važno s obzirom na to da je tržište zlata odraz globalnih ekonomskih kretanja, s jedne strane, i činjenice da bitkoin postaje sve važniji kao imovina, tj. investiciona alternativa, s druge strane. U studiji, koju je sproveo Dončić (2020) cilj je bio da se odgovori na pitanje da postoji kauzalna veza između kretanja cene bitkoina i cene zlata na globalnom finansijskom tržištu kako bi se odgovorilo na pitanje da li je moguće predvideti kretanje cene bitkoina na osnovu kretanja cene zlata na svetskom tržištu, ali i obratno. Istraživanje je sprovedeno u periodu od 1. januara 2019. godine do 1. decembra 2019. godine. Rezultati istraživanja pokazuju da istorijski podaci o kretanju cene zlata na svetskom tržištu ne mogu da se koriste za predviđanje promena u vrednosti i ceni bitkoina. Sa druge strane, rezultati istraživanja ukazuju da je moguća pouzdana primena istorijskih podataka o kretanju vrednosti i cene bitkoina za predviđanje cene zlata (Dončić, 2020). Upravo zbog toga u ovom radu između ostalog ispitivaće se i korelacija između kretanja cene bitkoina i zlata.

Rezultati istraživanja

Varijable koje se posmatraju u definisanom vremenskom intervalu su u skladu sa istraživačkim pitanjima. Analiza modela počinje pregledom rezultata deskriptivne statističke analize (minimum, maksimum, aritmetička sredina i standardna devijacija).

Tabela 3 - Deskriptivna statistika analiziranih varijablii

Naziv varijable	Minimum	Maksimum	Aritmetička sredina	Standardna devijacija
Cena bitkoina u dolarima	309,90	58.734,48	17.618,2136	17.181,31588
Broj korisnika bitkoin novčanika u milionima	0,89	73,00	46,7064	22,43624
Cena zlata u dolarima	1.072,40	1.956,05	1.634,5140	284,82795

Izvor: Autor

Raspon promenljive „cena bitkoina u dolarima" se kreće od 309,90 do 58.734,48 dolara. Srednja vrednost iznosi 17.618,2136 dolara, dok je standardno odstupanje od te srednje vrednosti 17.181,31588. Raspon promenljive „broj korisnika bitkoin novčanika u milionima" se kreće od 0,89 do 73,00 miliona. Srednja vrednost iznosi 46,7064 miliona, dok je standardno odstupanje od te srednje vrednosti 22,43624 miliona. Raspon promenljive „cena zlata u dolarima" se kreće od 1.072,40 do 1.956,05 dolara. Srednja vrednost iznosi 1.634,5140, dok je standardno odstupanje od te srednje vrednosti 284,82795 dolara.

Imajući u vidu dati pregled varijabli, interesantno je i uporediti vezu između kretanja cene bitkoina i kretanja broja korisnika novčanika, kao i kretanje cene bitkoina i cene zlata, za to će se koristiti korelaciona analiza. Cilj korelacione analize je da utvrdi da li postoji korelacija i u kojoj meri između posmatranih varijabli.

Zbog veličine uzorka posmatranih promenljivih za analizu je korišćen Spirmanov koeficijent korelacije. Rezultati analize prikazani su u tabeli 4. Koeficijent korelacije od 0,939 podrazumeva jaku pozitivnu korelaciju između kretanja cene bitkoina i broja korisnika bitkoin novčanika uz pretpostavku da se vrednost broja korisnika bitkoin novčanika nalazila na istom nivou 17. juna 2021. god. kao krajem maja 2021. godine. Koeficijent korelacije od 0,684 podrazumeva jaku pozitivnu korelaciju između kretanja cene bitkoina i kretanja cene zlata. Utvrđena je statistički signifikantna pozitivna korelacija između analiziranih varijabli (sig. < 0,05). To znači da su zaključci o uticaju kretanja cene bitkoina na broj korisnika novčanika, odnosno na kretanje cene zlata, relevantni.

Tabela 4 - Korelaciona analiza

	Spirmanov koeficijent korelacije	**Sig. (2-tailed)**
Korelacija između kretanja cene bitkoina i broja korisnika bitkoin novčanika	0,983	0,000
Korelacija između kretanja cene bitkoina i kretanja cene zlata	0,684	0,000

Izvor: Autor

Na osnovu rezultata korelacione analize utvrđen je statistički značajan pozitivan uticaj kretanja cene bitkoina na broj korisnika bitkoin novčanika i cene zlata, čime su prihvaćene prve dve istraživačke hipoteze. U slučaju pozitivne korelacije između cene bitkoina i broja korisnika bitkoin novčanika, imajući u vidu mehanizam funkcionisanja trgovanja bitkoinom, to se može objasniti činjenicom da veća vrednost valute, privlači veći broj investitora, odnosno povećava tražnju. Kada se posmatra pozitivna korelacija između kretanja cene bitkoina i cene zlata, naročito u uslovima pandemije, ovo je u skladu sa istraživanjem Dončić (2020), koji posmatrajući iste varijable zaključuje da rezultati istraživanja ukazuju da je moguća pouzdana primena istorijskih podataka o kretanju vrednosti i cene bitkoina za predviđanje cene zlata. Pozitivan trend kretanja cene bitkoina i cene zlata uočen tokom pandemije u suprotnosti je sa tendencijom koje je zlato iskazalo tokom globalne ekonomske krize i sa većinom ekonomske literature koja je ukazivala na pad vrednosti valuta na tržištima u kriznim periodima.

Kad se u kretanje cene bitkoina poslednjih godina uključe principi i istraživanja u oblasti bihevioralne ekonomije, čini se da su se investitori kada se pojavila ova kriza preusmerili sa tradicionalnih tržišta na alternativna, poput tržišta bitkoina, bar u ranim fazama krize upravo zbog značaja informacija.

Zlato je bogatstvo na koje mnogi misle kada je u pitanju održavanje vrednosti, ali bitkoin sada zaista postaje izazov za zlato u ovom pogledu. Razlika sa bitkoinom je u tome što je postao mnogo privlačnija investicija nego ikada ranije. Bitkoin brzo postaje ono što je poznato kao „safe haven assets" – imovina sigurnog utočišta, koja dobro funkcioniše čak i na nestabilnim tržištima i u nestabilnim vremenima poput pandemije. Zlato je klasičan primer imovine tzv. sigurnog utočišta, jer zadržava vrednost čak i kada tržišta imaju loš učinak. Svaki investitor zna da će njegov novac biti siguran uložen u zlato bez obzira na fluktuacije na tržištu. Bitkoin je dugo nastojao da dostigne status ovakve imovine. Bilo je potrebno da bitkoin dobije poverenje potrošača.

Tokom globalne pandemije, zemlje su uvele mere suzbijanja da bi ublažile širenje virusa COVID-19, uključujući ograničenja putovanja, socijalno distanciranje i politike zaključavanja (Sarkodie, Owusu, 2020). Preduzete mere suzbijanja značajno su uticale na ionako krhku globalnu ekonomiju, koja je već prevazišla finansijsku krizu iz 2008. godine, a sada se procenjuje da će dostići najdublju recesiju od Drugog svetskog rata. Tokom pandemije COVID -19, bitkoin je porastao za preko 500% u 2020. i 2021. godini, delimično usled špekulacija na finansijskom tržištu da investitori gomilaju digitalnu valutu zbog niske kamatne stope na tržištu (World Bank, 2020). U uslovima pandemije status bitkoina kao špekulativne investicije izgleda manje rizičan nego što bi bio u stabilnijim vremenima. Iako ne postoji centralizovani menadžment, marketing bitkoin je pozicioniran kao zaštita od eventualne inflacije - slično zlatu, ali digitalnom. Sposobnost bitkoina da deluje kao zaštita od inflacije ili kao alternativna valuta kao američki dolar nije uspostavljena, ali je određeni broj fondova dodao mali ulog rizika (uglavnom manji od 5%) u bitkoin i druge kripto valute upravo u tu svrhu (https://fintechmagazine.com/digital-payments/year-lockdown-how-has-bitcoin-navigated-pandemi).

Iako je na početku pandemije bitkoin zabeležio pad vrednosti, od tada se bitkoin oporavio i zabeležio rast cene. Pandemija COVID-19 dovela je do povećanja broja ljudi koji žele lako da investiraju od kuće. Bitkoin je uvek imao prednost što je u potpunosti digitalna valuta. Kupiti bitkoin je lakše nego ikad, delom zahvaljujući pandemiji. Po prvi put, mnogi ljudi vide prednost ulaganja u bitkoin i bitkoin tržište raste kako bi odgovorilo izazovu rastuće tražnje. Pandemija koronavirusa izazvala je veliki pomak ka digitalnom svetu u svim oblastima našeg života - od rada od kuće do naručivanja namirnica putem Interneta. To je već bio trend u porastu pre pandemije, ali COVID-19 je ubrzao ovaj trend. Daljinske finansijske usluge su popularnije nego ikad, a bitkoin postaje sve popularnije kako se ljudi prilagođavaju digitalnom svetu. Objašnjenje zasnovano na bihevioralnoj ekonomiji da ljudi kupuju kriptovalute jer to i drugi čine izgleda uverljivo. Štaviše, efekat može zabeležiti početak strategije „pump and dump" informisanih investitora, koji počinju da povećavaju ulaganja na tržište u nadi da će namamiti neinformisane investitore na tržište, a zatim sniziti cenu odsecanjem potražnje. Pored toga pastirsko ponašanje ili ponašanje stada je izuzetno prisutno u kriznim vremenima, što je još jedan od bihevioralnih aspekata objašnjenja kretanja cene bitkoina u uslovima pandemije. Sa racionalne strane, investitori koji veruju da je likvidnost od suštinske važnosti možda više vole da drže kriptovalute, jer su one lako dostupne bilo gde u svetu. Tada, investitori znaju da uvek mogu pristupiti svom novcu, bez potrebe da se oslanjaju na bilo koju centralnu vlast. Investitori koji izgube poverenje u banke i vlade više vole kripto opciju, jer zaobilazi strah od intervencije ovih entiteta. Sve što je potrebno je internetska veza za kupovinu i prodaju bitkoina, što ga čini savršenim valutom za preduzeća i pojedince koji žele da izvrše brze i jednostavne međunarodne transakcije. Pored toga inženjeri neprekidno smišljaju zelena, održiva rešenja za rudarstvo bitkoina tokom poslednje dve godine. To uključuje rudarstvo bitkoina na solarnu energiju i hidroelektriku. U svetu u kojem su klimatske promene postale jedno od najkritičnijih pitanja za većinu preduzeća i pojedinaca, bitkoin koji je često napadan sada razvija tehnologiju zasnovanu na obnovljivoj energiji (https://www.cultureliverpool.co.uk/news/how-bitcoin-is-handling-the-challenges-of-the-covid-19-pandemic/). Sve navedeno potvrđuje istraživačku hipotezu o sticanju statusa bitkoina kao imovine sigurnog utočišta u doba krize.

Zaključak

Godine 2009. kad je bitkoin plasiran, nije bilo sasvim jasno kako i gde se može trošiti. Sada velike kompanije kao što su Microsoft i Dell primaju uplate u bitkoinu za niz svojih proizvoda i digitalnog sadržaja. Može se leteti sa aviokompanijama, kupiti karte za pozorište, uzeti nekoliko boca zanatskog piva, itd. Ostale opcije uključuju plaćanje hotela i kupovinu imovine, namirivanje računa u različitim barovima i restoranima, priključivanje sajtovima za upoznavanje, kupovinu poklon vaučera, klađenje u online kazinu i dobrotvorne donacije. Postoji takođe niz različitih online tržišta koji trguju sa svim, od ilegalnih supstanci do vrhunskih, luksuznih predmeta. Narodna banka Srbije, ne priznaje bitkoin kao zakonsko sredstvo plaćanja i upozorava građane da koriste ovu valutu na sopstvenu odgovornost u slučaju prevare ili gubitka ulaganja. Bitkoin će zaživeti u Srbiji paralelno sa rastom popularnosti u svetu, jer je Internet kao globalna mreža pokazao da se trendovi brzo šire. Ipak, da bi se to desilo, mora da se ispuni još puno uslova.

Predmet ovog istraživanja bila je komparativna analiza kretanja cene bitkoina i cene zlata, kao i utvrđivanje postojanja veze između kretanja ove dve varijable, sa posebnim osvrtom na uticaj shvatanja bihevioralne ekonomije na objašnjenje kretanja bitkoina u doba pandemije COVID -19.

Testiranje početnih hipoteza utvrdilo je statistički značajnu vezu između kretanja cene bitkoina i cene zlata, što može biti osnov za predviđanje kretanja cene zlata u budućnosti na osnovu kretanja cene bitkoina. Utvrđena je signifikantna veza između kretanja cene bitkoina i porasta broja korisnika bitkoin novčanika, što jasno ukazuje na povećanje obima trgovine i široj zastupljenosti ove valute. Teorijsko istraživanje u ovom radu pokazuje da je bitkoin bio jedan od glavnih dobitnika pandemije koronavirusa. To može da implicira da kada se ekonomski oporavak nakon COVID-19 bude približio kraju, mogao bi se očekivati pad cene bitkoina kako potrošači ponovo budu počinjali da troše, a institucije nastave da ulažu u stvarne ekonomske aktivnosti. Uprkos tome, čini se da se bitkoin pokazao kao legitimno sredstvo za investiranje, zahvaljujući pandemiji, i iako bi eventualni ekonomski oporavak doveo do pada, verovatno će ostati privlačan za investitore u doglednoj budućnosti.

Bitkoin i kriptovalute su profiteri od ekonomskog haosa pandemije i nacionalnih računa koji se gomilaju i koji će se plaćati u budućnosti. Iako je bitkoin poznatija valuta nego što je bio pre pet godina, to je i dalje špekulativna investicija i pojedinačni investitori mu pristupaju s oprezom. Činjenica da je porasla vrednost ove valute kao da je poslužila kao utočište nekim investitorima tokom ekonomske krize pokazuje takođe koliko je kriza duboka. Da li će to i dalje činiti, ostaje da se vidi u narednom periodu. Nestabilna priroda tržišta kripto valuta otežava predviđanja koliko će dugo trajati rast vrednosti bitkoin. Ono što je sigurno jeste da se ponašanje potrošača značajno promenilo zbog pandemije. Sa prelaskom u digitalni svet koji se samo ubrzava, verovatno je da će bitkoin nastaviti da postaje sve više valuta kojoj teži veliki broj investitora. Zlato je i dalje sredstvo za upravljanje velikim fondovima za diverzifikaciju u alternativna sigurna utočišta. To ne znači da bitkoin neće pobediti performanse cena zlata, ali prerano je reći da li bitkoin može u potpunosti zameniti zlato kao sredstvo „safe haven asset".

Pored svega ovog opšteg entuzijazma, makroekonomske nestabilnosti koje je doneo COVID-19 doveo je do ogromnih podsticajnih paketa vlada širom sveta i mnogih centralnih banaka koje su štampale više novca. To bi moglo povećati inflaciju, što zauzvrat smanjuje kupovnu moć ljudi. Zato ne čudi da čak i centralne banke polako prihvataju kriptovalute. Rusija, Kina, Kanada, Evropska unija i mnogi drugi ili već rade na digitalnim valutama centralne banke za svoje zemlje ili objavljuju beleške sa detaljima o svojoj nameri da to učine.

Ovo je očigledan znak da sile koje su u starom finansijskom svetu kripto valute vide kao budućnost. U međuvremenu, američki savezni regulator najavio je da banke na malo mogu vršiti plaćanja stabilnim kovanicama, koje su kripto valute vezale za tradicionalne valute. Jedan fudbalski klub najavio je upotrebu bitkoina za plaćanje. Bitkoin jeste budućnost sistema plaćanja preko interneta. Međutim, i dalje će postojati tendencija da ga najviše koriste ljudi koji u bitkoin investiraju i vreme i novac koje sebi mogu da dopuste da izgube. Dakle, više će se i dalje koristiti kako bi se zaradilo na vrednosti novčića, a manje za plaćanja roba i usluga.

Ne postoji razlog koji bi sprečio da bitkoin toliko naraste da postane poput velikih nacionalnih valuta. Naravno neophodno je zakonski regulisati njegovo korišćenje kako bi se sve moguće zloupotrebe u smislu krađa, podvala i nezakonitih radnji svele na minimum. Ne postoji tehnički razlog koji bi to sprečio i nijedan teoretski zašto to ne bi moglo. Na svetu postoje male države čije nacionalne ekonomije su slabije od bitkoina, što je zaista fascinantno i govori dosta o potencijalima ovog sistema. Smatra se zlatom ovog veka, ali ima dug put do osvajanja poverenja krajnjih korisnika koje je zlato već učinilo.

Ostaje nejasno, kakva je budućnost bitkoina? Mnoga pitanja ostaju obavijena velom tajne: ko stoji iza fenomena bitkoina, ko profitira od ove šeme i da li će doći do kolapsa ili uspeha. Ovde niko ne može da kaže poslednju reč, iako mnoge stvari zavise od državnih vlasti i finansijskih institucija, kao i od krajnjih korisnika koji će odlučivati o sudbini bitkoina. Velika efikasnost elektronskog novca dovodi do povećanja rizika monetarne nestabilnosti. Zbog očekivanja naglog porasta upotrebe internet valuta, sa porastom stepena sigurnosti, ekonomičnosti i spremnosti prihvatanja u budućnosti, postavlja se pitanje njihovog uticaja na vođenje monetarne politike. Javlja se potreba za kontrolom i nadgledanjem njihove upotrebe, usled mogućeg negativnog uticaja na efikasnost instrumenata monetarne politike i na validnost tumačenja postojećih monetarnih indikatora. U narednom periodu će, za centralnu banku i nacionalne regulatorne organe, jedan od izazova svakako biti praćenje efekata korišćenja ovakvih valuta i njihova regulacija. Od regulacije bitkoina i drugih kriptovaluta, kao i njihove stabilnosti i sigurnosti, zavisiće i budućnost ovakvih valuta.

Komparacija kretanja posmatranih valuta bez stavljanja u kontekst sa dostignutim stupnjem ekonomskog razvoja nosi sa sobom određena ograničenja i ne daje realnu sliku, budući da tržišta nisu institucije koje ne zavise od privrednih kretanja. Imajući u vidu volatilnost tržišta bitkoina predviđanja kretanja cene zlata na osnovu samo cene bitkoina ne bi dalo sasvim pouzdane rezultate. Nemogućnost kvantitativnog ispitivanja uticaja bihevioralne ekonomije na kretanje cene bitkoina u uslovima pandemije, ograničava izvođenje relevantnih zaključaka o kreiranju slike kao „safe haven asset" bitkoina kod investitora u doba finansijskih kriza.

Prave efekte ekonomske krize izazvane pandemijom moguće je sagledati uključivanjem većeg broja valuta. Budući pravci istraživanja mogući su proširivanjem komparativne analize uključivanjem većeg broja valuta, i/ili proširivanjem vremenskog perioda.

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BITCOIN AND GOLD AS A SAFE HAVEN ASSET DURING THE PANDEMIC

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Abstract: The pandemic that hit the world in 2020 has left unforeseeable consequences for the entire world economy. Bitcoin and gold are currencies whose prices have risen despite the crisis period. The results of the research, using Spearman's correlation coefficient, showed a statistically significant relationship between the movement of the price of bitcoin and the price of gold, which can be the basis for predicting the movement of the price of gold in the future, based on the movement of the price of bitcoin. A significant relationship was found between the movement of the bitcoin price and the increase in the number of users of bitcoin wallets, which clearly indicates an increase in the volume of trade in this currency and a wider representation of this currency. Theoretical research of behavioral economics has confirmed the hypothesis that when the financial system is exposed to a crisis, bitcoin and gold will have the characteristics of a „safe haven asset" which can be explained by the principles of behavioral economics.

Keywords: bitcoin, gold, safe haven asset, behavioral economics

JEL classification: E71, G41

Introduction

The world experienced a health crisis in 2020 that has had far-reaching effects on people's physical, mental, and financial well-being. The COVID-19 virus-caused pandemic has significantly altered the global environment, imperiled national economies, and harmed public safety. In recent years, the use of internet currencies has grown. Bitcoin is the most significant digital currency used in the electronic payment system. Digital currency known as Bitcoin is used and transferred online. The fluctuating exchange rate of bitcoin makes it a fantastic investment opportunity. Bitcoin is a relatively new and intricate form of payment. The fact that customer options are still limited is therefore only reasonable, yet every day more and more companies, from small local coffee shops to enormous industrial conglomerates, are accepting Bitcoin payments. Although it is unreliable and underutilized money, its value has risen during the pandemic. On the other hand, gold has historically been the most reliable means of protecting the value of money. Investigating how these currencies' prices changed during the COVID-19 epidemic is intriguing given the traits of these currencies.

The purpose of this paper is to compare the price movements of bitcoin and gold, as well as to determine whether there is a relationship between the price movements of these two variables. We pay particular attention to how behavioral economics knowledge has affected the price movement of bitcoin during the COVID-19 pandemic. The scientific goal is reflected in the description of both theoretical and empirical analysis of the movement of the observed variables. In a theoretical sense, the scientific goal is based on the analysis of modern views on bitcoin and gold as currencies, while in an empirical sense, through a comparative analysis of the movement of these variables, the degree and impact of the movement of the price of bitcoin on the movement of the price of gold, the correlation between the movement of the price of bitcoin and number of bitcoin wallet users, as well as using the influence of behavioral economics to explain the movement of the price of bitcoin in the era of the crisis caused by the COVID-19 pandemic. From the aspect of the social goal, the research should show the current position and predict the movement of these two currencies, taking into account the established volatility of their markets, show a comparative analysis of price levels, the price impact of one currency on another, and how to predict future movements.

Bearing in mind the defined subject and goal of the research, the paper will start from the following hypotheses:

H1: There is a high correlation between the movement of the bitcoin price and the number of users of bitcoin wallets in the observed period.

H2: There is a high correlation between the movement of the price of Bitcoin and the movement of the price of gold in the observed period.

H3: If the financial system is exposed to a crisis, then bitcoin and gold will have the characteristics of a "safe haven asset", which is explained by the principles of behavioral economics.

Methodology and Data

The time period from 2013 to 2021 will be taken for the subject research. Representative international databases (World Gold Council, Yahoo Finance, Bloomberg Business, etc.) and all relevant domestic and foreign literature will be used for data collection. The statistical tool SPSS - The Statistical Package for the Social Sciences will be used to test the set hypotheses and arrive at the research results, and within it, correlation analysis will be used for statistical inference. Spearman's correlation coefficient will be used to analyze the relationship between the movement of the bitcoin price and the number of bitcoin wallet users, as well as to analyze the movement of the price of bitcoin and gold. Spearman's coefficient is a non-parametric test and can be applied to any combination of ordinal or higher measurement level variables. Spearman's correlation coefficient is suitable for quantities that can be ranked and especially for smaller series of data (Biljan-August, Pivac, Štambuk, 2007). Correlation coefficients range from -1 to 1, where the sign indicates whether it is a negative or positive correlation or whether we have an absence of correlation (0) (http://psihologija.ff.uns.ac.rs/viz/koeficijenti-korelacije-za-rangirane-podatke). Calculation formula:

$$r_S = 1 - 6\sum_{i=1}^{n} \frac{{d_i}^2}{n(n^2-1)}$$

where: d is the difference in the values of the ranks of the two observed variables, and n is the number of different series.

Obtaining answers to the set hypotheses requires determining the time frame, the choice of research methods and the elements that will be used.

Table 1 - Elements Used in the Analysis

The name of the variable	Data source	Period
Bitcoin price in dollars	Statista; Coin desk, YahooFinance	2013- 2021.
Number of bitcoin wallet users in millions	Statista; Coin desk, YahooFinance	2013- 2021.
The price of gold in dollars	Business insider, World Gold Council, Yahoo Finance,	2013- 2021.

Source: Author

The observed period is suitable for analysis because it includes a long enough period of time to follow the trend, and also the period of the world pandemic. In the research, secondary data from the website database on price movements of observed currencies on the markets were used. Table 2 shows the data that will be used as elements for the correlation assessment.

Table 2 - The Movement of Bitcoin and Gold in the Period 2013 - 2021

Year	Bitcoin price in dollars	Number of bitcoin wallet users in millions	The price of gold in dollars
2013[1]	744.17	0.89	1,205.90
2014	309.90	2.71	1,225.40
2015	424.96	5.34	1,072.40
2016	952.46	10.69	1,138.85
2017	13,062.15	21.51	1,264.50
2018	3,689.57	31.91	1,267.05
2019	7,251.28	44.51	1,469.50
2020	28,768.84	63.48	1,839.80
2021	47,128.47	73.00	1,814.95

Source: https://www.statista.com/statistics/326707/bitcoin-price-index/; https://www.coindesk.com/price/bitcoin; https://www.statista.com/statistics/647374/worldwide-blockchain-wallet-users/; https://finance.yahoo.com/topic/crypto/; https://markets.businessinsider.com/commodities/gold-price; https://www.gold.org/goldhub

The price of one bitcoin has changed over time, depending on the state of the market. In the first years, 1 bitcoin could be bought for less than 1 dollar, and the price of this currency has been increasing since 2009. Until the end of 2016, it was necessary to allocate less than a thousand dollars for one unit of bitcoin. Already at the end of 2017, it was necessary to allocate over 13,000 dollars for one unit of this decentralized cryptocurrency. During 2018, a drop to $3,689 was recorded. When the pandemic broke out, Bitcoin could be bought for around $7,200. Today, it costs more than $47,000 - a staggering over 500 percent increase. At the beginning of the COVID-19 crisis, the increase in the total number of cases was positively related to the market capitalization and trading volume of cryptocurrencies (Jabotinsky, Sarel, 2020). However, this upward trend is not necessarily obvious from a theoretical standpoint, as there are several forces that could have driven demand up or down in response to the crisis, making Bitcoin's growth even more interesting to analyze. Some countervailing forces could suppress demand. Bitcoin could become closely correlated with the traditional financial market in times of crisis, even if there is no such correlation in normal times, so that the benefit of switching to Bitcoin becomes negligible. Even worse, the chaos caused by the pandemic could have led to at least two dangerous activities that could have caused significant losses. First, sophisticated investors could manipulate the price of Bitcoin by artificially increasing demand to lure unsophisticated investors and then abandon their investment when the price is high enough. This is possible when it is taken into account that people demonstrate the so-called herding behavior, i.e., they buy bitcoin just because they are watching others. Second, even before the pandemic, Bitcoin was suspected of enabling criminal activity. With this in mind, people may fear that using cryptocurrencies would expose them to criminal charges for money laundering and therefore avoid trading (https://clsbluesky.law.columbia.edu/2021/03/26/how-the-covid-19-pandemic-affected-the-cryptocurrency-market/).

[1] *Balance as of: 31.12.*

The fact that bitcoin may be traded anywhere in the world somewhat mitigates the potential liquidity limitations that may occur if countries restrict trading activity as part of the lockdown, which is one of the rational justifications for the rise in bitcoin values in the pandemic era. As a result, Bitcoin gains appeal in comparison to competing currencies. Additionally, investors who believed that the crisis might result in market manipulation by central banks or political players decided to switch their investments to decentralized bitcoin. In other words, bitcoins can allow investors to insure against some political risks and so become more appealing because they are not managed by a central authority but rather run autonomously.

Since wallets allow users to create an unlimited number of accounts, the actual number of users cannot be known for sure, but it can be noted that the number of wallets, as well as the price of Bitcoin, only started to grow in January 2013, while Bitcoin was created in 2009. In the period July 2016-July 2017, it grew at a high speed. In July 2016, the number of registered wallets was over 7.8 million, and in July 2017, over 14.9 million. Since the beginning of the pandemic, from January 2020 to 2021, the number of Bitcoin wallet users has grown from 45.45 to 73 million.

If the price of gold is examined after 2013, a steady trend with a range of values between $1,072 and $1,267 may be seen. In 2019, there was a more notable increase. In times of stress, the financial community has focused on gold as a refuge, particularly prior to and during the early stages of the COVID-19 crisis. With the exception of March 2020 and the cessation of the rising trend in February 2021, which coincides with information about the subsidence of the epidemic and the beginning of vaccination, prices have increased during the whole course of the pandemic.

Literature Review

Various online currencies have been employed as payment methods in recent years. A form of electronic payment known as "internet currency" relies on either hardware- or software-based value storage. Bitcoin is the most significant digital currency used in the electronic payment system. This electronic money system has lasted longer than the previous ones, and as a result, deserves more attention from both the professional public and users. This is due to the design of the payment system as well as certain other conditions that the inventors themselves could not change. Because it may be destroyed by setting up the necessary software on a computer's hard disk, Bitcoin is truly software electronic money (Selgin, 2014). Bitcoin is utterly dominant due to the magnitude of the cryptocurrency market as a whole. Beginning in 2020, Bitcoin represented more than two-thirds of the market's capitalization and around one-third of its daily trade volume (Tomić, 2020). Similar to a bank account, a bitcoin address allows a user to receive, transmit, and store bitcoin. Bitcoins are safeguarded via public key cryptography rather than being physically kept in a vault. Each address contains a private key that needs to be kept hidden in addition to a public key that is accessible to everyone (Đoršević, 2018). A person with a specific private key is the only one who can spend bitcoins, even though anyone can transmit them to any public key.

BitPay refers to the system for handling bitcoin payments. This is a private network that draws businesses to begin accepting payments in bitcoin currency but is not owned by exchanges or maintains a client-to-client network (https://bitpay.com). Users can use one or more bitcoin addresses to get started with bitcoins, as they are used to receive bitcoins in the same manner that email addresses are used to receive emails. When sending money, the wallet generates a transaction that includes the recipient's address, the intended recipient's amount, and a signature. Using a Bitcoin wallet, you may store your available funds and execute online transactions. Until a transaction is recorded in the Bitcoin blockchain, it cannot be validated. The blockchain (trading platform) ensures the validity of every transaction and prevents double spending. Each user has access to the transaction history thanks to blockchain. Bitcoins cannot be stolen from their owners by a thief, bank, or government, once they have been acquired and properly safeguarded. No one or anything else has the authority to freeze an account or stop its owner from using the bitcoin network to perform free transactions (Tomić, Todorović, Jakšić, 2016).

The system is not necessarily anonymous, but it is intended to be secure. Theoretically, any user's transaction could be tracked. Bitcoin is both a currency and a payment system, and "mining" is how it works. Every member of the network who has used their computers to calculate challenging issues is required to process each transaction in order to guarantee its security (as well as its anonymity and irrevocability) (http://marketingitd.com/2013/sta-je-bitcoin- and-how-to-use-it-in-billing/). The issue with this theory is that all transactions are combined into a single, distributed, decentralized blockchain. Additionally, this implies that nothing can be concealed (Baxter - Reynolds, 2013). The network itself is utilized as a method to control the regularity of transactions in order to maintain the security of payments and avoid various abuses. R2R networks are the foundation of Bitcoin. Peer-to-peer networks have no "client-server" design; instead, all computers are treated equally as network members. When one computer "shares" certain content with the network, all other computers have access to that file, which is how it is typically used to share information (Dinić, 2014).

Bitcoin is not the first electronic payment system and is not likely to be the last. The main reasons why earlier operating solutions didn't succeed for a long time were that they couldn't ensure the security of their users and couldn't reach a large enough group of private users and commercial entities to accept them as a form of payment. How did bitcoin continue to function as an online currency in light of the possible issues? Bitcoin has been around for a while, though not quite long enough compared to past attempts at this kind of money (Miladinović, Smigić, 2018).

The Bitcoin system stands out from other electronic money systems thanks to a number of features. First of all, neither a bank initiating the system nor any central bank operating it, nor is there a firm behind bitcoin that is the system's owner. This further suggests that there are no commercial entities planning to profit from maintaining the system, freeing Bitcoin from the need to live economically. Because there were few users and little money in circulation when Internet currencies were initially used, it was simple to confirm the transaction's validity and create a report on it. It now takes longer to do verification and confirmation because there are more coins and users, which has made the process more difficult. Additionally, the hardware in regular computers, particularly laptops, has gotten too flimsy to support the workload of this substantial job (Raskin, 2013). This sort of money is not under the supervision of the central bank. The instability of cryptocurrencies, including Bitcoin, is the most glaring issue caused by the lack of a centralized authority.

Cryptocurrencies are entirely dependent on the market, that is, on the law of supply and demand, as opposed to national currencies, where central banks have a wide range of tools at their disposal to maintain the currency more or less stable. Since cryptocurrencies are worldwide and decentralized and are not governed by any one state, they are less susceptible to political events (https://www.barrons.com/articles/why-bitcoin-is-the-best-investment-opportunity-post- pandemic-heres-what-will-drive-the-price-higher-51607134443).

Despite being designed as an experimental payment mechanism at first, Bitcoin is currently very popular and getting a lot of media attention. The first truly global currency, according to its proponents, is one that does not discriminate against its users based on their nationality or location, is always available, simple to secure, has very low usage costs, is debt-free, etc. However, detractors contend that it is frequently used fraudulently to purchase items and "launder" enormous quantities of money and that it is very simple to steal Bitcoin in the event of a cyber attack (Ron, Shamir, 2013).

Despite being primarily intended for these purposes, bitcoin is still not widely used. The biggest trading platforms in the world do not yet accept Bitcoin, despite the fact that it is an intriguing financial prospect. This currency is not accepted by Amazon or eBay, and social networks do not permit its use as payment. Additionally, the majority of businesses that accept bitcoin payments are those that deal with the delivery of services over the internet (hosting companies), 3D designers and digital artists, bulk SMS providers, providers of online document storage, software developers, and online bookmakers. However, newly developed sales and auction sites created especially for conducting commerce with bitcoin cash are where the majority of product providers are located. The great volatility of the value of this currency is a significant issue with the denomination of pricing on selling websites in bitcoins (https://www.marketwatch.com/story/the-pandemic-showed-theres-a-need-for-digital-currencies-especially-bitcoin-11607031312).

But according to earlier studies, the price of bitcoin always increases whenever there is a global political or financial crisis, even if there is merely a hint that one might occur. The cost went up following the Brexit vote, the US presidential election, the newest pandemic, the Cyprus and Greek crises, the Brexit referendum, and the Brexit referendum. So, whenever faith in the current system is questioned, a certain proportion of individuals view cryptocurrency as a potential replacement. Since Bitcoin has weak underpinnings for the preservation of value and only functions as a means of exchanging money rather than a true medium of exchange, it is known to be unstable and highly volatile. Investors are aware that under these conditions adding a bigger proportion of Bitcoin to the portfolio structure greatly raises the risk of the holdings, thus the rise in price of this currency during the global epidemic is fascinating (http://www.societegenerale.rs/kako-je-nastao-bitcoin/).

The intersection of psychology and economics, or behavioral economics as it is known in the relevant literature, has attracted a lot of attention in recent years. It is a field of study that enhances the explanatory power of economic research by fusing it with more realistic psychological contexts and utilizing social, emotional, and cognitive elements to try to understand the economic choices made by people and institutions. According to Belsky and Gilovich (2010), behavioral economics combines psychology and economics to explain why and how people make illogical or irrational decisions when they borrow, spend, invest, and save money (Belsky, Gilovich, 2010).

Increasing the realism of the psychological underpinnings of economic analysis will improve the standard economic model in terms of producing theoretical knowledge, making accurate predictions about various phenomena, and developing better economic policy, according to the central tenet of this subdiscipline within economic science. The state and future of economic science are profoundly impacted by the relatively recent and promising field of behavioral economics. Fundamental behavioral economics research has unequivocally demonstrated that psychological concepts may be formalized into a different model and utilized to provide predictions that can then be applied in a real-world economic situation (Krstić, Radivojević, 2019). While traditional finance begins with the idea of perfect reason, behavioral finance considers the bounded rationality of market players. While traditional finance begins with the tenets of completely rational financial decision-making, behavioral finance emphasizes the incidence and repetition of irrationality.

From the widespread acceptance of the efficient market hypothesis (EMH), the cornerstone of conventional financial theory, through the advent of behavioral finance and behavioral criticism of EMH, financial theory has come a long way. A high number of market anomalies led to the EMH's validity being questioned, which opened the door for the development of a new financial strategy with the study of people's behavior and psychology as its main focus (Leković, 2020). As Águila (2009) claims, the growing interest in behavioral finance is the result of the accumulation of empirical anomalies, and the task of behavioral finance is to integrate psychology with finance and economics to ensure their better understanding. In behavioral micro finance, investor behavioral bias according to Baker, Nofsinger (2002) is grouped into how investors think (ground rules/heuristics) and how investors feel (emotions), while according to Pompian (2006) and Hirschei, Nofsinger (2008)) investor bias is grouped into cognitive bias and emotional bias (Pompian, 2006). This behavioral bias affects people in their decision making according to Zahera, Bansal (2018). A cognitive bias is making decisions using a ground rule for information or facts. Cognitive psychology refers to people's way of thinking and has an important role in behavioral finance, because numerous studies have shown that people make systemic mistakes in their way of thinking: they are overconfident, they attach too much importance to recent experiences, they use mental shortcuts, they avoid change (Ritter, 2003). Irrationalities present in the complex world of finance, behavioral finance seeks to explain via cognitive biases such as: 1) overconfidence, 2) framing or formulation, 3) mental accounting, 4) representativeness, i.e. availability or memory bias, 5) conservatism, i.e. tendency to avoid changes or "anchoring", 6) aversion to loss, 7) avoidance of regret, 8) herd behavior, i.e. herd mentality or crowd psychology, 9) confirmation or self-confirmation, 10) late insight, 11) cognitive dissonance, and 12) winner's curse. Emotional bias is decision making based on feelings. The advantage of behavioral finance is, among other things, reflected precisely in explaining market anomalies and the causes of market inefficiency. According to the standard theory, the asset price depends on the received information, while according to behavioral finance, the asset price depends on the reaction of market participants to the received information. (Fakhry, 2016).

Given the nature of the area, qualitative analyses predominate in behavioral economics. The field of quantitative research is very limited. Human irrationality frequently has a considerable impact on decision-making, which has important economic repercussions, according to contemporary behavioral economics. Big data, the advancement of behavioral and social sciences, and human resource management may soon make it possible for scientists to realize their goal of creating behavioral risk models.

Numerous external elements (political system, legislation, norms, and culture) as well as endogenous ones that affect investment decision-making may be included in qualitative study. New behavioral models and explanations of economic events may be developed as a result of the development of both quantitative and qualitative research in conjunction with big data (Petronijević, 2018).

Every time there are major issues, such as earthquakes, financial threats, or crises, that threaten the financial system, the price of gold tends to increase. It is particularly appealing during periods of high inflation because it presents itself as an asset that protects the value of money against further inflation-related degradation. Only by selling gold for a higher price—the so-called capital gain—can you profit from it. Real interest rate periods that decline or even negative are frequently advantageous for buying gold because in these circumstances, investors "flee" to safer assets to hedge against volatile market swings. This fluctuation in the price of gold offers investors a variety of ways to hedge against risks such as inflation, falling asset yields, and price volatility. The widespread perception that investors move their capital to gold when they are concerned about falling markets as a result of the flight to safety that occurred amid economic hardship has led to gold being viewed as a safe haven.

Sarkodie, Ahmed, Owusu (2021) in the research they conducted during the pandemic dealt with the connection between the growth of Bitcoin and those suffering from the corona virus. They found a relationship between these two variables. That is why it is interesting to observe the movement in the conditions of the pandemic, since it would be expected that the crisis will affect the reduction of trade in this currency. Cryptocurrency market participants appear to be behaving irrationally. A study conducted by Keller, Scholz (2019) aimed to identify types of investors, including behavioral principles and their influence. They identified six types of investors who place bids and four types of investors who demand (Keller, Scholz, 2019). Cheung, Roca, & Su (2015) state that Bitcoin is a bubble. Shiller (2000) defined a bubble as a situation in which news of price increases fuel investor enthusiasm, which spreads by psychological contagion from person to person, amplifying stories that could justify price increases and bringing in a larger and larger class of investors ... despite doubts into the real value of the investment". According to Baker, Nofsinger (2002), behavioral finance seeks to express the irrationality of investors in general and show human errors in cryptocurrency markets (Baker, Nofsinger, 2002). Based on the literature on cognitive and emotional biases that have influenced decision-making and that could be applied to cryptocurrency, a conceptual model for understanding the behavioral biases that influence cryptocurrency investing is envisioned. The biases are herding, optimism, overconfidence, confirmation bias, loss aversion, and the gambler's delusion. Herding is the tendency of someone who prefers to follow others or imitate group behavior in making decisions rather than making decisions independently. Optimism bias is someone's tendency to overestimate the possibility of positive things happening and underestimate the potential for unpleasant events. Overconfidence is the belief of someone who thinks they know and have better information. Confirmation bias or coincidence can occur in a phase when prices fall but temporarily rise again. Loss aversion is a bias that can be explained by prospect theory. Prospect theory is used to describe how people make decisions between different choices or prospects, especially under conditions of uncertainty. The gambler's fallacy is the belief that a correction will occur in a fair gamble (Hidayat, 2019). The results of Almansour (2020) show that behavioral economics has a significant impact on the behavior of investors in the cryptocurrency market, and this, on the other hand, significantly affects the price movement of these currencies (Almansour, 2020).

The inverse relationship between gold and stocks is cited by many in popular literature. However, some have noted that the relationship has changed in 2020. For example, Mark DeCambre noted in MarketWatch in August 2020 that "gold is at a historic low." A positive correlation between gold and stocks was observed early in the COVID-19 period. For example, Zhang (2020) argues that "when gold and stocks become positively correlated, it usually signals a market regime driven by liquidity and changing real returns" (Zhang, Chen Hamilton, 2020). Choudhri (2015) notes that gold was not a safe haven during the financial crisis of 2007–2009 due to the unidirectional relationship between gold returns and market returns (returning gold to stocks), but not bidirectional (Choudhry, Hassan, Shabi, 2015). He also notes that there is non-linear causality, arguing that gold may have been used as a hedge before the financial crisis, but not during the crisis period. AlAmeer (2018) observes a different correlation for the periods before, during and after the 2007–2008 financial crisis. (AlAmeer, Hammad, Ismail, Hamdan, 2018). The purpose of Drake's 2020 study is to explore the relationship between gold and the stock market, given the recent COVID-19 recession and the role of interest rates. The results indicate that the inverse relationship observed in the past is not supported in the two most recent recessions and that this relationship is influenced by real interest rates and stock market volatility. When real interest rates are negative, there is a positive relationship between gold and market returns (Drake, 2020).

In recent years, the Bitcoin market has been quite volatile, and there is a need to analyze ways to predict Bitcoin price movements. Since the gold market has also been under considerable interest in recent years, primarily due to its volatility and reflection of global economic trends, not only those related to economic and financial flows, but also wider socio-political ones, it is very interesting to consider the possibility of using data on the movement of the price of bitcoin on the global market in the context of the possibility of predicting the movement of the price of gold. This is especially important considering that the gold market is a reflection of global economic trends, on the one hand, and the fact that bitcoin is becoming more and more important as an asset, i.e., investment alternative, on the other hand. In a study conducted by Dončić (2020), the aim was to answer the question that there is a causal relationship between the movement of the price of bitcoin and the price of gold in the global financial market in order to answer the question of whether it is possible to predict the movement of the price of bitcoin based on the movement of the price of gold on the world market, but also vice versa. The research was conducted in the period from January 1, 2019 to December 1, 2019. The results of the research show that historical data on the movement of the price of gold in the world market cannot be used to predict changes in the value and price of Bitcoin. On the other hand, research results indicate that it is possible to reliably apply historical data on the movement of the value and price of bitcoins to predict the price of gold (Dončić, 2020). It is for this reason that in this paper, among other things, the correlation between the movement of the price of bitcoin and gold will be examined.

Research Results

The variables that are observed in a defined time interval are in accordance with the research questions. Model analysis begins with a review of descriptive statistical analysis results (minimum, maximum, arithmetic mean and standard deviation).

Table 3 - Descriptive Statistics of the Analyzed Variables

The name of the variable	Minimum	Maximum	Arithmetic mean	S tandard deviation
Bitcoin price in dollars	309.90	58,734.48	17,618.2136	17,181.31588
Number of bitcoin wallet users in millions	0.89	73.00	46.7064	22.43624
The price of gold in dollars	1,072.40	1,956.05	1,634.5140	284.82795

Source: Author

The range of the "Bitcoin Price in Dollars" variable ranges from $309.90 to $58,734.48. The mean is $17,618.2136, while the standard deviation from that mean is $17,181.31588. The range of the variable "number of bitcoin wallet users in millions" ranges from 0.89 to 73.00 million. The mean is 46.7064 million, while the standard deviation from that mean is 22.43624 million. The range of the variable "price of gold in dollars" ranges from $1,072.40 to $1,956.05. The mean is 1,634.5140, while the standard deviation from that mean is $284.82795.

Bearing in mind the given overview of the variables, it is interesting to compare the relationship between the movement of the price of bitcoin and the movement of the number of wallet users, as well as the movement of the price of bitcoin and the price of gold, for this correlation analysis will be used. The goal of correlation analysis is to determine if there is a correlation between the observed variables and to what extent.

Due to the sample size of the observed variables, Spearman's correlation coefficient was used for the analysis. The results of the analysis are shown in table 4. The correlation coefficient of 0.939 implies a strong positive correlation between the movement of the bitcoin price and the number of bitcoin wallet users. A correlation coefficient of 0.684 implies a strong positive correlation between Bitcoin price movements and gold price movements. A statistically significant positive correlation was established between the analyzed variables (sig. < 0.05). This means that the conclusions about the impact of the Bitcoin price movement on the number of wallet users, that is, on the movement of the gold price, are relevant.

Table 4 -Correlation analysis

	Spearman's correlation coefficient	Sig. (2-tailed)
Correlation between bitcoin price movement and the number of bitcoin wallet users	0.983	0.000
Correlation between bitcoin price movement and gold price movement	0.684	0.000

Source: Author

Based on the results of the correlation analysis, a statistically significant positive impact of the movement of the bitcoin price on the number of bitcoin wallet users and the price of gold was determined, thus accepting the first two research hypotheses. In the case of a positive correlation between the price of bitcoin and the number of bitcoin wallet users, bearing in mind the functioning mechanism of bitcoin trading, this can be explained by the fact that a higher value of the currency attracts a larger number of investors, i.e., increases demand. When observing the positive correlation between the movement of the price of bitcoin and the price of gold, especially in the conditions of a pandemic, this is in accordance with the research of Dončić (2020) who, looking at the same variables, concludes that the results of the research indicate that it is possible to reliably apply historical data on the movement of the value and price of bitcoin for predicting the price of gold. The positive trend in the price of Bitcoin and the price of gold observed during the pandemic is in contrast to the trend shown by gold during the global economic crisis and to the majority of the economic literature that indicated a decline in the value of currencies in the markets during periods of crisis.

When the principles and research in the field of behavioral economics are included in the movement of the bitcoin price in recent years, it seems that when this crisis appeared, investors shifted from traditional markets to alternative ones, such as the bitcoin market, at least in the early stages of the crisis precisely because of the importance of information.

Gold is the wealth that many think of when it comes to holding value, but Bitcoin is now really becoming a challenge to gold in this regard. The difference with Bitcoin is that it has become a much more attractive investment than ever before. Bitcoin is quickly becoming what is known as a "safe haven asset" - a safe haven asset that performs well even in volatile markets and volatile times like a pandemic. Gold is a classic example of the so-called safe haven property, because it retains value even when markets underperform. Every investor knows that their money will be safely invested in gold regardless of market fluctuations. Bitcoin has long sought to reach the status of such an asset, to gain the trust of consumers.

During the COVID-19 pandemic, Bitcoin rose over 500% in 2020 and 2021, partly due to financial market speculation that investors were hoarding the digital currency due to low market interest rates (Bloomberg, 2021). In pandemic conditions, Bitcoin's status as a speculative investment seems less risky than it would be in more stable times. Although there is no centralized marketing management, Bitcoin is positioned as a hedge against possible inflation - similar to gold, but digital. Bitcoin's ability to act as a hedge against inflation or as an alternative currency to the US dollar is not established, but a number of funds have added a small risk stake (generally less than 5%) to Bitcoin and other cryptocurrencies for this very purpose (https://fintechmagazine.com/digital-payments/year-lockdown-how-has-bitcoin-navigated-pandemi).

Bitcoin saw a decline in value at the start of the pandemic, but it has since recovered and witnessed a surge in price. People who desire to invest effortlessly from home are more numerous now thanks to the COVID-19 pandemic. Being a completely digital currency has always been a benefit of Bitcoin. In part because of the pandemic, purchasing Bitcoin is now simpler than ever. For the first time, a large number of people are realizing the value of investing in Bitcoin, and the market is expanding to keep up with the demand. Everything in our life has undergone a significant change toward the digital world as a result of the coronavirus pandemic, from working from home to placing grocery orders online. Before the pandemic, there was an upward tendency in this, but COVID-19 has exacerbated it. As individuals get used to the digital environment, remote financial services and Bitcoin are becoming more and more popular. It makes sense, according to behavioral economics, that people purchase cryptocurrency because other people are doing so. Additionally, the outcome might herald the start of an informed investor's "pump and dump" approach, in which informed investors first boost their investment in the market in an effort to draw in uninformed investors, then drop the price by stifling demand.

Another behavioral explanation for the movement of the bitcoin price in pandemics is pastoral behavior or herd behavior, which is highly prevalent in times of distress. On the logical side, investors who think having access to liquidity is important could opt to hold bitcoins because they are widely available everywhere. Investors can then access their money whenever they want without having to rely on a centralized authority. Investors who have lost faith in banks and governments choose the cryptocurrency alternative because it eliminates their concern about government meddling. Bitcoin is the ideal money for organizations and people wishing to conduct quick and simple international transactions because all you need is an internet connection to buy and sell it. Additionally, during the past two years, engineers have consistently developed environmentally friendly, sustainable ways for bitcoin mining. These include bitcoin mining and hydroelectricity. These include bitcoin mining and hydroelectricity. The frequently criticized Bitcoin is currently creating technology based on renewable energy in a world where climate change has emerged as one of the most important issues for most businesses and people (https://www.cultureliverpool.co.uk/news/how-bitcoin-is-handling-the-challenges-of-the-covid-19-pandemic/). All of the aforementioned evidence supports the research claim that Bitcoin has become a safe-haven asset in times of crisis.

Conclusion

When bitcoin was first introduced in 2009, it was unclear exactly how and where it could be used. Large corporations are now accepting Bitcoin payments for a variety of their products and digital content, including Dell and Microsoft. Airlines, theater tickets, artisan beer, and other things are all available for purchase. Purchasing real estate and lodging, paying bar and restaurant bills, signing up for dating websites, purchasing gift cards, wagering at online casinos, and making charitable contributions are further alternatives. Additionally, there are a variety of internet markets that deal in everything from illegal drugs to expensive, luxury goods. The National Bank of Serbia advises citizens to use Bitcoin at their own risk in case of fraud or loss of investment because it is not accepted as a legitimate form of payment in Serbia. Given that trends propagate swiftly on the Internet, a worldwide network, Bitcoin will take off in Serbia at the same time as it does globally. More requirements must be completed, though, in order for this to occur.

Initial hypothesis testing revealed a statistically strong correlation between changes in Bitcoin price and gold prices, which can be used to forecast future changes in gold price based on changes in Bitcoin price. The fluctuation of the price of Bitcoin and the rise in the number of Bitcoin wallet users were shown to be significantly correlated, which unmistakably points to an expansion of commerce and a wider use of this currency. Theoretical analysis in this work demonstrates that one of the biggest beneficiaries of the coronavirus outbreak has been Bitcoin. This may mean that if institutions continue to invest in actual economic activity and consumers begin to spend again, the price of Bitcoin will decline when the economic rebound following COVID-19 comes to an end. Despite this, the epidemic seems to have established Bitcoin as a reliable investment option, and even while an eventual economic recovery would result in a fall, it is likely to continue to be appealing to investors for the foreseeable future.

The economic havoc caused by the pandemic and the mounting national debt that must eventually be paid are being reaped by Bitcoin and other cryptocurrencies. Even while Bitcoin is more widely used today than it was five years ago, individual investors should still proceed with caution because it is still a speculative investment. How severe the economic crisis is also demonstrated by the fact that the value of this currency rose as if it were a haven for some investors. In the near future, it will be interesting to watch if it keeps doing so.

How long bitcoin's growth will persist is difficult to predict due to the erratic nature of the cryptocurrency industry. It is undeniable that the epidemic has had a huge impact on consumer behavior. Given the speed at which the world is going digital, it seems likely that Bitcoin will continue to gain popularity as a currency among investors. Gold is still used to diversify enormous sums of money into several safe havens. This is not to imply that Bitcoin won't outperform gold in terms of price performance, but it is still too early to predict if Bitcoin will entirely displace gold as a safe haven asset.

In addition to all of this public enthusiasm, the macroeconomic instability brought on by COVID-19 has prompted numerous central banks to increase their money printing and enormous stimulus packages from governments all over the world. This might lead to higher inflation, which would lower people's purchasing power. Therefore, it comes as no surprise that even central banks are beginning to embrace cryptocurrency. Many additional nations, including China, Canada, the European Union, and Russia, either have central banks developing digital currencies for their nations or have made plans public. This is a blatant indication that the established financial elite believes cryptocurrencies will rule the future. In the meantime, the US federal regulator has declared that small- and medium-sized banks can now accept payments in stablecoins, which have connected cryptocurrencies to conventional currencies. A soccer team has declared that it will accept Bitcoin payments. The future of internet payment methods is Bitcoin. There will, though, continue to be a propensity for it to be mostly used by those who are into bitcoin and commit time and money they can afford to lose. Therefore, a greater portion of the coin will still be utilized to earn value while a smaller portion will be used to purchase goods and services.

There is no reason to stop Bitcoin from expanding to the point where it resembles a significant national currency. It goes without saying that legal restrictions must be placed on its use to prevent any abuses—including theft, fraud, and unlawful activity—from occurring. Technically speaking, it cannot be done and theoretically, it cannot be done. It's incredibly amazing and says a lot about the potential of this system that there are tiny nations in the globe with national economies that are weaker than Bitcoin. It is regarded as the gold of this century, but it still has a long way to go before gaining the same level of consumer trust that gold has.

What Bitcoin's future holds is yet unknown. Who is behind the Bitcoin phenomena, who is making money off of this plan, and whether it will succeed or fail are just a few of the many unanswered issues. Although many factors depend on governmental agencies, financial institutions, and end users who will determine the future of Bitcoin, no one can claim to have the final say in this situation. The risk of monetary instability rises as a result of electronic money's high efficiency. The subject of their impact on the conduct of monetary policy is raised due to the assumption of a quick growth in the usage of Internet currencies, with an increase in the level of security, economy, and willingness to accept them in the future. Due to the potential harm to the efficiency of monetary policy instruments and the reliability of the interpretation of current monetary indicators, their usage must be controlled and monitored. Monitoring the effects of the use of such currencies and their regulation will undoubtedly be one of the difficulties in the future for the central bank and national regulatory authorities. The regulation of cryptocurrencies like bitcoin and others, as well as their stability and security, will determine how these currencies develop in the future.

Since markets are not entities that are independent of economic movements, comparing the movements of observed currencies without placing them in the context of the attained degree of economic development has some limitations and does not provide a realistic picture. Given the turbulence in the Bitcoin market, it would be difficult to forecast how the price of gold will change based solely on the price of Bitcoin.

The ability to draw meaningful conclusions about the development of the perception of bitcoin as a "safe haven asset" among investors in the age of financial crises is constrained by the impossibility of a quantitative examination of the impact of behavioral economics on the movement of the price of bitcoin under pandemic conditions.

By incorporating more currencies, the full impact of the pandemic-related economic catastrophe may be shown. By extending the comparison analysis to include more currencies and/or a longer time span, future research possibilities may be possible.

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ODRŽIVO POSLOVANJE – DA LI SU ESG STANDARDI STUBOVI OTPORNOSTI NOVOG MODELA POSLOVANJA?

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Rezime: Od kompanija u savremenom svetu očekuje se da rade na jačanju odgovornosti. Poslednjih godina je u prvi plan stavljen koncept održivog poslovanja, koje počiva na tri stuba: ekološki prihvatljivo stvaranje profita, dobro korporativno upravljanje i briga o društveno angažovanim temama. To je u osnovi skraćenice, koja se ovih dana uveliko sreće i u Srbiji. Autorka objašnjava za naše prilike nedovoljno poznati termin ESG, pošavši od Pariskog sporazuma o klimatskim promenama, koji je usvojen u atmosferi makar proklamovanog konsenzusa i usaglašenosti razvijenih i zemalja u razvoju. Pošavši od cilja ovog sporazuma, a to je delotvoran i napredan odgovor na pretnju klimatskih promena, kompanije će ubuduće morati da usvoje strategije sa ciljem smanjenja uticaja na životnu sredinu, koji se in ultima linea reflektuju na globalno zagrevanje. Autorka dokazuje da su ESG standardi stubovi otpornosti novog modela poslovanja svih kompanija koje bi pro futuro trebalo da dovedu do ostvarenja cilja klimatske neutralnosti.

Ključne reči: ESG, održivo poslovanje, Pariski sporazum, klimatske promene, odgovornost kompanija

JEL klasifikacija: G11, F34

Uvodna razmatranja

Poslovni ambijent u dvadeset i prvom veku karakterišu bitno drugačije prilike u odnosu na one koje su obeležile prethodni vek. Ključna promena u biznisu je nesumnjivo transformacija cilja poslovanja: dok je u vreme liberalne ekonomije bez imalo neprijatnosti istican profit kao primarna ciljna funkcija poslovanja („maksimizacija profita akcionara/vlasnika kompanije"), poslednjih decenija u prvi plan se ističe etička dimenzija moderne ekonomije (Hart, 2010). Poslovna etika i društvena odgovornost kompanija idu ruku pod ruku i doprinose moralizaciji biznisa (Petrović Tomić, 2008; Vasiljević, 2007). Dobronamerna ekonomija ustupila je mesto čisto tržišnom mehanizmu, koji je pod uticajem savremenih tendencija postao prevaziđen, bar u čistom obliku (Friedman, 1970). Pod uticajem aktivista koji se bore za zaštitu životne sredine, principa dobrog korporativnog upravljanja i zaštite opšteg interesa, došlo se do pojma održivog razvoja, koji polako ali sigurno osvaja i korporativni teren. Od kompanija se danas očekuje da sačine strategije održivog razvoja, kao i da iste implementiraju u svoje poslovanje. Štaviše, ide se ka tome da standardi održivog razvoja budu jedan od elemenata na osnovu koga se odlučuje da li će biznis određene kompanije biti prijemčiv za osiguranje. Da li nas čeka budućnost u kojoj će ESG poslovanje biti ulaznica u svet odabranih/osiguranih kompanija? Po našem mišljenju, takva budućnost je više nego izvesna.

Pogled na Pariski sporazum

U saradnji sa ključnim finansijskim institucijama Ujedinjene nacije su 2005. godine sačinile izveštaj pod nazivom „Ko se brine, taj pobeđuje". U njemu je premijerno upotrebljen termin ESG ulaganje (zaštita životne sredine, društvena odgovornost i korporativno upravljanje – „Environmental, Social and Corporate Governance"). Sledeći bitan korak Ujedinjene nacije preduzele su 2015. godine, održavanjem konferencije o održivom razvoju, na kojoj je usvojen Program globalnog razvoja za 2030. godinu (Agenda 2030) koji se sastoji od 17 Ciljeva održivog razvoja (eng.: Sustainable Development Goals, SDG). Ovi ciljevi se generalno govoreći odnose na zajedničku borbu protiv globalnog zagrevanja, siromaštva, stvaranje uslova za održivu potrošnju (Campbell, 2015). Napori međunarodne zajednice vezani za klimatske promene nastavljeni su zaključenjem Pariskog sporazuma (fran.: Accord de Paris), koji predstavlja novi globalni sporazum o klimatskim promenama (dalje: PS) (Todić, 2017). Najbitniji deo ovog sporazuma je akcioni plan za ograničenje globalnog zagrevanja, koji se odnosi i na države u razvoju koje su ga ratifikovale. Kao globalno pitanje, klimatske promene iziskuju saradnju svih zemalja sveta, kako najrazvijenijih, tako i onih u razvoju (Weart, 2012).

PS je međunarodni ugovor po svojoj pravnoj prirodi, te kao takav za svoje strane predstavlja izvor medjunarodno-pravnih prava i obaveza (Streck, Keenlyside, von Unger, 2016). Glavna svrha PS jeste, kako to proizlazi iz člana 2, nastojanje da se u kontekstu održivog razvoja i borbe za iskorenjivanje siromaštva, pojača globalni odgovor na opasnost od klimatskih promena.

Generalno govoreći, težnja kompanija da postanu održive nije nova ideja. Međutim, 2015. godina donosi značajan preokret, jer je tada usvojen Pariski klimatski sporazum kao „globalni odgovor na pretnje izazvane klimatskim promenama, uvažavajući održivi razvoj", a Ujedinjene nacije predstavljaju Ciljeve održivog razvoja u sklopu Agende 2030. god. Osnovni cilj Konferencije u Parizu bio je postizanje dogovora i usvajanje novog pravno obavezujućeg dokumenta, koji će definisati obaveze država članica Konvencije za period posle 2020. godine i time sprečiti porast temperature na globalnom nivou preko 2 stepena, u skladu sa zahtevima nauke. Iz preambule Pariskog sporazuma proizlazi da je neophodan delotvoran i napredan odgovor na neposrednu pretnju klimatskih promena. Ove inicijative značajno doprinose da se koncept ekološke i društvene odgovornosti redefiniše.

Naglašavamo: Pariski sporazum postavlja okvirni plan delovanja u cilju ograničavanja globalnog zagrevanja (Rosen, 2015). Njegove ključne karakteristike su:

• Dugoročan cilj – jačanje sprovođenja Okvirne konvencije i globalnog odgovora na pretnje izazvane klimatskim promenama u kontekstu održivog razvoja i napora za iskorenjivanje siromaštava (Savaresi, 2016). To podrazumeva tri konkretnije definisana cilja, i to: 1) ograničavanje povećanja prosečne temperature na nivou „znatno ispod 2 stepena Celzijusa", odnosno nastavak napora za ograničavanje povećanja temperature na 1,5 stepeni Celzijusa u odnosu sa pred-industrijski nivo; 2) jačanje sposobnosti adaptacije na negativne uticaje klimatskih promena i jačanje otpornosti na klimu i razvoj zasnovan na niskoj emisiji gasova sa efektom staklene bašte na način koji ne ugrožava proizvodnju hrane; i 3) obezbeđenje odgovarajućih finansijskih sredstava u skladu sa modelima koji podrazumevaju niske emisije sa efektom staklene bašte, te razvoj koji je prilagodljiv u odnosu na klimu.

• Nacionalno utvrđeni doprinosi – pre pariske konferencije i u toku njenog trajanja zemlje su podnele sveobuhvatne nacionalne akcione planove za borbu protiv klimatskih promena (takozvani nacionalno utvrđeni doprinosi) za smanjenje emisija. Sporazumom se utvrđuje kako bi razvijene zemlje trebale imati vodeću ulogu u sprovođenju cilja Sporazuma, a posebna se pažnja posvećuje „malim ostrvskim državama u razvoju," čije obaveze u sprovođenju cilja Sporazuma sam Sporazum utvrđuje na još nižem stepenu obaveznosti, odnosno dobrovoljnosti: „najmanje razvijene zemlje i male ostrvske države u razvoju mogu pripremiti strategije, planove i mere za razvoj u smeru niskog stepena emisija sa efektom staklenih bašti, koji odražavaju njihove posebne nacionalne okolnosti, te obaveštavati o tim strategijama, planovima i merama."

• Ambicija – vlade su se složile da će svakih pet godina izveštavati o svojim akcionim planovima i da će svakim novim planom postavljati ambicioznije ciljeve. Time se ispoljava „hibridna arhitektura" ovog sporazuma u odnosu na sve prethodne instrumente rešavanja gorućih klimatskih problema globalnom akcijom (Bodansky, 2012).

• Transparentnost – zemlje su se dogovorile da će izveštavati jedne druge i javnost o tome kako napreduju u postizanju svojih ciljeva kako bi se osigurali transparentnost i nadzor. Sporazum se oslanja na odgovornosti država za vlastite programe i sastav izveštavanja Stranaka konferencije, kao i na periodično proveravanje sprovođenja Sporazuma kako bi se procenio kolektivni napredak u smeru postizanja svrhe Sporazuma i njegovih dugoročnih ciljeva (što se naziva „globalni pregled stanja") u smislu čl. 12 PS (Salaj, 2017).

• Solidarnost – države članice EU-a i druge razvijene zemlje i dalje će finansirati borbu protiv klimatskih promena kako bi zemljama u razvoju pomogle da smanje emisije i izgrade otpornost u cilju odgovora na posledice klimatskih promena.

Budući da je EU jedna od potpisnica, Pariski sporazum je jedan od osnova za donošenje brojnih direktiva i uredbi. U EU su shvatili da je borba protiv klimatskih promena ključna za budućnost Evrope i sveta. Taj se cilj nadovezuje na obavezu koju su EU i njene države članice preuzele pri potpisivanju Pariskog sporazuma. Ključna ambicija je postizanje klimatske neutralnosti do 2050. godine. Šta u stvari znači klimatska neutralnost i kako EU planira ostvariti taj cilj? U skladu sa zahtevima iz tog sporazuma, EU je pre kraja 2020. godine izradila svoju dugoročnu strategiju smanjenja emisija i ažurirane klimatske planove, u kojima se obvezala da će svoje emisije do 2030. god. smanjiti za najmanje 55 % u odnosu na njihov nivo iz 1990. god.

Šta je ESG i zašto je važan?

Implementacija održivog razvoja u korporativnom kontekstu – pojam ESG standarda

Implementacija održivosti u korporativnom svetu prošla je određeni razvojni put. Najpre, na osnovu implementacije regulativa o zaštiti radnika i životne sredine tokom osamdesetih godina prošlog veka u korporativnom svetu raste značaj zdravlja, zaštite i bezbednosti radnika, kao i ekološkog uticaja poslovanja. Devedesetih godina prošlog veka održivi razvoj dobija sve više na značaju, s tim da je fokus stavljen na smanjenje negativnog uticaja na životnu sredinu. Početkom 21. veka, u daljim pokušajima da ostvare održivost, kompanije razvijaju koncept društveno odgovornog poslovanja (eng. Corporate Social Responsability – CSR). S obzirom na goruće ekološke i klimatske probleme, danas CSR polako evoluira u ESG koncept, sa ciljem da se uticaj kompanija kvantifikuje i rangira po industrijama u skladu sa stepenom održivosti. Buđenje svesti o značaju održivog razvoja dovodi do toga da se od samoregulacije i dobrovoljnih aktivnosti pređe na zakonodavnu delatnost. Lider u normiranju pitanja od značaja za održivi razvoj je EU, koja je usvojila brojna pravila koja regulišu ovu oblast, uključujući zahteve i standarde nefinansijskog izveštavanja (Direktiva 2014/95/EU Evropskog parlamenta i Veća o izmeni Direktive 2013/34/EU u pogledu objavljivanja nefinansijskih informacija i informacija o raznolikosti određenih velikih preduzeća i grupa, OJ L 330, 15.11.2014. god., poznatija kao NFRD (engl.: Non-Financial Reportive Directive), ESG merila, zahteve o izveštavanju za kompanije, preporuke o negovanju dugoročnog pristupa korporativnom upravljanju, usmeravanju tokova kapitala u održive ekonomske aktivnosti, itd. U EU postoji impresivna regulativa usvajana tokom prethodnih decenija, a naročito godina, u cilju olakšanja društvene i ekološke transparentnosti velikih kompanija, kao i olakšanja procene stejkholdera o održivosti kompanije za koju su zainteresovani. U EU, dakle, postoji kompleksan paket ESG regulative, koji iziskuje rad na usklađivanju poslovanja (Petrović Tomić, 2021).

Skraćenica ESG potiče od reči Environmental (životna sredina), Social (društvena zajednica) i Governance (upravljanje) (Lund, Pollman, 2021; Pargendler, 2021). U pitanju je kišobran pojam (eng.: umbrella term), sada već odomaćen u korporativnom svetu i koji pruža fleksibilan okvir koji varira u zavisnosti od konteksta, koji je globalno primenljiv, koji evoluira i koji se može raščlaniti na brojne podteme i koji se odnosi kako na najširi krug investitora, tako i na širok spektar zainteresovanih lica (Pollman, 2022).

Kada se upotrebi akronim ESG uz njega se sreću sledeće odrednice: „kriterijumi", „faktori", „standardi", „strategija", „rizici", „aktivnosti", „ciljevi", itd. Da li ESG upućuje na tri stuba na osnovu kojih se vrednuje održivost kompanije? (Booth, Nicholas, Singhai, 2020). Ili je to set standarda koje socijalno osvešćene (probuđene) kompanije koriste radi procene potencijalnih ulaganja? Upravo ove karakteristike mogu biti i najveća pogodnost i najveća mana ESG standarda, već prema okolnostima slučaja. Dok je po jednima ESG odlika savesnog biznisa, odnosno probuđenog kapitalizma, po drugima je ovaj koncept samo dobro osmišljeni marketing, odnosno obmanjivanje investitora (fenomen greenwashing), koje navodi na pogrešne zaključke korporativnu javnost, odnosno prikriva odgovornost kompanija (Pollman, 2022). Najlakše je postići konsenzus oko toga da je skoro sve u vezi sa pojmom ESG prilično nejasno i da je neophodan teorijski okvir, kojim bi se postavila polazna osnova daljih istraživanja.

ESG kriterijumi predstavljaju set standarda koje banke i drugi investitori razmatraju ukoliko imaju težnju da ulažu novac u ekološke i društveno korisne projekte. Ekološki kriterijumi treba da pokažu koliko se neka kompanija vodi ekološkim principima u svom poslovanju, odnosno koliko kroz svoje aktivnosti štiti životnu okolinu. Kriterijum društvene zajednice pokazuje koliko kompanija upravlja odnosima sa zaposlenima, dobavljačima, kupcima i, generalno, sa životnom zajednicom u kojoj posluje. Kriterijum načina upravljanja jedne kompanije bavi se time kako upravlja svojim procesima, na koji način nagrađuje menadžere, kako sprovodi interne revizije i kontrole i koja su prava akcionara.

Kada je reč o pravnoj prirodi ESG, postoji nekoliko gledišta. Prvo, ESG kriterijumi se posmatraju kao faktori koji su normalno integrisani u mainstream investicionu analizu. Kada se stvari ovako postave, ESG nije sinonim za etičko investiranje, već deo investicione strategije (Pollman, 2022). Drugo, ESG je sredstvo upravljanja rizikom. Po ovoj liniji razmišljanja, ESG nije samo metod identifikovanja investicionih mogućnosti, već i upravljanja rizikom. Za mnoge investitore i profesionalne menadžere, ključno upravljanje za implementaciju ESG faktora u investicionu analizu je njihov mogući učinak na nivo rizika u portfelju određene kompanije. U skladu sa ovim stanovištem, u razvijenim kulturama korporativnog upravljanja, ESG se razvio u odvojenu funkciju, sa ciljem vršenja monitoringa i upravljanja rizicima sa kojim se kompanije suočavaju zbog uticaja ekoloških i društveno angažovanih pitanja. Treće, ima onih koji ESG konceptualno izjednačavaju sa društvenom odgovornošću kompanija i nove termin smatraju sinonimom.

Stubovi otpornosti poslovanja i nužan uslov osigurljivosti biznisa

Posmatrano iz ugla poslovne prakse, manje je bitna pravna kvalifikacija ESG principa. Od krucijalnog je značaja ukazati na ulogu koju oni imaju ili će imati u biznisu. ESG se koristi kao okvir za procenu kako neka kompanija upravlja rizicima i prilikama koje promenljivi tržišni i ne-tržišni uslovi kreiraju. Promenljivost se ogleda kroz promene u ekološkim, društvenim i ekonomskim sistemima, koji utiču na celokupan ambijent u kome kompanije posluju. Akcenat je na prilagođavanju poslovnih ciljeva. Paragraf 14 Preambule SFDR Uredbe definiše rizik održivosti kao ekološki, društveni ili korporativni događaj (slučaj), čije ostvarenje može uzrokovati stvaran ili potencijalno negativan bitan učinak na vrednost ulaganja, dok su „činioci održivosti" u smislu člana 2 (24) iste Uredbe ekološka i socijalna pitanja, pitanja u vezi sa zaposlenima, poštovanjem ljudskih prava, borbom protiv korupcije i podmićivanjem. Od učesnika na finansijskom tržištu očekuje se da objavljuju politike u vezi sa uključivanjem rizika održivosti u svoj proces odlučivanja o ulaganjima.

ESG faktori koji determinišu održivost poslovanja nisu samo trend u EU ili u razvijenim državama (Pietrancosta, des Grottes, 2022). Oni su u središtu novog, holističkog pristupa vođenju poslovanja koji je direktno suprotan tradicionalnoj analizi maksimizacije profita. Na osnovu analize dostupne literature, koja je uglavnom nepravna, može se zaključiti da koncept održivog poslovanja pozajmljuje elemente četiri bolje etablirana koncepta: 1) održivi razvoj; 2) korporativna društvena odgovornost; 3) teorija zaštite interesa zainteresovanih lica i 4) teorija odgovornosti kompanija (Sjäfjell, Bruner, 2020; Wilson, 2003; Peterdy, 2022).

Imajući u vidu doprinos korporativne odgovornosti, odnosno usvajanja standarda održivog razvoja reputacionom imidžu kompanija, ESG koncept predstavlja neku vrstu osiguranja od štete za ugled, koje je uočljivo u poslovnom upravljanju prema najboljim praksama (Tafra-Vlahović, 2009). Pod uticajem ovog trenda, jezik i merila poslovanja su se preokrenuli. Biznis prema izmenjenom shvatanju služi tome da se zarađenim profitom učini nešto korisnije i bolje za čoveka, odnosno zajednicu (Zaradi profit da bi činio dobro, a ne Čini dobro da bi zaradio profit!). S tim u vezi, došlo je i do semantičkog prilagođavanja. Od 2000. godine pa na dalje sve češće je u upotrebi izraz „korporativna društvena mogućnost", čime se impliciraju mogućnosti koje povlači opredeljenje kompanije u prilog odgovornog poslovanja. Razlika u odnosu na raniji koncept sastoji se samo u njegovoj nadogradnji. Dok je u konceptu odgovornog poslovanja akcenat na standardima koji obezbeđuju trenutni imidž korporativnog odgovornog građanina, kod održivog poslovanja insistira se na poslovnom modelu koji će dugoročno obezbediti promociju vrednosti koje su usklađene sa opštim interesom. Sve više kompanija i deklarativno i suštinski potvrđuje svoj izbor u pogledu odgovornog poslovanja (ne moram biti odgovoran, već biram biti odgovoran, jer to znači dobar biznis!) (Handy, 2003).

Iako u ovom trenutku postoje velike razlike u pogledu pravnog okvira, činjenica je da je ESG uveliko u fokusu: u vodećim državama i finansijskim institucijama već postoji regulatorni okvir, dok se u državama koje kaskaju u razvoju rasprava o ESG tek otvara. U svakom slučaju, kompanije koje posluju na globalnom planu moraju uvrstiti u svoju poslovnu agendu pripreme za ono što je već nova realnost, jer je to jedini način da formiraju stubove otpornosti. Samo od njih i njihove ažurnosti zavisiće da li će ESG predstavljati poslovnu šansu ili pretnju (Almeyda, Darmansyah, 2019).

Uloga osiguranja u procesu verifikacije održivog poslovanja

Kao profesionalci u preuzimanju i upravljanju rizikom, osiguravači i reosiguravači, i industrija kao takva, igraju značajnu ulogu u promovisanju ESG. Ne samo što imaju finansijski potencijal da stvore fondove koji će smanjiti rizike njihovih klijenata, već su i u poziciji da utiču na razvoj društva. Pri tom ne smemo zaboraviti da na poslovanje sektora osiguranja najviše utiče kapital poverenja, koji se godinama gradi, a za neverovatno kratko vreme može biti doveden u pitanje. U teoriji se, naime, predlaže da se odnos sa klijentima gradi na 5P konceptu: purpose, pride, partnership, protection and personalization (Selimović, Danijela Martinović, Džana Hurko, 2020). Upravo krizna razdoblja poput onoga kroz koje prolazimo pružaju priliku osiguravačima i uopšte industriji osiguranja da se izdigne i pokaže šta istinski znači društvena odgovornost kompanija. Isto tako, osiguravači u svojstvu investitora su izloženi riziku pada vrednosti kompanija u koje oni investiraju, između ostalog i zbog neuvažavanja ESG standarda. Stoga, investiranje u odnos sa klijentima i upravljanje reputacionim rizikom čine osnovu održivog razvoja osiguravajućih kompanija (Khovrak, 2020).

Sektor osiguranja odgovara na izazov održivog poslovanja strategijom koja se odnosi na preuzimanje rizika i investicije, što je dovelo do usvajanja Principa održivog razvoja u osiguranju (skraćeno: PSI). Vodeći osiguravači su inkorporisali odredbe o zaštiti životne sredine u odredbe o osiguravajućem pokriću i strategije preuzimanja rizika, usmeravajući svoj biznis ka ekološki održivim kompanijama (Capiello, Lagasio, Santoboni, 2020). Uloga osiguravača je u najmanju ruku dvostruka. Oni najpre kao izuzetno moćni igrači na finansijskom tržištu treba da obezbede da njihov portfolio ulaganja i vođenja poslovanja bude održiv. Drugo, oni vrše screening funkciju, budući da je izgledno da će usklađenost poslovanja sa ESG standardima i zahtevima postati jedan od faktora osigurljivosti rizika kompanija. One kompanije za koje se ispostavi da nisu implementirale nova pravila igre, mogle bi ostati bez osiguravajućeg pokrića.

Nakon predstavnika same industrije, i tela nadzora su uvrstila agendu održivosti u vršenje nadzorne funkcije. Polazeći od instrukcija Evropske komisije, EIOPA je 2019. god. objavila završni izveštaj o tehničkom savetu o integraciji rizika i činioca održivosti u delegirane akte vezane za Solventnost II i IDD. Kada je reč o samim rizicima održivosti i uopšte politici održivosti pri donošenju investicionih odluka, EIOPA je istakla kako će to uticati na ključne funkcije, a najviše funkciju upravljanja rizikom, načelo savesnosti, pisane politike o upravljanju rizicima, kao i na sopstvenu procenu rizika (eng.: ORSA - Own Risk and Solvensy Assessment) (Alfier, 2020). EIOPA je objavila posebno mišljenje o održivosti u kontekstu Solvency II, sa akcentom na ublažavanje posledica klimatskih promena. Mišljenje se odnosi na integraciju rizika povezanih sa klimatskim promenama prema zahtevima Solvency II. U mišljenju je istaknuto da bi osiguravači trebalo da testiraju svoju izloženost rizicima održivosti, jer će oni pro futuro itekako uticati na sektor osiguranja.

Jedan od izazova sa kojim će morati da se suoče učesnici na finansijskom tržištu sastoji se u uspostavljanju adekvatnih sistema za obradu ESG podataka, izračunavanje ESG rizika i uvođenje internih pravila i politika vezanih za ESG standarde. Posebno će biti izražena obaveza nadzornih tela da daju uputstva subjektima na koje se odnosi nova regulativa o pravilnoj implementaciji novih obaveza. Ostaje bojazan da će različiti delovi finansijskog sektora usvojiti različite strategije implementacije standarda održivog poslovanja, što bi moglo dovesti do neujednačene prakse. Tako nešto u velikoj meri može biti posledica nedovoljnog poznavanja materije, koja je sadržana u brojnim dokumentima i koja se stalno nadograđuje usvajanjem novih standarda.

Zaključak

ESG predstavlja jedan od najznačajnijih trendova korporativnog upravljanja, investicija i uopšte savremenog korporativnog prava. Iako je termin na dnevnoj agendi savremenog poslovnog čoveka, malo njih zaista zna odakle potiče kovanica ESG, ko je izmislio, ostvarenju kojih ciljeva je izvorno trebalo da posluži. Ono što se sa izvesnošću može reći je da pojava ESG strategije označava buđenje kapitalizma i prelazak iz faze maksimizacije profita u fazu dobronamerne i održive ekonomije.

ESG kriterijumi predstavljaju set standarda koje banke i drugi investitori razmatraju ukoliko imaju težnju da ulažu novac u ekološke i društveno korisne projekte. Ekološki kriterijumi treba da pokažu koliko se neka kompanija vodi ekološkim principima u svom poslovanju, odnosno koliko kroz svoje aktivnosti štiti životnu okolinu. Kriterijum društvene zajednice pokazuje koliko kompanija upravlja odnosima sa zaposlenima, dobavljačima, kupcima i, generalno, sa životnom zajednicom u kojoj posluje. Kriterijum načina upravljanja jedne kompanije bavi se time kako upravlja svojim procesima, na koji način nagrađuje menadžere, kako sprovodi interne revizije i kontrole i koja su prava akcionara.

ESG standardi ne mogu biti zanemareni od strane kompanija koje pretenduju na imidž održivog poslovanja. Kako svest o održivosti pojačano utiče na zahteve potrošača i kako se regulatorna pažnja usmerava ka ovim temama, kompanije se moraju izjasniti u pogledu ovih zahteva kako kroz poslovnu strategiju, tako i u day-to-day poslovanju. Ovo će biti značajno zbog očuvanja reputacije, ali i konkurentnosti na tržištu koje se suočava sa sve suptilnijim i zahtevnijim potrošačima.

Da zaključimo: usvajanje ESG strategije više nije stvar izbora. Ovaj koncept je, zapravo, nametnut svima, od građana do države. Izveden iz ideje da ako velike kompanije učestvuju u stvaranju problema, logično je da imaju ključnu ulogu u pronalaženju rešenja. Na nivou EU je do sada već dovoljno učinjeno u pogledu normiranja ekološki održivog poslovanja. Osim Direktive kojom je uvedena obaveza sačinjavanja izveštaja sa nefinansijskim pokazateljima poslovanja, EU je usvojila i kriterijume na osnovu kojih se privredne, a posebno, finansijske delatnosti klasifikuju kao ekološki održive, tranzicione ili neodržive.

Kao lideri u upravljanju rizikom, osigurači i reosiguravači igraju značajnu ulogu u promociji ESG poslovanja. ESG kriterijumi se smatraju glavnim faktorima procene održivog i etičkog uticaja kompanija. Industrija osiguranja svakako prednjači u usvajanju i promociji ESG standarda i politika. Kao osvedočeni stručnjaci za upravljanje rizikom, predstavnici industrije osiguranja uzimaju u obzir rizik neodrživog poslovanja i sa njime se nose na jedan način: ne primaju u pokriće kompanije čije poslovanje odstupa od standarda prihvaćenih u EU. Naše je predviđanje da će budućnost doslovno izgledati na sledeći način. Ako je kompanija implementirala ESG model poslovanja, moći će da se učlani u klub osiguranih/ili bolje reći odabranih. Ako nije postigla usklađenost poslovanja u ovom segmentu, nijedan društveno odgovoran osiguravač neće želeti da se upušta u avanturu osiguranja njenog biznisa. Ovaj scenario, pri tom, nije isključivo zamisliv za EU. S obzirom na opseg obaveza iz regulatorne trilogije EU, svaki izvoznik/kompanija koja želi da posluje u EU, moraće da se povinuje novoustanovljenim trendovima ekološki održivog i uopšte osvešćenog poslovanja, nezavisno od toga da li pripada svetu EU ili je osnovana u nekoj od država tzv. trećeg sveta.

Iako u ovom trenutku postoje velike razlike u pogledu pravnog okvira, činjenica je da je ESG uveliko u fokusu: u vodećim državama i finansijskim institucijama već postoji regulatorni okvir, dok se u državama koje kaskaju u razvoju rasprava o ESG tek otvara. U svakom slučaju, kompanije koje posluju na globalnom planu moraju uvrstiti u svoju poslovnu agendu pripreme za ono što je već nova realnost, jer je to jedini način da formiraju stubove otpornosti. Samo od njih i njihove ažurnosti zavisiće da li će ESG predstavljati poslovnu šansu ili pretnju.

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SUSTAINABLE BUSINESS – ARE ESG STANDARDS POWERING THE RESILIENCE OF A NEW BUSINESS MODEL?

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Summary: The modern world requires companies to work on strengthening their responsibility. In recent years, the concept of sustainable business was placed in the forefront, and it relies on three pillars: ecologically acceptable profiting, good corporate governance, and care about social issues. That is the core of the abbreviation that has been increasingly present in Serbia, as well. The author explains the term ESG, as it is insufficiently familiar in her region, starting from the Paris Agreement on climate change, adopted in a proclaimed consensus and harmonisation of developed and developing countries. Starting from the aim of this Agreement, which is an efficient and advanced response to the threat of climate change, companies will from here on out have to adopt strategies to reduce their environmental impact, which is ultimately reflected on global warming. The author proves that ESG standards are powering the resilience of the new business models for all companies, which should lead to reaching climate neutrality in the future.

Keywords: ESG, sustainable business, The Paris Agreement, climate change, corporate responsibility

JEL classification: G11, F34

Introductory Remarks

The business environment of the 21st century is characterised by significantly altered circumstances than those that had marked the previous century. The transformation of the business aim is undoubtedly a key change in business operations: while profit had been unashamedly highlighted as a primary business goal in the era of liberal economics ("shareholder/owner profit maximisation"), the ethical value of modern economics has been in the forefront in the previous decades (Hart, 2010). The corporate business ethics and social responsibility go hand in hand and contribute to the moralisation of business (Petrović Tomić, 2008; Vasiljević, 2007). Well-intentioned economics has been replaced with a purely market-based mechanism, which became obsolete due to modern tendencies, at least in its pure form (Friedman, 1970). Under the influence of activists advocating for protection of the environment, good corporate governance principles, and the protection of common interests, the term "sustainable development" immerged, and slowly but surely it started spreading into the field of corporate business. Companies are now expected to draft sustainable development strategies, as well as to implement them into their operations. Moreover, the tendency is to make sustainable development standards one of the key elements that determine whether a company's business will be open to insurance. Are we looking at

An Overview of the Paris Agreement

In cooperation with key financial institutions, the UN drafted a report in 2005, titled "Who Cares, Wins". It first featured the term ESG investments (Environmental, Social and Corporate Governance). The UN made its next important step in 2015, by holding a conference on sustainable development, where the Global Development Programme for 2030 was adopted, containing 17 Sustainable Development Goals (SDG). These goals are generally focused on the joint efforts of fighting global warming and poverty, and creating conditions for sustainable consumption (Campbell, 2015). The efforts of the international community regarding climate change continued with the signing of the Paris Agreement (Accord de Paris), a new global agreement on climate change (Todić, 2017). The most important part of this agreement is the Action Plan for limiting global warming, which also relates to the developing countries which ratified it. As a global issue, climate change demand cooperation of all countries worldwide, both the most developed ones, and the developing countries (Weart, 2012). The PA is legally an international agreement, and hence is a source of international law and obligations (Streck, Keenlyside, von Unger, 2016). The main purpose of the PA, according to Article 2, is to strive to strengthen the global response to the danger of climate change, in the context of sustainable development and fight to end poverty.

In general, the endeavour of companies to become sustainable is not a new idea. However, a significant turning point happened in 2015, when the Paris Agreement was adopted, as a "global response to threats caused by climate change, bearing in mind sustainable development", and the United Nations presented the Sustainable Development Goals within the 2030 Agenda. The core goal of the Paris Conference was to reach an agreement and adopt a new, legally binding document, to define the obligations of the Convention's member countries, for the period after 2020, and thus prevent a global temperature increase of over 2 degrees, in accordance with scientists' demands.

The preamble of the Paris Agreement stipulates that an effective and advanced response to the imminent threat of climate change is necessary. These initiatives significantly contribute to redefining the concept of ecological and social responsibility.

We note: the Paris Agreement sets and framework for acting with the aim of limiting global warming (Rosen, 2015). Its key characteristics are as follows:

• Long-term goal – strengthening the implementation of the Framework Convention and the global response to threats caused by climate change in the context of sustainable development and efforts to eradicate poverty (Savaresi, 2016). This includes three more specifically defined goals: 1) limiting the increase of average temperature at the level "significantly below 2 degrees Celsius", i.e., continuing the efforts to limit the temperature increase to 1.5 degrees Celsius compared to the preindustrial level; 2) strengthening the ability to adapt to the negative effects of climate change and strengthening climate resilience and development based on a low emission of greenhouse gasses, in a way that does not endanger food production; and 3) securing appropriate financial means, in accordance with models that include low emissions of greenhouse gasses, and development that is adaptable with respect to climate.

• Nationally defined contributions – prior to the Paris Conference and during its programme, countries had submitted thorough national action plans for fighting climate change (so called nationally defined contributions) to reduce emissions. The Agreement defines how the developed countries should have a leading role in implementing the goal of the Agreement, while special attention should be given to "small, developing island countries" whose obligations in implementing the goals of the Agreement are defined by the Agreement to be less bindings, i.e., based on their willingness: "the least developed countries and small developing island countries can prepare strategies, plans, and measures for development in terms of low emissions of greenhouse gasses, which reflect their specific national circumstances, and then report on those strategies, plans, and measures".

• Ambition – the governments agreed to report every five years on their action plans and to set more ambitious goals with each new plan. Thus, a "hybrid architecture" of this agreement is achieved, compared to all previous instruments of solving key climate problems through global action (Bodansky, 2012).

• Transparency – the countries agreed to report to each other and the public on how far they are getting in terms of achieving their goals so as to ensure transparency and supervision. The Agreement is based on the responsibilities of the countries for their own programmes and the contents of their reports to the members of the conference, as well as to periodically monitor the implementation of the Agreement, in order to estimate the collective improvement towards achieving the purpose of the Agreement and its long-term goals ("global overview") in terms of Article 12 of the PA (Salaj, 2017).

• Solidarity – EU member states and other developed countries shall still finance the fight against climate change, so as to help developing countries to reduce emissions and build resilience, in order to respond to the consequences of climate change.

Seeing as how the EU is one of the parties in this Agreement, the PA is one of the bases for adopting numerous directives and regulations. The EU realised that the fight against climate change is key for the future of Europe and the world. This goal is linked to the obligation undertaken by the EU and its member states when signing the PA. Achieving climate neutrality by 2050 is a focal ambition. What is climate neutrality and how does the EU plan to achieve it? In accordance with the demands of that agreement, the EU drafted its long-term emission decreasing strategy by the end of 2020 and updated its climate plans, where it undertook to lower its emissions by 2030, by at least 55% compared to the levels from 1990.

What is ESG and Why is it Important?

Implementation of sustainable development in a corporate context – the concept of ESG standards

The implementation of sustainability in a corporate context has had its own road of development. Firstly, the implementation of worker and environmental protection regulations during the 1980s caused an increased importance of health, protection and safety of workers, as well as the ecological impact of business. During the 1990s, sustainable development gained more and more importance, with the focus being on the reduction of the negative environmental impact. At the start of the 21st century, companies developed a concept of corporate social responsibility (CSR) with their endeavours to achieve sustainability. Bearing in mind the burning ecological and climate issues, CSR is now slowly evolving into an ESG concept, with an aim to quantifying the impact of companies and rank it by industry, in terms of their level of sustainability. Raising awareness on the importance of sustainable development leads to the shift from self-regulation and voluntary activities towards law-making activities. EU is a leader in regulating key issues of sustainable development, adopting numerous rules regulating this field, including demands and standards of nonfinancial reporting (Directive 2014/95/EU of the European Parliament and Council on amending Directive 2013/34/EU in terms of publishing nonfinancial information and information on the diversity of certain large companies and groups, OJ L 330, 15.11.2014, aka Non-Financial Reporting Directive), ESG indicators, requests for reporting for companies, recommendations for fostering a long-term approach to corporate management, directing capital flows into sustainable economic activities, etc. The EU has impressive regulations adopted in the previous decades and years, with the aim to ease social and ecological transparency of large companies, as well as to ease stakeholders' assessments on the sustainability of a company they are interested in.

The EU thus has a complex package of ESG regulations, which demands work on business compliance (Petrović Tomić, 2021).

The abbreviation ESG stands for Environmental, Social and Governance (Lund, Pollman, 2021; Pargendler, 2021). This is an umbrella term, now in standard use in the corporate world, providing a flexible framework varying in respect of context, it has worldwide applicability, its meaning is evolving, and it can be segmented into various subtopics and relate to a wide spectrum of investors and interested persons (Pollman, 2022). When the acronym ESG is usually used with the collocations: "criteria", "factors", "standards", "strategy", "risks", "activities", "goals", etc. Does ESG point to the three pillars on which the sustainability of a company is measured? (Booth, Nicholas, Singhai, 2020) Or is it a set of standards that socially progressive companies use to assess potential investments?

These characteristics can be one of the largest benefits and the largest flaw of ESG standards, depending on the circumstances. While some consider ESG a trait of conscientious business, i.e., enlightened capitalism; others see it as well thought out marketing, or misleading investors (the greenwashing phenomenon) and the corporate public, and covering up a company's responsibility (Pollman, 2022). It is easiest to reach a consensus on everything about ESG being pretty unclear, and that a theoretical framework is necessary to set a basis for further research.

ESG criteria are a set of standards that banks, and other investors, consider if they want to invest in ecological and socially responsible projects. Ecological criteria should indicate how much a company is mindful of ecological principles in its operations, i.e., how much it protects the environment through its activities. The social criterion shows how much a company manages its relations with employees, procurers, buyers and, generally, the society in which it operates. The governance criterion deals with the management of processes, awarding managers, undertaking internal audits and control, and shareholders' rights.

When it comes to the legal nature of ESG, there are several viewpoints. Firstly, ESG criteria are considered factors normally integrated into mainstream investment analysis. From that point of view, ESG is not synonymous with ethical investment, but a part of the investment strategy (Pollman, 2022). Secondly, ESG as a means of risk management. From this perspective, ESG is not just a method of identifying investment possibilities, but also a method of risk management. For many investors and professional managers, the key of implementing ESG factors into the investment analysis is their possible impact on the levels of risk in a company's portfolio. In line with this view, ESG has developed into a separate function in developed corporate management cultures, in order to monitor and manage risks that companies face due to ecological and social matters. Thirdly, there are some who conceptually equate ESG with social responsibility of companies and consider the new terms synonymous.

Powering the Business Resilience and a Necessary Condition of Business Insurability

From the view of business practice, the legal qualification of ESG principles is less important. It is crucial to highlight the role they have or will have in business. ESG is used as a framework for assessing the way a company manages risks and opportunities that the fluctuating market and non-market conditions create. This changeability is featured in changes in ecological, social and economic systems, that affect the entire environment in which companies operate. The focus is on adapting business goals. Paragraph 14 of the preamble of the SFDR Direction defines the sustainability risk as an ecological, social, or corporate event whose realisation can cause a real or potentially negative important impact on the value of investment, while the "sustainability element" in terms of Article 2 (24) of the same Directive are the ecological and social issues, employee issues, respecting human rights, the fight against corruption and bribery. Participants on the financial market are expected to publish policies on including sustainability risk into their decision-making process, in terms of investments.

ESG factors determining the sustainability of business are not just a trend in the EU or developed countries (Pietrancosta, des Grottes, 2022). They are the core of a new, holistic approach to business, that is directly opposite from the traditional analysis of profit maximisation. Based on the analysis of the available literature, mostly non-legal in nature, it can be concluded that the concept of sustainable business borrows elements from four better established concepts: 1) sustainable development; 2) corporate social responsibility; 3) theory of protecting stakeholders' interests; 4) company responsibility theory (Sjäfjell, Bruner, 2020; Wilson, 2003; Peterdy, 2022)

Bearing in mind the contribution of corporate responsibility, i.e., the adoption of sustainable development standards for the reputational image of a company, the ESG concept is a sort of insurance from reputational damages, as can be seen in business management according to best practices (Tafra-Vlahović, 2009). Due to this trend, the language and indicators of business have shifted. According to this altered view, the goal of business is to do something useful or better for mankind and the community, with the earned profits ("Earn profit to do good", and not "Do good to earn profit"!). Similarly, a semantic adjusting occurred. Since 2000, the term "corporate social possibility" has been more commonly used, implying the possibilities stemming from a company's decision to operate responsibly. The difference compared to the earlier concept is in its further broadening. While the basis of the concept of responsible business are the standards enabling the current image of a corporate, responsible citizen, sustainable business insists on the business model for a long-term promotion of values in line with the general best interest. More and more companies, both declaratively and truly confirm their choice when it comes to responsible business (I do not have to be responsible, but I choose to be responsible, because it means good business!) (Handy, 2003).

Although there are still large discrepancies in terms of the legal framework, ESG is, for a fact, largely in focus: leading countries and financial institutions already have a regulatory framework, while developing countries are just now raising the issue of ESG. Nonetheless, companies operating globally must amend their business agendas with preparations for the new reality, as that is the only way to build resilience. Whether ESG will be a business opportunity, or a threat, depends on the companies and their response-time (Almeyda, Darmansyah, 2019).

The Role of Insurance in the Sustainable Business Verification Process

Insurers and reinsurers, as professionals in taking on and managing risk, together with the entire industry as such, play a key role in promoting ESG. Not only do they have the financial potential to create funds to lower their clients' risks, but they are also in the position to influence the development of society. Also, we must note that the work of the insurance sector is mostly influenced by the trust capital, that takes years to build and can be compromised in an unbelievably short time. In theory, it is suggested that relationships with clients should be built on the 5P concept: purpose, pride, partnership, protection, and personalization (Selimovic, Danijela Martinovic, Džana Hurko, 2020). Periods of crisis, like the one we are currently facing, give an opportunity to insurers and the insurance industry in general to rise above and show the true meaning of social responsibility of companies. Likewise, insurers in the role of investors are exposed to the risk of decreasing value of companies they invest in, among other things due to noncompliance with ESG standards. Thus, investing into client relationships and managing reputational risk are the basis of sustainable development of insurance companies (Khovrak, 2020). The insurance sector responds to the challenge of sustainable business with the strategy that includes taking on risks and investments, which led to the adoption of the Principles of Sustainable Development in Insurance (PSI). Leading insurers incorporated the provisions on environmental protection into provisions on insurance coverage and risk-taking strategies, directing their operations towards ecologically sustainable companies (Capiello, Lagasio, Santoboni, 2020). The role of insurers is at least twofold. They are most of all incredibly strong players on the financial market and they must secure their investment and management portfolio and make it sustainable.

Secondly, they perform the screening function, as it is evident that compliance with ESG standards and demands will become one of the factors of the insurability of companies' risk. Those companies that do not end up implementing the new rules of the game, might be left with no insurance coverage.

Following the industry representatives, the supervisory bodies have also added the sustainability agenda into their supervisory function. Starting from the European Commission, in 2019 EIOPA published a final report on the technical advice on integrating risk and sustainability factors into delegated acts linked to Solvency II and IDD. When it comes to sustainability risks and the general sustainability policy when making investment decisions, EIOPA pointed out that this will impact key functions, and mostly with risk management function, the conscientiousness principle, the written risk management policies, and the Own Risk and Solvency Assessment) (Alfier, 2020). EIOPA published a special opinion on sustainability in the context of Solvency II, with a focus on mitigating climate change consequences. This opinion concerns the integration of risk connected to climate change, based on the requirements of Solvency II. The opinion highlights that insurers should test their sustainability risk exposure, as they will pro future have a great impact on the insurance sector.

One of the challenges that players on the financial market will have to face is the establishment of adequate systems for processing ESG data, calculating ESG risk, and adopting internal rules and policies for ESG standards. It will be highly necessary for supervisory bodies to provide directions for those subject to this new regulation on the appropriate implementation of new obligations. The possibility remains that different parts of the financial sector could adopt different strategies of implementing sustainable business standards, which could lead to unharmonized practices. Something like that could be a significant consequence of insufficient knowledge on the matter which is contained in numerous documents and is constantly updated by the adoption of new standards.

Conclusion

ESG is one of the most significant trends of corporate management, investments, and contemporary corporate law as a whole. Although the term is now on the daily agenda of the modern businessman, few of them know where the abbreviation comes from, who came up with it, and which goals it had originally been made to achieve. What can be said with certainty is that the emergence of ESG strategies signifies the waking of capitalism and the transition from the phase of maximising profit to the phase of benevolent and sustainable economics.

ESG criteria are a set of standards which banks and other investors consider if they lean towards investing into ecological and socially beneficial projects. The ecological criterion should show how much a company is following ecological principles in its operations, i.e., how much it protects the environment through its activities. The social criterion shows how much a company manages its relations with employees, procurers, buyers and, generally, the society in which it operates. The governance criterion deals with the management of processes, awarding managers, undertaking internal audits and control, and shareholders' rights.

ESG standards cannot be disregarded by companies that want to achieve an image of sustainable operations. As the awareness on sustainability increasingly affects the consumers' demands, and as the regulations are more focused on these issues, companies must respond to these demands, both through business strategies, and through day-to-day operations. This will be significant for reputation maintenance, and for competition on the market that is faced with increasingly more subtle and demanding consumers.

To conclude: adopting an ESG strategy is no longer a matter of choice. This concept is, essentially, imposed on everyone, from the citizens to the state. It was deduced from the idea that if large companies take part in the creation of a problem, they should, logically, have a key role in finding a solution. So far enough has been done at the EU level to define ecologically sustainable business. Aside from the Directive establishing the obligation of drafting reports with nonfinancial business indicators, the EU also adopted the criteria for the classification of economic, and especially financial activities as ecologically sustainable, transitional, or unsustainable.

As leaders in risk management, insurers and reinsurers play a key role in the promotion of ESG business. ESG criteria are the main factors of estimating sustainable and ethical impact of companies. The insurance industry certainly spearheads the adoption and promotion of ESG standards and policies. As certified risk management experts, the insurance industry representatives take into account the risk of unsustainable business and handle it in their way: they do not cover companies whose business deviates from the standards accepted by the EU. Our estimate is that the future will literally look as follows. If a company has integrated an ESG business model, it will be able to join the club of the insured/or better said the selected. If it did not achieve compliance in this segment, no socially responsible insurer will want to be adventurous and insure their business. By the way, this scenario is not exclusively likely in the EU alone. Considering the scope of obligations defined by the regulatory trilogy of the EU, each exporter/company that wants to work in the EU, will have to comply with the newly established trends of ecologically sustainable and enlightened operations, regardless of whether they are part of the EU or if they were established in one of the so called third world countries.

Although there are still large discrepancies in terms of the legal framework, the fact is that ESG has largely been in focus: leading countries and financial institutions already have a regulatory framework, while developing countries are just raising the issue of ESG. In any case, companies operating on a global level must add preparation for the new reality to their business agenda, since that is the only way to build resilience. Whether ESG will become a business opportunity, or a threat depends solely on these companies and their responses.

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BAROMETAR/BAROMETER

NOVEMBAR 2021 – OKTOBAR 2023. / NOVEMBER 2021 – OCTOBER 2023

1. PROMET / TURNOVER

Mesec/ Month	Listing	Open Market	Regulisano Tržište/Regulated market	MTP/MTF	Ukupno/ Total	Broj transakcija/ Number of transactions
Oktobar 2022	1.382.479.554	84.339.714,00	1.466.819.268	440.877.757,00	1.907.697.025	1.642,00
Septembar 2022	850.312.236	92.472.647,00	942.784.883	22.516.108,00	965.300.991	1.774,00
Avgust 2022	4.479.060.082	459.733.906,00	4.938.793.988	29.345.450,00	4.968.139.438	2.300,00
Jul 2022	354.339.606	178.637.741,00	532.977.347	53.487.861,00	586.465.208	1.775,00
Jun 2022	1.934.625.257	200.481.199,00	2.135.106.456	142.514.8770	2.277.621.333	2.299,00
Maj 2022	9.919.443.195	304.783.345,00	10.224.226.540	41.664.773,00	10.265.891.313	2.788,00
April 2022	2.174.994.092	157.561.026,00	2.332.555.118	251.428.547,00	2.583.983.665	2.071,00
Mart 2022	3.151.301.502	22.364.765,00	3.173.666.267	120.761.401,00	3.294.427.668	2.119,00
Februar 2022	1.959.662.678	11.539.264,00	1.971.201.942	48.167.269,00	2.019.369.211	1.137,00
Januar 2022	2.749.265.371	30.937.162,00	2.780.202.533	18.277.405,00	2.798.479.938	808,00
Decembar 2021	4.001.970.725	79.976.538,00	4.081.947.263	232.917.610,00	4.314.864.873	1.429,00
Novembar 2021	2.972.330.624	37.088.592,00	3.009.419.216	60.560.485,00	3.069.979.701	1.669,00
	35.929.784.921	1.659.915.899,00	37.589.700.820	1.462.519.543,00	39.052.220.363	21.811,00

*RSD

2. INDEKSI / INDICES

		BELEX15	BELEXline
Nov 2022. Okt 2023	Poslednja vrednost / Last value	875,94	1841,45
	Promena (abs) / Change (abs)	51,33	101,59
	Promena (%) / Change (%)	6,22%	5,84%
	Najviša vrednost / Maximum value	927,7	1850,14
	Najniža vrednost / Minimum value	775,14	1712,96
	Istorijski max / History maximum value	3.335,2	5.007,34
	Istorijski min / History minimum value	347,46	841,99
	Vrednost prometa / Value of turnover	116.737.413,00	138.399.413,00

3. TRŽIŠNA KAPITALIZACIJA / MARKET CAPITALISATION

	AVGUST	SEPTEMBAR	OKTOBAR
Ukupna tržišna kapitalizacija/ Total market capitalisation	418.482.478	423.636.340	423.200.635
Regulisano tržište/Regulated Market	408.269.872	415.003.563	414.576.160
Listing			
Prime Listing – akcije/ Prime Listing – shares	208.048.060	209.632.484	210.873.393
Standard Listing – akcije/ Standard Listing - shares			
Open Market	200.221.812	205.371.079	203.702.767
MTP/MTF	10.212.607	8.632.777	8.624.475
BELEX15	248.970.252	251.021.656	250.771.146
BELEXline	261.469.268	264.063.245	264.550.093

*u hiljadama RSD / in RSD thousands

4. UČEŠĆE STRANIH INVESTITORA / FOREIGN INVESTORS PARTICIPATION

	Učešće stranih investitora / Foreign Investors Participation		
Novembar 2022. Oktobar 2023.	FIS	total	4,51%
		b-FIS	3,73%
		s-FIS	5,29%
	FIB		2,9%
	FIT		3,12%

Indeks_Belex15	Indeks_BELEXLine	Datum	BELEX15	BELEXLine
BELEX15	BELEXLine	1.11.2022	793,79	1.753,39
BELEX15	BELEXLine	2.11.2022	788,17	1.745,31
BELEX15	BELEXLine	3.11.2022	779,84	1.731,05
BELEX15	BELEXLine	4.11.2022	779,85	1.726,01
BELEX15	BELEXLine	7.11.2022	787,52	1.734,08
BELEX15	BELEXLine	8.11.2022	786,56	1.730,79
BELEX15	BELEXLine	9.11.2022	793,61	1.732,94
BELEX15	BELEXLine	10.11.2022	780,00	1.712,96
BELEX15	BELEXLine	14.11.2022	789,32	1.725,11
BELEX15	BELEXLine	15.11.2022	800,46	1.747,93
BELEX15	BELEXLine	16.11.2022	808,22	1.762,68
BELEX15	BELEXLine	17.11.2022	808,93	1.754,84
BELEX15	BELEXLine	18.11.2022	806,89	1.754,92
BELEX15	BELEXLine	21.11.2022	803,41	1.749,16
BELEX15	BELEXLine	22.11.2022	806,57	1.750,18
BELEX15	BELEXLine	23.11.2022	807,14	1.750,28
BELEX15	BELEXLine	24.11.2022	811,95	1.759,80
BELEX15	BELEXLine	25.11.2022	816,51	1.764,71
BELEX15	BELEXLine	28.11.2022	813,97	1.756,89
BELEX15	BELEXLine	29.11.2022	814,97	1.761,58
BELEX15	BELEXLine	30.11.2022	815,83	1.768,97
BELEX15	BELEXLine	1.12.2022	812,91	1.768,29
BELEX15	BELEXLine	2.12.2022	813,97	1.769,42
BELEX15	BELEXLine	5.12.2022	810,29	1.764,61
BELEX15	BELEXLine	6.12.2022	811,69	1.767,78
BELEX15	BELEXLine	7.12.2022	814,66	1.770,84
BELEX15	BELEXLine	8.12.2022	815,60	1.772,38
BELEX15	BELEXLine	9.12.2022	811,54	1.766,33
BELEX15	BELEXLine	12.12.2022	809,16	1.759,04
BELEX15	BELEXLine	13.12.2022	810,28	1.760,12

BELEX15	BELEXLine	14.12.2022	810,59	1.763,12
BELEX15	BELEXLine	15.12.2022	811,58	1.764,22
BELEX15	BELEXLine	16.12.2022	809,33	1.760,72
BELEX15	BELEXLine	19.12.2022	810,14	1.762,12
BELEX15	BELEXLine	20.12.2022	808,95	1.760,85
BELEX15	BELEXLine	21.12.2022	808,92	1.761,01
BELEX15	BELEXLine	22.12.2022	811,25	1.763,45
BELEX15	BELEXLine	23.12.2022	808,73	1.765,64
BELEX15	BELEXLine	26.12.2022	809,51	1.766,47
BELEX15	BELEXLine	27.12.2022	809,77	1.767,33
BELEX15	BELEXLine	28.12.2022	811,27	1.723,50
BELEX15	BELEXLine	29.12.2022	824,61	1.739,86
BELEX15	BELEXLine	9.1.2023	820,82	1.739,12
BELEX15	BELEXLine	10.1.2023	839,12	1.762,76
BELEX15	BELEXLine	11.1.2023	839,09	1.772,70
BELEX15	BELEXLine	12.1.2023	839,93	1.773,56
BELEX15	BELEXLine	13.1.2023	842,93	1.778,74
BELEX15	BELEXLine	16.1.2023	841,16	1.773,99
BELEX15	BELEXLine	17.1.2023	843,22	1.776,19
BELEX15	BELEXLine	18.1.2023	831,64	1.749,76
BELEX15	BELEXLine	19.1.2023	833,05	1.754,45
BELEX15	BELEXLine	20.1.2023	833,56	1.755,53
BELEX15	BELEXLine	23.1.2023	838,01	1.750,84
BELEX15	BELEXLine	24.1.2023	841,96	1.757,94
BELEX15	BELEXLine	25.1.2023	851,88	1.768,42
BELEX15	BELEXLine	26.1.2023	840,76	1.742,27
BELEX15	BELEXLine	27.1.2023	852,41	1.759,49
BELEX15	BELEXLine	30.1.2023	854,89	1.759,23
BELEX15	BELEXLine	31.1.2023	860,34	1.765,65
BELEX15	BELEXLine	1.2.2023	857,36	1.762,79
BELEX15	BELEXLine	2.2.2023	861,61	1.755,78

BELEX15	BELEXLine	3.2.2023	865,76	1.761,33
BELEX15	BELEXLine	6.2.2023	865,18	1.748,55
BELEX15	BELEXLine	7.2.2023	864,04	1.748,52
BELEX15	BELEXLine	8.2.2023	868,66	1.753,42
BELEX15	BELEXLine	9.2.2023	872,16	1.768,84
BELEX15	BELEXLine	10.2.2023	878,54	1.775,49
BELEX15	BELEXLine	13.2.2023	872,23	1.763,70
BELEX15	BELEXLine	14.2.2023	869,08	1.752,40
BELEX15	BELEXLine	17.2.2023	875,94	1.762,03
BELEX15	BELEXLine	20.2.2023	876,33	1.768,56
BELEX15	BELEXLine	21.2.2023	877,61	1.770,12
BELEX15	BELEXLine	22.2.2023	877,73	1.765,34
BELEX15	BELEXLine	23.2.2023	882,70	1.773,90
BELEX15	BELEXLine	24.2.2023	874,54	1.767,25
BELEX15	BELEXLine	27.2.2023	878,85	1.775,83
BELEX15	BELEXLine	28.2.2023	876,22	1.776,33
BELEX15	BELEXLine	1.3.2023	878,79	1.784,55
BELEX15	BELEXLine	2.3.2023	880,08	1.785,46
BELEX15	BELEXLine	3.3.2023	891,48	1.815,11
BELEX15	BELEXLine	6.3.2023	890,58	1.798,22
BELEX15	BELEXLine	7.3.2023	889,95	1.795,77
BELEX15	BELEXLine	8.3.2023	889,17	1.791,22
BELEX15	BELEXLine	9.3.2023	892,16	1.795,70
BELEX15	BELEXLine	10.3.2023	894,40	1.799,18
BELEX15	BELEXLine	13.3.2023	894,45	1.795,53
BELEX15	BELEXLine	14.3.2023	894,51	1.796,74
BELEX15	BELEXLine	15.3.2023	892,05	1.792,73
BELEX15	BELEXLine	16.3.2023	897,31	1.799,69
BELEX15	BELEXLine	17.3.2023	897,50	1.799,08
BELEX15	BELEXLine	20.3.2023	895,28	1.799,81
BELEX15	BELEXLine	21.3.2023	896,98	1.802,34

BELEX15	BELEXLine	22.3.2023	894,64	1.798,01
BELEX15	BELEXLine	23.3.2023	898,95	1.799,75
BELEX15	BELEXLine	24.3.2023	891,15	1.790,20
BELEX15	BELEXLine	27.3.2023	894,17	1.794,92
BELEX15	BELEXLine	28.3.2023	891,87	1.792,56
BELEX15	BELEXLine	29.3.2023	889,26	1.789,62
BELEX15	BELEXLine	30.3.2023	888,41	1.789,03
BELEX15	BELEXLine	31.3.2023	891,29	1.798,01
BELEX15	BELEXLine	3.4.2023	888,04	1.791,65
BELEX15	BELEXLine	4.4.2023	885,72	1.789,55
BELEX15	BELEXLine	5.4.2023	883,79	1.780,31
BELEX15	BELEXLine	6.4.2023	885,58	1.783,31
BELEX15	BELEXLine	7.4.2023	883,38	1.781,00
BELEX15	BELEXLine	10.4.2023	878,48	1.780,13
BELEX15	BELEXLine	11.4.2023	868,31	1.767,80
BELEX15	BELEXLine	12.4.2023	870,24	1.770,23
BELEX15	BELEXLine	13.4.2023	878,88	1.781,13
BELEX15	BELEXLine	18.4.2023	886,66	1.792,94
BELEX15	BELEXLine	19.4.2023	888,05	1.794,36
BELEX15	BELEXLine	20.4.2023	889,28	1.794,39
BELEX15	BELEXLine	21.4.2023	893,45	1.796,99
BELEX15	BELEXLine	24.4.2023	903,11	1.802,13
BELEX15	BELEXLine	25.4.2023	895,82	1.792,35
BELEX15	BELEXLine	26.4.2023	903,82	1.798,06
BELEX15	BELEXLine	27.4.2023	910,59	1.813,13
BELEX15	BELEXLine	28.4.2023	904,49	1.806,97
BELEX15	BELEXLine	3.5.2023	905,38	1.809,53
BELEX15	BELEXLine	4.5.2023	904,89	1.809,50
BELEX15	BELEXLine	5.5.2023	905,82	1.809,70
BELEX15	BELEXLine	8.5.2023	911,54	1.815,54
BELEX15	BELEXLine	9.5.2023	914,49	1.813,02

BELEX15	BELEXLine	10.5.2023	913,91	1.811,81
BELEX15	BELEXLine	11.5.2023	915,58	1.812,71
BELEX15	BELEXLine	12.5.2023	913,04	1.808,62
BELEX15	BELEXLine	15.5.2023	919,80	1.818,11
BELEX15	BELEXLine	16.5.2023	920,64	1.821,41
BELEX15	BELEXLine	17.5.2023	922,80	1.825,18
BELEX15	BELEXLine	18.5.2023	923,33	1.828,64
BELEX15	BELEXLine	19.5.2023	920,45	1.821,64
BELEX15	BELEXLine	22.5.2023	913,41	1.814,14
BELEX15	BELEXLine	23.5.2023	907,42	1.807,08
BELEX15	BELEXLine	24.5.2023	908,35	1.807,93
BELEX15	BELEXLine	25.5.2023	907,47	1.807,47
BELEX15	BELEXLine	26.5.2023	914,33	1.815,02
BELEX15	BELEXLine	29.5.2023	914,45	1.813,66
BELEX15	BELEXLine	30.5.2023	911,05	1.810,26
BELEX15	BELEXLine	31.5.2023	910,39	1.813,48
BELEX15	BELEXLine	1.6.2023	909,06	1.812,06
BELEX15	BELEXLine	2.6.2023	904,84	1.807,48
BELEX15	BELEXLine	5.6.2023	904,14	1.807,41
BELEX15	BELEXLine	6.6.2023	901,43	1.807,12
BELEX15	BELEXLine	7.6.2023	892,02	1.795,85
BELEX15	BELEXLine	8.6.2023	885,51	1.789,32
BELEX15	BELEXLine	9.6.2023	888,74	1.791,81
BELEX15	BELEXLine	12.6.2023	902,48	1.796,82
BELEX15	BELEXLine	13.6.2023	888,36	1.781,02
BELEX15	BELEXLine	14.6.2023	887,80	1.780,37
BELEX15	BELEXLine	15.6.2023	887,51	1.778,91
BELEX15	BELEXLine	16.6.2023	861,38	1.758,15
BELEX15	BELEXLine	19.6.2023	864,48	1.764,64
BELEX15	BELEXLine	20.6.2023	855,15	1.751,12
BELEX15	BELEXLine	21.6.2023	858,77	1.754,82

BELEX15	BELEXLine	22.6.2023	862,10	1.758,25
BELEX15	BELEXLine	23.6.2023	861,46	1.757,67
BELEX15	BELEXLine	26.6.2023	861,22	1.757,43
BELEX15	BELEXLine	27.6.2023	860,13	1.757,36
BELEX15	BELEXLine	28.6.2023	862,61	1.760,08
BELEX15	BELEXLine	29.6.2023	861,18	1.754,33
BELEX15	BELEXLine	30.6.2023	869,40	1.762,55
BELEX15	BELEXLine	3.7.2023	867,65	1.762,06
BELEX15	BELEXLine	4.7.2023	869,51	1.764,08
BELEX15	BELEXLine	5.7.2023	867,12	1.761,90
BELEX15	BELEXLine	6.7.2023	861,79	1.754,18
BELEX15	BELEXLine	7.7.2023	861,40	1.753,79
BELEX15	BELEXLine	10.7.2023	874,04	1.770,25
BELEX15	BELEXLine	11.7.2023	873,61	1.769,29
BELEX15	BELEXLine	12.7.2023	882,94	1.782,03
BELEX15	BELEXLine	13.7.2023	868,78	1.756,44
BELEX15	BELEXLine	14.7.2023	868,88	1.756,30
BELEX15	BELEXLine	17.7.2023	868,01	1.757,68
BELEX15	BELEXLine	18.7.2023	872,03	1.763,74
BELEX15	BELEXLine	19.7.2023	876,28	1.768,26
BELEX15	BELEXLine	20.7.2023	871,86	1.763,33
BELEX15	BELEXLine	21.7.2023	874,42	1.766,36
BELEX15	BELEXLine	24.7.2023	874,42	1.766,36
BELEX15	BELEXLine	25.7.2023	873,94	1.765,96
BELEX15	BELEXLine	26.7.2023	874,48	1.768,23
BELEX15	BELEXLine	27.7.2023	878,74	1.780,36
BELEX15	BELEXLine	28.7.2023	876,78	1.778,03
BELEX15	BELEXLine	31.7.2023	874,25	1.775,43
BELEX15	BELEXLine	1.8.2023	875,43	1.782,92
BELEX15	BELEXLine	2.8.2023	875,71	1.783,35
BELEX15	BELEXLine	3.8.2023	872,65	1.779,61

BELEX15	BELEXLine	4.8.2023	873,91	1.781,18
BELEX15	BELEXLine	7.8.2023	873,68	1.781,36
BELEX15	BELEXLine	8.8.2023	875,56	1.786,33
BELEX15	BELEXLine	9.8.2023	870,39	1.781,41
BELEX15	BELEXLine	10.8.2023	872,19	1.793,45
BELEX15	BELEXLine	11.8.2023	871,20	1.792,32
BELEX15	BELEXLine	14.8.2023	865,85	1.787,15
BELEX15	BELEXLine	15.8.2023	861,51	1.783,03
BELEX15	BELEXLine	16.8.2023	853,69	1.771,35
BELEX15	BELEXLine	17.8.2023	853,85	1.768,96
BELEX15	BELEXLine	18.8.2023	854,57	1.769,68
BELEX15	BELEXLine	21.8.2023	862,64	1.778,67
BELEX15	BELEXLine	22.8.2023	863,12	1.775,08
BELEX15	BELEXLine	23.8.2023	878,45	1.798,13
BELEX15	BELEXLine	24.8.2023	888,01	1.811,17
BELEX15	BELEXLine	25.8.2023	892,01	1.818,47
BELEX15	BELEXLine	28.8.2023	893,82	1.824,18
BELEX15	BELEXLine	29.8.2023	893,82	1.824,22
BELEX15	BELEXLine	30.8.2023	886,25	1.816,99
BELEX15	BELEXLine	31.8.2023	884,90	1.817,29
BELEX15	BELEXLine	1.9.2023	886,38	1.815,71
BELEX15	BELEXLine	4.9.2023	885,16	1.818,25
BELEX15	BELEXLine	5.9.2023	887,11	1.814,74
BELEX15	BELEXLine	6.9.2023	881,93	1.820,57
BELEX15	BELEXLine	7.9.2023	890,94	1.819,81
BELEX15	BELEXLine	8.9.2023	887,94	1.817,13
BELEX15	BELEXLine	11.9.2023	901,53	1.843,75
BELEX15	BELEXLine	12.9.2023	902,55	1.845,36
BELEX15	BELEXLine	13.9.2023	905,29	1.847,97
BELEX15	BELEXLine	14.9.2023	907,25	1.850,14
BELEX15	BELEXLine	15.9.2023	905,55	1.845,51

BELEX15	BELEXLine	18.9.2023	902,88	1.842,02
BELEX15	BELEXLine	19.9.2023	900,60	1.838,99
BELEX15	BELEXLine	20.9.2023	900,56	1.838,77
BELEX15	BELEXLine	21.9.2023	899,87	1.840,81
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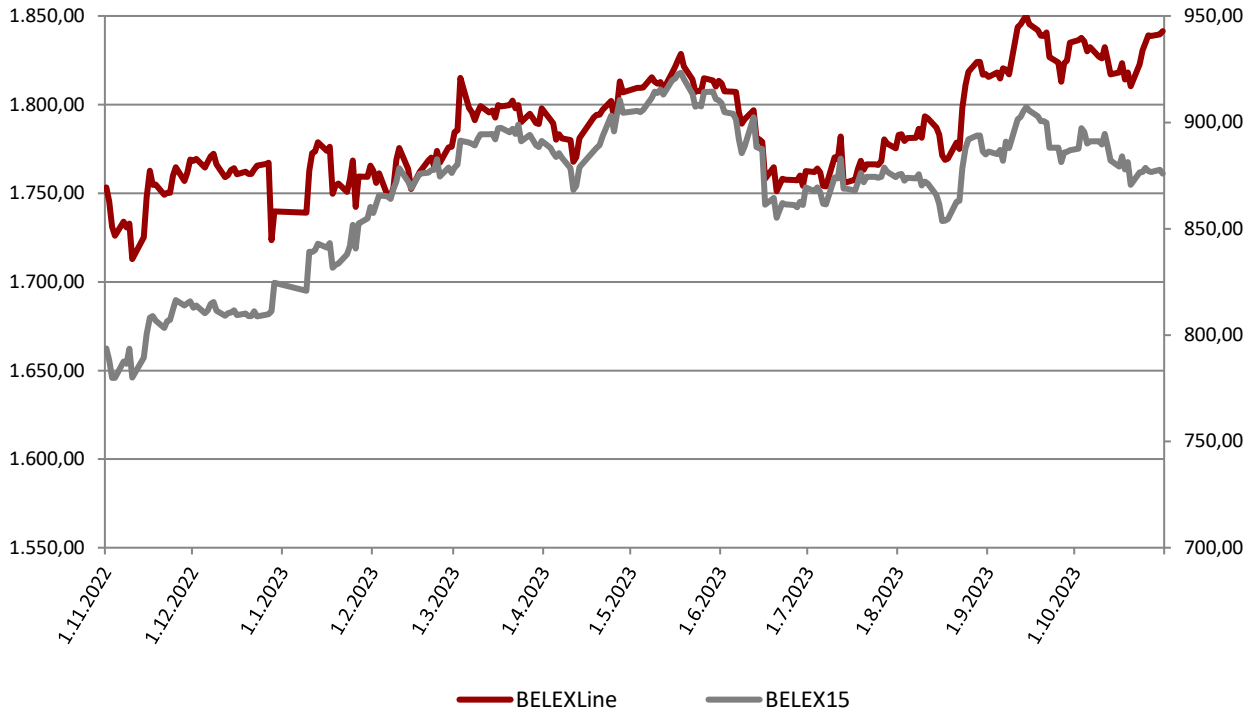
BELEX15	BELEXLine	26.9.2023	881,28	1.812,96
BELEX15	BELEXLine	27.9.2023	885,92	1.823,37
BELEX15	BELEXLine	28.9.2023	886,17	1.824,88
BELEX15	BELEXLine	29.9.2023	886,89	1.835,02
BELEX15	BELEXLine	2.10.2023	887,66	1.836,49
BELEX15	BELEXLine	3.10.2023	897,24	1.837,61
BELEX15	BELEXLine	4.10.2023	895,43	1.835,74
BELEX15	BELEXLine	5.10.2023	890,06	1.830,12
BELEX15	BELEXLine	6.10.2023	891,16	1.832,47
BELEX15	BELEXLine	9.10.2023	891,05	1.826,95
BELEX15	BELEXLine	10.10.2023	889,68	1.826,21
BELEX15	BELEXLine	11.10.2023	894,61	1.832,40
BELEX15	BELEXLine	12.10.2023	888,72	1.825,24
BELEX15	BELEXLine	13.10.2023	882,14	1.817,15
BELEX15	BELEXLine	16.10.2023	879,27	1.818,19
BELEX15	BELEXLine	17.10.2023	883,99	1.823,41
BELEX15	BELEXLine	18.10.2023	877,89	1.814,16
BELEX15	BELEXLine	19.10.2023	881,36	1.818,14
BELEX15	BELEXLine	20.10.2023	870,61	1.810,45
BELEX15	BELEXLine	23.10.2023	876,59	1.822,84
BELEX15	BELEXLine	24.10.2023	876,66	1.830,72
BELEX15	BELEXLine	25.10.2023	878,57	1.834,78
BELEX15	BELEXLine	26.10.2023	877,18	1.839,18
BELEX15	BELEXLine	27.10.2023	876,67	1.838,72
BELEX15	BELEXLine	30.10.2023	877,73	1.839,63
		31.10.2023	875,94	1.841,45



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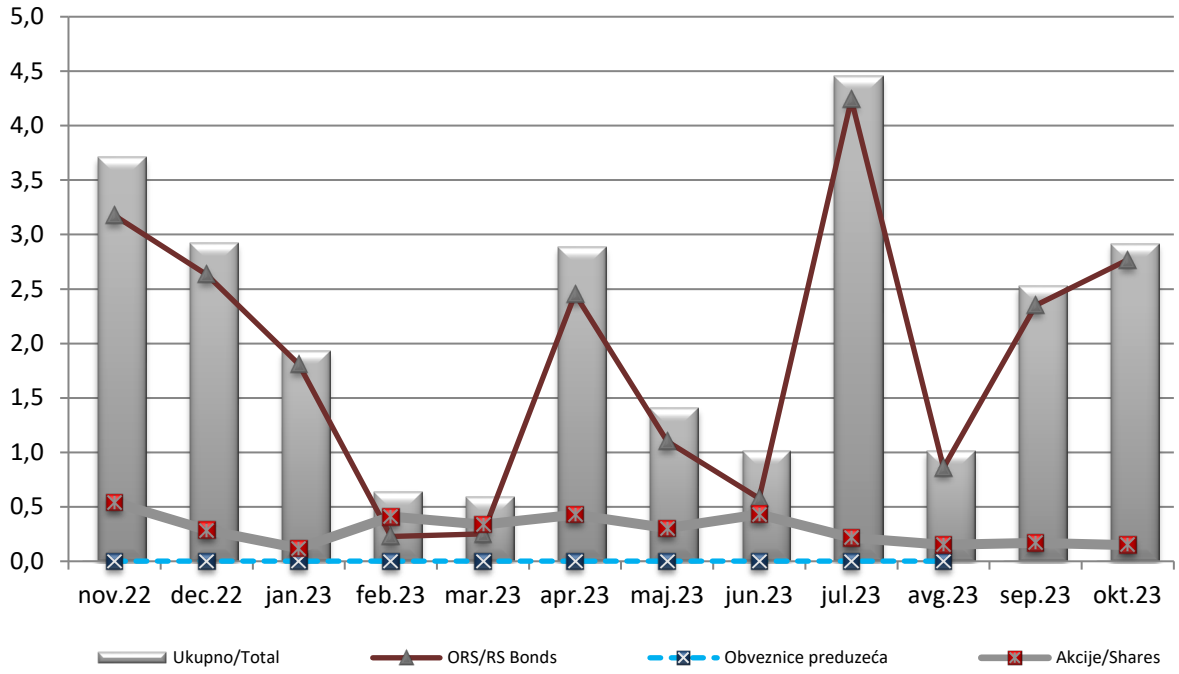
NOV 2022- OKT 2023



2022	Ukupno/Total	ORS/RS Bonds	Obveznice preduzeća	Akcije/Shares
nov.22	3.710.983.894	3.173.524.753	0	537.459.141
dec.22	2.918.600.331	2.633.372.307	0	285.228.024
jan.23	1.926.018.491	1.808.427.047	0	117.591.444
feb.23	637.211.598	227.809.312	0	409.402.286
mar.23	587.548.068	251.378.033	0	336.170.035
apr.23	2.882.563.543	2.453.909.769	0	428.653.774
maj.23	1.402.643.492	1.099.709.511	0	302.933.981
jun.23	1.008.575.957	577.146.764	0	431.429.193
jul.23	4.454.853.140	4.240.041.370	0	214.811.770
avg.23	1.008.065.602	857.956.730	0	150.108.872
sep.23	2.519.251.108	2.349.508.572		169.742.536
okt.23	2.915.552.901	2.766.562.093		148.990.808

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• Ispraviti sve gramatičke i greške u kucanju.

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- Časopisi: Pantelić S. (2013). Flavije Valerije Konstantin (306-337). Bankarstvo 42 (4), 136-145. (prilikom citiranja iz elektronskih verzija časopisa na kraju dodati: doi broj citiranog članka, ako ga ima, odgovarajući internet link i datum pristupa)

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• The author should also designate where in the paper photographs should be placed, submitting each of them as a separate file in the .eps or .tiff format, resolution 300 dpi.

• A table must not exceed the margins in width, must not be longer than one page and must have the title and the source.

• Text boxes are not to be used either in the text or in the tables.

• Websites are to be typed as a text, not as a hyperlink.

• Please, correct all grammatical or typing errors.

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- Other sources: web pages (web link and date of access), dissertations (last name, first name, title,institution in which the PhD dissertation was presented, year), official publications (name of publication/organization/institution, title, place of publishing, publisher, issue, year).

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