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UTICAJ RIZIKA KAMATNE STOPE NA POSLOVANJE BANAKA U BOSNI I HERCEGOVINI

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Rezime: *Osnovni cilj u ovom radu je da se identifikuju faktori koji imaju statistički značajan uticaj na izloženost banaka u BiH riziku kamatne stope, te refleksiju na indikatore profitabilnosti poslovanja. Dakle, ovaj rad istražuje uticaj rizika kamatne stope na performanse poslovanja banaka u Bosni i Hercegovini između 2014, i 2024. godine. Panel regresioni model najmanjih kvadrata vrši predikciju za povrat na aktivu i povrat na vlasničku glavnicu banaka u BiH kao funkciju rizika kamatne stope koji je indeksiran odnosom kredita i aktive, prosečnim koeficijentom pozajmljivanja i rizikom diversifikacije kamatnih stopa. Empirijski nalazi u radu su otkrili da nezavisna varijabla prosečni koeficijent pozajmljivanja, kao mera rizika kamatne stope po osnovu metode najmanjih kvadrata, ima značajno pozitivni uticaj na prvu i drugu zavisnu promenljivu, odnosno ROA i ROE sa signifikantnošću manjom od 5%. Korelacija između rizika diversifikacije kamata i prvog indikatora profitabilnosti (ROA) je pozitivna sa značajnošću manjom od 5%, dok je korelacija između rizika diversifikacije kamata i drugog indikatora (ROE) pozitivna, ali sa značajnošću većom od 5%. Posmatrano sa druge strane, negativna korelacija je zabeležena između odnosa kredita i sredstava i indikatora ROA sa značajnošću većom od 5%. Takođe, pozitivna korelacija je ostvarena između odnosa kredita i sredstava i indikatora ROA sa verovatnoćom većom od 5%.*

Ključne riječi: Rizik kamatne stope, EURIBOR, povrat na aktivu, povrat na vlasničku glavnicu, regresiona analiza

JEL klasifikacija: G20, G21, E43

1. Uvodna razmatranja

Osetljivost ekonomske vrednosti banke na fluktuacije kamatnih stopa je posebno važno za akcionare, menadžment banke i supervizorsku vlast (Basel Committee on Banking Supervision, 2004). Dakle, ovo je važno zbog činjenice da varijacija u kamatnim stopama predstavlja veliku pretnju po finansijsku stabilnost banke. Veliki broj faktora u zadnjih nekoliko godina su dali ogroman značaj upravljanju rizika kamatnih stopa. Povećanje kolebljivosti kamatnih stopa na finansijskim tržištima izazvano ekonomskom krizom iz 2008. godine, doprinelo je nestabilnosti prihoda, troškova i ekonomske vrednosti banaka, dok je prihod od kamatnih stopa ostao najvažniji izvor prihoda banaka. Takođe, potrebno je istaći da regulatorni okvir poslovanja banaka definisan Bazelskim sporazumom II, i III zahteva da se rezerve izdaju prema procenjenoj izloženosti tržišnom riziku, što isto utiče na postavljanje pitanja analize i upravljanja kamatnim stopama.

Rizik kamatne stope je vrsta tržišnog rizika, što znači da banke trpe gubitke zbog promena tržišnih kamatnih stopa (Chorafas, 1999). Rizik kamatnih stopa je toliko važna vrsta rizika, da banke prosto mogu pretrpeti astronomske gubitke ako se rizikom kamatnih stopa ne upravlja efikasno. Generalno, depoziti banaka su kratkoročni, dok krediti dati klijentima imaju duži rok dospeća. Zbog date situacije svako povećanje kamatne stope uzrokuje gubitak za banke. Glavni razlog za ovaj problem ogleda se u tome što će banke početi da isplaćuju veće iznose kamata deponentima, ali sa druge strane neće biti promene u iznosu kamata koje dužnici plaćaju banci (Angbazo, 1997).

Dakle, rizik kamatne stope može se definisati kao potencijalni uticaj na ekonomsku vrednost ili profitabilnost banke zbog promene kamatnih stopa. Izvori rizika kamatne stope mogu biti različiti (Fraser i ostali, 2002). Najvažniji izvor rizika kamatnih stopa je rizik ponovnog određivanja kamatnih stopa, koji za banke prirodno nastaje zbog neusklađenosti u vremenu do dospeća ili vremenu do ponovnog određivanja kamatnih stopa između imovine i obaveza bilansa banaka. Primera radi, banka koja finansira dugoročne kredite s fiksnom kamatnom stopom kratkoročnim depozitima pretrpeće pad ekonomske vrednosti ako kamatne stope porastu jer će trošak sredstava rasti, dok će zarada od kredita ostati fiksna. S druge strane banka će umesto toga dobiti ako kamatne stope padnu.

Kamatne stope na kredite u BiH su u poslednjih 5 do 6 godina bile na izuzetno niskim nivoima i u kontinuiranom padu, pri čemu se najčešće korišćena referentna vrednost za promenjivi deo kamatne stope u kreditnim ugovorima EURIBOR nalazila u negativnom rasponu još od 2015. godine. Istovremeno, kamatne stope koje su banke plaćale na deponirana sredstva bile su značajno niske. U pogledu aktivnih kamatnih stopa, nije bilo značajnijih odstupanja u dinamici kretanja na domaćem tržištu i tržištu eurozone (https://banke-biznis.com). Ovaj rad ima osnovni cilj da ispita kako indirektno faktori rizika kamatnih stopa utiču na efikasnost poslovanja banaka u Bosni i Hercegovini u periodu između 2014., i 2024. godine. Empirijski nalazi će pomoći bankama u BiH da pronađu i identifikuju efekat faktora rizika kamatnih stopa, te da pomognu bankarskom menadžmentu da blagovremeno i sveobuhvatno prati i kontroliše rizik.

Rad je struktuiran iz pet delova. Prvi deo odnosi se na uvodna razmatranja sa posebnim osvrtom na definiciju kamatnog rizika, kratkog pregleda na kretanja kamatnih stopa u BiH i uticaja na profitabilnost poslovanja u bankarskom sektoru u BiH. Drugi deo opisuje kretanje referentne kamatne stope tj. EURIBOR te komparaciju sa domaćim kamatnim stopama, kao i kretanje indikatora profitabilnosti i kamatnih stopa na kredite u BiH. Treći deo opisuje pregled relevantnih istraživanja u kontekstu uticaja rizika kamatnih stopa na indikatore profitabilnosti depozitnih banaka u BiH. Četvrti deo opisuje izabranu metodologiju istraživanja i potrebne podatke. Peti deo predstavlja dobijene rezultate istraživanja, kao i određena zapažanja i preporuke.

2. Rizik kamatnih stopa u bankarskom sektoru

Bankarski prihodi mogu se klasifikovati kao prihodi od kamata ili kao prihodi koji ne potiču od kamata. Prihodi banke koji nisu od kamata generišu se od osiguranja, savetovanja i drugih usluga. Kada više kamatne stope smanje ekonomski rast obim početnih javnih ponuda i drugih usluga kao što su akvizicije, takođe se smanjuje. S tim u vezi, naknade koje banke generišu kao rezultat osiguranja, ili savetovanja smanjuju se. Što se banka više oslanja na ove vrste olakšica, veća bi trebala da bude njena osetljivost na povećanje kamatnih stopa. Stoga bi banke koje se više oslanjaju na prihode koji nisu od kamata trebalo da budu više izložene riziku kamatnih stopa.

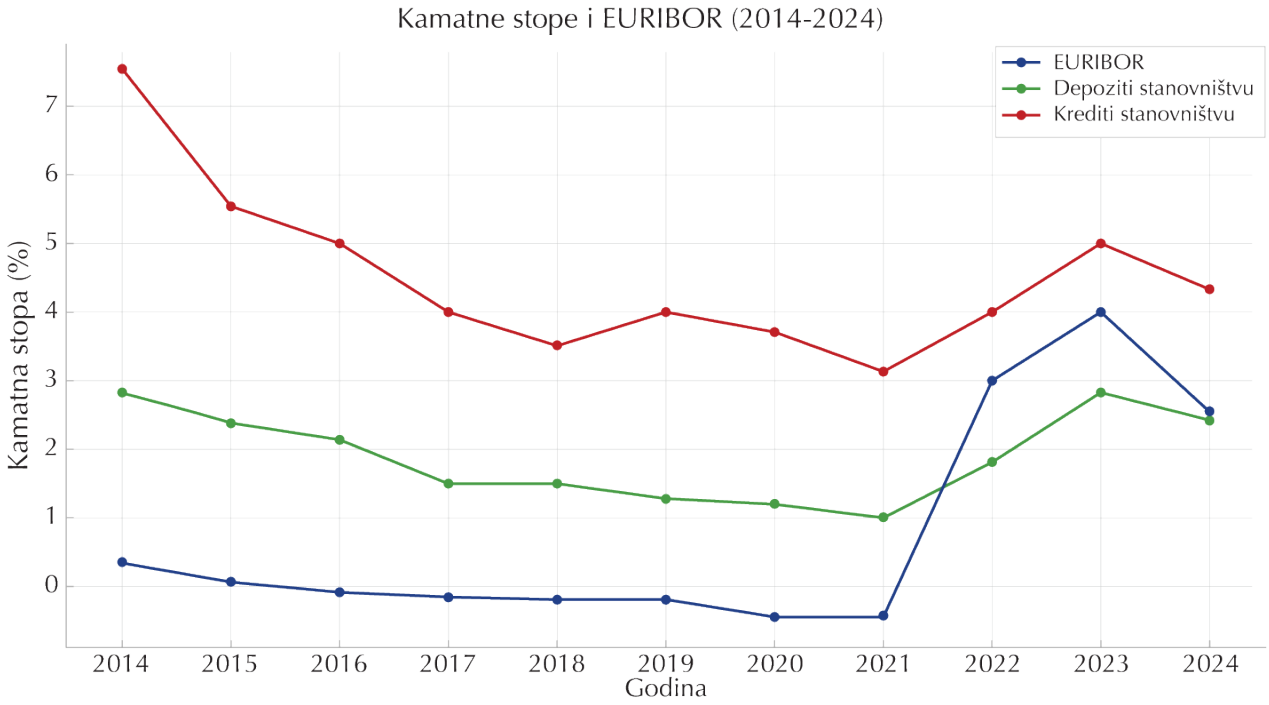
Rizik kamatne stope odnosi se na verovatnoću da banke pretrpe gubitak usled promena tržišne kamatne stope (Hellwig, 1994). Depoziti banaka su obično kratkoročni, dok krediti dati klijentima imaju duži rok dospeća. S tim u vezi, svako povećanje kamatnih stopa stvara probleme bankama. Drugačije rečeno, banke moraju da plaćaju veće kamate deponentima nakon datuma dospeća u slučaju porasta kamatnih stopa. S druge strane, nema promene u prihodima od kamata dobijenim od kredita datim klijentima (Stanton, 1997).

Uglavnom postoje dve različite metode za merenje rizika kamatnih stopa banaka. Prva metoda je GAP analiza koja ispituje kako promene kamatnih stopa utiču na bilans stanja banaka. Dakle, potrebno je definisati račune osetljive na kamatne stope u aktivi i obavezama. Nakon toga, izračunava se odnos aktive i obaveza. Ovaj odnos se naziva i GAP koeficijent (Kim i Koppenhaver, 1993). Ukoliko je ovaj koeficijent veći od 1 to znači da je imovina osetljivija na promene kamatnih stopa nego obaveze. Posmatrano sa druge strane, kada je ovaj odnos manji od 1 to implicira na zaključak da promene kamatnih stopa više utiču na obaveze nego na imovinu.

Druga metoda za merenje rizika kamatne stope je analiza trajanja. Ova metoda analizira kako promene kamatnih stopa utiču na sadašnju vrednost investicija (Macaulay, 1938). U ovoj analizi prvo, trajanje imovine i obaveza banaka se izračunava za različite rokove dospeća. Situacija u kojoj je trajanje imovine veće od obaveza pokazuje da je imovina te banke osetljivija na fluktuacije kamatnih stopa. S tim u vezi, ukoliko banka očekuje bilo kakvo povećanje kamatnih stopa, preferiraće da sačuva preostale pozicije jer će vrednost imovine rasti. Dakle, banka bi trebala da promeni strukturu svog bilansa stanja ako se očekuje pad kamatnih stopa u budućnosti (Bierwag ve Kaufman, 1985).

Centralna banka BiH, s obzirom na aranžman valutnog odbora kojeg sledi od 1997. godine, u svom instrumentariju ne poseduje eskontnu stopu jer joj je zakonom zabranjeno da odobrava kredite bilo kome. Kamatna stopa nije instrument monetarno kreditne politike Centralne banke BiH. S tim u vezi se kamatne stope slobodno formiraju na finansijskom tržištu bez uticaja Centralne banke. Komercijalne banke u BiH svoje kamatne stope formiraju u skladu sa svojom poslovnom politikom i stanjem na finansijskom tržištu, te nivou tržišnih kamatnih stopa. Grafikon u nastavku teksta ilustruje trend kretanja tržišne kamatne stope, tj. EURIBOR-a i kamatnih stopa na depozite i kredite sektora stanovništva banaka u BiH za period: 2014.-2024. godine.

Grafikon 1 - Kretanje EURIBOR-a i kamatnih stopa na depozite sektora stanovništva i kredite sektora stanovništva u bankama u BiH za period: 2014 – 2024. godine (u%)



Izvor: https://www.euribor-rates.eu i https://cbbh.ba (Prilagođeno od strane autora)

EURIBOR (engl. *Euro Interbank Offered Rate*) je ključna referentna kamatna stopa koja reflektuje kamate po kojima evropske banke međusobno posuđuju sredstva. Iz prethodnog grafikona je evidentno da je EURIBOR imao negativne vrednosti od 2015. godine sa stopom od minus 0,006 pa sve do 2021. godine, sa stopom -0,505. Od 2022. godine EURIBOR je doživeo značajne promene zahvaljujući politici Evropske centralne banke (ECB) usmerene na borbu protiv inflacije. Od 2022. godine pa do 2023. godine beleži rast vrednosti od oko 3,902% a odmah nakon 2023. godine ostvaruje pad na 2,431%. Ove promene odražavaju ekonomsku politiku ECB i tržišne uslove u eurozoni. Dakle, ECB i FED su u periodu skoro do 2022. godine sprovodili ekspanzivnu monetarnu politiku[1] u cilju daljeg smanjivanja referentne kamatne stope u periodima ekonomske stagnacije i recesije kako bi uticale na snižavanje kamatnih stopa radi podsticanja zaduživanja i daljeg ulaganja (Centralna banka BiH, 2019). ECB je nakon završetka ciklusa povećanja ključnih kamatnih stopa u septembru 2023. godine, zadržala restriktivnu monetarnu politiku[2] , skoro sve do polovine 2024. godine. Blagi zaokret u monetarnoj politici reflektovao se slabljenjem inflatornih pritisaka, te generalnim usporavanjem inflacije, što je u većoj meri bio rezultat prethodno vođenje restriktivne politike (Centralna banka BiH, 2024). Uticaj kamatnih stopa na evropskom novčanom tržištu ima efekte putem transmisionog mehanizma koji polazi

[1] Ekspanzivna monetarna politika je skup mera koje Centralna banka provodi sa prvenstvenim ciljem povećanja ponude novca te podsticanja privredne aktivnosti.
[2] Restriktivna monetarna politika je skup mera koje Centralna banka preduzima sa prvenstvenim ciljem smanjenja količine novca u opticaju i povećanja kamatnih stopa, a sa daljim ciljem obuzdavanja inflacije i pregrevanja ekonomije.

od Centralne banke BiH koja drži likvidna sredstva na kratkoročnoj osnovi u evropskim bankama sa najvećim kreditnim rejtingom. To dalje znači i relativno niže kamatne stope koje prati visoki kreditni rejting evropskih banaka sa kojima radi Centralna banka. S obzirom da Centralna banka BiH drži rezerve domaćih banaka na računima kod ino banaka, to kamatne stope na ta sredstva diktiraju i kamatne stope na rezerve, odnosno višak rezervi mimo obavezne rezerve koju Centralna banka obračunava komercijalnim bankama. Drugi kanal delovanja kamatnih stopa sa Evropskog tržišta je oročavanje sredstava domaćih banaka na računima stranih banaka koje je u uslovima izuzetno niskih kamatnih stopa apsolutno neprofitabilno za domaće banke. Iz tih razloga banke smanjuju oročenja i na ino računima stranih banaka i okreću se prekompoziciji svog portfolija u pravcu ulaganja u državne hartije od vrednosti koje nose znatno povoljniju kamatnu stopu (Plakalović i Alihodžić, 2015).

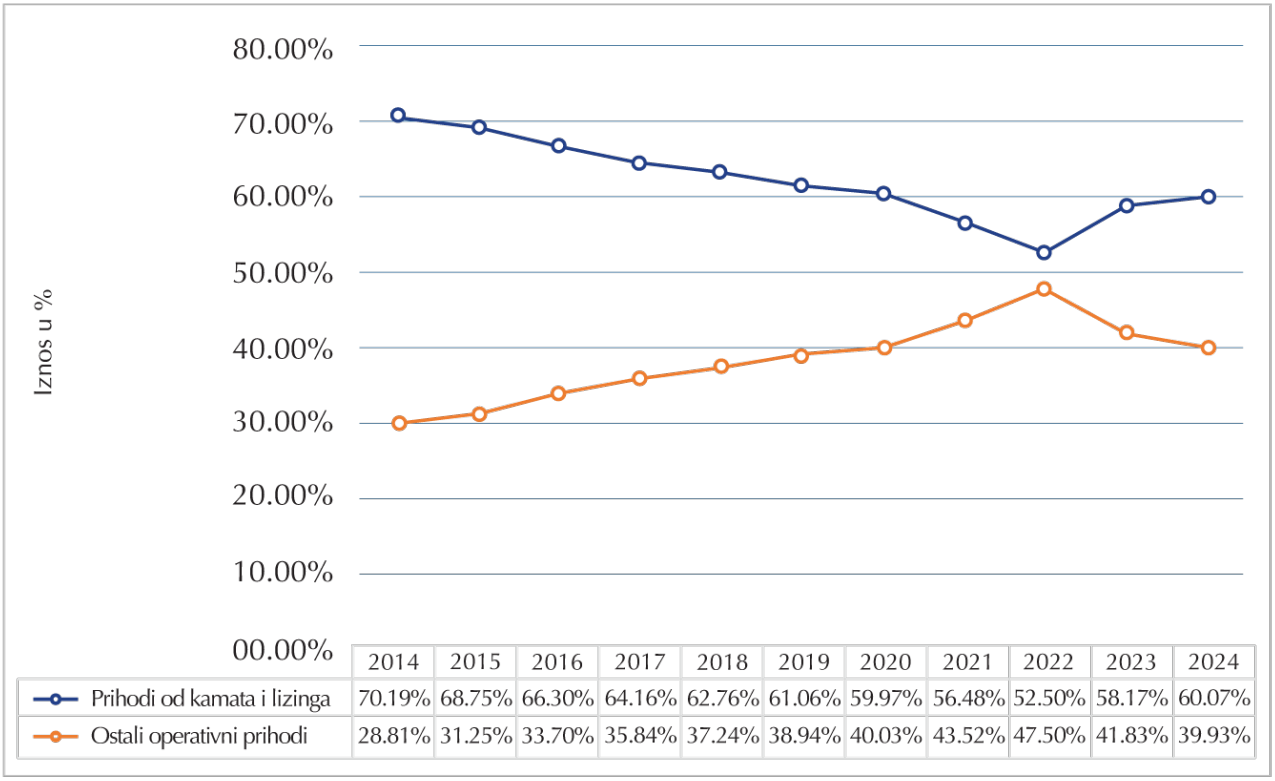
Tabela 1 - Tendencija kretanja povrata na aktivu i kamatnih stopa na kredite i depozite realnog sektora u BiH za period: 2014-2024. godine (u %)

Indikatori	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
ROA	0,80	0,91	1,00	1,30	1,20	1,20	0,70	1,20	1,40	1,80	1,90
Kamatne stope na kredite preduzećima	6,35	5,52	4,71	4,01	3,50	3,17	2,94	2,85	2,84	2,94	3,01
Kamatne stope na depozite preduzećima	3,52	1,94	1,82	1,82	1,96	1,49	1,47	0,95	1,50	2,73	3,02

IZVOR: Proračun autora na osnovu podataka Agencija za bankarstvo FBiH i Republike Srpske i Centralne banke BiH

Tabela 1 analizira da li postoji kauzalnost i uzajamna uslovljenost između indikatora ROA i kamatnih stopa na kredite i depozite preduzećima u BiH za period: 2014 - 2024. godine. Kao što se da primetiti direktna korelacija ne postoji izuzev za godine: 2022 - 2024., gde je vidljivo da sa blagim trendom rasta kamatnih stopa na kredite i depozite dolazi do blagog trenda povećanja vrednosti indikatora ROA. Ge-neralno, kamatne stope u BiH su imale trend pada, na primer kamatne stope na kredite preduzećima od 6,35% u 2014. godini, su pretrpele pad na 2,84% u 2022. godini.

Grafikon 2 - Tendencija kretanja prihoda od kamata i lizinga i ostalih operativnih prihoda banaka u BiH za period: 2014 - 2024. godine (u%)



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Prihodi od kamata i lizinga	70.19%	68.75%	66.30%	64.16%	62.76%	61.06%	59.97%	56.48%	52.50%	58.17%	60.07%
Ostali operativni prihodi	28.81%	31.25%	33.70%	35.84%	37.24%	38.94%	40.03%	43.52%	47.50%	41.83%	39.93%

Izvor: Proračun autora na osnovu podataka Agencije za bankarstvo Federacije BiH i Agencije za bankarstvo Republike Srpske

Iz prethodnog grafikona je evidentno da prihodi od kamata i lizinga kao i ostali operativni prihodi banaka u BiH nisu imali isti obrazac kretanja za posmatrani period. Dakle, prihodi od kamata i lizinga banaka u BiH su sa 70,19% u 2014. godini zabeležili linearni pad na 52,50% u 2022. godini, da bi nakon toga krenuo blagi rast sa 58,17% u 2023. godini na 60,07% u 2024. godini. S druge strane, ostali operativni prihodi su ostvarili linearni rast sa 29,81% u 2014. godini na 47,50% u 2022. godini, te nakon toga pad na 39,93% u 2024. godini. Kao esencijalni faktori pada prihoda od kamata i lizinga kao core biznisa kojima se banke u BiH bave mogu se navesti sledeći: sve veći broj loših dužnika, averzija prema riziku, suzdržavanje ili neodobravanje kredita u onoj meri koliko to rezerve dozvoljavaju, itd. (Alihodžić, 2021). Takođe, posle blagog oporavka kreditne aktivnosti koji je usledio u 2022. godini kao rezultat pokretanja ekonomske aktivnosti po okončanju COVID-19, te povećanje makroekonomskih rizika koji su se prelili na ekonomiju u BiH doveli su do ponovnog usporavanja kreditne aktivnosti. Isto tako produžena neizvesnost i povećana percepcija rizika uticali su na usporavanje ukupnog kreditnog portfolija (Centralna banka BiH, 2022).

3. Teorijska osnova - pregled relevantne literature

U Bosni i Hercegovini je monetarna politika ograničena sistemom valutnog odbora, i banke posluju sa visokim iznosom stranog kapitala, i promene kamatnih stopa imaju značajan uticaj na profitabilnost

poslovanja. Dakle, kamatne stope u BiH uglavnom prate kretanje kamatnih stopa u eurozoni. Promene kamatnih stopa u EU se prenose na BiH putem finansijskih tržišta, bez domaće intervencije. Osnovni problem u ovom istraživanju je utvrditi u kojoj meri i na koji način promene kamatnih stopa utiču na profitabilnost poslovanja banaka. S obzirom da je mali broj radova pisan na ovu temu na prostoru BiH ovo istraživanje zaslužuje posebnu pažnju. Izloženost komercijalnih banaka riziku kamatnih stopa bila je predmet značajnih empirijskih istraživanja. Većina istraživanja usredsredila se na dva međusobno povezana pitanja: 1) Da li su prinosi banaka osetljivi na promene kamatnih stopa? 2) Da li je osetljivost akcija banaka na kamatne stope povezana sa određenim karakteristikama imovine i obaveza pojedinih banaka? U literaturi, većina studija empirijskih i teorijskih ukazuje na to da fluktuacija kamatnih stopa ima izrazito značajan pozitivan odnos sa profitom banaka uopšte. Drugačije rečeno, većina autora se slaže da se u slučajevima povećanja kamatne stope povećava i profit banaka, dok se sa druge strane u periodu pada kamatne stope smanjuje profit banaka.

Veći broj studija otkriva da su prinosi akcija banaka negativno korelisani sa promenom kamatnih stopa. Na primer, Lynge i Zumwalt (1980.), Booth i Officer (1985.), Bae (1990.) i Kwan (1991.) pronalaze značajno negativnu vezu između promena kamatnih stopa i prinosa akcija banaka. Suprotno, Lloyd i Shick (1977.) te Chance i Lane (1980.) ne pronalaze značajnu povezanost između kretanja kamatnih stopa i prinosa bankovnih dionica.

Staikouras and Wood (2004) su radili sa izbalansiranim uzorkom koji je pokrivao sve bankarske industrije EU u periodu od 1994. godine, pa do 1998. godine. Rezultati studije su pokazali da su evropske banke pod uticajem eksternih i internih faktora, te da je kamatna stopa određena kao jedan od eksternih faktora koji utiču na značajnu pozitivnost evropskih banaka, drugačije rečeno, svako povećanje kamata izaziva i povećanje profitabilnosti banaka.

Zaganov i ostali (2009) su sproveli studiju u cilju prikazivanja kako banke regulišu svoj profil kamatnih stopa. Došli su do zaključka da je većina banaka u uzorku negativno pogođena nepovoljnim kretanjima kamatnih stopa, što implicira da menadžeri ne uspevaju da usvoje sveobuhvatne strategije zaštite od rizika. Isto tako su došli do novih zaključaka da veći nivo ekonomske slobode, bolje upravljanje, efikasnost pravnog sistema i viši kvalitet državnog nadzora su povezani sa manjom izloženošću banaka riziku kamatnih stopa.

Demirguc i Huizinga (1999) pronašli su pozitivnu korelaciju između kamatnih stopa i profita, posebno u razvijenim zemljama i zemljama u razvoju, dok studije kao što su Ebrahim i ostali (2013) pronašle negativnu značajnu vezu između rizika kamatne stope i profitabilnosti.

Bacha (2004) je analizirao obim potencijalne izloženosti riziku kamatnih stopa za malezijske islamske banke koristeći mesečne podatke od januara 1994. godine, do jula 2003. godine. U radu je implementiran Pearsonov koeficijent korelacije, zatim obična regresiona analiza najmanjih kvadrata i Grendžerov test uzročnosti. Došao je do zaključka da promene kamatnih stopa konvencionalnih banaka i ukupnih depozita uzrokuju promene stope prinosa islamskih banaka, respektivno.

Zainol i Kassim (2010) analizirali su dinamičke efekte promena kamatnih stopa na stopu prinosa islamskih banaka i iznos depozita u konvencionalnim i islamskim bankama u Maleziji. Koristeći podatke koji pokrivaju period od januara 1997., do oktobra 2008. godine, došli su do zaključka da stopa prinosa islamskih banaka i kamatna stopa konvencionalnih banaka imaju dugoročnu ravnotežu, te da između njih postoji dvosmerna kauzalnost. Takođe, su došli do zaključka da stope prinosa i depoziti islamskih banaka značajno reaguju na promene konvencionalnih kamatnih stopa. To implicira na zaključak da

kada se kamatna stopa konvencionalnih banaka poveća, deponenti islamskih banaka će prebaciti svoja sredstva iz islamskih u konvencionalne banke.

Akpomiemie (2012) je istraživao uticaj fluktuacije tržišnih kamatnih stopa na profitabilnost komercijalnih banaka i to za 14 komercijalnih banaka i jednu investicionu banku u Južnoj Africi između 2001. i 2010. godine. On je otkrio da promene kamatnih stopa imaju pozitivan uticaj na profitabilnost komercijalnih banaka u Južnoj Africi. U vremenu rasta kamatnih stopa raste i profit malih poslovnih banaka.

Piergiorgio i Nelson (2012) su ispitali povezanost između kamatne stope i profita banaka koristeći regresioni model i jedinstveni skup podataka o bankama u Velikoj Britaniji u periodu od prvog kvartala 1992 do trećeg kvartala 2009. Rezultat je pokazao da povećanje kamatne stope u kratkom roku smanjuje profitabilnost, međutim svako povećanje kamatne stope na duži rok može dovesti do povećanja profitabilnosti.

Khedira & Khedhiri (2011) studirao je putem panel podataka i regresione analize u radu pod naslovom: Determinante bankarske neto kamatne marže u Tunisu, profite i kamatne stope za 10 komercijalnih banaka u Tunisu u periodu 1996-2003. godine. Rezultati studije su pokazali da kamatne stope utiču kako na troškove banaka, tako i na profitabilnost banaka.

Na osnovu gornje diskusije, ovaj rad će istražiti sledeće hipoteze:

H1: Postoji negativna korelacija između odnosa kredita i sredstava i indikatora profitabilnosti bankarskog sektora u BiH.

H2: Postoji pozitivna korelacija između prosečnog koeficijenta pozajmljivanja i indikatora profitabilnosti bankarskog sektora u BiH.

H3: Postoji pozitivna korelacija između rizika diversifikacije kamata i indikatora profitabilnosti bankarskog sektora u BiH.

4. Metodologija i podaci

4.1 Model

Osetljivost profita na promene kamatnih stopa može se neposredno izmeriti pomoću analize jaza (engl. gap analysis), u kojoj se od iznosa kamatno osetljive aktive oduzima iznos kamatno osetljive pasive i razlika množi sa promenom kamatne stope (Lukić, 2010).

Panel podaci se odnose na objedinjavanje opservacija o preseku domaćinstava, zemalja, preduzeća, itd., tokom nekoliko vremenskih perioda. Panel podaci se sastoje od vrednosti N broja jedinica za različite vremenske periode. Dakle, panel podaci kombinuju podatke preseka i vremenske serije. Broj jedinica je izražen kao N, dok je broj perioda izražen kao T (Baltagi, 2005).

Prateći Arcand i ostali (2015), započećemo naše procene regresijom jednačina pomoću metode najmanjih kvadrata (OLS). Klein i Weill (2018) ukazuju da OLS regresija nije samo koristan metod za opisivanje podataka, već i za pružanje prve (pristrasne) procene koeficijenata. Svi proračuni obično koriste nivo značajnosti od 5%. Stoga je test značajnosti izvršen za sve promenljive korišćenjem t- testa na nivou značajnosti od 95% (Chmelarova, 2007).

Model koji će se koristiti u ovoj studiji je prilagođena verzija modela od strane Zagonov i ostali (2009), odnosno to je model najmanjih kvadrata, gde su prinos na kapital (ROE) i prinos na aktivu (ROA) proxy varijable performansi banaka u BiH i u funkciji su sledećih nezavisnih varijabli: odnosa kredita i sredstava (LTAR), prosečnog koeficijenta pozajmljivanja (ALR), i rizika diversifikacije kamata (ROID), i svi oni predstavljaju indekse za merenje rizika kamatnih stopa. Funkcionalna veza modela je data u obliku sledećih jednačina. Ekonometrijske jednačine za model se mogu specifikovati na sledeći način:

$$ROA = \propto_0 + \propto_1 * LTAR + \propto_2 * ALR + \propto_3 * ROID + \mu \quad (1)$$

$$ROE = \propto_0 + \propto_1 * LTAR + \propto_2 * ALR + \propto_3 * ROID + \mu \quad (2)$$

Gde su:

$\propto_0$ - vrednost preseka ili konstantan član,

$\propto_1$ _ $\propto_3$ - koeficijenti parametara u modelu,

LTAR - odnos kredita i sredstava,

ALR - prosečni koeficijent pozajmljivanja,

ROID - rizik diversifikacije kamata

μ- slučajna greška.

4.2 Podaci

U ovom istraživanju cilj je bio da se ispita kako rizik kamatnih stopa utiče na indikatore efikasnosti poslovanja banaka u BiH, odnosno ROA i ROE. U tom kontekstu korišćeni su kvartalni podaci za period između 2014. i 2024. godine za bankarski sektor u Bosni i Hercegovini. Podaci su prikupljeni sa oficijalnih web stranica Agencije za bankarstvo u Federaciji BiH i Agencije za bankarstvo u Republici Srpskoj. Rezultati analize su dobijeni na osnovu statističkog paketa STATA 17.0.

Sažetak merenja varijabli predstavljen je u tabeli 2:

Tabela 2 - Zavisne i nezavisne varijable

Skraćenica varijable	Varijabla	Metod izračunavanja	Poziv na literaturu
ROE	Povrat na kapital (%)	(Dobit nakon oporezivanja/ kapital)*100	Demirgüç-Kunt,A., i Huizinga,H. (1999), Khan and Sattar (2014)
ROA	Povrat na aktivu (%)	(Dobit nakon oporezivanja/ ukupna aktiva)*100	Hanweck i Kilcollin (1984), Memmel (2011), Peng i ostali (2003)

LTAR	Odnos kredita i sredstava	Neto krediti/Ukupna aktiva	Sierra and Yeager (2004), Drehmann and others (2010)
ALR	Prosečni koeficijent pozajmljivanja	Prihodi od kamata/Ukupna aktiva koja donosi prihod	Dietrich i Wanzenried (2011), ECB (2015), Trujillo-Ponce (2013), Bikker i Hu (2002).
ROID	Rizik diversifikacije kamata	1- (Neto prihodi od kamata – Nekamatni prihodi)/Ukupni poslovni prihodi	Mishkin and Eakins (2006), Scheiber i ostali (2016), Arseneau (2017), Nofiyanti (2014)

Izvor: Proračun autora

5. Empirijski nalazi

5.1 Deskriptivna statistika

Tabela 3 reprezentuje indikatore deskriptivne statistike korišćenih u ovom istraživanju. Ukupan broj observacija iznosi 44 što predstavlja relativno reprezentativan uzorak, kako u pogledu podataka na tržištu banaka u Bosni i Hercegovini, tako i u kontekstu vremenskog okvira. Određene banke su izuzete iz istraživanja zbog nedostupnosti podataka.

Tabela 3 - Deskriptivna statistika zavisnih i nezavisnih varijabli u modelu banaka u Bosni i Hercegovini za period: 2014 – 2024. godine

Skraćenica varijable	ROA	ROE	LTAR	ALR	ROID
Srednja vrednost	0,879	9,918	0,595	0,023	0,774
Standardna devijacija	0,413	5,183	0,033	0,015	0,132
Max	1,900	20,40	0,700	0,070	1,310
Min	0,300	2,30	0,480	0,001	0,580
Mera asimetrije	0,503	0,443	0,311	1,369	1,341
Spljoštenost	2,658	2,190	7,808	4,926	7,221
Broj observacija	44	44	44	44	44

Izvor: Proračun autora

Može se primetiti da se ROA za odabrane banke u Bosni i Hercegovini kreće od minimalnih 0,30% do maksimalnih 1,90 % sa prosekom od 0,88. Druga mera profitabilnosti banaka u BiH, tj. povrat na vlasničku glavnicu zabeležila je minimalnu vrednost od 2,30% do maksimalne vrednosti od 20,40% i prosečne vrednosti od oko 9,91%. Minimalnu vrednost od 2,30% je ostvario bankarski sektor u prvom kvartalu 2022. godine, usled smanjenog kreditiranja i prihoda po osnovu lizinga za oko 1,1% i smanjenja prosečne ponderisane nominalne kamatne stope na kredite sa 3,30% na 3,08% (Agencija za bankarstvo Federacije BiH, 2022). U kontekstu kretanja prve mere rizika odnosno standardne devijacije najjaču volatilnost su zabeležile sledeće varijable: stopa povrata na vlasničku glavnicu od oko 5,18%, zatim stopa povrata na aktivu banaka u BiH od oko 0,41% i rizik diversifikacije kamata od oko 0,13%. Dakle, date varijable su imale isti obrazac kretanja kao kretanje srednje vrednosti. Najveću srednju

vrednost su ostvarile varijable ROE od oko 9,92%, ROA od oko 0,88% i rizik diversifikacije kamata od oko 0,77%. Na promenljiv i jako volatilan trend indikatora ROE, ROA i ROID su imali uticaj pad kreditne aktivnosti u delu prema realnom sektoru, te obnova depozitnog potencijala banaka nakon masovnog povlačenja depozita na početku pandemije COVID-19 (Centralna banka BiH, 2020).

5.2 Korelaciona analiza

Prema Cohen-u (1988) ukoliko se koeficijent korelacije kreće od 0,10 do 0,29 onda je reč o maloj korelaciji. Takođe, ukoliko se koeficijent korelacije kreće od 0,30 do 0,49 onda je prisutna srednja korelacija. I ukoliko koeficijent korelacije poprima vrednosti od 0,50 do 1,0 onda je evidentno da je korelacija velika.

Tabela 4 - Korelaciona analiza (Pearson koeficijent korelacije) između prve zavisne varijable (ROA) i nezavisnih varijabli banaka u Bosni i Hercegovini za period: 2014 – 2024. godine

		ROA	LTAR	ALR	ROID
ROA	Pearson korelacija	1,000	-0,042	0,307	0,180
	Sig. (2-tailed)	-	0,789	0,043	0,242
LTAR	Pearson korelacija	-0,042	1,000	0,486	-0,592
	Sig. (2-tailed)	0,789	-	0,001	0,000
ALR	Pearson korelacija	0,307	0,486	1,000	-,0570
	Sig. (2-tailed)	0,043	0,001	-	0,000
ROID	Pearson korelacija	0,180	-0,592	-0,570**	1,000
	Sig. (2-tailed)	0,242	0,000	0,000	-

Izvor: Kalkulacija autora na osnovu podataka Agencije za bankarstvo u FBiH i Agencije za bankarstvo u Republici Srpskoj

Iz prethodne tabele je evidentno da je najjača pozitivna korelaciju sa prvom zavisnom promenljivom, odnosno povratom na aktivu (ROA) ostvarena sa sledećim nezavisnim varijablama: prosečni koeficijent pozajmljivanja 0,307 pri signifikantnošću ($p<0,05$), te rizik diversifikacije kamata od oko 0,180 pri značajnošću većom od 5%. Dakle, sa povećanjem koeficijenta pozajmljivanja konsekventno dolazi i do povećanja indikatora ROA. Prosečni prihodi od kamata i lizinga u BiH bankama za period: 2014 - 2024. godina iznosili su oko 62%, dok se preostalih 38% odnosio na ostale operativne prihode. Köhler (2015) je istraživao stabilnost banaka u 15 zemalja EU i otkrio je da su banke znatno stabilnije i profitabilnije ukoliko povećaju svoj udeo u izvorima prihoda koji nisu od kamata. Dakle, Köhler je došao do zaključka da postoje značajne koristi od diversifikacije prihoda. Chiorazzo i ostali (2008) su otkrili da diversifikacija prihoda povećava prinose prilagođene riziku na uzorku italijanskih banaka. Prema Maudosu (2017) koji se bavio odnosom između korišćenja prihoda koji ne potiču od kamata i rizika i profitabilnosti za evropske banke tokom perioda 2002 - 2012. godina, došao je do zaključka da povećanje prihoda koji ne potiču od kamata ima negativan uticaj na profitabilnost, ali je povezano

sa povećanjem rizika. Posmatrano sa druge strane, najjača negativna korelacija sa prvom zavisnom promenljivom, odnosno povratom na aktivu (ROA) zabeležena je sa nezavisnom varijablom odnos kredita i sredstava (-0,042) pri značajnošću većom od 5%. Na bankarskom tržištu u Federaciji BiH u 2014. godini učešće kredita u ukupnoj aktivi iznosilo je oko 69,10%, da bi u 2024. godini došlo do relativnog pada na oko 59,57% (Agencija za bankarstvo FBiH, 2024). Na bankarskom tržištu Republike Srpske u 2014. godini učešće kredita u ukupnoj aktivi iznosilo je oko 71,10%, da bi u 2024. godini došlo do relativnog pada na oko 59%. (Agencija za bankarstvo Republike Srpske, 2024).

Tabela 5 - Korelaciona analiza (Pearson koeficijent korelacije) između druge zavisne varijable (ROE) i nezavisnih varijabli banaka u Bosni i Hercegovini za period: 2014 – 2024. godine

		ROE	LTAR	ALR	ROID
ROA	Pearson korelacija	1,000	-0,070	0,316	0,019
	Sig. (2-tailed)	-	0,650	0,037	0,902
LTAR	Pearson korelacija	-0,070	1,000	0,486	-0,592
	Sig. (2-tailed)	0,650	-	0,001	0,000
ALR	Pearson korelacija	0,316	0,486	1,000	-,0570
	Sig. (2-tailed)	0,037	0,001	-	0,000
ROID	Pearson korelacija	0,019	-0,592	-0,570	1,000
	Sig. (2-tailed)	0,902	0,000	0,000	-

Izvor: Kalkulacija autora na osnovu podataka Agencije za bankarstvo u FBiH i Agencije za bankarstvo u Republici Srpskoj

Dobijeni rezultati korelacione analize između druge zavisne promenljive (ROE) i nezavisnih promenljivih su skoro pa identični rezultatima korelacione analize između prve zavisne promenljive (ROA) i nezavisnih promenljivih. Iz tabele 5 se jasno vidi da je najjača pozitivna korelaciju sa drugom zavisnom promenljivom, odnosno povratom na vlasničku glavnicu (ROE) ostvarena sa sledećim nezavisnim varijablama: prosečni koeficijent pozajmljivanja 0,316 pri signifikantnošću ($p<0,05$), te rizik diversifikacije kamata od oko 0,019 pri signifikantnošću većom od 5%. S druge strane najjača negativna korelacija sa drugom zavisnom promenljivom, odnosno povratom na vlasničku glavnicu (ROE) zabeležena je sa nezavisnom varijablom odnos kredita i sredstava (- 0,070) pri značajnošću većom od 5%.

Svaka varijabla u modelu koja ima VIF vrednost veću od 3 smatra se multikolinearnom, te je time odbačena iz modela. U slučaju multikolinearnosti, koeficijenti varijabli postali su nestabilni, a standardne greške precenjene. Tabela 6 prikazuje dobijene rezultate multikolinearne analize između posmatranih varijabli u modelu.

Tabela 6 - Multikolinearna analiza putem faktora inflacije varijanse (VIF)

Varijable	VIF	1/VIF
LTAR	1,62	0,616596
ALR	1,56	0,640855
ROID	1,83	0,545070

Izvor: Proračun autora (STATA 13.0)

Kao što se može primetiti iz prethodne tabele, svaka pojedinačna nezavisna varijabla ima vrednost koeficijenta VIF manju od 3. Jasno je da nema multikolinearnosti između varijabli, tako da je postavljeni model validan.

Tabela 7 ilustruje rezultate panel regresione analize zasnovane na modelu najmanjih kvadrata između nezavisnih varijabli i prinosa na aktivu bankarskog sektora Bosne i Hercegovine. Vrednost F – statistike kod metode najmanjih kvadrata iznosi 5,23 kao i verovatnoća je manja od 5% što ukazuje na to da je model jako značajan (tabela 7). U ovom empirijskom delu, regresija najmanjih kvadrata se razmatra zbog brojnih prednosti koje ima u odnosu na druge tehnike procene. Te prednosti se ogledaju pre svega u najboljem pronalaženju prave koja opisuje odnos između zavisne i nezavisnih varijabli i daje najbolju liniju trenda za skup posmatranih podataka. Takođe, u ovom istraživanju su korišćeni Breusch-Pagan-Godfrey test kao i Breusch-Pagan Harvey test za testiranje heteroskedastičnosti. Rezultat verovatnoće dobijen preko Breusch-Pagan-Godfrey test iznosi 0,1064 što je veće od 5% i što potvrđuje da u regresionom modelu nije prisutna heteroskedastičnost. Isto tako rezultat verovatnoće dobijen preko Breusch-Pagan Harvey testa iznosi 0,4797 što isto potvrđuje da u regresionom modelu nije prisutna heteroskedastičnost.

Tabela 7 - Koeficijenti nezavisnih promenljivih pri regresiji najmanjih kvadrata za period: 2014:Q1 - 2024:Q4

Regresioni model	Metod najmanjih kvadrata (OLS)		
Zavisna varijabla - ROA			
Nezavisne varijable	Koef.	Std. Greška	Verovatnoća
C	-0,437	1,5153	0,7742
LTAR	-0,510	2,1409	0,8127
ALR	16,717	4,5445	0,0001
ROID	1,5830	0,5665	0,001
Koeficijent determinacije	0,2819	-	-
Pseudo R- Squared	-	-	-
Prilagođeni koeficijent determinacije	0,22805	-	-

F-Statistic	5,2345	-	-
Prob (F-statistic)	0,003	-	-
Prob (Rn-squared st)	-	-	-
Prob (Quasi -LR stat)	-	-	-

Izvor: Proračun autora

Primenom jednačine (1) na dobijene podatke po metodi najmanjih kvadrata u tabeli 7 dolazimo do sledećeg prognoziranog modela:

$$ROA = - 0,437 - 0,510 * LTAR + 16,717 * ALR + 1,5830 * ROID$$

Prilagođeni koeficijent determinacije kod modela najmanjih kvadrata iznosi 0,22805 ili 0,23. Ovo ukazuje da je 23% varijacije ROA objašnjeno promenama u merama rizika kamatne stope, dok je preostalih 77% objašnjeno faktorima koji nisu navedeni u modelu. Verovatnoća F-statistike kod metoda najmanjih kvadrata ima vrednost od 0,003, što pokazuje da je model statistički značajan na nivou značajnosti od 5% jer je p – vrednost manja od 5%.

Kod metode najmanjih kvadrata vrednost koeficijenata LTAR, ALR i ROID iznosi -0,510, 16,717 i 1,583 respektivno. ROA je negativno povezan sa LTAR i pozitivno sa ALR i ROID, gde je verovatnoća manja od 5% kod promenljivih ALR i ROID. Testiranjem prve istraživačke hipoteze da postoji negativna korelacija između odnosa kredita i sredstava i prvog indikatora profitabilnosti, tj. povrata na aktivu bankarskog sektora u BiH, dolazi se do zaključka da postoji negativna korelacija, ali sa verovatnoćom većom od 5%, čime se odbacuje prva istraživačka hipoteza.

Ako se prosečni koeficijent pozajmljivanja poveća za oko 1% prva zavisna promenljiva ROA kod metode najmanjih kvadrata će se povećati za oko 16,72 jedinice, pod pretpostavkom da ostale varijable ostanu nepromenjene. Testiranjem druge istraživačke hipoteze da postoji pozitivna korelacija između prosečnog koeficijenta pozajmljivanja i prvog indikatora profitabilnosti, tj. povrata na aktivu bankarskog sektora u BiH dolazi se do zaključka za prihvatanjem hipoteze jer je verovatnoća manja od 5%. Veći portfolio kredita generiše veliku većinu neto prihoda od kamata, što očigledno ima pozitivan odjek na profitabilnost banaka, ali je isto tako podložan većem kreditnom riziku, koji može zauzvrat pogoršati profitabilnost. Empirijski dokazi, Dietrich i Wanzenried (2011), ECB (2015), i Trujillo-Ponce (2013) otkrivaju da u celini, kreditiranje pozitivno utiče na profitabilnost. Bikker i Hu (2002) otkrivaju da je kreditiranje prociklično i da će banke sa većim profitom pozajmljivati izdašnije.

Ukoliko se rizik diversifikacije kamata poveća za oko 1% prva zavisna promenljiva ROA kod metode najmanjih kvadrata će se povećati za oko 1,58 jedinica, pod pretpostavkom da ostale varijable ostanu nepromenjene. Testiranjem treće istraživačke hipoteze da postoji pozitivna korelacija između rizika diversifikacije kamata i prvog indikatora profitabilnosti tj. povrata na aktivu bankarskog sektora u BiH dolazi se do zaključka za prihvatanjem hipoteze jer je verovatnoća manja od 5%. Scheiber i ostali

(2016) i Arseneau (2017) smatraju da rizik diversifikacije kamata i sposobnost banke da diversifikuju svoje izvore prihoda ima pozitivan uticaj na bankarsku profitabilnost. Aruwa i Musa (2014) pronašli su negativnu značajnu vezu između rizika kamatne stope i profitabilnosti.

Tabela 8 - Koeficijenti nezavisnih promenljivih pri regresiji najmanjih kvadrata za period: 2014:Q1 - 2024:Q4

Regresioni model	Metod najmanjih kvadrata (OLS)		
Zavisna varijabla - ROA			
Nezavisne varijable	Koef.	Std. Greška	Verovatnoća
C	-13,307	19,916	0,507
LTAR	15,671	28,138	0,581
ALR	170,620	59,729	0,006
ROID	12,902	7,446	0,091
Koeficijent determinacije	0,1949	-	-
Pseudo R- Squared	-	-	-
Prilagođeni koeficijent determinacije	0,1345	-	-
F-Statistic	3,228	-	-
Prob (F-statistic)	0,03		-
Prob (Rn-squared st)	-	-	-
Prob (Quasi -LR stat)	-	-	-

Izvor: Proračun autora

Primenom jednačine (2) na dobijene podatke po metodi najmanjih kvadrata u tabeli 8 dolazimo do sledećeg prognoziranog modela:

$$ROE = -13,307 + 15,671 * LTAR + 170,62 * ALR + 12,902 * ROID$$

Iz prethodne tabele je evidentno da prilagođeni koeficijent determinacije kod modela najmanjih kvadrata iznosi 0,1345 ili 13,45%. Ovo ukazuje da je 13% varijacije ROE objašnjeno promenama u merama rizika kamatne stope, dok je preostalih 87% objašnjeno faktorima koji nisu navedeni u modelu. Verovatnoća F- statistike kod metoda najmanjih kvadrata ima vrednost od 0,003, što pokazuje da je model statistički značajan na nivou značajnosti od 5% jer je p – vrednost manja od 5%. Kod posmatranog modela vrednost nezavisne promenljive prosečni koeficijent pozajmljivanja (ALR) ima pozitivnu vrednost i signifikantnost manju od 5%. Dakle, to dalje objašnjava da ako se prosečni koeficijent pozajmljivanja poveća za oko 1% da će se ROE kod metode najmanjih kvadrata povećati za oko 170,62 jedinice, pod uslovom da ostale varijable ostanu nepromenjene.

Testiranjem prve istraživačke hipoteze da postoji negativna korelacija između odnosa kredita i sredstava i drugog indikatora profitabilnosti tj. povrata na vlasničku glavnicu bankarskog sektora u BiH, dolazi se do zaključka da postoji pozitivna korelacija, ali sa verovatnoćom većom od 5%, čime se odbacuje prva istraživačka hipoteza. Rivai i ostali (2007) smatraju da je odnos kredita i sredstava odnos koji se koristi za demonstriranje sposobnosti banaka da zadovolje potražnju za kreditima koristeći ukupnu imovinu koju poseduju banke. Što je ovaj odnos veći, to je bolji nivo kreditnih performansi, jer je veća komponenta kredita u ukupnoj strukturi imovine. S druge strane, to negativno utiče na likvidnost, jer što je ovaj odnos veći to znači da se postojeća sredstva široko koriste za raspodelu kredita, a manje za kratkoročne obaveze. Testiranjem druge istraživačke hipoteze da postoji pozitivna korelacija između prosečnog koeficijenta pozajmljivanja i drugog indikatora profitabilnosti tj. povrata na vlasničku glavnicu bankarskog sektora u BiH dolazi se do zaključka za prihvatanjem hipoteze jer je verovatnoća manja od 5%. Testiranjem treće istraživačke hipoteze da postoji pozitivna korelacija između rizika diversifikacije kamata i drugog indikatora profitabilnosti tj. povrata na vlasničku glavnicu bankarskog sektora u BiH dolazi se do zaključka za odbacivanjem hipoteze jer je verovatnoća veća od 5%.

Zaključna razmatranja

Rizik kamatne stope predstavlja osnovni tržišni rizik koji može uticati na poslovne rezultate banaka. Banke upravljaju svojom imovinom i obavezama, gde usled neusklađenosti imovine i obaveza specifične za banke može da utiče na povećanje rizika kamatne stope. Centralna banka BiH u sistemu valutnog odbora ne može aktivno menjati kamatne stope niti voditi ekspanzivnu ili restriktivnu monetarnu politiku.

Cilj ovog rada je bio da se empirijski ispita kako indirektno specifični faktori rizika kamatnih stopa utiču na efikasnost poslovanja banaka u Bosni i Hercegovini, mereno preko indikatora ROA i ROE. Panel analiza je zasnovana na skupu podataka za bankarski sektor u BiH u periodu od 2014 do 2024. godine, a na osnovu podataka Agencije za bankarstvo u FBiH i Republici Srpskoj. Faktor rizika kamatne stope koji je identifikovan da ima značajnog uticaja na indikatore profitabilnosti banaka u BiH je prosečni koeficijent pozajmljivanja. Testiranjem prve istraživačke hipoteze da postoji negativna korelacija između odnosa kredita i sredstava i prvog indikatora profitabilnosti tj. povrata na aktivu bankarskog sektora u BiH, došlo se do zaključka da postoji negativna korelacija, ali sa verovatnoćom većom od 5%. Korelacija između odnosa kredita i sredstava i drugog indikatora profitabilnosti tj. povrata na vlasničku glavnicu je pozitivna, ali sa značajnošću većom od 5%, čime se odbacuje prva istraživačka hipoteza.

Ispitivanjem druge istraživačke hipoteze da postoji pozitivna korelacija između prosečnog koeficijenta pozajmljivanja i indikatora profitabilnosti ROA i ROE bankarskog sektora u BiH došlo se do zaključka za prihvatanjem hipoteze jer je verovatnoća manja od 5%. Dakle, prosečni koeficijent pozajmljivanja u svojstvu nezavisne varijable dobijen u ovom radu putem modela najmanjih kvadrata pokazuje da ima potpuno statistički značajnu predikciju na zavisnih promenljivih ROA i ROE. Prosečni koeficijent kreditiranja otkriva da veliki portfolio kredita povećava profitabilnost banaka. Posmatrano sa druge strane, veći kreditni rizik uzrokuje značajno pogoršanje profitabilnosti banaka. Štaviše, banke imaju manju izloženost riziku na nižim nivoima kamatnih stopa zbog negativne selekcije i loših dužnika.

Komercijalne banke u Bosni i Hercegovini svoje kamatne stope formiraju u skladu sa svojom poslovnom politikom, stanjem na finansijskim tržištima, te nivoom tržišnih kamatnih stopa. Dakle, kamatne stope u BiH uglavnom prate kretanje kamatnih stopa u eurozoni. Promene kamatnih stopa u EU se

prenose na BiH putem finansijskih tržišta, bez domaće intervencije. Kamatne stope na kredite u BiH su u poslednjih nekoliko godina bile na izuzetno niskim nivoima i u kontinuiranom padu. U pogledu efekta okruženja niskih kamatnih stopa na preuzimanje rizika od strane banaka postoje generalno dva kanala preuzimanja rizika. Posmatrano sa jedne strane, nisu pronađeni jasni dokazi da su banke povećale svoju izloženost riziku u potrazi za prinosom. Do sada su banke bile u stanju da održe svoj nivo profitabilnosti, te s tim u vezi nisu kompenzovale smanjeni prihod od kamata rizičnijim investicijama. S druge strane, evidentno je da su u poslednje vreme banke u određenom iznosu smanjile nivo rezervisanja za kreditne gubitke u okruženju niskih kamatnih stopa. Dakle, banke su tako održale svoj ukupan nivo profitabilnosti na račun manjeg jastuka za kreditne gubitke. U narednom periodu banke će biti primorane da promene svoje poslovne modele i prošire svoje trgovačke aktivnosti kako bi bile manje zavisne od svojih tradicionalnih praksi kreditiranja i finansiranja.

Ispitivanjem treće istraživačke hipoteze da postoji pozitivna korelacija između rizika diversifikacije kamata i prvog indikatora profitabilnosti tj. povrata na aktivu bankarskog sektora u BiH došlo se do zaključka za prihvatanjem hipoteze jer je verovatnoća manja od 5%. S druge strane korelacija između rizika diversifikacije kamata i drugog indikatora profitabilnosti, tj. povrata na vlasničku glavnicu je pozitivna, ali sa verovatnoćom većom od 5%, što implicira na zaključak za odbacivanjem date hipoteze.

Ograničenje ovog istraživanja ogleda se u tome što su uzete u razmatranju samo depozitne banke u BiH, kao i to da su uzete samo tri mere rizika kamatne stope kao nezavisne promenljive. Dalja preporuka bi bila da se uzmu banke zemalja u razvoju, pojedinih zemalja članica EU i razvijenih zemalja, kao i više mere rizika kamatne stope.

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THE IMPACT OF INTEREST RATE RISK ON THE OPERATIONS OF BANKS IN BOSNIA AND HERZEGOVINA

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Summary: *The primary objective of this paper is to identify factors that have a statistically significant impact on the exposure of banks in Bosnia and Herzegovina to interest rate risk and its effect on business profitability indicators. Therefore, this paper investigates the impact of interest rate risk on the performance of banks in Bosnia and Herzegovina between 2014 and 2024. The least squares panel regression model predicts the return on assets and the return on equity of banks in Bosnia and Herzegovina as a function of interest rate risk, which is indexed by the ratio of loans to assets, the average lending ratio, and the risk of interest rate diversification. Empirical findings in the paper revealed that the independent variable, average lending ratio as a measure of interest rate risk based on the method of least squares, has a significantly positive influence on the first and second dependent variables, that is, ROA and ROE, with a significance of less than 5%. The correlation between the risk of interest diversification and the first indicator of profitability (ROA) is positive with a significance of less than 5%, while the correlation between the risk of diversification of interest and the second indicator (ROE) is positive but with a significance of more than 5%. On the other hand, a negative correlation was recorded between the loan-to-assets ratio and the ROA indicator, with a significance greater than 5%. Also, a positive correlation was achieved between the loan-to-assets ratio and the ROA indicator with a probability greater than 5%.*

Keywords: Interest rate risk, EURIBOR, return on assets, return on equity, regression analysis.

JEL classification: G20, G21, E43

1. Introductory Considerations

The sensitivity of a bank's economic value to interest rate fluctuations is particularly important for shareholders, bank management, and the supervisory authority (Basel Committee on Banking Supervision, 2004). Therefore, this is important due to the fact that the variation in interest rates represents a great threat to the financial stability of the bank. A large number of factors in the last few years have given enormous importance to the management of interest rate risks. The increase in the volatility of interest rates on the financial markets caused by the economic crisis of 2008 contributed to the instability of income, expenses, and economic value of banks, while income from interest rates remained the most important source of income for banks. Also, it should be pointed out that the regulatory framework of banking operations defined by the Basel II and III agreements requires that reserves be issued according to the estimated exposure to market risk, which also affects the analysis and management of interest rates.

Interest rate risk is a type of market risk, which means that banks suffer losses due to changes in market interest rates (Chorafas, 1999). Interest rate risk is such an important type of risk that banks can simply suffer astronomical losses if interest rate risk is not managed effectively. In general, bank deposits are short-term, while loans given to clients have a longer maturity. Due to the given situation, any increase in the interest rate causes a loss for the banks. The main reason for this problem is reflected in the fact that banks will start paying higher amounts of interest to depositors, but on the other hand, there will be no change in the amount of interest that debtors pay to the bank (Angbazo, 1997).

Therefore, interest rate risk can be defined as the potential impact on a bank's economic value or profitability due to changes in interest rates. The sources of interest rate risk can be different (Fraser et al., 2002). The most important source of interest rate risk is interest rate redetermination risk, which naturally arises for banks due to mismatches in the time to maturity or the time to redetermination of interest rates between the assets and liabilities of banks' balance sheets. For example, a bank that finances long-term loans with a fixed interest rate with short-term deposits will suffer a decline in economic value if interest rates rise because the cost of funds will rise, while earnings from loans will remain fixed. On the other hand, the bank will instead gain if interest rates fall.

In the last 5 to 6 years, interest rates on loans in Bosnia and Herzegovina have been at extremely low levels and in continuous decline, with the most commonly used reference value for the variable part of the interest rate in credit contracts, EURIBOR, being in the negative range since 2015. At the same time, the interest rates paid by banks on deposited funds were significantly low. In terms of active interest rates, there were no significant deviations in the dynamics of the domestic market and the Eurozone market (https://banke-biznis.com). The main goal of this paper is to examine how the interest rate risk factors indirectly affect the efficiency of banks in Bosnia and Herzegovina in the period between 2014 and 2024. Empirical findings will help banks in B&H to find and identify the effect of interest rate risk factors, and to help bank management to timely and comprehensively monitor and control risk.

The paper is structured in five parts. The first part refers to introductory considerations with a special focus on the definition of interest rate risk, a brief overview of interest rate trends in B&H, and the impact on the profitability of business operations in the banking sector in B&H. The second part describes the movement of the reference interest rate, i.e., EURIBOR, and comparison with domestic interest rates, as well as the movement of profitability indicators and interest rates on loans in B&H.

The third part describes an overview of relevant research in the context of the impact of interest rate risk on profitability indicators of deposit banks in B&H. The fourth part describes the chosen research methodology and the required data. The fifth part presents the obtained research results, as well as certain observations and recommendations.

2. Interest Rate Risk in the Banking Sector

Banking income can be classified as either interest income or non-interest income. The bank's non-interest income is generated from insurance, consulting, and other services. When higher interest rates reduce economic growth, the volume of initial public offerings and other services, such as acquisitions, also decreases. In this regard, fees generated by banks as a result of insurance, or consulting are reduced. The more a bank relies on these types of facilities, the greater its sensitivity to interest rate increases should be. Therefore, banks that rely more on non-interest income should be more exposed to interest rate risk.

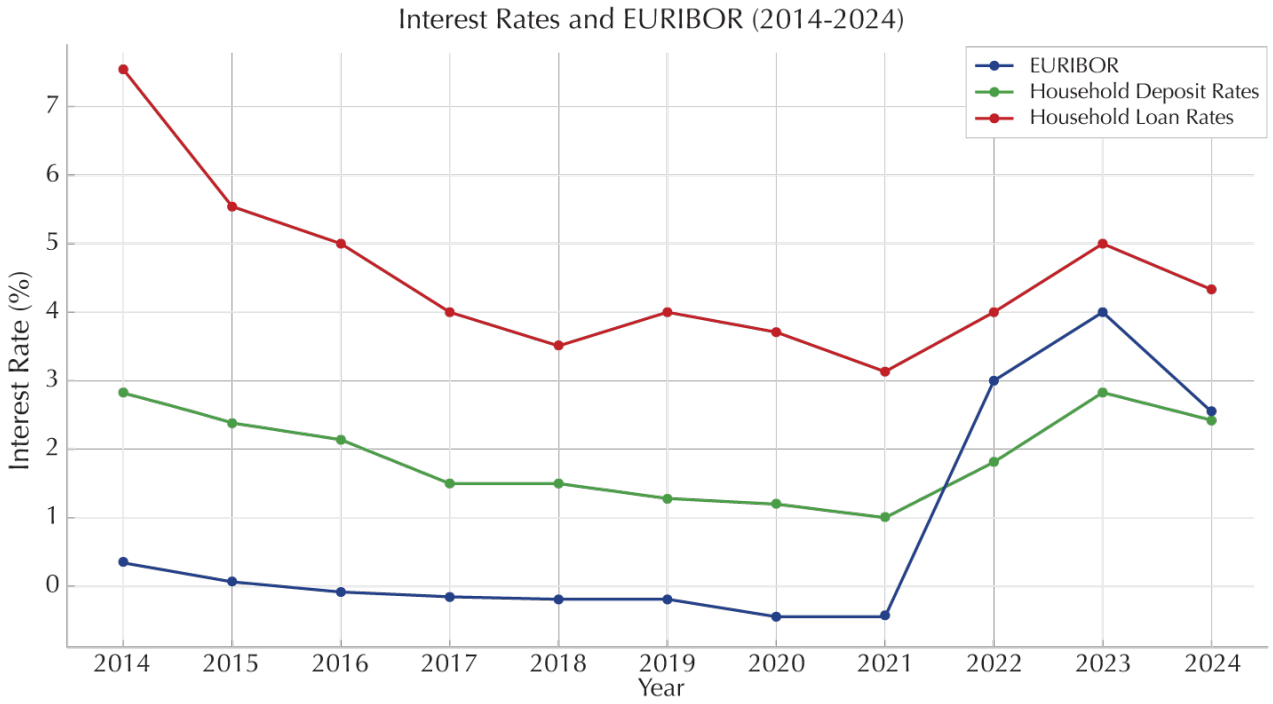
Interest rate risk refers to the probability that banks will incur a loss due to changes in the market interest rate (Hellwig, 1994). Bank deposits are usually short-term, while loans given to clients have a longer maturity. In this regard, any increase in interest rates creates problems for banks. In other words, banks have to pay higher interest to depositors after the maturity date in case of rising interest rates. On the other hand, there is no change in interest income received from loans given to clients (Stanton, 1997).

There are mainly two different methods for measuring bank interest rate risk. The first method is GAP analysis, which examines how changes in interest rates affect banks' balance sheets. Therefore, it is necessary to define accounts sensitive to interest rates in assets and liabilities. After that, the ratio of assets and liabilities is calculated. This ratio is also called the GAP ratio (Kim & Koppenhaver, 1993). If this coefficient is greater than 1, it means that assets are more sensitive to changes in interest rates than liabilities. On the other hand, when this ratio is less than 1, it implies the conclusion that changes in interest rates affect liabilities more than assets.

Another method for measuring interest rate risk is duration analysis. This method analyzes how changes in interest rates affect the present value of investments (Macaulay, 1938). In this analysis, first, the duration of banks' assets and liabilities is calculated for different maturities. A situation where the duration of assets is longer than liabilities shows that the bank's assets are more sensitive to interest rate fluctuations. In this regard, if the bank expects any increase in interest rates, it will prefer to preserve the remaining positions because the value of the assets will increase. Therefore, the bank should change the structure of its balance sheet if interest rates are expected to fall in the future (Bierwag ve Kaufman, 1985).

Considering the arrangement of the currency board that it has followed since 1997, the Central Bank of Bosnia and Herzegovina does not have a discount rate in its instruments because it is forbidden by law to grant loans to anyone. The interest rate is not an instrument of the monetary credit policy of the Central Bank of Bosnia and Herzegovina. In this regard, interest rates are freely formed on the financial market without the influence of the Central Bank. Commercial banks in B&H set their interest rates in accordance with their business policy and the state of the financial market, as well as the level of market interest rates. The graph below illustrates the trend of the market interest rate, i.e., EURIBOR and interest rates on deposits and loans of the household sector of banks in B&H for the period: 2014-2024.

Graph 1 - Movement of EURIBOR and Interest Rates on Deposits of the Household Sector and Loans of the Household Sector in Banks in BiH for the Period: 2014 - 2024 (in%)



SOURCE: https://www.euribor-rates.eu and https://cbbh.ba (Adapted by the author)

Euro Interbank Offered Rate (EURIBOR) is a key reference interest rate that reflects the interest rates at which European banks lend funds to each other. It is evident from the previous graph that EURIBOR had negative values from 2015, with a rate of minus 0.006 until 2021, with a rate of -0.505. From 2022, EURIBOR has experienced significant changes thanks to the policy of the European Central Bank (ECB) aimed at fighting inflation. From 2022 to 2023, it records a growth in value of about 3.902%, and after 2023, it declines to 2.431%.

These changes reflect the ECB's economic policy and market conditions in the Eurozone. Therefore, the ECB and the FED implemented an expansionary monetary policy[1] in the period until 2022 in order to further reduce the reference interest rate in periods of economic stagnation and recession, in order to influence the lowering of interest rates in order to encourage borrowing and further investment (The Central Bank of Bosnia and Herzegovina, 2019). After the end of the key interest rate increase cycle in September 2023, the ECB maintained a restrictive monetary policy[2] almost until the middle of 2024.

[1] Expansionary monetary policy is a set of measures implemented by the Central Bank with the primary goal of increasing the money supply and stimulating economic activity.
[2] Restrictive monetary policy is a set of measures undertaken by the Central Bank with the primary goal of reducing the amount of money in circulation and increasing interest rates, and with the further goal of curbing inflation and overheating the economy.

The slight turn in monetary policy was reflected in the weakening of inflationary pressures and the general slowdown of inflation, which was largely the result of the previous restrictive policy (The Central Bank of Bosnia and Herzegovina, 2024). The influence of interest rates on the European money market has effects through a transmission mechanism that originates from the Central Bank of B&H, which holds liquid assets on a short-term basis in European banks with the highest credit rating. This also means relatively lower interest rates, which are accompanied by the high credit rating of the European banks with which the Central Bank works. Given that the Central Bank of Bosnia and Herzegovina holds reserves of domestic banks in accounts with foreign banks, the interest rates on these funds also dictate the interest rates on reserves, i.e., excess reserves over and above the mandatory reserve that the Central Bank calculates for commercial banks. Another channel of the effect of interest rates from the European market is the term deposit of funds of domestic banks in the accounts of foreign banks, which is absolutely unprofitable for domestic banks in conditions of extremely low interest rates. For these reasons, banks are reducing terms on foreign bank accounts and are turning to overcomposition of their portfolio in the direction of investing in government securities that carry a significantly more favorable interest rate (Plakalović & Alihodžić, 2015).

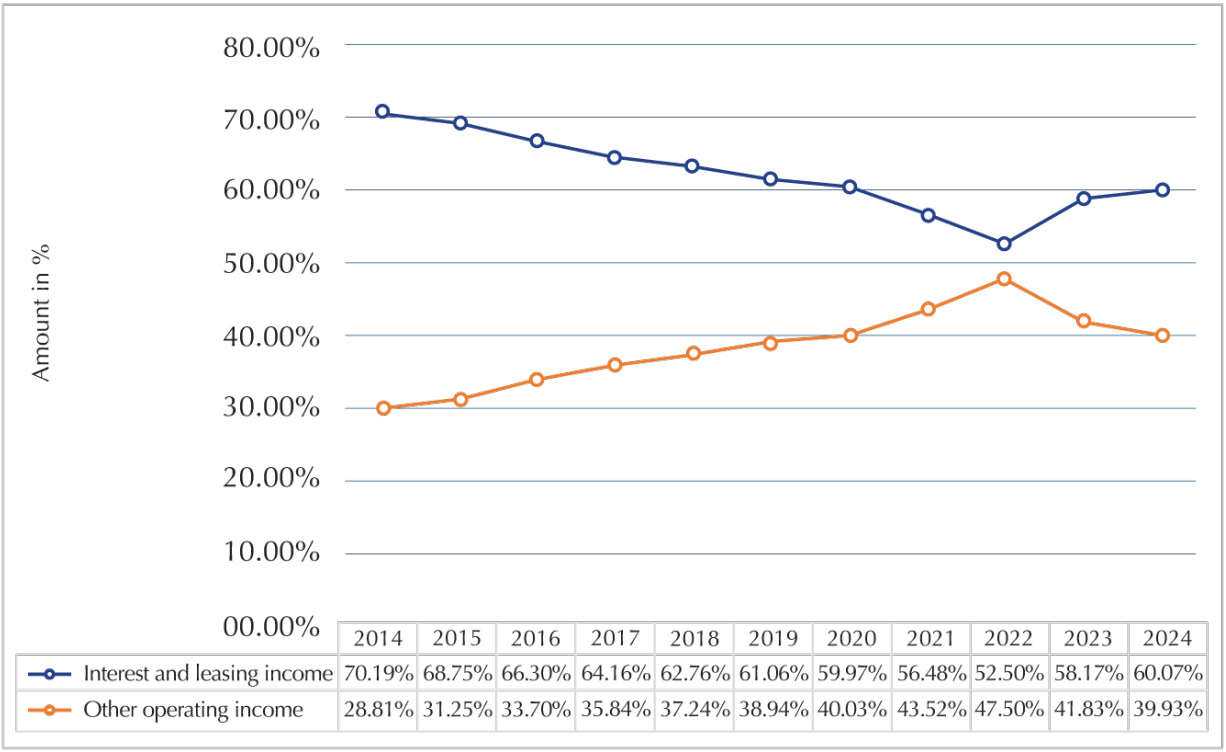
Table 1 - Tendency of Return on Assets and Interest Rates on Loans and Deposits of the Real Sector in B&H for the period: 2014 - 2024. (in %)

Indicators	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
ROA	0.80	0.91	1.00	1.30	1.20	1.20	0.70	1.20	1.40	1.80	1.90
Interest rates on loans to companies	6.36	5.52	4.70	4.01	3.50	3.17	2.94	2.85	2.84	2.94	3.01
Interest rates on deposits to companies	3.52	1.94	1.82	1.82	1.96	1.49	1.47	0.95	1.50	2.73	3.02

SOURCE: Calculation by the author based on data from the Banking Agency of the FB&H and Republika Srpska and The Central Bank of B&H

Table 1 analyzes whether there is causality and mutual dependence between the ROA indicator and interest rates on loans and deposits to companies in B&H for the period 2014-2024. As you can see, there is no direct correlation except for the years 2022-2024, where it is visible that with a slight trend of growth in interest rates on loans and deposits, there is a slight trend of increasing the value of the ROA indicator. In general, interest rates in Bosnia and Herzegovina have had a downward trend, for example, interest rates on loans to companies from 6.35% in 2014 have suffered a decline to 2.84% in 2022.

Graph 2 - Tendency of Interest and Leasing Income, and Other Operating Income of Banks in B&H for the Period: 2014-2024. (in%)



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Interest and leasing income	70.19%	68.75%	66.30%	64.16%	62.76%	61.06%	59.97%	56.48%	52.50%	58.17%	60.07%
Other operating income	28.81%	31.25%	33.70%	35.84%	37.24%	38.94%	40.03%	43.52%	47.50%	41.83%	39.93%

SOURCE: Calculation by the author based on data from the Banking Agency of the Federation of Bosnia and Herzegovina and the Banking Agency of the Republika Srpska

From the previous graph, it is evident that income from interest and leasing, as well as other operating income of banks in B&H, did not have the same pattern of movement for the observed period. Therefore, the income from interest and leasing of banks in Bosnia and Herzegovina was recorded as a linear decline from 70.19% in 2014 to 52.50% in 2022, after which a slight growth started from 58.17% in 2023 to 60.07% in 2024. On the other hand, other operating income showed a linear growth from 29.81% in 2014 to 47.50% in 2022, and then a decline to 39.93% in 2024. The following can be cited as essential factors for the decline in income from interest and leasing as the core business that banks in Bosnia and Herzegovina deal with: the increasing number of bad debtors, risk aversion, withholding or not approving loans to the extent that reserves allow, etc (Alihodžić, 2021). Also, after the slight recovery of credit activity that followed in 2022 as a result of the start of economic activity after the end of COVID-19, and the increase in macroeconomic risks that spilled over to the economy in B&H, led to another slowdown in credit activity. Likewise, extended uncertainty and increased risk perception influenced the slowdown of the overall loan portfolio (The Central Bank of Bosnia and Herzegovina, 2022).

3. Theoretical Basis - Review of Relevant Literature

In Bosnia and Herzegovina, monetary policy is limited by the currency board system, and banks operate with a high amount of foreign capital, and changes in interest rates have a significant impact on

business profitability. Therefore, interest rates in Bosnia and Herzegovina generally follow the trend of interest rates in the Eurozone. Changes in interest rates in the EU are transferred to B&H through financial markets, without domestic intervention. The main problem in this research is to determine to what extent and in what way changes in interest rates affect the profitability of bank operations. Given that a small number of papers have been written on this topic in B&H, this research deserves special attention.

The exposure of commercial banks to interest rate risk has been the subject of considerable empirical research. Most research has focused on two interrelated questions: 1. Are bank returns sensitive to changes in interest rates? 2. Is the sensitivity of bank shares to interest rates related to certain characteristics of assets and liabilities of individual banks? In the literature, most empirical and theoretical studies indicate that interest rate fluctuations have a highly significant positive relationship with bank profits in general. In other words, most authors agree that in cases of interest rate increases, banks' profits also increase, while on the other hand, in periods of interest rate decreases, bank profits decrease.

A number of studies reveal that bank stock returns are negatively correlated with changes in interest rates. For example, Lynge and Zumwalt (1980), Booth and Officer (1985), Bae (1990), and Kwan (1991) find a significantly negative relationship between changes in interest rates and bank stock returns. On the contrary, Lloyd and Shick (1977) and Chance and Lane (1980) find no significant relationship between interest rate movements and bank stock returns.

Staikouras and Wood (2004) worked with a balanced sample that covered all EU banking industries in the period from 1994 to 1998. The results of the study showed that European banks are influenced by external and internal factors, and that the interest rate is determined as one of the external factors that influence the significant positivity of European banks; in other words, any increase in interest rates causes an increase in bank profitability.

Zaganov et al. (2009) conducted a study to show how banks regulate their interest rate profile. They came to the conclusion that most banks in the sample are negatively affected by adverse interest rate movements, which implies that managers fail to adopt comprehensive hedging strategies. They also came to new conclusions that a higher level of economic freedom, better governance, efficiency of the legal system, and a higher quality of state supervision are associated with lower exposure of banks to interest rate risk.

Demirguc and Huizinga (1999) found a positive correlation between interest rates and profits, especially in developed and developing countries, while studies such as Ebrahim et al. (2013) found a significant relationship between interest rate risk and profitability.

Bacha (2004) analyzed the extent of potential exposure to interest rate risk for Malaysian Islamic banks using monthly data from January 1994 to July 2003. The paper implements Pearson's coefficient of correlation, then ordinary least squares regression analysis, and Granger's causality test. He came to the conclusion that changes in interest rates of conventional banks and total deposits cause changes in the rate of return of Islamic banks, respectively.

Zainol and Kassim (2010) analyzed the dynamic effects of interest rate changes on the rate of return of Islamic banks and the amount of deposits in conventional and Islamic banks in Malaysia. Using data covering the period from January 1997 to October 2008, they came to the conclusion that the rate of return of Islamic banks and the interest rate of conventional banks have a long-term equilibri-

um, and that there is a two-way causality between them. Also, they came to the conclusion that rates of return and deposits of Islamic banks react significantly to changes in conventional interest rates. This implies the conclusion that when the interest rate of conventional banks increases, depositors of Islamic banks will transfer their funds from Islamic to conventional banks.

Akpomiemie (2012) investigated the impact of market interest rate fluctuations on commercial bank profitability for 14 commercial banks and one investment bank in South Africa between 2001 and 2010. He found that changes in interest rates have a positive impact on the profitability of commercial banks in South Africa. At a time of rising interest rates, the profits of small commercial banks also grow.

Piergiorgio and Nelson (2012) examined the relationship between interest rate and bank profits using a regression model and a unique dataset of UK banks in the period from the first quarter of 1992 to the third quarter of 2009. The result showed that an increase in the interest rate in the short term reduces profitability; however, any increase in the interest rate in the long term can lead to an increase in profitability.

Khedira & Khedhiri (2011) studied through panel data and regression analysis in a paper entitled: Determinants of banking net interest margin in Tunisia, profits and interest rates for 10 commercial banks in Tunisia in the period 1996-2003. The results of the study showed that interest rates affect both bank costs and bank profitability.

Based on the above discussion, this paper will investigate the following hypotheses:

H1: *There is a negative correlation between the ratio of loans and assets and profitability indicators of the banking sector in Bosnia and Herzegovina.*

H2: *There is a positive correlation between the average lending ratio and profitability indicators of the banking sector in B&H.*

H3: *There is a positive correlation between the risk of interest diversification and profitability indicators of the banking sector in Bosnia and Herzegovina.*

4. Methodology and Data

4.1 Model

The sensitivity of profit to changes in interest rates can be directly measured using gap analysis, in which the amount of interest-sensitive assets is subtracted from the amount of interest-sensitive liabilities, and the difference is multiplied by the change in the interest rate (Lukić, 2010).

Panel data refers to the pooling of observations on a cross-section of households, countries, businesses, etc., over several time periods. Panel data consists of the values of N units for different time periods. Therefore, panel data combines cross-sectional and time-series data. The number of units is expressed as N, while the number of periods is expressed as T (Baltagi, 2005).

Following Arcand et al. (2015), we begin our estimations by regression equations using the method of least squares (OLS). Klein and Weill (2018) indicate that OLS regression is not only a useful method for describing the data, but also for providing a first (biased) estimate of the coefficients. All calcu-

lations typically use a 5% significance level. Therefore, the significance test was performed for all variables using the t-test at a significance level of 95% (Chmelarova, 2007).

The model that will be used in this study is an adapted version of the model by Zagonov et al. (2009), that is, it is a least squares model, where return on equity (ROE) and return on assets (ROA) are proxy variables of the performance of banks in B&H and are a function of the following independent variables: loan-to-asset ratio (LTAR), average lending ratio (ALR), and interest diversification risk (ROID), and all of them represent indices for measuring interest rate risk. The functional relationship of the model is given in the form of the following equations. The econometric equations for the model can be specified as follows:

$$ROA = \propto_0 + \propto_1 * LTAR + \propto_2 * ALR + \propto_3 * ROID + \mu \quad (1)$$

$$ROE = \propto_0 + \propto_1 * LTAR + \propto_2 * ALR + \propto_3 * ROID + \mu \quad (2)$$

Where:

$\propto_0$ - intercept value or constant term,

$\propto_1$ _ $\propto_3$ - parameter coefficients in the model,

LTAR - loan-to-asset ratio,

ALR - average lending ratio,

ROID - interest rate diversification risk.

μ- random error.

4.2 Data

In this research, the goal was to examine how the risk of interest rates affects the efficiency indicators of banks in Bosnia and Herzegovina, that is, ROA and ROE. In this context, quarterly data for the period between 2014 and 2024 were used for the banking sector in Bosnia and Herzegovina. The data were collected from the official websites of the Banking Agency in the Federation of Bosnia and Herzegovina and the Banking Agency of Republika Srpska. The results of the analysis were obtained based on the statistical package STATA 17.0.

A summary of the measurement variables is presented in Table 2

Table 2 - Dependent and Independent Variables

Variable abbreviation	Variable	Calculation method	Call for literature
ROE	Return on equity (%)	(Profit after taxation/capital) *100	Demirgüç-Kunt,A., & Huizinga ,H.(1999), Khan and Sattar (2014)

ROA	Return on assets (%)	(Profit after tax/total assets) *100	Hanweck & Kilcollin (1984), Memmel (2011), Peng et. al. (2003)
LTAR	Loan-to-asset ratio	Net loans/Total assets	Sierra and Yeager (2004), Drehmann and others (2010)
ALR	Average lending ratio	Interest income/Total income generating assets	Dietrich & Wanzenried (2011), ECB (2015), Trujillo-Ponce (2013), Bikker & Hu (2002).
ROID	Risk of diversification interest	1-(Net interest income - Non-interest income)/Total business income	Mishkin and Eakins (2006), Scheiber et. al. (2016), Arseneau (2017), Nofiyanti (2014)

Source: Calculation by the author

5. Empirical Findings

5.1 Descriptive Statistics

Table 3 represents the indicators of descriptive statistics used in this research. The total number of observations is 44, which represents a relatively representative sample both in terms of data on the banking market in Bosnia and Herzegovina and in the context of the time frame. Certain banks were excluded from the survey due to the unavailability of data.

Table 3 - Descriptive Statistics of Dependent and Independent Variables in the Model of Banks in Bosnia and Herzegovina for the Period: 2014 - 2024

Statistical measures	ROA	ROE	LTAR	ALR	ROID
Mean	0.879	9.918	0.595	0.023	0.774
Standard deviation	0.413	5.183	0.033	0.015	0.132
Max	1.900	20.40	0.700	0.070	1.310
Min	0.300	2.30	0.480	0.001	0.580
Skewness	0.503	0.443	0.311	1.369	1.341
Kurtosis	2.658	2.190	7.808	4.926	7.221
Number of observations	44	44	44	44	44

Source: Calculation by the author

It can be noted that the ROA for selected banks in Bosnia and Herzegovina ranges from a minimum of 0.30% to a maximum of 1.90% with an average of 0.88. Another measure of bank profitability in B&H, i.e., return on equity, was recorded at a minimum value of 2.30% to a maximum value of 20.40% and an average value of around 9.91%. The minimum value of 2.30% was achieved by the banking sector in the first quarter of 2022, due to reduced lending and income from leasing by about 1.1% and a decrease in the average weighted nominal interest rate on loans from 3.30% to

3.08% (Banking Agency of the FB&H, 2022). In terms of the movement of the first measure of risk, i.e., the standard deviation, the following variables were recorded the strongest volatility: the rate of return on equity of about 5.18%, then the rate of return on assets of banks in B&H of about 0.41% and the risk of interest diversification of about 0.13%. Therefore, the given variables had the same pattern of movement as the movement of the mean value. The highest mean values were achieved by the variables ROE of around 9.92%, ROA of around 0.88% and risk of interest diversification of around 0.77%. The changeable and highly volatile trend of the ROE, ROA and ROID indicators was influenced by the decline in credit activity in the part towards the real sector, and the restoration of the deposit potential of banks after the massive withdrawal of deposits at the beginning of the COVID-19 pandemic (The Central Bank of Bosnia and Herzegovina, 2020).

5.2 Correlation Analysis

According to Cohen (1988), if the coefficient of correlation ranges from 0.10 to 0.29, then it is a small correlation. Also, if the coefficient of correlation ranges from 0.30 to 0.49, then there is a medium correlation. And if the coefficient of correlation takes values from 0.50 to 1.0, then it is evident that the correlation is high.

Table 4 - Correlation Analysis (Pearson Coefficient of Correlation) Between the First Dependent Variable (ROA) and Independent Variables of Banks in Bosnia and Herzegovina for the Period: 2014 – 2024.

		ROA	LTAR	ALR	ROID
ROA	Pearson Correlation	1.000	-0.042	0.307	0.180
	Sig. (2-tailed)	-	0.789	0.043	0.242
LTAR	Pearson Correlation	-0.042	1.000	0.486	-0.592
	Sig. (2-tailed)	0.789	-	0.001	0.000
ALR	Pearson Correlation	0.307	0.486	1.000	-.0570
	Sig. (2-tailed)	0.043	0.001	-	0.000
ROID	Pearson Correlation	0.180	-0.592	-0.570**	1.000
	Sig. (2-tailed)	0.242	0.000	0.000	-

Source: Calculation by the author based on data from the Banking Agency of the FB&H and the Banking Agency of Republika Srpska

From the previous table, it is evident that the strongest positive correlation with the first dependent variable, i.e., return on assets (ROA), was achieved with the following independent variables: average lending coefficient of 0.307 at significance ($p<0.05$), and risk of interest diversification of around 0.180 at significance greater than 5%. Therefore, with an increase in the lending ratio, the ROA indicator also increases. Average income from interest and leasing in B&H banks for the period: 2014-2024, amounted to about 62%, while the remaining 38% related to other operating income. Köhler (2015) investigated the stability of banks in 15 EU countries and found that banks are signifi-

cantly more stable and profitable if they increase their share of non-interest income sources. Therefore, Köhler came to the conclusion that there are significant benefits from income diversification. Chiorazzo et al. (2008) found that income diversification increases risk-adjusted returns in a sample of Italian banks. According to Maudos (2017), who dealt with the relationship between the use of non-interest income and risk and profitability for European banks during the period 2002-2012, he came to the conclusion that an increase in non-interest income has a negative impact on profitability, but is associated with an increase in risk. On the other hand, the strongest negative correlation with the first dependent variable, i.e., return on assets (ROA), was recorded with the independent variable loan-to-assets ratio (-0.042) at a significance of more than 5%. In the banking market in the Federation of Bosnia and Herzegovina in 2014, the share of loans in total assets was about 69.10%, and in 2024, there would be a relative decline to about 59.57% (Banking Agency of the FB&H, 2024). In the banking market of Republika Srpska in 2014, the share of loans in total assets was about 71.10%, and in 2024, there would be a relative decline to about 59% (Banking Agency of Republika Srpska, 2024).

Table 5 - Correlation Analysis (Pearson Coefficient of Correlation) Between the Second Dependent Variable (ROE) and Independent Variables of Banks in Bosnia and Herzegovina for the Period: 2014 – 2024.

		ROE	LTAR	ALR	ROID
ROA	Pearson Correlation	1.000	-0.070	0.316	0.019
	Sig. (2-tailed)	-	0.650	0.037	0.902
LTAR	Pearson Correlation	-0.070	1.000	0.486	-0.592
	Sig. (2-tailed)	0.650	-	0.001	0.000
ALR	Pearson Correlation	0.316	0.486	1.000	-.0570
	Sig. (2-tailed)	0.037	0.001	-	0.000
ROID	Pearson Correlation	0.019	-0.592	-0.570	1.000
	Sig. (2-tailed)	0.902	0.000	0.000	-

Source: Calculation by the author based on data from the Banking Agency of the FB&H and the Banking Agency of Republika Srpska

The obtained results of the correlation analysis between the second dependent variable (ROE) and the independent variables are almost identical to the results of the correlation analysis between the first dependent variable (ROA) and the independent variables. Table 5 clearly shows that the strongest positive correlation with the second dependent variable, i.e., return on equity (ROE), was recorded with the following independent variables: average lending ratio of 0.316 at significance ($p<0.05$), and rate of interest diversification of around 0.019 at significance greater than 5%. On the other hand, the strongest negative correlation with the second dependent variable, namely return on equity (ROE), was recorded with the independent variable loan-to-asset ratio (- 0.070) at a significance level greater than 5%.

Any variable in the model that has a VIF value greater than 3 is considered multicollinear and is thus rejected from the model. In the case of multicollinearity, the coefficients of the variables became unstable, and the standard errors were overestimated. Table 6 shows the obtained results of the multicollinear analysis between the observed variables in the model.

Table 6 - Multicollinear Analysis Using Variance Inflation Factor (VIF)

Variables	VIF	1/VIF
LTAR	1.62	0.616596
ALR	1.56	0.640855
ROID	1.83	0.545070

Source: Calculation by the author (STATA 13.0)

As can be seen from the previous table, every single independent variable has a value of the VIF coefficient less than 3. It is clear that there is no multicollinearity between the variables; therefore, the set model is valid.

Table 7 illustrates the results of the panel regression analysis based on the least squares model between the independent variables and return on assets of the banking sector of Bosnia and Herzegovina. The value of the F-statistics for the method of least squares is 5.23, and the probability is less than 5%, which indicates that the model is very significant (Table 7). In this empirical section, least squares regression is discussed because of the numerous advantages it has over other estimation techniques. These advantages are primarily reflected in the best finding of the line that describes the relationship between the dependent and independent variables and gives the best trend line for the set of observed data. Also, in this research, the Breusch-Pagan-Godfrey test and the Breusch-Pagan Harvey test were used to test heteroskedasticity. The probability result obtained through the Breusch-Pagan-Godfrey test is 0.1064, which is greater than 5% and confirms that there is no heteroskedasticity in the regression model. Likewise, the probability result obtained through the Breusch-Pagan Harvey test is 0.4797, which also confirms that there is no heteroskedasticity in the regression model.

Table 7 - Coefficients of Independent Variables in Ordinary Least Squares Regression for the Period: 2014:Q1 - 2024:Q4

Regression model	Ordinary Least squares method (OLS)		
Dependent variable - ROA			
Independent variables	Coeff.	Std. Error	Probability
C	-0.437	1.5153	0.7742
LTAR	-0.510	2.1409	0.8127
ALR	16.717	4.5445	0.0001
ROID	1.5830	0.5665	0.001

Coefficient of determination	0.2819	-	-
Pseudo R- Squared	-	-	-
Adjusted coefficient of determination	0.22805	-	-
F-Statistic	5.2345	-	-
Prob (F-statistic)	0.003	-	-
Prob (Rn-squared st)	-	-	-
Prob (Quasi -LR stat)	-	-	-

Source: Calculation by the author

By applying equation (1) to the data obtained by the method of least squares in Table 7, we arrive at the following predicted model:

$$ROA = - 0{,}437 - 0{,}510 * LTAR + 16{,}717 * ALR + 1{,}5830 * ROID$$

The adjusted coefficient of determination in the least squares model is 0.22805 or 0.23. This indicates that 23% of the ROA variation is explained by changes in interest rate risk measures, while the remaining 77% is explained by factors not specified in the model. The probability of the F-statistic in the least squares method has a value of 0.003, which shows that the model is statistically significant at the 5% significance level because the p-value is less than 5%.

With the method of least squares, the value of the LTAR, ALR, and ROID coefficients is -0.510, 16.717, and 1.583, respectively. ROA is negatively associated with LTAR and positively with ALR and ROID, where the probability is less than 5% for the ALR and ROID variables. By testing the first research hypothesis that there is a negative correlation between the ratio of loans and assets and the first indicator of profitability, i.e., return on assets of the banking sector in Bosnia and Herzegovina, the conclusion is reached that there is a negative correlation, but with a probability higher than 5%, thus rejecting the first research hypothesis.

If the average leverage ratio increases by about 1%, the first dependent variable ROA in the least squares method will increase by about 16.72 units, assuming that other variables remain unchanged. By testing the second research hypothesis that there is a positive correlation between the average lending ratio and the first indicator of profitability, i.e., return on the assets of the banking sector in B&H, the conclusion is reached to accept the hypothesis because the probability is less than 5%. A larger loan portfolio generates a large majority of net interest income, which obviously has a positive impact on bank profitability, but is also subject to higher credit risk, which may in turn worsen profitability. Empirical evidence, Dietrich and Wanzenried (2011), ECB (2015), and Trujillo-Ponce (2013) reveal that overall, lending has a positive effect on profitability. Bikker and Hu (2002) find that lending is procyclical and that banks with higher profits will lend more generously.

If the risk of interest diversification increases by about 1%, the first dependent variable ROA in the least squares method will increase by about 1.58 units, assuming that other variables remain unchanged. By testing the third research hypothesis that there is a positive correlation between the risk of interest diversification and the first indicator of profitability, i.e., return on assets of the banking sector in B&H, the conclusion is reached to accept the hypothesis because the probability is less than 5%. Scheiber et al. (2016) and Arseneau (2017) believe that the risk of interest diversification and the ability of banks to diversify their sources of income have a positive impact on banking profitability. Aruwa and Musa (2014) found a negative relationship between interest rate risk and profitability.

Table 8 - Coefficients of Independent Variables in Ordinary Least Squares Regression for the Period: 2014:Q1 - 2024:Q4

Regression model	Ordinary Least squares method (OLS)		
Dependent variable - ROE			
Independent variables	Coeff.	Std. Error	Probability
C	-13.307	19.916	0.507
LTAR	15.671	28.138	0.581
ALR	170.620	59.729	0.006
ROID	12.902	7.446	0.091
Coefficient of determination	0.1949	-	-
Pseudo R- Squared	-	-	-
Adjusted coefficient of determination	0.1345	-	-
F-Statistic	3.228	-	-
Prob (F-statistic)	0.03		-
Prob (Rn-squared st)	-	-	-
Prob (Quasi -LR stat)	-	-	-

Source: Calculation by the author

By applying equation (2) to the data obtained by the method of least squares in Table 8, we arrive at the following predicted model:

$$ROE = -13{,}307 + 15{,}671 * LTAR + 170{,}62 * ALR + 12{,}902 * ROID$$

It is evident from the previous table that the adjusted coefficient of determination in the least squares model is 0.1345 or 13.45%. This indicates that 13% of the ROE variation is explained by changes in interest rate risk measures, while the remaining 87% is explained by factors not specified in the model. The probability of the F-statistic in the least squares method has a value of 0.003, which shows that

the model is statistically significant at the 5% significance level because the p-value is less than 5%. In the observed model, the value of the independent variable, average lending ratio (ALR), has a positive value and a significance of less than 5%. Therefore, it further explains that if the average leverage ratio increases by about 1% then ROE will increase by about 170.62 units, under the least squares method, provided that other variables remain unchanged.

By testing the first research hypothesis that there is a negative correlation between the ratio of loans and assets and the second indicator of profitability, i.e., return on equity of the banking sector in Bosnia and Herzegovina, it is concluded that there is a positive correlation, but with a probability greater than 5%, thus rejecting the first research hypothesis.

Rivai et al. (2007) consider that the loan-to-asset ratio is a ratio used to demonstrate the ability of banks to meet the demand for loans using the total assets held by banks. The higher this ratio, the better the level of credit performance, because the greater the component of credit in the total structure of assets. On the other hand, it has a negative effect on liquidity, because the higher this ratio is, it means that existing funds are widely used for the distribution of loans, and less for short-term liabilities. By testing the second research hypothesis that there is a positive correlation between the average lending ratio and another indicator of profitability, i.e., the return on equity of the banking sector in B&H, the conclusion is reached to accept the hypothesis because the probability is less than 5%. By testing the third research hypothesis that there is a positive correlation between the risk of interest diversification and the second indicator of profitability, i.e. the return on equity of the banking sector in B&H, the conclusion is reached to reject the hypothesis because the probability is greater than 5%.

Concluding Remarks

Interest rate risk represents the basic market risk that can affect the business results of banks. Banks manage their assets and liabilities, where due to a mismatch of bank-specific assets and liabilities it can increase interest rate risk. In the currency board system, the Central Bank of Bosnia and Herzegovina cannot actively change interest rates or conduct an expansive or restrictive monetary policy.

The aim of this paper was to empirically examine how specific interest rate risk factors indirectly affect the efficiency of bank operations in Bosnia and Herzegovina, as measured by ROA and ROE indicators. The panel analysis is based on a set of data for the banking sector in B&H in the period from 2014 to 2024, and based on data from the Banking Agency in FB&H and Republika Srpska. The interest rate risk factor identified as having a significant impact on the profitability indicators of banks in Bosnia and Herzegovina is the average lending ratio. By testing the first research hypothesis that there is a negative correlation between the ratio of loans and assets and the first indicator of profitability, i.e., return on assets of the banking sector in Bosnia and Herzegovina, it was concluded that there is a negative correlation, but with a probability higher than 5%. Correlation between the ratio of loans and assets and another indicator of profitability i.e., return on equity, is positive but with a significance greater than 5%, which rejects the first research hypothesis.

By examining the second research hypothesis that there is a positive correlation between the average lending ratio and profitability indicators ROA and ROE of the banking sector in B&H, the conclusion was reached to accept the hypothesis because the probability is less than 5%. Therefore, the average lending ratio as an independent variable obtained in this paper through the least squares

model shows that it has a completely statistically significant prediction on the dependent variables ROA and ROE. The average lending ratio reveals that a large loan portfolio increases banks' profitability. On the other hand, higher credit risk causes a significant deterioration in banks' profitability. Moreover, banks have less exposure to risk at lower levels of interest rates due to adverse selection and bad borrowers.

Commercial banks in Bosnia and Herzegovina set their interest rates in accordance with their business policy, the state of the financial markets, and the level of market interest rates. Therefore, interest rates in Bosnia and Herzegovina generally follow the trend of interest rates in the Eurozone. Changes in interest rates in the EU are transferred to B&H through financial markets, without domestic intervention. Interest rates on loans in Bosnia and Herzegovina have been at extremely low levels and in continuous decline in the last few years. Regarding the effect of the low-interest-rate environment on risk-taking by banks, there are generally two channels of risk-taking. On the one hand, no clear evidence was found that banks increased their risk exposure in search of return. Until now, banks have been able to maintain their level of profitability and, in this regard, have not compensated for reduced interest income with riskier investments. On the other hand, it is evident that recently, banks have reduced the level of provisions for loan losses by a certain amount in the environment of low interest rates. Therefore, the banks maintained their overall level of profitability at the expense of a smaller cushion for loan losses. In the coming period, banks will be forced to change their business models and expand their trading activities in order to be less dependent on their traditional lending and financing practices.

Examining the third research hypothesis that there is a positive correlation between the risk of interest diversification and the first indicator of profitability, i.e., return on assets of the banking sector in B&H, the conclusion was reached to accept the hypothesis because the probability is less than 5%. On the other hand, the correlation between the risk of interest diversification and another indicator of profitability, i.e., return on equity, is positive, but with a probability greater than 5%, which implies the conclusion to reject the given hypothesis.

The limitation of this research is reflected in the fact that only deposit banks in Bosnia and Herzegovina were taken into consideration, as well as the fact that only three measures of interest rate risk were taken as independent variables. A further recommendation would be to take banks from developing countries, individual EU member states, and developed countries, as well as more measures of interest rate risk.

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