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TEHNIČKA ANALIZA I TRŽIŠTE AKCIJA U BOSNI I HERCEGOVINI

Rezime

Na finansijskom tržištu Bosne i Hercegovine alatima tehničke analize se može predvidjeti kretanje cijena akcija. Svi modaliteti tehničke analize koji su korišteni u radu, osim indeksa novčanog toka i impulsa, imaju upotrebnu vrijednost: svijećnjaci, Fibonačijevi brojevi, ROC i RSI, Bulindžerove granice i linija trenda. Upotreba pojedinih instrumenata tehničke analize se veže za konkretnu tržišnu situaciju i vrstu trenda. Prediktivna moć tehničke analize raste sa kombinovanom primjenom njenog instrumentarija kao i sa prilagođavanjem karakteristikama trenda. Korisnost metoda tehničke analize u predviđanju prelomnih događaja u kretanju cijena akcija je funkcija njene fleksibilne, prilagodljive i združene primjene.

Ključne riječi: tehnička analiza, tehnički indikatori, tržište akcija, grafički obrasci, svijećnjaci, Fibonačijevi brojevi, Bosna i Hercegovina.

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Summary

On the financial market of Bosnia and Herzegovina tools of technical analysis can predict the movement of stocks prices. All modalities of technical analysis which have been used in this paper, except for the money flow index and momentum, have their usability value: candlesticks, Fibonacci numbers, technical indicators, Boolinger Bands, and trend line. The use of particular instruments of technical analysis is related to the specific market situation and the kind of the trend. Predictive power of technical analysis rises with the combined use of its instruments, as well as with its adaptation to the trend's characteristics. Usefulness of the technical analysis methods in predicting crucial events in the movement of stock prices is the function of its flexible, adaptable and joint implementation.

Key words: technical analysis, technical indicators, stock market, candlesticks, Fibonacci numbers, Bosnia and Herzegovina

JEL Classification: G12, G14

TECHNICAL ANALYSIS AND STOCK MARKET IN BOSNIA AND HERZEGOVINA

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Uvod

Tehnička analiza je suprotnost fundamentalnoj analizi. Investitore naklonjene tehničkoj analizi (čartisti, grafičari, tehničari) ne zanimaju fundamentalne varijable već samo krajnji efekti promjene tih i ostalih varijabli na kretanje cijene. Samo po sebi, kretanje cijena i volumena - sa aspekta tehničke analize - predstavlja informaciju o fundamentalnim varijablama koje se nalaze u pozadini tržišnog procesa.

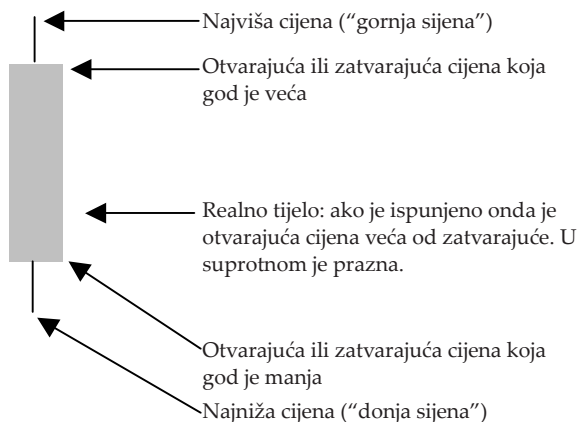
Čartisti izvode kupovne/prodajne signale iz kvantitativno/kvalitativnih karakteristika promjene cijena i volumena. Prema tehničkoj analizi jedna slika vrijedi više nego hiljadu riječi. Predmet istraživanja je položaj tehničke analize u odnosu na tržište akcija u Bosni i Hercegovini (Banjalučka Berza - BLSE i Sarajevska berza - SASE). Cilj je ispitivanje upotrebne vrijednosti tehničke analize na domaćem tržištu. Polazimo od hipoteze da se na finansijskom tržištu Bosne i Hercegovine alatima tehničke analize i njihovom kombinacijom može predvidjeti kretanje cijena akcija.

Materijal i metode

Metodološku osnovu rada čine instrumenti tehničke analize; pokretni prosjeci (kratkoročni pokretni prosjek - k.p.p. i srednjoročni pokretni prosjek - s.p.p), Bulindžerove granice (*Boollinger Bands*) i tehnički indikatori (indeksa relativne moći (*RSI - relative strength index*), indeks novčanog toka (*MFI index - money flow index*), stopa promjene cijene (*ROC - rate of change*) i impuls/momentum). U radu se za predviđanje smjera kretanja cijena akcija koriste grafički obrasci iz teorije svijećnjaka (*candlestick*) i osnove Eliotove teorije talasa - u obliku Fibonačijevih brojeva. Od ostalih grafičkih obrazaca u radu se pojavljuju obrazac glave i ramena i obrazac dvostrukog vrha.

Grafikon 1 ilustruje način obuhvatanja promjene cijena akcija preko koncepta svijećnjaka. Svijećnjaci ubrzavaju i olakšavaju analizu kretanja cijene akcija. Boja realnog tijela, prostor između zatvarajuće i otvarajuće cijene, pokazuje smjer kretanja cijena. Dužina tijela svijećnjaka je slika relativnog odnosa između *bull* i *bear* investitora.

Grafikon 1. Elementi svijećnjaka



U teoriji svijećnjaka postoje brojni karakteristični obrasci preokreta cijene u pravcu *bear/bull* tržišta. U radu su izolovani i obrađeni obrasci; čekića (*hammer*), obrnutog čekića (*inverted hammer*), dodžija (*doji*), opadajuće zvijezde (*shooting star*), prodornog obrasca (*piercing pattern*), crnog oblaka koji prekriva (*dark cloud cover*), rastućeg (*bullish engulfing*) i opadajućeg svijećnjaka (*bearish engulfing*) koji okružuje.

Teorija talasa - tj. kretanje cijena u obliku talasa - je kombinacija tehničke analize i teorije cikličnog kretanja. Njen matematički derivat je Fibonačijev niz: 1, 2, 3, 5, 8, 13, 21, 34..... sa 4 glavne osobine. Prva je da je suma dva uzastopna broja niza jednaka prvom sljedećem broju u nizu. Druga je da količnik između broja i njegovog sljedbenika nakon niza od četiri broja konvergira broju 0,618. Treća je da količnik bilo kojeg broja i prethodnog broja teži broju 1,618 - što je recipročna vrijednost od 0,618. Četvrta osobina niza je da količnici između svaka dva druga broja konvergiraju broju 2,618 odnosno njihovoj recipročnoj vrijednosti 0,382 (npr. $13/5 = 2,6$, $13/34 = 0,38$).

Bulindžerove granice mjere volatilnost/promjenljivost cijene akcije preko pokretnog prosjeka cijene korigovanog sa standardnom devijacijom. U radu, Bulindžerova granica je pokretni prosjek cijene (15 dana) uvećan/umanjen za dvije standardne devijacije. Smisao samostalne upotrebe ovog indikatora je u uočenoj zakonitosti sukcesivne promjene perioda niske i visoke volatilnosti i promjene kretanja cijene koja iz toga proizilazi.

Pokretni prosjeci (p.p) su tzv. zaostajući

Introduction

Technical analysis is the opposite of a fundamental analysis. The investors inclined towards technical analysis (charters, graphic presenters, technicians) are not interested in the fundamental variables, but only in the final effects caused by the changes in these and other variables in the movement of prices. Prices and volume movement in itself - from the aspect of technical analysis - is an information on the fundamental variables that are to be found in the background of the market process.

Chartists receive buying/selling signals from the quantitative/qualitative characteristics in the change of prices and volume. According to the technical analysis, one picture is worth a thousand words. The subject of our research is the position of the technical analysis in respect to the stock market in Bosnia and Herzegovina (Banja Luka Stock Exchange - BLSE, and Sarajevo Stock Exchange - SASE). The objective of the paper is to examine functional values of technical analysis on the domestic market. The starting point of the hypothesis is that, in the financial market of Bosnia and Herzegovina, technical analysis tools and their combination can predict movement of the stock prices.

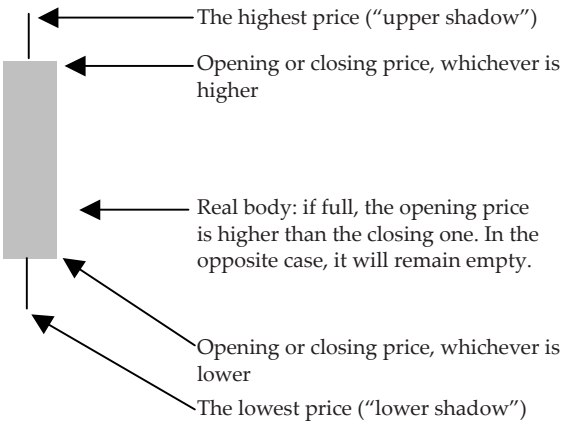
Materials and Methods

Methodological basis of this paper are the technical analysis tools: shifting averages and indices (short-term shifting average, and medium-term shifting average, Boolinger Bands, and technical indicators of the relative strength index - RSI, money flow index - MFI, rate of change - ROC, and the impulse/momentum). In this paper, for the prediction of movement in the stock prices, charted patters are used from the candlestick theory and the basics of the Elliott Wave Theory - in the form of Fibonacci numbers. Among other charted patterns presented in the paper are the head and shoulders patters, and the double-top pattern.

Chart 1 illustrates the way to present stock price changes through the candlestick concept. Candlesticks are accelerating and facilitating stock price movement analysis. The colour of

the real body, the space between the closing and the opening price, indicate the price movement trend. The length of the candlestick body is the picture illustrating relative ratio between the bull and the bear investors.

Chart 1 Candlestick elements



In the candlestick theory there are many characteristic patters for price changes in the direction of a bear/bull market. This paper singled out and examined the following patterns: hammer, inverted hammer, doji, shooting star, piercing pattern, dark cloud cover, bullish engulfing, and bearish engulfing.

Elliott Wave Theory, i.e. wave-like price movement, is a combination of the technical analysis and the cyclic movement theory. Its mathematical derivative is the Fibonacci number series: 1, 2, 3, 5, 8, 13, 21, and 34... with 4 main features. The first one is that the sum of two subsequent numbers in the series is equal to the number coming next in the series. The second is that the quotient between a given number and the number that follows after the series of four numbers is converging on the number 0.618. The third is that the quotient of any one number and the previous number tends towards the number 1,618 - which is a reciprocal value of 0.618. The fourth feature of the series is that the quotients between every two other numbers are converging towards the number 2,618, i.e. towards their reciprocal value of 0.382 (for example, $13/5 = 2.6$, $13/34 = 0.38$).

Boolinger Bands are measuring volatility/changeability of stock prices through the price shifting average corrected for standard deviation. In this work, Boolinger Band is the

indikatori (*lagging indicator*) jer ne ukazuju na mogućnost promjene trenda cijene akcije prije nego što se sama promjena desi. Njihova senzibilnost na promjenu cijene je obrnuto proporcionalna njihovoj dužini. Kupovni/prodajni signali su generisani kada cijena sječe p.p odozdo prema gore odnosno odozgo prema dole. U drugom obliku kupoprodajni signal se javlja kada p.p. rastu, ili opadaju. U zadnjoj varijaciji kupoprodajnog signala samo međusobno ukrštanje pokretnih prosjeka generiše kupovni/prodajni signal. Način interpretacije presjeka je isti kao kod ukrštanja cijene i p.p s tim da ovdje ulogu cijene igra p.p. kraće ročnosti.

Zadnji primjenjeni alat tehničke analize - linija trenda (*trend line*) - je najjednostavniji. Jednostavnost u otkrivanju promjene trenda ne ide na račun efikasnosti. Linija trenda spaja, ili sukcesivne rastuće dolje trenda (*higher lows*), ili seriju opadajućih vrhova (*lower highs*). Presjek ovako konstruisane linije trenda i cijene je znak da se - sa velikim stepenom izvjesnosti - može očekivati promjena trenda.

Testiranje postavljene hipoteze - o efikasnosti tehničke analize - smo izvršili na osnovu kretanja cijena akcija na banjalučkoj (*BLSE*) i sarajevskoj berzi (*SASE*). Rad se sastoji od analize kretanja cijena 4 akcije: 1) Bosnalijek d.d. Sarajevo - *BSLRN* 2) BH Telecom d.d. Sarajevo - *BHTSR* 3) Telekom Srpske a.d. Banjaluka - *TLKM-R-A* 4) ZIF Euroinvestment fond a.d. Banjaluka - *EINP-R-A*.

Rezultati i diskusija

Bosnalijek d.d.Sarajevo - *BSLRN*

Nakon pucanja balona na finansijskom tržištu *BiH* (April 2007. g.) *BSLRN* se kreće po modelu, koji podsjeća na kretanje talasa. U relativno kratkom vremenskom periodu - 2 mjeseca - *BSLRN* formira 8 talasa, sa 5 vrhova i 4 dolje (**grafikon 2**). Talasi su nepravilno raspoređeni, razmaci između vrhova su u prosjeku 16 dana (koeficijent varijacije 0,38), a između dolja sekundarnog trenda 18 dana. Preokret u ekstremnim tačkama sekundarnog trenda se - zbog frekvencije oscilacija - ne

može predvidjeti preko tehničkih indikatora. U tačkama 1, 2, 3, 4, 5 vrijednosti ROC_{15} 33%, 2,7%, - 6,58%, - 6,62% i - 4,29% respektivno su nelogične i ne pružaju nikakvu podršku za predviđanje promjene cijene. Prvi vrh ($ROC_{15} = 33\%$) predstavlja kraj primarnog trenda, a ostale maksimalne vrijednosti su dio oscilacija unutar sekundarnog trenda. ROC_{15} nije prilagođen karakteristikama - trajanju - predmetnog sekundarnog trenda. Kod donjih tačaka/dolji sekundarnog trenda stvari stoje drugačije. Vrijednosti RSI_{15} u tačkama a, b, c, d od 44,92, 37,07, 36,9 i 32,52 respektivno konvergiraju ka donjoj granici indikatora koja najavljuje preokret. Aritmetička sredina ROC_{15} u doljama trenda je 37,8, a koeficijent varijacije značajno niži u odnosu na vršne tačke sekundarnog trenda - svega 0,137.

MFI_{15} je najbliži vrijednosti koja najavljuje preokret - 80 - kod prvog ekstrema. Ostale vrijednosti MFI uopšte ne signaliziraju preokret. One značajno osciliraju, jer je MFI indikator volumena, a na plitkim tržištima - kao što je bosansko-hercegovačko dnevni prometi nisu ni približno ujednačeni. U vrhovima sekundarnog trenda tačkama 1, 2, 3, 4, 5 protrgovani volumeni se značajno razlikuju i iznose 18.724, 29.649, 19.617, 3.941 i 3.003. MFI ispoljava iste karakteristike tokom deskripcije najnižih tačaka sekundarnog trenda.

Alternativa tehničkim indikatorima - kada oni "otkažu" - su pokretni prosjeci i standardna devijacija cijene (**grafikon 3**). Nivo otpora (*resistance level*) se formira približno na nivou vrijednosti k.p.p. (15 dana) - dok ulogu nivoa podrške (*support level*) na sebe preuzima donja Bulindžerova granica. Unutar ovog intervala cijena oscilira tokom cjelog posmatranog perioda.

Smanjenje volatilnosti cijene i sužavanje Bulindžerovih granica - koje i predstavljaju volatilnost cijene, ali u obliku pokretnog prosjeka - je najava promjene sekundarnog trenda. Nivo otpora sada postaje k.p.p. sve do momenta (13.07.2010.g) kada cijena odozdo prema gore definitivno sječe k.p.p (**Grafikon 5**, tačka "A").

shifting price average (15 days) increased/decreased for two standard deviations. The objective of independent use of this indicator is in the observed regularity of successive changes between periods of low and high volatility, and the changes in the price movements deriving there from.

Shifting averages are the so-called lagging indicators because they do not indicate the possibility of the stock prices trend changes before the change itself happens. Their sensibility to the price change is proportional in reverse to their length. Buying/selling signals are generated when the price is crossing through the shifting averages from the bottom upwards, i.e. from the top to bottom. In the other form, buying/selling signal appears when the shifting averages grow or fall. In the last variation of the buying/selling signal, only the mutual crossing of shifting averages generates the buying/selling signal. The manner of interpretation of the crossing section is the same as in crossing price and shifting average, but in this case the role of price is played by the shifting average of shorter maturity.

The last of the technical analysis tools applied in this work - the trend line - is the simplest. Simplicity in discovering trend changes is not at the expense of efficacy. Trend line connects either successive trend higher lows, or a series of lower highs. The cross-section of so construed trend line and price is the sign that - with a high degree of certainty - a change in trend may be expected.

Testing of the presented hypothesis - dealing with the efficacy of technical analysis - was conducted on the basis of the stock price movement on the Banja Luka (BLSE) and the Sarajevo (SASE) stock exchanges. The work consists of the price movement analysis for 4 stocks: 1) Bosnalijek d.d. Sarajevo - BLSRN; 2) BH Telecom d.d. Sarajevo - BHTSR; 3) Telekom Srpska a.d. Banjaluka / TLKM-R-A; and 4) ZIF Euroinvestment fund a.d. Banjaluka - EINP-R-A.

Results and Discussion

Bosnalijek d.d. Sarajevo - BSLRN

After the bubble burst in the financial market of Bosnia and Herzegovina (in April 2007),

BSLRN moved along the model resembling wave-like movement. Over a rather short period of time - 2 months - BSLRN formed 2 waves, with 5 highs and 4 lows (Chart 2). Waves had an irregular distribution, space between highs was an average of 16 days (variation ration 0.38), and between the secondary trends lows it was 18 days. The shift in extreme secondary trend points - because of oscillation frequency - could not be predicted through technical indicators. In points 1, 2, 3, 4, and 5 ROC_{15} values 33% 2.7% - 6.58% - 6.62%, and - 4.29% were respectively illogical without offering any support to the price change prediction. The first high (ROC_{15} = 33%) represents the end of the primary trend, while the other maximum values are the part of oscillation within the secondary trend. ROC_{15} is not adjusted to the characteristics - duration - of the relevant secondary trend. In the case of low points/lows of the secondary trend, things are different. The RSI_{15} values in points a, b, c, and d of 44.92, 37.07, 36.9, and 32.52 respectively are converging towards the lower indicator band, which announces the shift. Arithmetic mean of ROC_{15} in the trend lows is 37.8, while the variation ratio is significantly lower in respect to the high point of the secondary trend - of only 0.137.

MFI_{15} is the closest value which announces the shift - 80 - in the first extreme. Other MFI values do not signalize any shift at all. They have a significant oscillation, because the MFI is the volume indicator, and in the shallow markets - such as is the Bosnian-Herzegovina one - daily turnovers are not even closely equalised. In the secondary trend high points 1, 2, 3, 4, and 5, traded volumes differ substantially and amount to 18...,724, 29,649, 19,617, 3,941, and 3,003. MFI manifests the same characteristics during the description of the lowest points of the secondary trend.

An alternative to technical indicators - when they "break down" - are the shifting averages and the standard price deviation (Chart 3). Resistance level is formed approximately at the value of the short-term shifting average (16 days) - while the role of the support level is taken upon itself by the lower Boolinger band. Within this interval, the price is oscillating during the entire observed period.

Reduced price volatility and narrowing

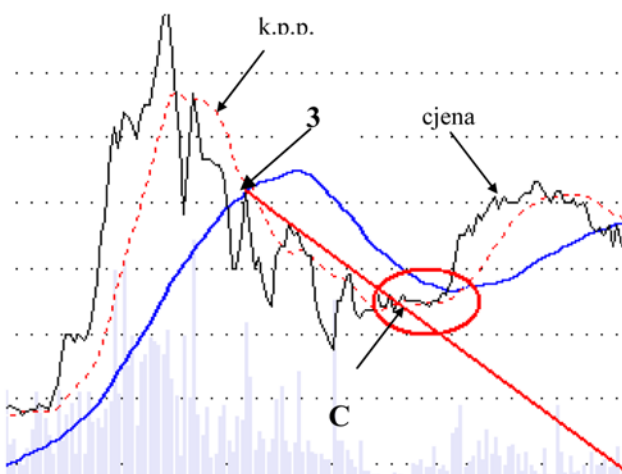
Grafikon 2. Kretanje cijene po modelu talasa, BSLRN, 2007. g.



Izvor: www.sase.ba (obradio autor).

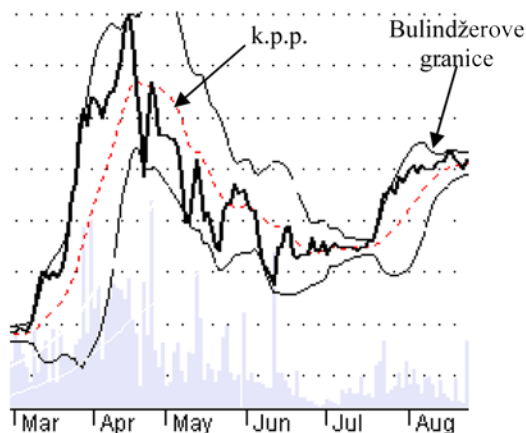
Promjena sekundarnog trenda je potvrđena nekoliko dana kasnije (18.07.2010. g), kada cijena sječe i s.p.p. odozdo prema gore (**Grafikon 5**, tačka "B"). Linija trenda povučena iz tačke 3 do tačke "C" (**Grafikon 4**) najavljuje promjenu trenda cijene prije opisane kombinacije cijene i k.p.p. Vodeći indikator (*leading indicator*) anticipira promjenu cijene 7 trgovačkih dana prije zadnjeg presjeka cijene i k.p.p. (04.07. vs. 13.07) i pruža pouzdan kriterij za rano zauzimanje duge pozicije.

Grafikon 4. Cijene, pokretni prosjeci i linija trenda, BSLRN decembar 2006 - septembar 2007. g.



Izvor: *Ibid.*

Grafikon 3. Nivo otpora - KPP i nivo podrške - Bulindžerova granica, BSLRN 2007. g.

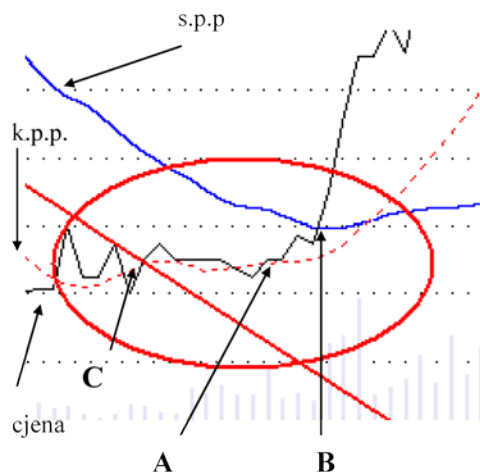


Izvor: *Ibid.*

BH Telecom d.d. Sarajevo - BHTSR

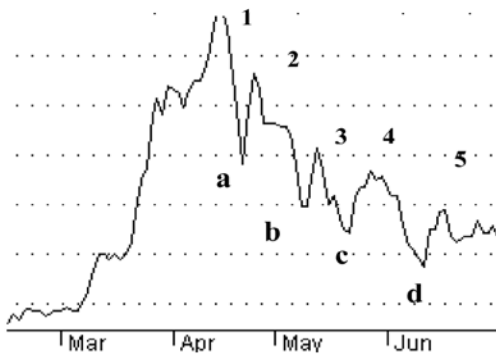
Cijena akcije BHTSR u dva uzastopna dana trgovanja formira obrazac blizak čekiću/hammer (grafikon 6). Za razliku od čistih teorijskih karakteristika čekića ovdje tijelo svijećnjaka ne postoji - cijena otvaranja i zatvaranja su jednake. Gornja sjena - što je i pravilo za ovu vrstu grafičkog obrasca - nedostaje. Dva uzastopna čekića predstavljaju vrlo jak *bullish* znak. Rast - koji je uslijedio - potvrđuje ispravnost ovakvog zaključka.

Grafikon 5. BSLRN, cijene, pokretni prosjeci i linija trenda (uvećano)



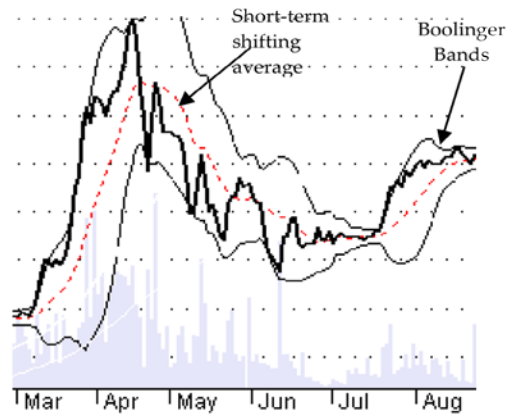
Izvor: *Ibid.*

Chart 2 Wave-model price movement, BSLRN, year 2007



Source: www.sase.ba (compiled by the author)

Chart 3 Resistance level - short-term shifting average and support level - Boolinger Band, BSLRN, year 2007



Source: Ibid

down of Boolinger Bands - which represent price volatility, but in the form of a shifting average - is the announcement of change in the secondary trend. Resistance level now becomes the short-term shifting average, lasting until the moment (on 13.07.2010) when the price had definitely crossed, from bottom upwards, the short-term shifting average (Chart 5 Point "A").

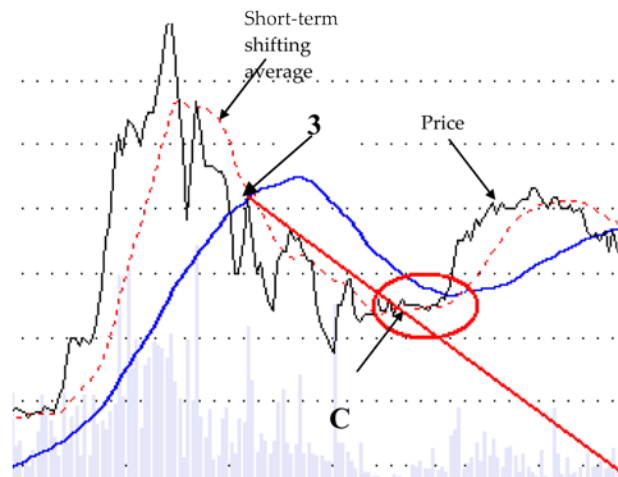
The change in secondary trend was confirmed several days later (on 18.07.2010), when the price also crossed the medium-term shifting average from the bottom upwards (Chart 5 Point "B"). Trend line drawn from

point 3 to point "C" (Chart 4) announced the change in price trend prior to the described combination of the price and the short-term shifting average. The leading indicator is anticipating the price change 7 trading days before the last crossing of price and the short-term shifting average (04.07 vs. 13.07) and offers a reliable criterion for early long positioning.

BH Telecom d.d. Sarajevo - BHTSR

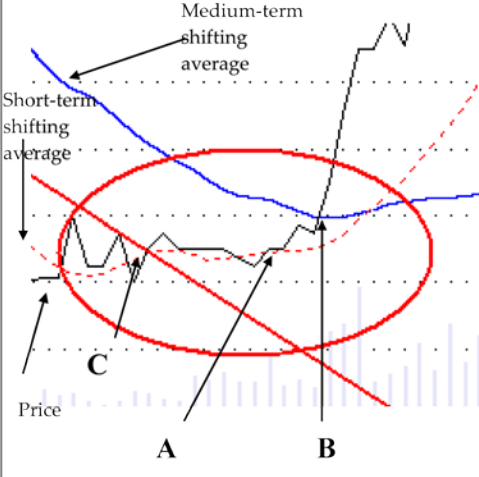
The price of BHTSR stock, on two consecutive trading days, formed a closely resembling hammer pattern (Graph 6).

Chart 4 Prices, shifting averages and trend line, BSLRN, December 2006 - September 2007



Source: Ibid

Chart 5 BSLRN, prices, shifting averages and the trend line (magnified)



Source: Ibid

Na grafikonu 7 je izolovan knjiški primjer istog obrasca - čekića. Tjelo se formira pri vrhu svijećnjaka sa cijenom zatvaranja koja je jednaka prethodnoj cijeni zatvaranja. Donja sjena je dugačka, tjelo svijećnjaka je bijelo - cijena zatvaranja je viša od cijene otvaranja. Nakon formiranja čekića sljedi preokret (*reversal*) - cijena raste za 4,7 %. Kvalitet obrasca - u predviđanju promjene trenda - je u tome što se pojavljuje nakon nekoliko uzastopnih dugačkih crnih svijećnjaka.

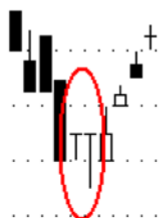
Na sljedećem grafikonu - **grafikonu 8** - prikazan je crni oblak koji prekriva (*dark cloud cover*). Obrazac se sastoji od dva dugačka svijećnjaka - jednog bijelog/*bullish* svijećnjaka i jednog crnog/*bearish* svijećnjaka. Jačina ovog obrasca zavisi od stepena integracije crnog u bijeli svijećnjak, koja je u našem slučaju polovična. Prediktivnu snagu dotičnog obrasca izvlačimo iz ne tako tipične dugačke donje sjene. Sedam trgovanja nakon formiranja obrasca cijena zatvaranja je manja za 7,2 %.

Na opadajućem tržištu prethodno opisano stanje je označeno kao prodorni obrazac (*piercing pattern*). Obrazac se sastoji od dva velika svijećnjaka - po redosljedu crni pa bijeli. Cijena otvaranja bijelog svijećnjaka je ispod cijene zatvaranja crnog svijećnjaka, dok je njegova cijena zatvaranja duboko u tijelu prvog - crnog svijećnjaka. Prodorni obrazac smo identifikovali na papiru *BHTSR* (**grafikon 9**). Nakon formiranja obrasca cijena počinje rasti.

Grafikon 10 je kombinacija prodornog obrasca (pravougaonik u **grafikonu 10**) i opadajućeg svijećnjaka koji okružuje/*bearish engulfing* (krug u **grafikonu 10**). Obrazac nije savršen jer crni svijećnjak ne obuhvata bijeli svijećnjak. Obrascu prethodi dodži (*doji*), tržišno stanje u kojem su sve četiri ključne cijene (cijena otvaranja, najviša, najniža i cijena zatvaranja) jednake. Nakon takvog - nesavršenog obrasca - cijena se smanjuje za 4,6 %.

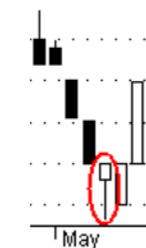
Jedna od karakteristika finansijskog tržišta je ritmično ponavljanje oscilacija cijena finansijskih

Grafikon 6.
Čekić *BHTSR*
10.02.2005.



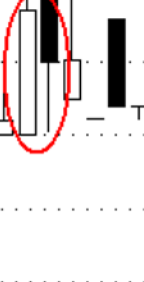
Izvor: *Ibid.*

Grafikon 7.
Čekić *BHTSR*
10.05.2010.



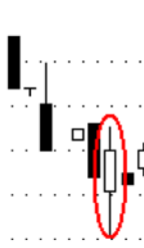
Izvor: *Ibid.*

Grafikon 8. Crni oblak koji prekriva *BHTSR*, 24.02.2010.



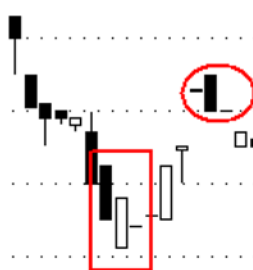
Izvor: *Ibid.*

Grafikon 9. Prodorni obrazac *BHTSR*, 11.03.2010.



Izvor: *Ibid.*

Grafikon 10. Prodorni obrazac, dodži i opadajući svijećnjak koji okružuje *BHTSR*, 24.06.2009. i 02.07.2009.



Izvor: *Ibid.*

Opposite to the difference in purely theoretical hammer characteristics, the candlestick body is here absent - the opening and closing prices are equal. The upper shadow - which is also a rule for this type of chart pattern - is missing. Two consecutive hammers designate a very strong bullish sign. Growth - which followed - confirmed the accuracy of this conclusion.

On Chart 7, the text-book case of this same pattern - the hammer - is isolated. Body is formed at the top of the candlestick with the closing price equal to the previous closing price. The lower shadow is long, the candlestick body is white - the closing price is higher than the opening price. After the formation of the hammer, a reversal is to follow - the price grows for 4.7%. Pattern quality - in prediction of trend changes - is the fact that it appears after several consecutive long black candlesticks.

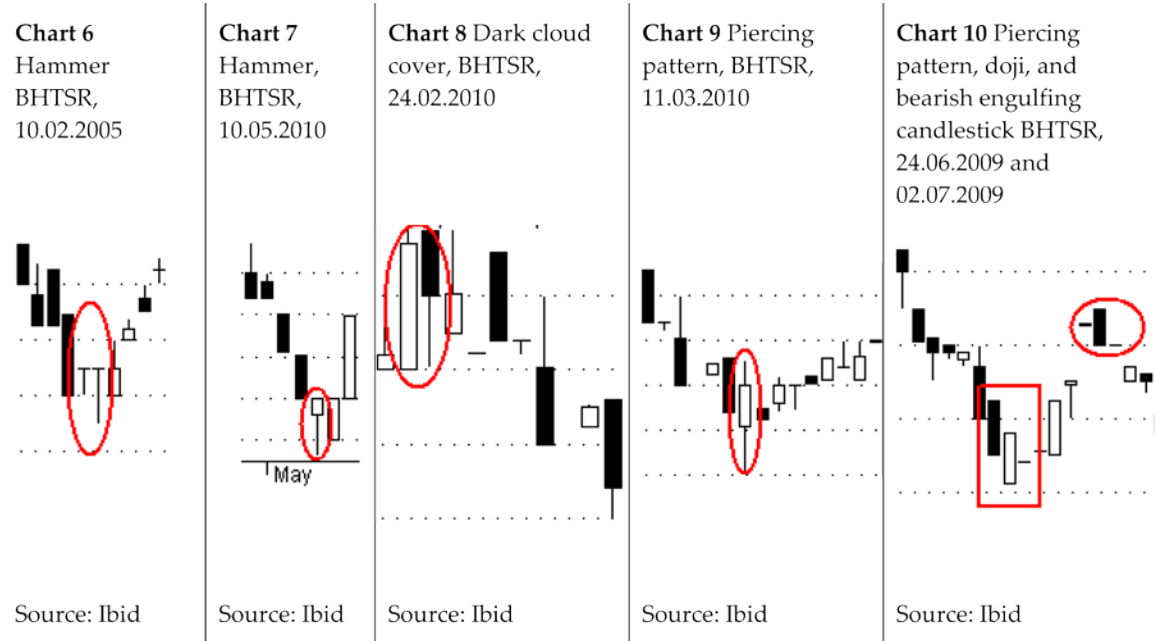
The next Chart 8 shows a dark cloud cover. This pattern consists of two long candlesticks - one white/bullish candlestick, and one black/bearish candlestick. The strength of this pattern depends on the degree of integration of the black candlestick into the white one, which in our case is only partial. Predictive strength of this pattern we draw from not so typical long

lower shadow. Seven trading operations, after the formation of the pattern, showed that the closing price was lower for 7.2%.

In the falling market, previously described situation is designated as the piercing pattern. This pattern consists of two large candlesticks - in the order of first black, followed by the white. Opening price in the white candlestick is below the closing price of the black candlestick, while its closing price pierces deep into the body of the first one - the black candlestick. Piercing pattern we have identified on paper in BHTSR (Chart 9). After the formation of the pattern, the price starts to grow.

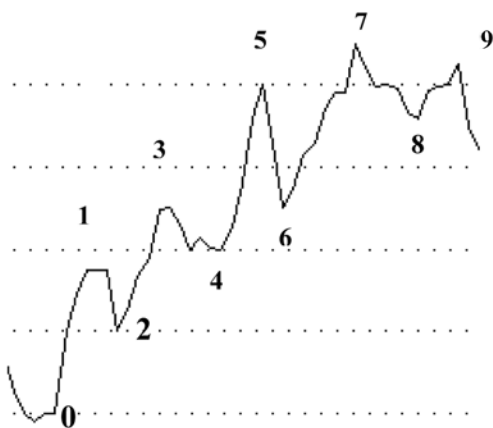
Graph 10 is a combination of the piercing pattern (a rectangle in Chart 10) and the falling candlestick bearish engulfing (a circle in Chart 10). The pattern is not perfect because the black candlestick does not cover the white candlestick. This pattern is preceded by a doji, market situation in which all the four key prices (opening price, highest, lowest, and the closing price) are equal. After such an imperfect pattern, the price is falling for 4.6%.

One of the financial market characteristics is a rhythmical repetition of financial instruments price oscillation. This characteristic



instrumenata. Ova osobina se ispoljava u vremenskim intervalima različite dužine. Kretanje tržišta u kratkim, ravnomjernim, talasima demonstrira **grafikon 11**. Tokom dvomjesečnog uzlaznog trenda izdvajaju se 4 vrha (svaki viši od prethodnog - *higher highs*) i četiri rastuće dolje (*higher lows*). Prema Eliotovoj teoriji talasa rastući trend se sastoji od 5 talasa, a svaki talas se sastoji od sekundarnih talasa. Talasi rasta bi - po ovoj teoriji - trebali imati 5 podtalasa, a talasi pada 3 podtalasa. Iako ritam *BHTSR* nije u potpunosti usklađen sa Eliotovim obrascem, on ipak predstavlja kretanje u obliku talasa.

Grafikon 11. Kretanje cijene po modelu talasa, *BHTSR* 05.03.2009 - 05.05.2009. g.



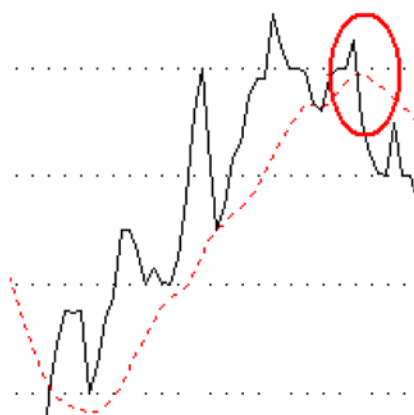
Izvor: *Ibid.*

Prikazano kretanje ima ukupno 9 talasa. Talasi su čisti - ne sastoje se od manjih talasa. Ovo važi kako za talase raste (1, 3, 5, 7, 9), tako i za talase pada (2, 4, 6, 8). Sedmi i deveti talas formiraju nešto slično obrascu dvostrukog vrha (*double top*). Tržište dva puta stiže do vrha, ali ne uspijeva da probije nivo rezistencije koji se formira na nivou između 25 KM (vrh talasa 7) i 24,51 KM (vrh talasa 8). Vrstu uspostavljenog ritma ne mogu opisati ni tehnički indikatori - korigovani za prosječnu dužinu trajanja talasa. ROC_6 u tačkama 3, 5 i 7 je približno

ujednačen 16,39% uz koeficijent varijacije od 0,117. Međutim vrijednost indikatora slabi kada se u analizu uključe talasi 1 i 9 čiji se ROC_6 značajno razlikuju od prosjeka; 21,8% i 2,55% respektivno. Za razliku od najviših tačaka trenda dolje trenda pokazuju mnogo veći stepen ujednačenosti (**grafikon 12**). K.p.p. (15) formira nivo podrške trendu u njegovim najnižim tačkama. Tačka presjeka cijene i k.p.p. (15) označava definitivni kraj rastućeg trenda (krug na **grafikonu 12**), s malim zakašnjenjem u odnosu na opisani obrazac dvostrukog vrha.

Retrospektivna analiza promjene cijene *BHTSR* pokazuje odnos ritma promjena

Grafikon 12. Presjek cijene i k.p.p. *BHTSR* 05.03.2009 - 05.05.2009. g.

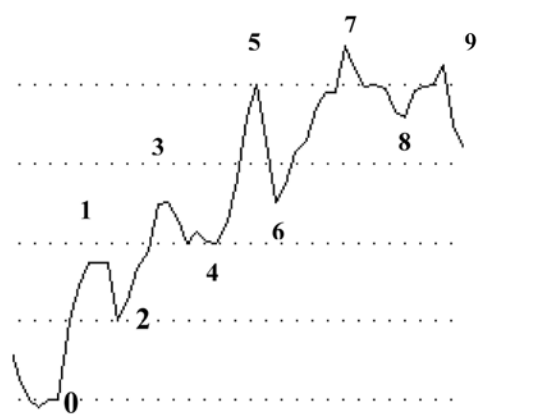


Izvor: *Ibid.*

i zakonomjernosti koje proizilaze iz Fibonačijevog niza brojeva (**Grafikon 13**). Za prvi pad cijene - sa 19,32 KM - se veže omjer 61,8%. Tokom uzlaznog trenda oko omjera 38,2 se dešava preokret cijene. Slično važi i za opadajući trend u kojem do preokreta dolazi na cijeni od 21,47 KM što predstavlja 38,2 % ukupne vrijednosti prethodnog, rastućeg, trenda. 38,2 je Fibonačijev broj - on je količnik između svakog prvog i trećeg broja u nizu. Zakonomjernost jača sa razvojem niza.

is manifested in time intervals of different duration. Market movements, in short regular waves, are presented in Chart 11. During a two-month ascending trend, 4 highs are outstanding (each one higher than the previous one - higher highs) and higher lows. According to Elliott wave theory, growing trend consists of a 5-wave impulse sequence, and each wave consists of secondary waves. Growth waves - according to this theory - should have 5 sub-waves, and the fall waves, 3 sub-waves. Although the BHTSR rhythm is not fully harmonised with the Elliott pattern, nevertheless it presents a wave-like movement.

Chart 11 Wave-like model price movement, BHTSR, 05.03.2009 - 05.05.2009

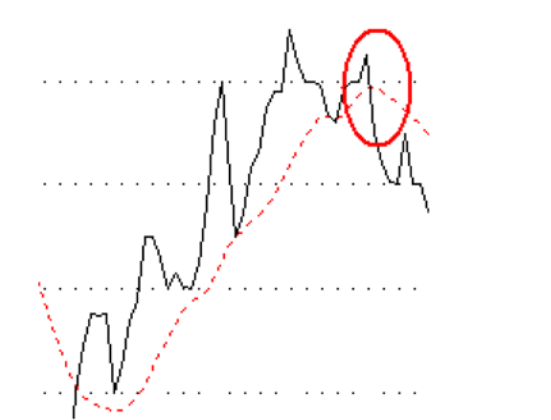


Source: Ibid

The above presented movement has a total of 9 waves. Waves are clean - they do not consist of smaller waves. The same applies both to the growth waves (1.3.5.7.9), and to the fall waves (2.4.6.8). Seventh and the ninth wave are forming something similar to the double top pattern. The market twice reaches the top, but does not succeed in piercing the resistance level which is formed on the level between 25 KM (wave 7 top) and 24.51 KM (wave 8 top). The type of established rhythm can not be described either by the technical indicators - corrected for the average wave length duration. ROC_6 in points 3, 5, and 7 is approximately harmonized 16.39%

with the variation ratio of 0.117. The indicator value, however, is weakening when the waves 1 and 9 are added to the analysis, as their ROC_6 significantly differs from the averages: 21.8% and 2.55% respectively. Contrary to the highest points of the trend, the trend lows show a much higher degree of regularity (Chart 12). Short-term shifting average (15) is forming the level of support for the trend in its lowest points. The crossing point between the price and the short-term shifting average (15) designates a definite end of the growing trend (a circle in Chart 12), with a slight delay in respect to the described double top pattern.

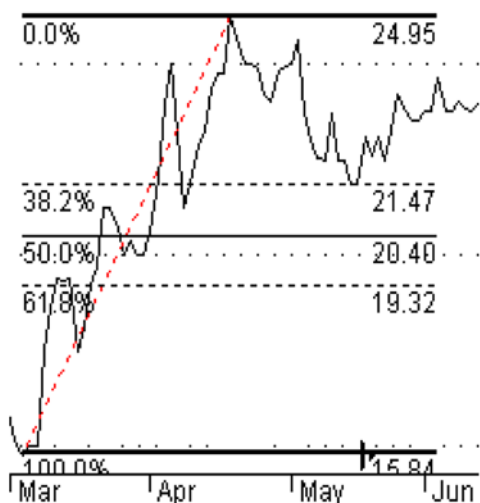
Chart 12 Price and short-term shifting average crossing, BHTSR, 05.03.2009 - 05.05.2009



Source: Ibid

Analysis in retrospect of the BHTSR price change shows the ratio of the rhythm changes and regularities deriving from the Fibonacci numbers sequence (Chart 13). For the first fall in price - from 19.32 KM - the ratio of 61.8% is linked. During the ascending trend, around the ratio 38.2, the reversal in price is happening. Similar applies also to the falling trend in which the reversal happens at the price of 21.47 KM which is 38.2% of the total value of the previous growing trend. 38.2 is the Fibonacci number - it is the quotient between every first and third number in the sequence. Regularity grows stronger with the development of the sequence.

Grafikon 13. BHTSR mart-jun 2007. g.
- Fibonačijevi brojevi



Izvor: Ibid.

Donji primjeri pokazuju da se Eliotova teorija talasa, odnosno zakonitosti Fibonačijevog niza, mogu - sa velikim stepenom efikasnosti - primjeniti na predviđanje promjene cijene BHTSR i u kraćim vremenskim intervalima. Na **grafikonu 14** je prikazan *retracement* (*retrace* - povrata istim putem) sa 19,54 na 18,13 po obimu blizak Fibonačijevom broju - 38,2%. Na **grafikonu 15** je identičan odnos. Opet se pad cijene zaustavlja na 38,2% (19,85 KM) vrijednosti prethodnog trenda. Samo prividno različit slučaj je sa **grafikonom 16**. Maksimalna cijena 23,98 KM nije smanjena za 38,2% već približno za

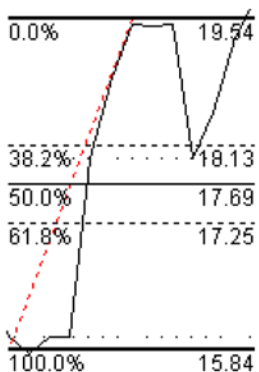
61,8%, što opet predstavlja jedan karakterističan omjer iz Fibonačijevog niza. Kretanje cijena na **grafikonu 17** ilustruje kombinovanu upotrebu različitih omjera. Pad cijene je zaustavljen u Fibonačijevom broju - 38,2%. Omjer prekida pad cijene na 23,39 KM. Potom omjer 61,8% formira nivo otpora (*resistance level*) na 22,44 KM, a omjer 38,2% opet zaustavlja cijenu na 23,39 KM - ali ovog puta tokom njenog rasta.

Na grafikonima koji sljede prikazani su još neki izvodi iz teorije svijećnjaka vezani za ovu akciju. BHTSR na dan 23.07.2008. g. (**grafikon 18**) formira opadajući svijećnjak koji okružuje - karakterističan obrazac koji signalizira preokret cijene. Dugačkom crnom svijećnjaku prethodi 5 rastućih bijelih svijećnjaka. Dalja analiza pokazuje da se preokret mogao identifikovati i ranije - preko tehničkih indikatora. Već 21.07.2010. g. dva trgovačka dana prije formiranja opadajućeg svijećnjaka koji okružuje indikator cijene *RSI* dostiže vrijednost od 61,05 vrlo blisku kritičnoj vrijednosti - 70 - koja najavljuje preokret. *RSI* - u ovome slučaju - istupa kao vodeći indikator promjene trenda cijene.

Na **grafikonu 19** se pojavljuje dodži, ali u razblaženoj formi - *near doji*. Svijećnjak nema tijelo, a gornja sjena je izuzetno malena. Pa ipak *bullish* signal se transformiše u promjenu trenda i rast cijene u naredna 4 dana trgovanja.

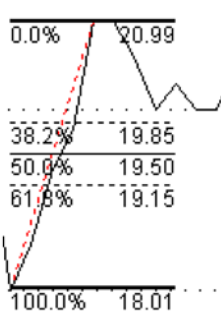
Prediktivnu snagu najjednostavnijeg obrasca - dodžija - pokazuje i **grafikon 20**. Nakon pada

Grafikon 14. BHTSR
05.03.09 - 17.03.09.



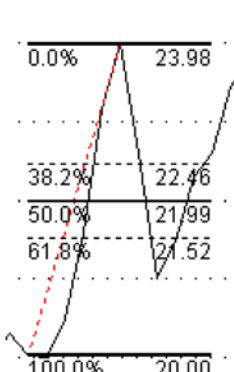
Izvor: Ibid.

Grafikon 15. HTSR
17.03.09 - 26.03.09.



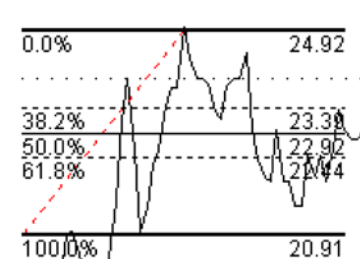
Izvor: Ibid.

Grafikon 16. BHTSR
31.03.09 - 08.04.09.



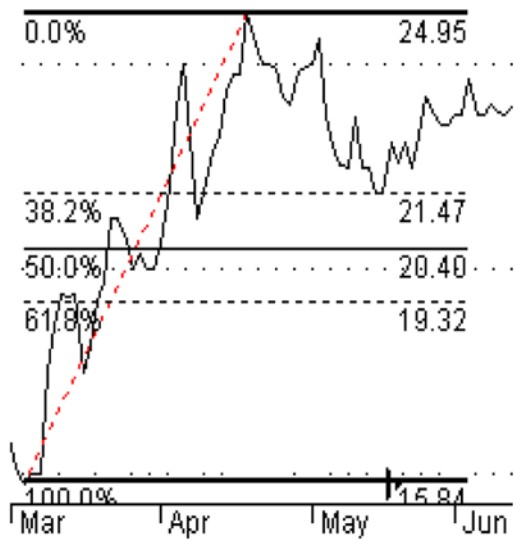
Izvor: Ibid.

Grafikon 17. BHTSR 23.03.09 -
26.05.09.



Izvor: Ibid.

Chart 13 BHTSR March-June 1997
- Fibonacci numbers



Source: Ibid

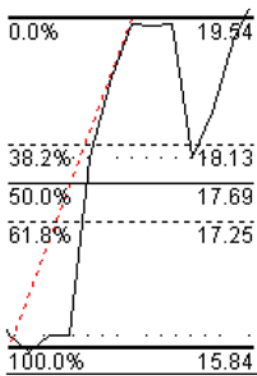
The examples that follow show that the Elliott Wave Theory, i.e. constancy of Fibonacci sequence, may also be applied, with a high degree of efficacy, to the prediction of the BHTSR price change over shorter time intervals. In Chart 14, retracement is shown from 19.54 to 18.13, which in volume is close to the Fibonacci number - 38.2%. Chart 15 presents an identical ratio. Again the price fall is stopped at 38.2% (19.85 KM) value of the preceding trend. Only apparently we see a different case in Chart 16. The maximum price of 23.98 KM is not reduced

for 38.2%, but approximately for 61.8%, which in turn is a characteristic ratio from the Fibonacci number sequence. Price movement in Chart 17 illustrates a combined use of different ratios. Fall in price is stopped at the Fibonacci number - 38.2%. Ratio stops the price fall at 23.39 KM. Then again, the ratio 61.8% is forming the resistance level at 22.44 KM, and ratio 38.2% again stops the price at 23.39 KM - but this time, during its growth.

The charts that follow show some more excerpts from the candlestick theory relative to this exercise. *BHTSR*, on 23.07.2008 (Chart 18) forms falling engulfing candlestick - a characteristic pattern signaling the price rebound. Long black candlestick is preceded by 5 growing white candlesticks. Further analysis indicates that the reversal could have been identified earlier - through the technical indicators. As early as 21.07.2010, two trading days before forming the falling candlestick engulfing the price indicator *RSI* reaches the value of 61.05 very close to the critical value - 70 - which heralds the reversal, *RSI* - in this case - appears as the leading indicator of the price change.

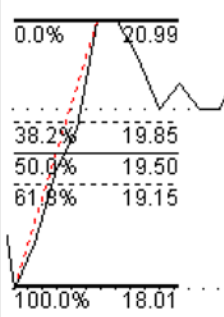
The Chart 19 contains a doji, but in a mild form - *near doji*. The candlestick has no body, the upper shadow is extremely small. However, the *bullish* signal transforms into the trend change and the growth of price in following 4 days of trading.

Chart 14. BHTSR
05.03.09 - 17.03.09



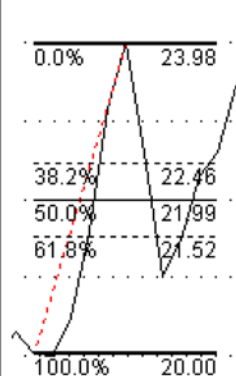
Source: Ibid

Chart 15. HTSR
17.03.09 - 26.03.09



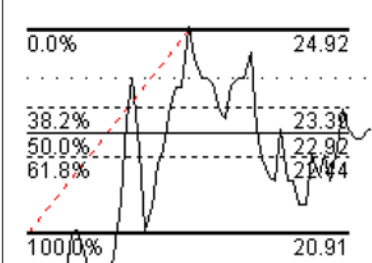
Source: Ibid

Chart 16. BHTSR
31.03.09 - 08.04.09



Source: Ibid

Chart 17. BHTSR 23.03.09 - 26.05.09

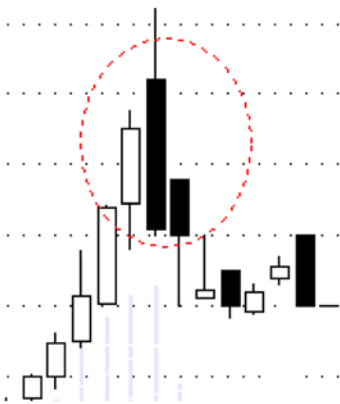


Source: Ibid

cijene, kroz dva sukcesivna dodžija se postiže ravnoteža odnosa između bikova i medvjeda i formira nivo podrške (*support level*) poslije čega slijedi rast tržišta. Na dan formiranja obrasca (28.05.2010. g) *RSI* - 40,2 je daleko od vrijednosti koja najavljuje preokret (30), a *MFI* od 22,2 se nalazi blizu donje granične vrijednosti indikatora od 20.

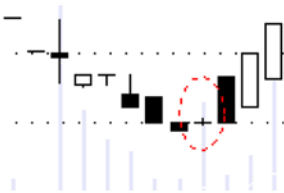
drugačije stoje sa najavom rastućeg trenda. *RSI*₁₅ je vrlo neprecizan - u momentu preokreta njegova vrijednost je 15 (potrebna oko 30) uz koeficijent varijacije od 0,23. Veliku disperziju ima i *MFI*₁₅ sa koeficijentom varijacije od 0,663. Razlog variranja u kvalitetu mjerenja je odnos između dužine ciklusa i "dužine" tehničkog indikatora. Prosječno trajanje rastućeg trenda

Grafikon 18. Opadajući svijećnjak koji okružuje, *BHTSR* 23.07.2008. g.



Izvor: *Ibid.*

Grafikon 19. Dodži (*near doji*), *BHTSR* 03.03.2009. g.



Izvor: *Ibid.*

Grafikon 20. Dodži, *BHTSR* 28.05.2010. g.



Izvor: *Ibid.*

Sposobnost tehničkih indikatora da predvide promjene u cijeni varira sa vrstom trenda i njegovim trajanjem. Najava opadajućeg trenda (**tabela 1**) je vrlo pouzdana, s malim odstupanjem.

od 11 dana približava se trajanju *RSI* od 15 dana. Opadajući trendovi traju znatno duže - od 53 do 135 dana. Impuls (*MOM*) ispoljava veliku disperziju tokom opadajućeg, a posebno tokom rastućeg trenda. To umanjuje njegove

Tabela 1. Tehnički indikatori, *BHTSR*

	19.5.2008.	11.7.2008.	22.7.2008.	10.10.2008.	21.10.2008.	5.3.2009.	rastući		opadajući	
Trend ^a	rastući	opadajući	rastući	opadajući	rastući	opadajući	A.S. ^b	K.V. ^c	A.S.	K.V.
<i>RSI</i> (15)	79,57	14,88	66,6	18,26	66,7	11,42	71,0	0,105	14,9	0,23
<i>MFI</i> (15)	92,98	12,84	75,64	31,88	78,4	9,67	82,3	0,113	18,1	0,663
<i>MOM</i> (15) (<i>u KM</i>)	9	-9,1	5,74	-6,57	6,53	-7,17	7,1	0.24	-7,6	-0,174
Razlika u danima		53	11	80	11	135				

Izvor: www.sase.ba (obradio autor).

Napomena: ^a Vrijednosti u vrhu i dolji trenda. ^b Aritmetička sredina. ^c Koeficijent varijacije.

Prosječne vrijednosti i *RSI*₁₅ 71 i *MFI*₁₅ 82,3 su vrlo blizu gornjim graničnim vrijednostima 70 i 80 respektivno. Preciznost nije postignuta na račun varijabiliteta, naprotiv koeficijenti varijacije *RSI* i *MFI* uoči preokreta cijene na dole su niski 0,105 i 0,113 respektivno. Stvari

prediktivne sposobnosti.

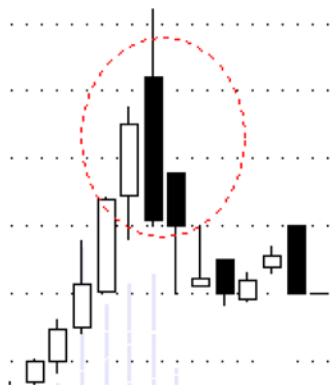
Telekom Srpske a.d. Banjaluka - *TLKM-R-A*

Kod jednog drugog papira - *TLKM-R-A* – takođe uočavamo da neki tehnički indikatori mogu, a drugi ne mogu predviditi promjenu

Predictive power of the most simple pattern - *doji* - is found in the Chart 20. After the fall of the price, in two successive dojis the equilibrium of relations between bulls and bears is formed and the support level is formed, followed by the rise of the market. On the day of forming of the pattern (28.05.2010) *RSI* - 40,2 iz far from the value that indicates the reversal (30), and *MFI* of 22.2 iz close to the lower value of the indicator 20.

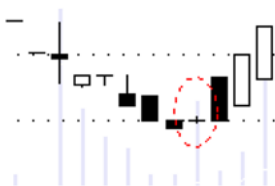
variation ratios of *RSI* and *MFI*, immediately preceding the reversal of price downwards, are low at 0.105 and 0.113, respectively. Things are different, however, when the growing trend is announced. *RSI*₁₅ is very imprecise - at the moment of reversal its value is 15 (the required one is some 30), with the variation ratio of 0.23. Great dispersion also is found in *MFI*₁₅, with the variation coefficient of 0.663. The reason for the variation in the measurement quality is the ratio

Chart 18 Bearish engulfing candlestick, BHTSR, 23.07.2008



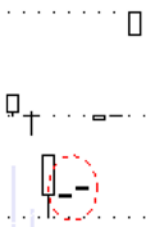
Source: Ibid

Chart 19 Near doji, BHTSR, 03.03.2009



Source: Ibid

Chart 20 Doji, BHTSR, 28.05.2010



Source: Ibid

The ability of technical indicators to predict price changes varies with the type of trend and its duration. The announcement of the falling trend (Table 1) is very reliable, with slight digressions.

between the length of cycle and the “length” of technical indicator. The average duration of the growing trend of 11 days is closing up on the duration of the *RSI* of 15 days. The falling trends are lasting substantially longer - from 53 to 135

Table 1 Technical indicators, BHTSR

	19.5.2008	11.7.2008	22.7.2008	10.10.2008	21.10.2008	5.3.2009	growing		falling	
Trend ^a	growing	falling	growing	falling	growing	falling	A.S. ^b	K.V. ^c	A.S.	K.V.
<i>RSI</i> (15)	79,57	14,88	66,6	18,26	66,7	11,42	71,0	0,105	14,9	0,23
<i>MFI</i> (15)	92,98	12,84	75,64	31,88	78,4	9,67	82,3	0,113	18,1	0,663
<i>MOM</i> (15) (in KM)	9	-9,1	5,74	-6,57	6,53	-7,17	7,1	0,24	-7,6	-0,174
Difference in days		53	11	80	11	135				

Source: www.sase.ba (compiled by author)
 Note: ^a Value at high and low of trend. ^b Arithmetic mean. ^c Variation ratio.

Mean values and *RSI*₁₅ 71 and *MFI*₁₅ 82.3 are very close to the upper limit values of 70 and 80, respectively. The precision was not achieved at the expense of variability; on the contrary,

days. Impulse (*MOM*) is manifesting great dispersion during the falling, and especially during the growing trend. This is diminishing its predictive capabilities.

kretanja cijene (**tabela 2**). Indikatori koji se zasnivaju na promjeni cijene - RSI_{15} i ROC_{15} - imaju vrlo malenu disperziju. Prosječan koeficijent varijacije RSI_{15} i ROC_{15} u momentima nastupa *bull* tržišta su 0,088 i - 0,139 respektivno. Kritičnu vrijednost RSI_{15} - 30 - u ovome uzorku zamjenjuje vrijednost od ca. 20. U prosjeku vrijednost ROC_{15} *bull* signala je -17,5% - nakon čega slijedi rast. Vrijednost indeksa novčanog toka (MFI_{15}) je vrlo nestabilna i kao takva apsolutno nepouzdana u predviđanju kretanja cijena. Odnos standardne devijacije i prosjeka MFI_{15} je 0,385. Uzrok visoke disperzije su oscilacije volumena i u vezi s tim činjenica da je MFI indikator volumena, a ne cijena. Sličan zaključak se odnosi i na momentum. Njegova srednja vrijednost od - 0,4 sa koeficijentom

varijacije 0,3 je neupotrebljiva za tehničku analizu.

Jedan vrlo prost alat tehničke analize, već demonstriran u radu na grafikonima 4 i 5 - linija trenda (**grafikon 21**) - koji spaja sukcesivne niže vrhove (*lower highs*) potvrđuje teoriju talasa u djelu o primarnom trendu. Tačka presjeka linije trenda i cijene je pouzdan vjesnik izmjene znaka primarnog trenda. Varijacija na temu je promjena primarnog trenda cijene *TLKM-R-A* (**grafikon 22**). Isto pravilo - presjek linije trenda i kretanja cijene *TLKM-R-A* - određuje promjenu primarnog trenda, s tom razlikom da prva linija trenda, linija "A", ima status vodećeg indikatora, jer prije linije trenda "B" otkriva smjenu primarnog trenda.

Tabela 2. Indikatori tehničke analize, *TLKM-R-A*

	25.06.2007.	01.11.2007.	11.03.2008.	10.10.2008.	AS	SD	KV
<i>RSI(15)</i>	21,43	20,78	18,48	22,9	20,9	1,8	0,088
<i>MFI(15)</i>	23,44	13,96	21,4	35,89	23,7	9,1	0,385
<i>ROC(15) (u %)</i>	-19,44	-14,29	-19,33	-16,94	-17,5	2,4	0,139
<i>MOM(15) (u KM)</i>	-0,53	-0,42	-0,36	-0,25	-0,4	0,1	-0,3
Volumeni	5.287	42.809	46.750	59.380			

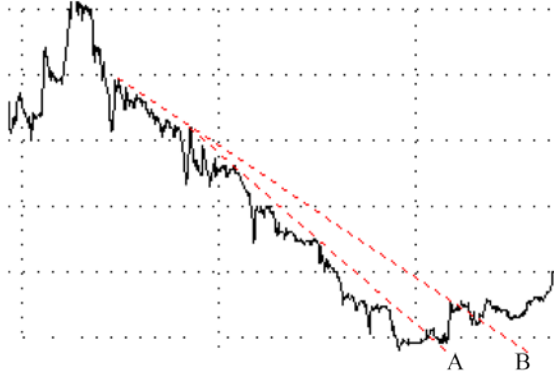
Izvor: www.blberza.com (obradio autor)

Grafikon 21. Kraj primarnog trenda - linija trenda *BSLRN**



Izvor: www.sase.ba (obradio autor)

Grafikon 22. Kraj primarnog trenda - *TLKM-R-A* april 2007 - april 2009. g.



Izvor: www.blberza.com (obradio autor)

* Ovim grafikonom smo napravili izuzetak od pravila da se elementi tehničke analize u radu izlažu grupisani po pojedinim akcijama. Cilj uporednog prikaza *BSLRN* i *TLKM-R-A* je demonstracija zajedničkih osobina tržišta akcija u Republici Srpskoj i Federaciji BiH.

Telekom Srpske a/d/ Banjaluka - TLKM-R-A

In another study of the TLKM-R-A - we are also noticing that some of the technical indicators might, while the other can not, predict changes in the price movement (Table 2). Indicators based on the price change - RSI_{15} and ROC_{15} - have a very small dispersion. The average variation ratios of the RSI_{15} and of the ROC_{15} , at the moment of advent of the bull market, are 0.088 and - 0.139, respectively. Critical value of RSI_{15} - 30, in this sample is being replaced by the value of ca. 20. In an average, the value of ROC_{15} bull signal is -17.5%, after which follows growth. The value of the money flow index (MFI_{15}) is very unstable and as such is absolutely unreliable in the price movement prediction. The ratio between the standard deviation and the mean MFI_{15} is 0.385. The reason for such a high dispersion are the volume oscillations, and in this respect, also the fact that the MFI is the indicator of volume, not of the price. Similar

conclusion pertains to the momentum. Its mean value of -0.4, with the variation ratio of 0.3, is not applicable in technical analysis.

One very simple technical analysis tool, already demonstrated in the Charts 4 and 5, is the trend line (Chart 21) - connecting the successive lower highs, and it confirms the wave theory in the part pertaining to the primary trend. The crossing point between the trend line and the price is a reliable herald of the sign change in the primary trend. Variation on this theme is the change in the primary price trend of the TLKM-R-A (Chart 22). The same rule - crossing of the trend line and the price movement of the TLKM-R-A - determines the change of the primary trend, with the difference that the first trend line "A" has the same status of the leading indicator, because earlier than the trend line "B", it discovers the change in the primary trend.

Table 2 Indicators of technical analysis, TLKM-R-A

	25.06.2007	01.11.2007	11.03.2008	10.10.2008	AS	SD	KV
$RSI(15)$	21,43	20,78	18,48	22,9	20,9	1,8	0,088
$MFI(15)$	23,44	13,96	21,4	35,89	23,7	9,1	0,385
$ROC(15)$ (u %)	-19,44	-14,29	-19,33	-16,94	-17,5	2,4	0,139
$MOM(15)$ (u KM)	-0,53	-0,42	-0,36	-0,25	-0,4	0,1	-0,3
Volumes	5.287	42.809	46.750	59.380			

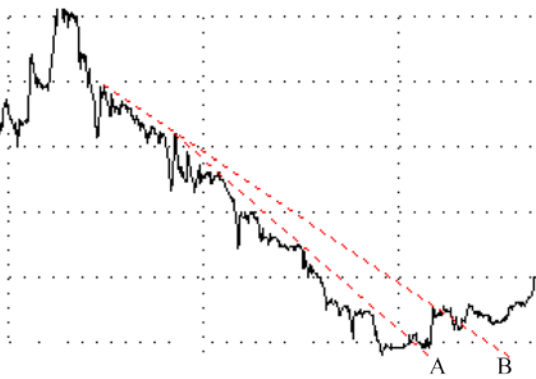
Source: www.blberza.com (Compiled by author)

Chart 21 The end of the primary trend - trend line of the BSLRN*



Source: www.sase.ba (Compiled by author)

Chart 22 The end of the primary trend - TLKM-R-A, April 2007 - April - 2009



Source: www.blberza.com (Compiled by author)

Note: * This chart serves as an exception to the rule that the technical analysis elements in this paper are being presented as grouped around particular and individual stocks. The aim of comparative presentation of the BSLRN and of the TLKM-R-A stocks is a demonstration of the common features prevailing in the Republic of Srpska and the Federation of Bosnia and Herzegovina Stock Markets.

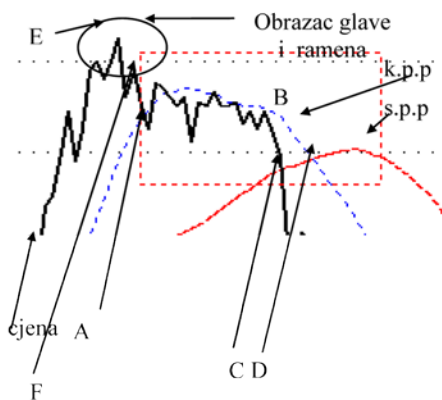
Primjeri primjene tehničke analize koji sljede takođe se odnose na *TLKM-R-A*. Prvo analiziramo odnos cijene i pokretnih prosjeka. U tački "A" cijena sječe k.p.p., što nagovještava pad tržišta (**Grafikon 23**). Sve do tačke "B" kratkoročni prosjek pruža otpor daljem rastu cijene, tj. ponaša se kao nivo otpora, poslije čega slijedi rapidan pad cijene. Cijena prvo sječe s.p.p. odozdo prema dole (tačka "C"), a ubrzo poslije toga i k.p.p. pada ispod s.p.p. (tačka "D"). Na ovaj način opadajući trend je definitivno potvrđen, ali sa zakašnjenjem, u maniru kratkoročnih prosjeka kao zaostajućih indikatora. Međutim obrazac glave i ramena daje informaciju o promjeni trenda mnogo ranije. Zaključak o predstojećem padu tržišta se "nalazi" u tački F (**Grafikon 23**) - koja predstavlja desno rame obrasca glave i ramena. Pokretni prosjeci signaliziraju promjenu trenda sa zakašnjenjem u odnosu na obrazac glave i ramena. A *ROC* i *RSI* su ispred i pokretnih prosjeka i grafičkog obrasca. U tački "E" vrijednost *ROC*₁₅ i *RSI*₁₅ su ekstremne 22,07%

i 76,78 respektivno, pa tehnički indikatori istupaju kao vodeći indikatori promjene trenda.

Vrlo čista tržišna pozicija koja nagovještava rast cijene - prodorni obrazac - prikazana je na **grafikonu 24**. Bijeli svijećnjak nakon sukcesivnog pada cijene prodire u tijelo crnog svijećnjaka i preokreće smjer kretanja cijene.

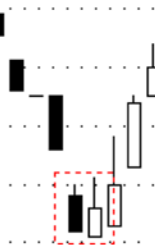
Modaliteti korištenja standardne devijacije za predviđanje promjene cijena su brojni. Jedan od njih je prikazan na **grafikonu 25**. Periodu manje volatilnosti cijene odgovara sužavanje Bulindžerovih granica. Period više volatilnosti, smjenjuje period manje volatilnosti i tako redom. Smanjenje volatilnosti je indicija za očekivanu promjenu cijene bez jasne poruke o smjeru budućeg kretanja cijene. Stanje iščekivanja - ovdje se radi o pozitivnim informacijama - kojeg prati niska volatilnost cijene prekida nova informacija koja stiže na tržište. U ovom slučaju to je odluka o isplati dividende, koja vodi ka enormnom rastu cijene i prelasku u zonu širokih Bulindžerovih granica.

Grafikon 23. Cijena, pokretni prosjeci i obrazac glave i ramena, *TLKM-R-A* april - jun 2010. g.



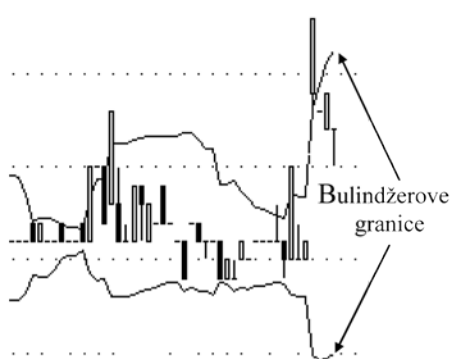
Izvor: *Ibid.*

Grafikon 24. Prodorni obrazac, *TLKM-R-A* 11.03.2008. g.



Izvor: *Ibid.*

Grafikon 25. Cijena i Bulindžerove granice, *TLKM-R-A* 05.08.2010 - 05.10.2010. g.



Izvor: *Ibid.*

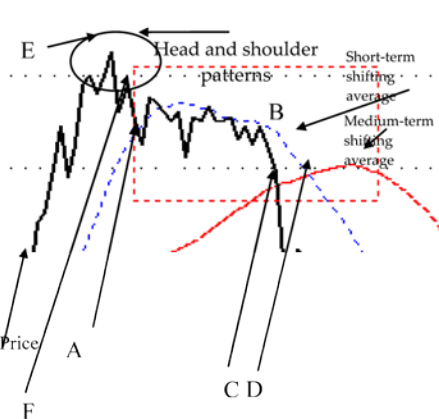
The examples of the technical analysis application, that are to follow, also pertain to the TLKM-R-A. Firstly, let us analyse the ratio between price and shifting averages. In point "A", the price is crossing the short-term shifting average which points at the market fall (Chart 23). All the way up to the point "B", the short-term shifting average is offering resistance to the further price growth, i.e. it behaves as the resistance level, this to be followed by a rapid fall in price. The price crosses firstly the medium-term shifting average from top to bottom (point "C"), and soon thereafter, also the short-term shifting average falls below the medium-term shifting average (point "D"). In this way, the falling trend was definitely confirmed, but with a delay, in the manner of the short-term averages as the delaying indicators. The head and shoulder pattern, however, provides the information of the trend change much earlier. The conclusion, that the market fall is forthcoming, "is to be found" in point F (Chart 23), which represents the right-hand shoulder in the head and shoulder pattern. Shifting averages are signalling trend change with a certain delay, in respect to the head and shoulder pattern. Both the ROC and RSI stand well ahead of both the shifting averages and of the charter pattern. In point "E", values

of ROC_{15} and of the RSI_{15} are extreme, 22.07 and 76.78, respectively, and thus the technical indicators function as the leading indicators of the trend change.

Very clean market position suggesting a price growth - the piercing pattern - is presented in Chart 24. The white candlestick, after a successive price fall, pierces the body of the black candlestick and reverses the price movement trend.

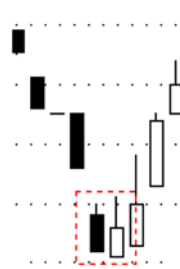
Modalities for use of standard deviation in the prediction of price change are many. One of them is presented in Chart 25. A period of lower price volatility is well suited by the narrowing down of the Boolinger Bands. A period of higher volatility replaces the period of lower volatility, and so on. Lower volatility is an indication of the expected price change without a clear message as to the direction in which the future prices will move. The state of expectation - and here we speak of positive expectation - to be followed by the low price volatility, is suspended by the new information coming from the market. In this case, this is the decision on the payment of dividends, which is leading towards an enormous rise in prices and the transition into the zone of broad Boolinger Bands.

Chart 23 Price, shifting averages, and the head and shoulder pattern, TLKM-R-A, April - June 2010



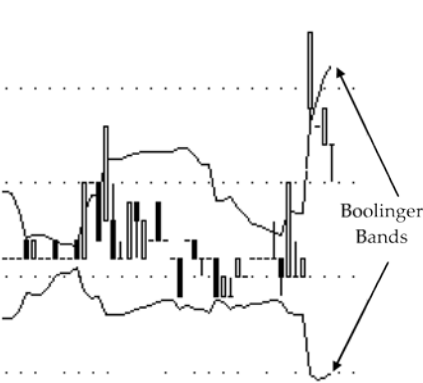
Source: Ibid

Chart 24 Piercing pattern, TLKM-R-A, 11.03.2008



Source: Ibid

Chart 25 Price and Boolinger Bands, TLKM-R-A, 05.08.2010 - 05.10.2010

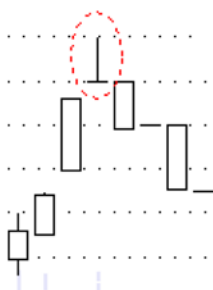


Source: Ibid

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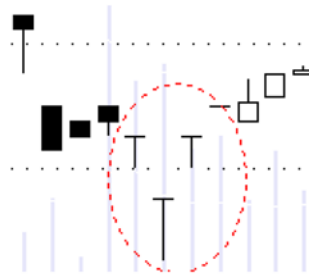
Kretanje cijene papira EINP-R-A stvara brojne obrasce iz teorije svijećnjaka. Na donjim grafikonima su prikazani neki karakteristični primjeri. Prvi je opadajuća zvijezda, indikator početka kretanja tržišta prema dole (**grafikon 26**). Cijena otvaranja i zatvaranja su jednake - donje sjenke nema, a gornja je izuzetno dugačka. Opadajućoj zvijezdi prethodi, što je uobičajeno, izuzetno jako rastuće tržište (bijeli svijećnjaci). Obrazac je toliko jak da čak ni bijeli svijećnjaci koji slijede iza njega - što je atipično za razvoj ovoga obrasca - nisu u stanju da osujete razvoj opadajućeg trenda.

Grafikon 26. Opadajuća zvijezda, EINP-R-A 05.02.2008. g.



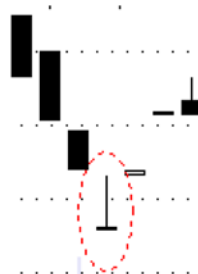
Izvor: Ibid.

Grafikon 27. Čekić EINP-R-A 25.06.2007. g.



Izvor: Ibid.

Grafikon 28. Obrnuti čekić, EINP-R-A 27.10.2006. g.



Izvor: Ibid.

Obrazac čekića kojem prethodi jedan neubjedljivi čekić, a slijedi jedan čekić koji dodatno potvrđuje promjenu trenda ilustrovan je na **grafikonu 27**. Kao što je to karakteristično za ovaj obrazac, donja sjena ima svoju završnicu u cijeni zatvaranja koja je niža od najniže cijene u prethodnom danu trgovanja, a jednaka cijeni otvaranja. Medvjedi cijenu nakon otvaranja tržišta vuku na dole, ali je bikovi vraćaju na početni nivo. Najdužu sjenu ima srednji obrazac čekića. Tačka najvećeg pesimizma ujedno označava i prelom trenda.

Grafikon 28 se svodi na obrnuti čekić. Obrascu prethode tri relativno dugačka crna svijećnjaka. Obrazac obrnutog čekića ima vrlo malo tjelo, ali je zato gornja sjena izdužena. Nakon formiranja obrasca, cijena počinje rasti.

Zaključak

Izolovani obrasci kretanja cijena akcija - najviša cijena, cijena otvaranja i zatvaranja i najniža cijena - stvaraju osnov za formiranje zaključaka o promjeni trenda cijene preko teorije svijećnjaka. Svi uočeni grafički obrasci cijene - čekić, obrnuti čekić, dodži, prodorni obraza, crni oblak koji prekriva, opadajuća zvijezda, rastući svijećnjak koji okružuje i opadajući svijećnjak koji okružuje - pokazuju teorijski-očekivane zakonomjernosti.

Iako predstavljaju zaostajuće indikatore pokretni prosjeci su vrlo precizni u formiranju nivoa otpora i nivoa podrške. Oni potvrđuju

signale koje daju vodeći indikatori.

Na domaćem finansijskom tržištu se može primijeniti Eliotova teorija talasa - odnosno njen derivat Fibonačijev niz - i karakteristični omjeri izvedeni iz ovog niza. Fibonačijevi brojevi 61,2, i 38,2 su manje ili više precizan nagovještaj promjene kretanja cijene akcija.

Tehnički indikatori koji se zasnivaju na cijeni - *ROC* i *RSI* - su zbog relativno niske disperzije pouzdani vjesnici zaokreta tržišta. Da bi se povećala prediktivna snaga tehničkih indikatora potrebno je izvršiti njihovo prilagođavanje ritmu tržišta.

MFI kao indikator volumena ispoljava najveću slabost, jer protrgovani volumeni na mladim tržištima - kakvo i jeste finansijsko tržište Bosne i Hercegovine - uopšte nisu stabilni. Velike oscilacije volumena smanjuju kvalitet *MFI* do stepena njegove neupotrebljivosti u

**Closed investment fund Euroinvestment
fond a.d. Banjaluka - FINP-R-A**

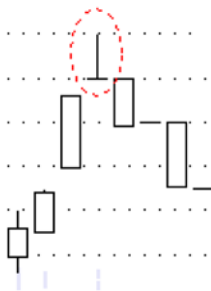
Price movement of the EINP-R-A securities is creating many patters of the candlestick theory. In the charts to follow, some characteristic examples have been presented. The first one is the shooting star, the indicator of the start of downward market movement (Chart 26). The opening and the closing prices are equal - the lower shadow is absent, while the upper shadow is extremely long. The shooting star is preceded, as is the usual occurrence, by an extremely strong growing market (the white candlesticks). The pattern is so strong that even the white candlesticks that are to follow thereupon - which is atypical for the development of this pattern - are not able to undermine the development of the falling trend.

hammer. This pattern is preceded by three relatively long black candlesticks. The pattern of inverted hammer has a very small body, but because of that its upper wall is extended. After the formation of the pattern, the price starts to grow.

Conclusion

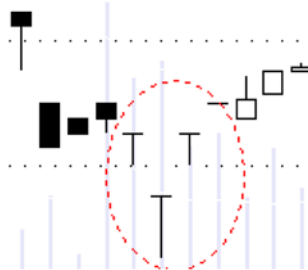
Isolated stock price movement patterns - the highest price, the opening and the closing price, and the lowest price - are creating basis that serves for coming to a conclusion on the price trend changes, through the candlestick theory. All the observed chartered price patterns - hammer, inverted hammer, doji, piercing pattern, dark cloud cover, shooting star, bullish engulfing candlestick, and the bearish engulfing

Chart 26 The shooting star, EINP-R-A, 05.02.2008



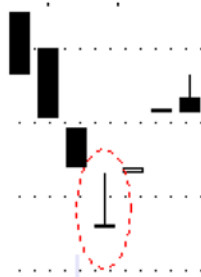
Source: Ibid

Chart 27 The hammer, EINP-R-A, 25.06.2007



Source: Ibid

Chart 28 Inverted hammer, EINP-R-A, 27.10.2006



Source: Ibid

The hammer pattern, which is preceded by an unconvincing hammer and followed by a hammer further confirming the change in trend, is illustrated in Chart 27. As is the characteristic of this type of pattern, the lower shadow has its finishing point in the closing price, which is lower than the lowest price during the previous trading day, and is equal to the opening price. The bears are pulling the price, after the opening of the market, downwards, but the bulls are returning it back to its initial level. The longest shadow is displayed by the middle hammer pattern. The point of highest pessimism concurrently designates the trend break.

Chart 28 is coming down to an inverted

candlestick - are demonstrating theoretically-anticipated regularities.

Although they present the delaying indicators, shifting averages are very precise in the formation of the resistance level and of the support level. They confirm the signals given by the leading indicators.

In the domestic financial market, it is possible to apply the Elliott Wave Theory - i.e. its derivative, the Fibonacci number sequence - and the characteristic ratios derived from this sequence. Fibonacci numbers 61.2 and 38.2 are more or less a precise prediction of the change in the price of stocks.

Technical indicators based on the price - ROC and RSI - because of their relatively low

predviđanju preokreta cijene.

Kao i **MFI** i **MOM** (impuls) ima slabu sposobnost predviđanja. Razlog treba tražiti u cjenovnim oscilacijama, koje ako su predstavljene preko apsolutnih vrijednosti, ne mogu služiti kao osnov za prognozu.

Promjena primarnog trenda se može predvidjeti linijom trenda (*trend line*) - vrlo jednostavnim instrumentom. Jednostavnost metode ne treba biti razlog za njeno odbacivanje i sumlju u kvalitet zaključaka koji su na bazi nje izvedeni.

Bulindžerove granice mjere raspon

volatilnosti cijene. Ciklična smjena perioda visoke i niske volatilnost je pravilo korisno za formiranje očekivanja o promjeni cijene.

Tehnička analiza je vrlo prilagodljiva. Omogućava predviđanje promjene cijene za trendove različite dužine trajanja.

Alati tehničke analize, primjenjeni na tržište akcija Republike Srpske, su u stanju da predvide promjenu cijene. Njihova sposobnost predviđanja promjene cijene nije opšte prirode.

Snaga instrumenata tehničke analize u predviđanju promjene cijene leži u njihovoj kombinovanoj i fleksibilnoj primjeni.

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dispersion, are reliable heralds of the market turn. In order to enhance the predictive power of the technical indicators, it is necessary to adjust them to the market rhythm.

MFI, as the volume indicator, is manifesting the highest shortcomings, because the traded volumes in the younger markets - such as is the financial market of Bosnia and Herzegovina - are not at all stable. High volume oscillations are lowering the quality of the MFI up to the degree of its unsuitability for the use in price reversal predictions.

Not unlike the MFI, the MOM (impulse) itself has a weak prediction capability. The reason for this is to be found in the price oscillations which, if presented in absolute values, can not serve as basis for prognosis.

The change in primary trend can be predicted through the trend line - which is

a very simple instrument. The simplicity of this method should not be the reason for its rejection and for doubts into the quality of the conclusions derived on the basis thereof.

Boolinger Bands are measuring the range of price volatility. Cyclical change between periods of high and low volatility is a rule that can be usefully applied in the making expectations regarding the price changes.

Technical analysis is very adaptable. It makes possible price change predictions for trends of different duration. The technical analysis tools, applied on the stock market of the Republic of Srpska, are able to predict price changes. Their prediction capability of price change is not of a general nature.

The power of technical analysis tools in the price change prediction is to be found in their combined and flexible application.