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# EFEKTI BANKARSKE REGULACIJE NA PERFORMANSE POSLOVANJA BANKARSKOG SEKTORA: EVIDENCIJA BANAKA ZEMALJA ZAPADNOG BALKANA

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## Rezime

Osnovni cilj ove kvantitativne studije je da ispita odnos između sledećih nezavisnih varijabli: stope adekvatnosti kapitala (CAR), likvidne aktive prema ukupnoj aktivi (LATA) i veličine banke (BS) i zavisnih varijabli: povrat na aktivu (ROA), indikator kreditnog boniteta (Zscore) i povrata na vlasničku glavnicu (ROE) za odabrane zemlje banaka Zapadnog Balkana. Navedeni model procenjen je pomoću metodologije podataka panela zasnovane na pretpostavci fiksnog i slučajnog efekta kako je odlučeno u Hausmanovom testu. Rezultati su pokazali da promenljiva veličina banke (BS) pozitivno utiče na povrat na aktivu banaka zemalja Zapadnog Balkana, dok varijable likvidna aktiva prema ukupnoj aktivi (LATA) i stopa adekvatnosti kapitala (CAR) imaju negativan uticaj. Rezultati su takođe pokazali da promenljiva udeo likvidne aktive prema ukupnoj aktivi ima pozitivan uticaj na indikator kreditne sposobnosti banaka zemalja Zapadnog Balkana (ZScore). Treći rezultat je promenljiva povrat na vlasničku glavnicu (ROE) i imala je najjači pozitivni uticaj sa nezavisnom promenljivom veličina banke.

**Ključne reči:** bankarska regulacija; supervizija; povrat na aktivu; povrat na vlasničku glavnicu; Z-Score

**JEL klasifikacija:** G21, G28, C51

## Uvod

Bankarsko poslovanje nije puka aktivnost za koje sve poslovne odluke treba predati vlasnicima ili upravi takvih kompanija. Priroda bankarstva i prateći rizici za operatore i celi sistem ekonomista zahtevaju određene stepene jedinstvene operativne prakse. Bankarska regulacija se može definisati kao okvir koji kontroliše stvaranje, rad i likvidaciju banaka u jednoj ekonomiji. Potreba za regulisanjem aktivnosti banaka postaje pitanje krajnje neophodno nakon globalnih trendova kolapsa, te loše uprave finansijskih institucija. Poslednjih godina bankarski sistem širom sveta bio je predmet žestokih kritika i nadzora. Globalna finansijska kriza nakon neuspeha velikih banaka poput braće Lehman i drugih istakla je važnost adekvatne regulacije i nadzora banaka. Odobrenje Bazelskog odbora za bankarsku regulativu za jačanje globalnih propisa o kapitalu i likvidnosti u cilju promovisanja bankarskog sektora od strane G20 pozitivan je signal u ovom pravcu (Klomps i De Haans, 2011).

Mnogi delimično veruju da je nedostatak regulacije i nadzornih struktura doveo svet na ivicu finansijskog kolapsa, dok na drugoj strani mnogi veruju da su godine prosperiteta koje je svet doživeo neposredno pre kolapsa u velikoj meri bile posledica delimične deregulacije, slobodno gotovo slobodno tržište u kontekstu finansijskog sektora. Barth i ostali (2012) tvrde da su slabi regulatorni i nadzorni okviri doprineli krizi i da bi se smanjili krizni uticaji neophodno je preduzeti mere poput jačanja podsticaja privatnog praćenja. I pored toga što se bankarska regulativa i nadzor prepisuju i restrukturiraju kao odgovor na globalnu finansijsku krizu, njihova primena zahteva složene korake u zavisnosti od nacionalne politike svake zemlje, što bi moglo imati različite efekte na preuzimanje rizika u bankama u zavisnosti od finansijskog i institucionalnog okruženja u kojem banke posluju (Bouheni, 2013).

Veći broj tržišta podleže određenom stepenu regulacije iz različitih razloga (Heffernan, 2005):

- Potrebno je zaštititi potrošača („neka se kupac čuva“) smatra se nedovoljnim stavljanjem prevelike odgovornosti na potrošača za mnoga dobra i usluge kojima nedostaje transparentnost.
- Da bi se proverila zloupotreba oligopolističke i monopolističke moći: postoji mnogo tržišta na kojima posluje samo jedna ili nekoliko preduzeća. Stepem monopolske moći preduzeća utiče na cene njihovih proizvoda.
- Da zaštiti javnost od kriminalnih aktivnosti.
- Suočavanje sa efektima eksternalija: efekti delovanja jednog agenta u ekonomiji na druge, što se ne odražava kroz mehanizam cena.

Najosnovniji razlog za uvođenje bankarske regulacije je pre svega zaštita deponenata od neprimernog rizika za njihove depozite. Preduzeća i pojedinci drže značajan deo svojih sredstava u bankama, gde postoji osnovna zabrinutost zbog zaštite njihovih sredstava. Kao rezultat toga, bankarske agencije odgovaraju na takve zabrinutosti propisima kojima se nastoje zaštititi štediša banaka. Agencija za osiguranje depozita u Bosni i Hercegovini osigurava male deponente, odnosno klijente do 50.000 BAM od januara 2014. godine tako da nemaju brige oko kvaliteta i boniteta banke (Plakalović & Alihodžić, 2015).

Odabrane Balkanske ekonomije (kao što su ekonomije Srbije, Hrvatske i Bosne i Hercegovine) imale su veoma slične promene u ekonomskom i političkom sistemu što znači da su morale uspostaviti tržišnu ekonomiju iz početka sa povratom političke i državničke nezavisnosti (Kubiszewska, 2016). Jedan od

razloga zbog kojeg se istražuju ove zemlje je taj što ove zemlje imaju prilično sličnu modernu istoriju i iskustva u kontekstu sa bankarskim aplikacijama. Bankarski sektor u ovim zemljama karakteriše visok udeo stranih banaka, gde strane banke od 1990-tih igraju ulogu zemlje domaćina (Karkowska and Pawłowska, 2017). Bankarski sektor u zemljama Zapadnog Balkana doživio je značajne promene u kontekstu privatizacije, zakonodavnih, finansijskih i strukturnih reformi, kao i liberalizacije i priliva kapitala, što je dovelo do diversifikacije bankarskih proizvoda i usluga, povećanja kredibiliteta, te performansi bankarskog sektora (Onofrei i ostali, 2018).

Osnovni cilj ovog rada je da se istraži uticaj bankarske regulacije i supervizije na efikasnost poslovanja banaka u Srbiji, Hrvatskoj i Bosni i Hercegovini za period od 2010 do 2019. god. U radu ćemo koristiti tri indikatora u svojstvu zavisnih varijabli, i to povrat na aktivu (ROA), povrat na akcijski kapital (ROE) kao i indikator kreditnog skora (Z-score). Objašnjavajuće varijable u modelu uključuju performanse bankarskih varijabli i varijable finansijske strukture. Preostali dio istraživanja je organizovan na sledeći način: Deo 2 se sastoji iz pregleda literature, te dimenzija različitih studija koje se sprovode na temu bankarske regulacije i supervizije banaka. U delu 3 - metodološkom pristupu razmatra se uzorak, prikupljeni podaci i model istraživanja. Empirijski nalazi ove studije predstavljeni su u delu 4. Deo 5 sastoji se od zaključaka i preporuka.

## Pregled relevantne literature i istraživačke hipoteze

Tradicionalni pristupi bankarskoj regulaciji ističu pozitivne karakteristike zahtjeva za adekvatnošću kapitala. Kapital služi kao zaštita od gubitaka, te konsekvntno tome i od neuspeha. Dalje uz ograničenu odgovornost, sklonost banaka da se bave rizičnim aktivnostima umanjena je sa većim iznosima rizičnog kapitala. Zahtjevi za adekvatnošću kapitala, posebno kod osiguranja depozita, igraju presudnu ulogu u usklađivanju podsticaja vlasnika banaka sa deponentima i drugim poveriocima (Berger i ostali, 1995).

Ekonomska teorija daje oprečna gledišta o potrebi i efektu propisa za ulazak banaka. Neki tvrde da efikasan pregled ulaska banaka može promovisati stabilnost. Drugi naglašavaju da banke sa monopolističkom moći imaju veću vrednost franšize što pojačava razborito ponašanje pri preuzimanju rizika (Keeley, 1990).

Kasimidou i ostali (2006) u svojoj studiji testirali su efikasnost banaka u Velikoj Britaniji koristeći veličinu banke kao ključni faktor. Takođe, su kategorizirali banke u dve vrste i to velike i male banke prema obimu aktive. Rezultati njihove studije zaključili su da su male banke pokazale veće performanse u poređenju sa velikim bankama. Dalje, dokazano je da veličina banke utiče na profitabilnost pored ostalih faktora kao što je likvidnost.

Uprkos teorijskim i empirijskim interesima koji se generišu već nekoliko decenija, i dalje postoji kontradikcija oko tačnog uticaja regulatornog kapitala na bankarske ishode. Na primjer, mnoge studije otkrivaju da veći ili strožiji kapitalni zahtevi smanjuju profitabilnost budućih zajmova, odnosno bankarsku efikasnost (Repullo i Suarez, 2008). Drugi autori smatraju da strožiji kapitalni zahtevi poboljšavaju troškovnu efikasnost i imaju značajan uticaj na efikasnost alokacije banaka (Fare i ostali, 2004).

Pasiouras i ostali (2009) su koristili model Stohastičke analize granica (SFA) kako bi pružili međunarodne dokaze o uticaju regulatornog i nadzornog okvira na efikasnost poslovanja banaka. Istražili su uticaj

propisa koji se odnose na tri stuba Bazela II (dakle, zahtev za adekvatnošću kapitala, supervizorsku moć i tržišnu disciplinu) na troškove i efikasnost banaka. Njihova otkrića sugerišu da strožiji kapitalni zahtevi poboljšavaju ekonomičnost, ali smanjuju profitnu efikasnost, dok ograničenja na bankarske aktivnosti imaju suprotan efekat, smanjuju troškovnu efikasnost, ali poboljšavaju profitnu efikasnost.

Berger i Bouwman (2011) istraživali su kako bankarski kapital utiče na opstanak, profitabilnost i tržišni udeo banaka tokom kriznih i normalnih vremenskih ciklusa koristeći regresiju logit panela. Rezultati studije pokazali su da veći kapital povećava opstanak, tržišne udele i profitabilnost banaka i u normalnim i u kriznim vremenima. Dati rezultati su postignuti u odvojenim regresijama panela. Važno je napomenuti da je ova studija prepoznala postojanje potencijalne endogenosti između profita i tržišnih udela, i to je rešeno korišćenjem njihovih zaostalih vrednosti.

Goddard i ostali (2014) testirali su profitabilnost banaka kroz veličinu banke, rizik, diversifikaciju i vrstu vlasništva. Došli su do zaključka da je veza između veličine banke i profitabilnosti slaba, dok je sa druge strane korelacija između stope adekvatnosti kapitala i profitabilnosti bila pozitivna.

Tran i ostali (2016) istraživali su međusobnu vezu između regulatornog kapitala, formiranja likvidnosti i profitabilnosti u američkom bankarskom sektoru. Studija je pokazala da se regulatorni kapital pozitivno odnosi na stvaranje likvidnosti, te održavanje profitabilnosti banaka konstantnim u slučaju malih banaka u nekriznim periodima. Banke koje pokazuju visok rizik nelikvidnosti rezultiraju niskom profitabilnošću, gde je odnos između regulatornog kapitala i profitabilnosti banaka nelinearan i zavisi od nivoa kapitala.

Arıcan i ostali (2019) sprovedli su analizu kointegracije u periodu između 2002. i 2016. godine u svom članku koji je ispitivao uticaj Bazelskih kriterijuma na profitabilnost banaka u Turskoj. Prema dobijenim rezultatima, zaključeno je da kreditni rizik, rizik likvidnosti i adekvatnost kapitala negativno utiču na profitabilnost banaka, odnosno na prinos na imovinu i prinos na kapital.

Kilci (2019) je ispitivao odnos između adekvatnosti kapitala i profitabilnosti u periodu između 1980. i 2017. godine, pomoću Fourierevog pristupa i prema dobijenim rezultatima utvrđena je kointegracija između odnosa kapitala/ukupne imovine, kapitala/(depoziti + nedepozitni resursi) i ROE i NFM varijabli izabranih kao promenljive profitabilnosti.

U cilju osiguranja efikasne transmisije jedinstvene monetarne politike, bolje diversifikacije rizika, kroz države članice i adekvatno finansiranje privrede Evropskoj monetarnoj uniji potrebna je Bankarska unija. S tim u vezi, kompletiranje i dalje jačanje Bankarske unije će uticati na jačanje finansijske stabilnosti u kontekstu vraćanja poverenja u bankarski sektor kroz arsenal mera čiji je cilj prevashodno smanjenje rizika (Ristić i Živković, 2020).

*Na osnovu cilja postavljenog u uvodnom delu rada biće testirane sledeće hipoteze uz pomoć modela slučajnih i modela fiksnih efekata:*

### Prva hipoteza

$H_0$ ): Ne postoji signifikantni statistički uticaj sledećih varijabli (stope adekvatnosti kapitala - CAR, likvidne aktive prema ukupnoj aktivi - LATA i veličine banke - BS na povrat na aktivu pri nivou značajnosti  $p \leq 0.05$ ). Prva hipoteza se sastoji iz sledećih pod-hipoteza:

$H_{0/I-1}$ - Ne postoji signifikantni statistički uticaj stope adekvatnosti kapitala na povrat na aktivu (ROA) pri nivou značajnosti  $p \leq 0.05$ .

$H_{0/I-2}$ - Ne postoji signifikantni statistički uticaj likvidne aktive prema ukupnoj aktivi na povrat na aktivu (ROA) pri nivou značajnosti  $p \leq 0.05$ .

$H_{0/I-3}$ - Ne postoji signifikantni statistički uticaj veličine banke na povrat na aktivu (ROA) pri nivou značajnosti  $p \leq 0.05$ .

### Druga hipoteza

$H_{0/II}$ ): Ne postoji signifikantni statistički uticaj sledećih varijabli (stope adekvatnosti kapitala - CAR, likvidne aktive prema ukupnoj aktivi - LATA i veličine banke - BS na indikator kreditnog boniteta (Zscore) pri nivou značajnosti  $p \leq 0.05$ . Druga hipoteza se sastoji iz sledećih pod-hipoteza:

$H_{0/II-1}$ - Ne postoji signifikantni statistički uticaj stope adekvatnosti kapitala na indikator kreditnog boniteta (Zscore) pri nivou značajnosti  $p \leq 0.05$ .

$H_{0/II-2}$ - Ne postoji signifikantni statistički uticaj likvidne aktive prema ukupnoj aktivi na indikator kreditnog boniteta (Zscore) pri nivou značajnosti  $p \leq 0.05$ .

$H_{0/II-3}$ - Ne postoji signifikantni statistički uticaj veličine banke na indikator kreditnog boniteta (Zscore) pri nivou značajnosti  $p \leq 0.05$ .

### Treća hipoteza

$H_{0/III}$ ): Ne postoji signifikantni statistički uticaj sledećih varijabli (stope adekvatnosti kapitala - CAR, likvidne aktive prema ukupnoj aktivi - LATA i veličine banke - BS na povrat na vlasničku glavnicu (ROE) pri nivou značajnosti  $p \leq 0.05$ . Treća hipoteza se sastoji iz sledećih pod-hipoteza:

$H_{0/III-1}$ - Ne postoji signifikantni statistički uticaj stope adekvatnosti kapitala na povrat na vlasničku glavnicu (ROE) pri nivou značajnosti  $p \leq 0.05$ .

$H_{0/III-2}$ - Ne postoji signifikantni statistički uticaj likvidne aktive prema ukupnoj aktivi na povrat na vlasničku glavnicu (ROE) pri nivou značajnosti  $p \leq 0.05$ .

$H_{0/III-3}$ - Ne postoji signifikantni statistički uticaj veličine banke na povrat na vlasničku glavnicu (ROE) pri nivou značajnosti  $p \leq 0.05$ .

## Bankarski sektor zemalja Zapadnog Balkana u svetlu analize indikatora regulatornog poslovanja

Finansijski model u zemljama Zapadnog Balkana je banko-centričan i karakteriše ga vrlo visok nivo konkurencije. Posmatrano sa druge strane, osim konkurencije u bankarskom sistemu posmatranih zemalja izražena je i umerena koncentracija. Tabela 1. prikazuje linearni trend kretanja pokazatelja stope adekvatnosti kapitala odabranih zemalja Zapadnog Balkana (Srbija, Hrvatska i Bosna i Hercegovina) za period: 2010:Q4 – 2020:Q4.

**Tabela 1:** Tendencija kretanja stope adekvatnosti kapitala (CAR) Srbije, Hrvatske i Bosne i Hercegovine za period:2010:Q4 -2020:Q4 (u %)

	2010:Q4	2011:Q4	2012:Q4	2013:Q4	2014:Q4	2015:Q4	2016:Q4	2017:Q4	2018:Q4	2019:Q4	2020:Q4	Prosek
Srbija	19,9%	19,1%	19,87%	20,9%	19,96%	20,89%	21,83%	22,61%	22,26%	23,39%	22,40%	21,19%
Hrvatska	18,8%	20,5%	20,9%	20,9%	21,8%	21,0%	22,5%	23,2%	22,9%	23,2%	24,9%	21,87%
BiH	16,2%	17,1%	17,0%	17,8%	16,3%	14,9%	15,8%	15,7%	17,5%	18,0%	19,2%	16,86%

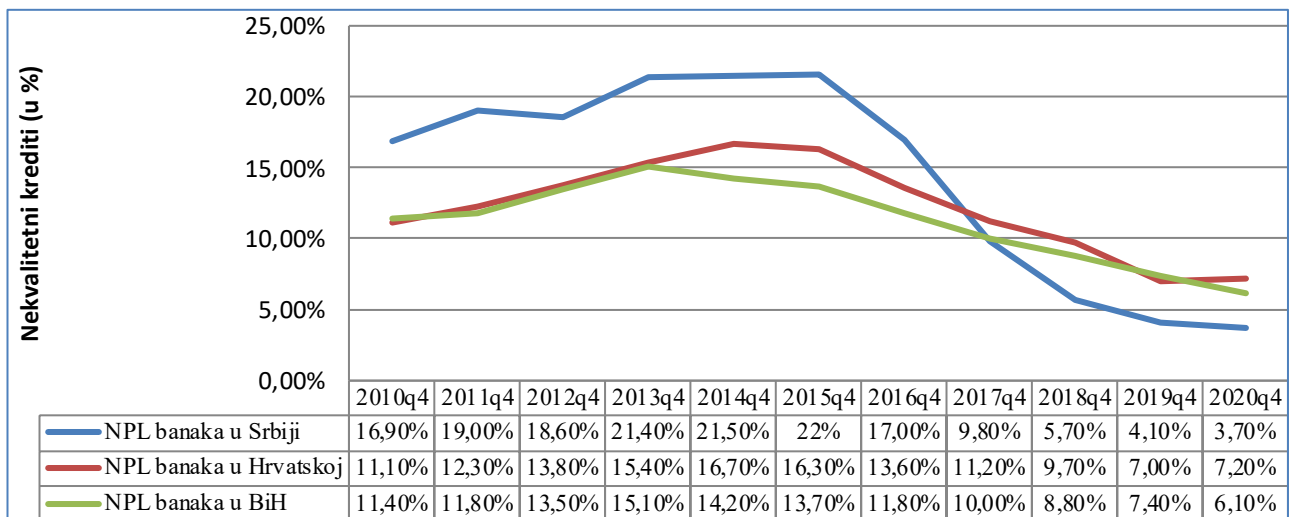
Izvor: <https://data.imf.org> i [https://nbs.rs/sr\\_RS/drugi-nivo-navigacije/statistika/](https://nbs.rs/sr_RS/drugi-nivo-navigacije/statistika/) (Prilagođeno od strane autora)

Najniža vrednost stope adekvatnosti kapitala za banke u Srbiji zabeležena je u četvrtom kvartalu 2011. godine (19.1%), dok je s druge strane najviša vrednost zabeležena u četvrtom kvartalu 2019. godine (23.39%) i prosečna vrednost od 21.19%. Najniža vrednost stope adekvatnosti kapitala za banke u Hrvatskoj zabeležena je u četvrtom kvartalu 2010. godine (18.8%), dok je s druge strane najviša vrednost zabeležena u četvrtom kvartalu 2020. godine (24.9%) i prosečna vrednost od 21.87%. Najniža vrednost stope adekvatnosti kapitala za banke u Bosni i Hercegovini zabeležena je u četvrtom kvartalu 2015. godine (14.9%), dok je s druge strane najviša vrednost zabeležena u četvrtom kvartalu 2020. godine (19.2%) i prosečna vrednost od 16.86%. Pokazatelj adekvatnosti kapitala za bankarski sektor odabranih zemalja Zapadnog Balkana (Srbija, Hrvatska, Bosna i Hercegovina) je daleko iznad regulatornog minimuma, kako prema domaćoj regulativi od 12%, tako i prema Bazelskim standardima od 8%. Dakle, banke u Srbiji, Hrvatskoj i Bosni i Hercegovini su adekvatno kapitalizirane i u kontekstu ostvarenog nivoa pokazatelja adekvatnosti kapitala, te i u pogledu strukture regulatornog kapitala. Stopa adekvatnosti kapitala je u određenim vremenskim intervalima imala blagu tendenciju smanjenja kao rezultat povećanja kreditnog rizika i rizične aktive. Održavanje zaštitnog praga kapitala iznad propisanog regulatornog minimuma povećava otpornost banaka na gubitke, te smanjuje prekomerne izloženosti i ograničava raspodelu kapitala u cilju ograničenja sistematskih rizika u finansijskom sistemu (Narodna banka Srbije, 2019).

Rezultati mrežne analize koji su sprovedeni s kraja 2019. godine ne ukazuju na veće pretnje po kapitalizovanost drugih banaka po osnovu međubankarske izloženosti. Dakle, ako se pođe od pretpostavke da zbog neizmirenja obaveza jedne banke druga banka bi eventualno imala gubitak u iznosu 100% svojih potraživanja prema nesolventnoj banci, ali u konačnici ni jednoj banci ne bi bila ugrožena adekvatnost kapitala. Isto tako, rezultati analize pokazuju da se adekvatnost kapitala ne bi ugrozila i pod pretpostavkom da pored kreditnog šoka egzistira i šok finansiranja. Ovo je sve rezultat visoke kapitaliziranosti svih banaka u sistemu na kraju 2019. godine (Centralna banka BiH, 2019).

Najniža stopa toksičnih kredita za banke u Srbiji zabeležena je u poslednjem kvartalu 2020. godine (3.70%), dok je s druge strane najveća vrednost ostvarena u četvrtom kvartalu 2014. godine od oko 21.50%, i prosečna vrednost od oko 14.48%. Banke u Hrvatskoj najnižu stopu nekvalitetnih kredita su ostvarile u četvrtom kvartalu 2019. godine od oko 7.0%, najveću stopu u četvrtom kvartalu 2014. godine od oko 16.70% i prosečnu stopu od oko 12.21%. Banke u Bosni i Hercegovini najnižu stopu nekvalitetnih kredita su ostvarile u četvrtom kvartalu 2020. godine od oko 6.10%, najvišu stopu u četvrtom kvartalu 2013. godine od oko 15.10% i prosečnu stopu od oko 11.25%. Evidentno je da su banke u sve tri zemlje imale od 2016. godine opadajući trend u kretanju toksičnih kredita, i to posebno banke u Srbiji koje su zabeležile značajno smanjenje toksičnih kredita. U cilju sprečavanja nastanka novih problematičnih kredita Vlada Republike Srbije je u decembru 2018. godine, usvojila Program za rešavanje problematičnih kredita za period: 2018-2020. god. (Narodna banka Srbije, 2019). Osim

**Grafik 1:** Linearni trend kretanja nekvalitetnih kredita banaka u Srbiji, Hrvatskoj i Bosni i Hercegovini za period: 2010:q4 – 2020:q4 (u%)



Izvor: Proračun autora na osnovu podataka Međunarodnog monetarnog fonda, Narodne banke Srbije, Narodne banke Hrvatske i Centralne banke BiH

programa na pad nivoa toksičnih kredita kao esencijalni faktori uticali su pored otpisa nekvalitetnih kredita i ostalih mera monitoringa i rast kreditne aktivnosti.

## Regresioni model

Da bi se procenio uticaj bankarskih, specifičnih, tržišnih i makroekonomskih varijabli na profitabilnost i kreditnu sposobnost banaka zemalja Zapadnog Balkana korišćen je sledeći opšti regresioni model:

$$Y_{it} = \alpha + \beta' X_{it} + \mu_{it} \quad (1)$$

gde je:  $Y_{it}$  – zavisna varijabla,  $\alpha$  – predstavlja konstantu, odnosno srednju vrednost od  $Y$ ,  $\beta$  – je a kx1 vektor parametra koji se procenjuju na objašnjavajućim promenljivama i  $\mu$  je slučajna greška (Brooks, 2008). Uključivanjem svih nezavisnih i zavisnih promenljivih u jednačinu (1) model 1 se formuliše na sledeći način:

$$ROA_{i,t} = \alpha + \beta_{it}(CAR_{i,t} + LATA_{i,t} + AB_{i,t}) + \mu_{it} \quad \text{Model 1}$$

Uključivanjem druge zavisne (ZScore) i nezavisnih promenljivih u jednačinu 1 model 2 se formuliše na sledeći način:

$$ZScore_{i,t} = \alpha + \beta_{it}(CAR_{i,t} + LATA_{i,t} + AB_{i,t}) + \mu_{it} \quad \text{Model 2}$$

Na kraju, uključivanjem treće zavisne promenljive (ROE) i nezavisnih promenljivih u jednačinu 1, model 3 se formuliše na sledeći način:

$$ROE_{i,t} = \alpha + \beta_{it}(CAR_{i,t} + LATA_{i,t} + AB_{i,t}) + \mu_{it} \quad \text{Model 3}$$

Ukoliko je p - vrednost statistički značajna treba koristiti model fiksnog efekta. S druge strane, ako p - vrednost nije statistički značajna treba koristiti model slučajnog efekta. Test značajnosti je izveden za sve promenljive korišćenjem t - testa na nivou značajnosti od 95% (Chmellarova, 2007). Nulta i prva alternativna hipoteza će biti testirane uz pomoć Hausmanovog testa.

**Tabela 2:** Kratak opis zavisnih i nezavisnih varijabli u modelu

PROMENLJIVA	KRATKA DEFINICIJA	OČEKIVANI ZNAK
ROA	Odnos dobiti i ukupne aktive	
ZScore		
ROE	Ovaj odnos se dobija deljenjem neto dobiti banke sa kapitalom	
CAR	Predstavlja odnos između neto iznosa kapitala i aktive koja je izložena riziku.	+or-
LATA	Predstavlja odnos ukupno likvidne aktive prema ukupnoj aktivi	-
BS	Dobija se kao logaritam ukupnih sredstava banaka, odnosno kao proxy varijabla a u cilju bolje komparacije	+

Izvor: Kalkulacija autora

**Povrat na aktivu (ROA)** - smatra se najprikladnijom merom za procenu učinka poslovanja banke. ROA se dobija deljenjem prihoda banke pre kamata sa njenom imovinom. Dakle, ROA meri efikasnost menadžmenta u korišćenju resursa banke za ostvarivanje profita. Takođe, procenjuje efikasnost banke u korišćenju i stvarnih investicija za zarade od kamata i drugih naknada. Ova mera profitabilnosti banaka je posebno značajna kada se upoređuje operativna efikasnost banaka (Sinkey,1989).

**Povrat na vlasničku glavnica (ROE)** – izražava koliko banka zaradi po osnovu knjigovodstvene vrednosti svojih ulaganja. Ovaj odnos se dobija deljenjem neto dobiti banke sa kapitalom, koji odražava stvaranje prihoda, operativnu efikasnost, finansijsku polugu i poresko planiranje. Za neke banke ROE može biti visok jer banke nemaju odgovarajući odnos kapitala. Banke sa niskim povratom sredstava mogu povećati svoj povrat ulaganja, korišćenjem dodatne poluge, odnosno povećanjem odnosa imovine i kapitala (Koch & MacDonald, 2009).

**ZScore** - indeks predstavlja meru kreditnih performansi preduzeća. Razvijen od strane Edwarda Altmana koji je koristio višestruku diskriminacionu analizu za predviđanje bankrotstva. Kod Zscore modela ako je Z skor veći od 2,99 preduzeće ima dobre kreditne performanse i njegovo poslovanje je ocenjeno kao zdravo. S druge strane ako je Z skor manji od 1,81 preduzeće nema kreditne performanse i njegovo poslovanje je pred bankrotstvom. Korišćenjem ovog modela stečaj preduzeća za period od godinu dana moguće je predvideti sa verovatnoćom od 96%, dok za period od 5 godina stečaj je moguće predvideti sa verovatnoćom od 70% (Rodić i ostali, 2011).



**Stopa adekvatnosti kapitala (CAR)** – se utvrđuje na osnovu upoređivanja neto iznosa kapitala sa aktivom koja je izložena riziku. To se odnosi ne samo na aktivu bilansa banke već i na vanbilansne stavke banke. Dakle, stopa adekvatnosti kapitala se izračunava na osnovu stope neto kapitala (usklađeni kapital) čiji se iznos utvrđuje kao razlika između iznosa kapitala i odbitnih stavki (Plakalović i Alihodžić, 2015).

**Likvidna aktiva prema ukupnoj aktivi (LATA)** - odnosi se na udeo visoko likvidne imovine koju poseduju finansijske institucije kako bi se osigurala njihova stalna sposobnost da ispune kratkoročne obaveze. Ovaj odnos je u stvari generički stres test koji ima za cilj da predvidi šokove na celom tržištu i osigura da finansijska institucija poseduje odgovarajuće očuvanje kapitala, da bi otklonila bilo kakav kratkoročni poremećaj likvidnosti (www.investopedia.com).

**Veličina banke (BS)** - U literaturi se koriste različite metode za određivanje veličine preduzeća. Bateni i ostali (2014) su rasporedili logaritam knjigovodstvene vrednosti imovine da bi utvrdili veličinu banke. Mnogi drugi naučnici su koristili vrednost kapitalizacije ili tržišnu vrednost kapitala za određivanje veličine preduzeća, dok su drugi koristili veličinu filijala i kreditnog portfolija kao odrednice veličine banke (De Jonghe i ostali, 2015, Laeven i ostali, 2016). U ovom istraživanju je korišćen logaritam ukupnih sredstava kao proxy varijabla da bi se približio veličini drugih promenljivih u cilju lakšeg poređenja.

## Rezultati

Pre testiranja postavljenih hipoteza rezultati korelacije i regresije prikazani su u tabelama 3 – 10. Ukupan broj observacija iznosi 530, što predstavlja jako reprezentativan uzorak kako u kontekstu bankarskog sektora izabranih zemalja Zapadnog Balkana, tako i u kontekstu vremenskog okvira.

**Tabela 3:** Korelaciona matrica (Pearson koeficijent korelacije) između zavisnih i nezavisnih varijabli banaka zemalja Zapadnog Balkana za period: 2010 – 2019.

		ROA	ZS	ROE	CAR	LATA	BS
ROA	Pearson Correlation	1,000	0,065	0,659	-0,320	-0,107	0,210
	Sig. (2-tailed)	-	0,137	0,000	0,000	0,013	0,000
	N	530	530	530	530	530	530
ZS	Pearson Correlation	0,065	1,000	0,074	0,010	0,398	-0,070
	Sig. (2-tailed)	0,137	-	0,091	0,822	0,000	0,105
	N	530	530	530	530	530	530
ROE	Pearson Correlation	0,659	0,074	1,000	-0,333	-0,114	0,235
	Sig. (2-tailed)	0,000	0,091	-	0,000	0,009	0,000
	N	530	530	530	530	530	530
CAR	Pearson Correlation	-0,320	0,010	-0,333	1,000	0,130	-0,214
	Sig. (2-tailed)	0,000	0,822	0,000	-	0,003	0,000
	N	530	530	530	530	530	530
LATA	Pearson Correlation	-0,107	0,398	-0,114	0,130	1,000	-0,079
	Sig. (2-tailed)	0,013	0,000	0,009	0,003	-	0,070
	N	530	530	530	530	530	530
BS	Pearson Correlation	0,210	-0,070	0,235	-0,214	-0,079	1,000
	Sig. (2-tailed)	0,000	0,105	0,000	0,000	0,070	-
	N	530	530	530	530	530	530

Izvor: kalkulacija autora

Snažna pozitivna korelacija između prve zavisne promenljive u modelu (ROA) zabeležena je sa nezavisnom promenljivom veličinom banke (0.210) pri signifikantnošću ( $p < 0.05$ ). Najjača negativna korelacija zabeležena je između promenljive ROA i stope adekvatnosti kapitala (-0.320) pri signifikantnošću od  $p < 5\%$ , kao i odnosa likvidne aktive prema ukupnoj aktivi (-0.107) pri signifikantnošću od 0.01. Velike banke imaju tendenciju da održavaju visok nivo likvidnosti u odnosu na verovatnoću neuspeha ili nedostatka likvidnosti da bi prevazišle bilo kakve probleme nesolventnosti. Naprotiv, male banke teže da ulože sve raspoloživa likvidna sredstva u cilju povećanja prinosa.

**Tabela 4:** Sumarna korelaciona statistika između zavisne i nezavisnih varijabli banaka zemalja Zapadnog Balkana za period: 2010 – 2019.

Zavisne varijable	R	R <sup>2</sup>	Prilagođen R <sup>2</sup>	Standardna greška procene	Durbin - Watson
ROA	0,356	0,127	0,122	3,496	1,888
ROE	0,378	0,143	0,138	14,339	1,812
ZS	0,404	0,163	0,158	2,674	1,938

Izvor: kalkulacija autora

Prema Cohen-u (1988) dobijene vrednosti koeficijenta korelacije mogu se tumačiti na sledeći način:

- Kada je  $r = 0,10$  do  $0,29$  onda je korelacija mala.
- Kada je  $r = 0,30$  do  $0,49$  onda je korelacija srednja.
- Kada je  $r = 0,50$  do  $1,0$  onda je korelacija velika.

Ako su vrednosti Durbin-Watson statistike manje od 2 tada postoji pozitivna serijska korelacija. Dobijene vrednosti u pogledu Durbin-Watson korelacije su različite. Sve tri zavisne promenljive u modelu (ROA, ROE i Zscore) su imale vrednosti veće od 1 i manje od 2 što navodi na zaključak da je riječ o pozitivnoj serijskoj korelaciji. Ovo istraživanje usmereno je na analizu regulatornih i specifičnih varijabli na efikasnost i kreditnu sposobnost poslovanja banaka u regionu (Srbija, Bosna i Hercegovina i Hrvatska). Rezultati regresije za Model 1 predstavljeni su u tabelama 5 i 6.

**Tabela 5:** Regresioni model fiksnih efekata između zavisne (ROA) i nezavisnih varijabli banaka zemalja Zapadnog Balkana za period: 2010 – 2019. (Model 1)

Fiksni efekti (unutar) regresije				Broj opservacija = 530			
R <sup>2</sup> : unutar = 0,1264				Broj grupa = 4			
između = 0,6749							
ukupno = 0,1266				Opservacije po grupi: min = 132,5			
avg = 132 max = 134 F(7,523) = 25,23 Prob > F = 0,000							
ROA (zavisna)	Koef.	St. greška	t	P>[t]	[95% Conf. Interval]		
CAR	-0,07035	0,10592	-6,64	0,000	-0,09116	-0,04954	
LATA	-0,02727	0,01819	-1,50	0,135	-0,06302	0,00847	
BS	0,68735	0,19873	3,46	0,001	0,29695	1,07776	
_cons	-1,62613	1,24382	-1,31	0,192	-4,06962	0,81736	
sigma_u	0,214450						
sigma_e	3,50123						
rho	0,00373						

Izvor: Proračun autora

Ukupan broj opservacija je 530 što čini model jako reprezentativnim. Empirijska vrednost F – testa za 7 stepena slobode u numeraciji i 523 u apoenu iznosila je 25.23. Takođe, verovatnoća zasnovana na regresiji fiksnih efekata je 0.000 što objašnjava da je model veoma značajan. Testiranjem prve tri podhipoteze može se zaključiti da najjaču kauzalnost odnosno korelaciju sa stopom povrata na aktivu su zabeležile sledeće varijable: regulatorni kapital (0.000) i veličina banke (0.001) pri nivou značajnosti manjem od 0.05. Dobijeni rezultati dovode do zaključka da se odbacuje nulta hipoteza i prihvata alternativna hipoteza. Nezavisna varijabla udeo likvidne aktive prema ukupnoj aktivu nema signifikatni uticaj na povrat na aktivu kod banaka zemalja Zapadnog Balkana. Kod druge podhipoteze prihvata se nulta hipoteza i odbacuje alternativna hipoteza.

**Tabela 6:** Regresija slučajnih efekata (GLS) između zavisne i nezavisnih varijabli banaka zemalja Zapadnog Balkana za period: 2010 – 2019 (Model 1)

Nasumični efekti GLS regresije				Broj opservacija = 530			
R <sup>2</sup> : unutar = 0,1264				Broj grupa = 4			
između = 0,6936							
ukupno = 0,1266				Opservacije po grupi: min = 132,5			
avg = 132 max = 134 Wald chi2 (3) = 76,28 Prob > chi2 = 0,000							
ROA (zavisna)	Koef.	St. greška	z	P>[z]	[95% Conf. Interval]		
CAR	-0,07066	0,10573	-6,68	0,000	-0,09139	-0,04994	
LATA	-0,02626	0,01813	-1,45	0,148	-0,06181	0,00928	
BS	0,69034	0,19840	3,48	0,000	0,30148	1,07920	
_cons	-1,65277	1,241733	-1,33	0,183	-4,08653	0,78097	
sigma_u	0						
sigma_e	3,501233						
rho	0						

Izvor: Proračun autora

Rezultati su pokazali da generalizovana regresija najmanjih kvadrata (GLS) na bolji način opisuje uticaj nezavisnih varijabli na povrat sredstava (ROA). Rezultati Hausmanovog testa pokazali su da je  $Pro>chi^2 = 0.8948$ , odnosno model slučajnog efekta (GLS) daje veći značaj od regresije fiksnog efekta iz jednostavnog razloga što je vrednost  $Pro>chi^2 > 0.00$ . Najjači pozitivni uticaj na zavisnu varijablu (ROA) je ostvarila nezavisna varijabla veličina banke – BS (0.690) pri signifikantnošću od 0.000, dok je sa druge strane najslabiji uticaj na zavisnu promenljivu ostvarila varijabla stopa adekvatnosti kapitala – CAR (-0.070) pri značajnošću od 0.000. U kontekstu testiranja prve tri podhipoteze dobijeni rezultati su isti kao i kod modela fiksnih efekata sa jedinom razlikom koja se ogleda u boljoj predikciji varijable veličine banke na povrat na aktivu. U literaturi mnogih istraživanja postoji tvrdnja da je profitabilnost banaka pozitivno povezana sa veličinom aktive banaka. Halkos i Salamouris (2004) istraživali su uticaj veličine banke na njenu efikasnost za grčke banke. Došli su do zaključka da što su veća bankarska sredstva, time je veća i efikasnost poslovanja banaka. Sa povećanjem bankarske aktive raste i učešće kako kreditnih plasmana, tako i hartija od vrednosti koji se mogu konvertovati u zarade što opet zavisi od efektivnosti i efikasnosti menadžmenta banaka.

Indikator Z-Score se široko koristi u empirijskoj bankarskoj literaturi da bi se odrazila verovatnoća bankarske nesolventnosti. Takođe, to je jedan od pokazatelja koje koristi Svetska banka u svojoj bazi podataka o globalnom finansijskom razvoju za merenje stabilnosti finansijskih institucija. Tradicionalni Z-Score zasnovan na povratu koji se trenutno koristi može biti dizajniran kao pokazatelj verovatnoće da kapital banke može biti smanjen ili uništen zbog ostvarenih gubitaka. Ukupan broj observacija je 530 što čini model jako reprezentativnim. Empirijska vrednost F- testa za 7 stepena slobode u numeraciji i 523 u apoenu je 33.86. Verovatnoća zasnovana na regresiji fiksnih efekata je 0.00 što objašnjava da je model veoma značajan.

**Tabela 7:** Regresioni model fiksnih efekata između zavisne (ZScore) i nezavisnih varijabli banaka zemalja Zapadnog Balkana za period: 2010 – 2019. (Model 2)

Fiksni efekti (unutar) regresije				Broj opservacija = 530		
R <sup>2</sup> : unutar = 0,1626				Broj grupa = 4		
između = 0,2521						
ukupno = 0,1630				Opservacije po grupi: min = 132.5		
avg = 132						
max = 134						
F(7,523) = 33,86						
Prob > F = 0,000						
ZScore (zavisna)	Koef.	St. greška	t	P> t	[95% Conf. Interval]	
CAR	-0,01017	0,00808	-1,26	0,209	-0,02606	0,005707
LATA	0,13775	0,01388	9,92	0,000	0,11046	0,165039
BS	-0,18938	0,15170	-1,25	0,212	-0,48740	0,108636
_cons	0,73458	0,94947	0,77	0,439	-1,13067	2,599846
sigma_u	0,24729					
sigma_e	2,67269					
rho	0,00848					

Izvor: Proračun autora

Iz prethodne tabele je vidljivo da nezavisna varijabla koja značajno utiče na zavisnu varijablu je udeo likvidne aktive u ukupnoj aktivi ( $p < 5\%$ ). Testiranjem druge tri podhipoteze može se zaključiti da najjaču kauzalnost odnosno korelaciju sa indikatorom kreditnog boniteta je zabeležila sledeća varijabla: udeo likvidne aktive prema ukupnoj aktivi pri nivou značajnosti manjem od 0.05. Dobijeni rezultat dovode do zaključka da se odbacuje nulta hipoteza i prihvata alternativna hipoteza. Nezavisne varijable stopa adekvatnosti kapitala i veličina banke nemaju signifikatni uticaj na indikator kreditnog boniteta banaka zemalja Zapadnog Balkana. Kod prve i treće podhipoteze prihvata se nulta hipoteza i odbacuje alternativna hipoteza. Sa povećanjem likvidne aktive prema ukupnoj aktivi za jednu jedinicu uz uslov da ostali faktori ostanu konstantni dovodi do povećanja ZScore indikatora za oko 0.137 jedinica. Dakle, sa povećanjem likvidne aktive banaka dolazi i po povećanja ZScore indikatora i kreditne sposobnosti banaka.

Posmatrano sa druge strane rizici ulaganja u realni sektor kod banaka zemalja Zapadnog Balkana u komparaciji sa iznosima novca bankarskih grupacija stvorili su neku vrstu cash drag-a, odnosno likvidnosti koja se kratkoročno i sigurno ne može plasirati da bi se pokrili troškovi. Kao rezultat date situacije banke su vraćale pozajmljena sredstva stranim kreditorima (Plakalović i Alihodžić, 2015). F statistika i Wald chi2 test su značajni na nivou značajnosti manjem od 5% za posmatrane skupove podataka, što ukazuje na to da predloženi model dobro odgovara podacima. Takođe, pokazuje da se 16.30% promjene u ZScore indikatoru odabranih banaka zemalja Zapadnog Balkana objašnjava nezavisnim varijablama koje se koriste u ovom modelu (Tabela 7).

**Tabela 8:** Regresija slučajnih efekata (GLS) između zavisne (ZScore) i nezavisnih varijabli banaka zemalja Zapadnog Balkana za period: 2010 – 2019. (Model 2)

Nasumični efekti GLS regresije				Broj opservacija = 530		
R <sup>2</sup> : unutar = 0.1626				Broj grupa = 4		
između = 0.2532						
ukupno = 0.1630				Opservacije po grupi: min = 132.5		
avg = 132						
max = 134						
Wald chi2 (3) = 102.41						
Prob > chi2 = 0.000						
ZScore (zavisna)	Koef.	St. greška	z	P>[z]	[95% Conf. Interval]	
CAR	-0,01043	0,0080	-1,29	0,197	-0,02628	0,00541
LATA	0,13818	0,0138	9,96	0,000	0,11100	0,16536
BS	-0,18614	0,1517	-1,23	0,220	-0,48351	0,11123
_cons	0,71489	0,9496	0,75	0,452	-1,1463	2,57608
sigma_u	0					
sigma_e	2,67269					
rho	0					

Izvor: Proračun autora

Mere Z-scora zasnovane na povratu i regulatornom kapitalu mogu se povezati sa bezuslovnom verovatnoćom bankrota, odnosno veza između Z-scora i verovatnoće bankrota može biti uslovljena vidljivim karakteristikama banke (npr. veličina banke) te makroekonomskim okruženjem (smanjenje kapitala moglo bi predstavljati veći izazov za banku tokom perioda finansijske krize nego u toku uobičajenog vremena). U kontekstu testiranja hipoteza isti rezultati su zabeleženi kao i kod modela fiksnih efekata, gde od tri posmatrane nezavisne varijable najjaču signifikantnost je ostvarila varijabla udeo likvidne aktive prema ukupnoj aktivi.

**Tabela 9:** Regresioni model fiksnih efekata između zavisne (ROE) i nezavisnih varijabli banaka zemalja Zapadnog Balkana za period: 2010 – 2019. (Model 3)

Fiksni efekti (unutar) regresije				Broj opservacija = 530		
R <sup>2</sup> : unutar = 0.1426				Broj grupa = 4		
između = 0.9112						
ukupno = 0.1429				Obs per group: min = 132.5		
avg = 132						
max = 134						
F(7,523) = 29.0						
Prob > F = 0.000						
ROE (zavisna)	Koef.	St. greška	t	P>[t]	[95% Conf. Interval]	
CAR	-0,3007	0,43427	-6,93	0,000	-0,38606	-0,215442
LATA	-0,1144	0,74600	-1,53	0,125	-0,26104	0,032068
BS	3,28539	0,81477	4,03	0,000	1,68475	4,886036
_cons	-5,06249	5,09957	-0,99	0,321	-15,0806	4,955659
sigma_u	0,97240					
sigma_e	14,3548					
rho	0,00456					

Izvor: Proračun autora

F statistika i Wald chi2 test su signifikantni na nivou od 5% za posmatrane skupine podataka, što pokazuje na to da predloženi model dobro odgovara podacima. Takođe, pokazuje da se 14.29% promena profitabilnosti svih banaka zemalja Zapadnog Balkana objašnjava varijablama koje se koriste u ovom modelu.

Testiranjem treće tri podhipoteze može se zaključiti da su najjaču kauzalnost, odnosno korelaciju sa indikatorom povrat na vlasničku glavnica zabeležile sledeće varijable: stopa adekvatnosti kapitala i veličina banke pri nivou značajnosti manjem od 0.05. Dobijeni rezultat dovodi do zaključka da se odbacuje nulta hipoteza i prihvata alternativna hipoteza. Nezavisna varijabla udeo likvidne aktive prema ukupnoj aktivi nema signifikatni uticaj na indikator povrata na vlasničku glavnica banaka zemalja Zapadnog Balkana. Kod druge podhipoteze prihvata se nulta hipoteza i odbacuje alternativna hipoteza.

**Tabela 10:** Regresija slučajnih efekata (GLS) između zavisne i nezavisnih varijabli banaka zemalja Zapadnog Balkana za period: 2010 – 2019. (Model 3)

Nasumični efekti GLS regresije		Broj opservacija = 530			
R <sup>2</sup> : unutar = 0.1426		Broj grupa = 4			
između = 0.9117					
ukupno = 0.1429		Opservacije po grupi: min = 132.5			
avg = 132					
max = 134					
Wald chi2 (3) = 87,73					
Prob > chi2 = 0,000					
ROE (zavisna)	Koef.	St. greška	z	P> z	[95% Conf. Interval]
CAR	-0,30125	0,43364	-6,95	0,000	-0,386248 -0,2162641
LATA	-0,11505	0,74375	-1,55	0,122	-0,260822 0,0307233
BS	3,30279	0,81368	4,06	0,000	1,708003 4,897584
_cons	-5,14001	5,09262	-1,01	0,313	-15,12149 4,841239
sigma_u	0				
sigma_e	14,354				
rho	0				

Izvor: Proračun autora

U kontekstu testiranja hipoteza isti rezultati su zabeleženi kao i kod modela fiksnih efekata, gde od tri posmatrane nezavisne varijable najjaču signifikantnost su ostvarile sledeće varijable: stopa adekvatnosti kapitala i veličina banke. Spathis i ostali (2002) su testirali finansijska tržišta kroz studiju sprovedenu za istraživanje grčkih banaka. Njihova studija se fokusirala na efekat veličine imovine banaka, gde je cilj studije bio da se istraži efikasnost velikih i malih grčkih banaka testiranjem pokazatelja ROE kao mere profitabilnosti i njen odnos sa nekim faktorima klasifikacije kao što su obim imovine, likvidnost i rizik. Podaci od 1990. do 1999. god., korišćeni su za otkrivanje faktora uspeha ovih banaka. Rezultati studije su pokazali da su velike banke efikasnije od malih banaka, da male banke karakteriše visok iznos kapitala, dok velike banke takođe karakteriše visok prinos aktive.

## Zaključak

U ovom radu je testiran uticaj bankarske regulacije i supervizije na efikasnost poslovanja banaka u Srbiji, Hrvatskoj i Bosni i Hercegovini na uzorku od ukupno 53 banke i 530 opservacija tokom perioda: 2010 - 2019. godine. U istraživanju su korišćeni efekti nezavisnih promenljivih na zavisnu promenljivu korišćenjem objedinjenog OLS regresionog modela (FE), te regresionog modela slučajnih efekata GLS uz pomoć Hausmanovog testa. Najznačajniji uticaj preko OLS i GLS regresionog modela su imale sledeće varijable: veličina banke i stopa adekvatnosti kapitala. Snažni regulatorni zahtevi za kapitalom unapređuju razvoj banaka i povećavaju efikasnost banaka.

Dakle, nalazi ove studije indiciraju da su u okviru prve hipoteze potvrđene sledeće podhipoteze: prva i treća podhipoteza, odnosno najjači uticaj na povrat na aktivu su zabeležile sledeće nezavisne varijable: veličina banke sa pozitivnom korelacijom i stopa adekvatnosti kapitala sa

negativnom korelacijom. U okviru druge hipoteze potvrđene su sledeće podhipoteze: druga podhipoteza, a odbačene prva i treća podhipoteza. Najjači uticaj na indikator kreditnog boniteta je ostvarila varijabla udeo likvidne aktive prema ukupnoj aktivi. Sa povećanjem likvidne aktive konsekvntno dolazi do povećanja vrednosti Z-Score indikatora i kreditne sposobnosti banaka.

U okviru treće hipoteze potvrđene su sledeće podhipoteze: prva i treća podhipoteza, a druga je odbačena. Najjači uticaj na povrat na vlasničku glavnica je ostvarila varijabla veličine banke zemalja Zapadnog Balkana. Dakle, sa povećanjem bankarske aktive povećava se i učešće, kako kreditnih plasmana, tako i hartija od vrednosti koji se mogu konvertovati u zarade što opet zavisi od efektivnosti i efikasnosti menadžmenta banaka.

Iako se bankarska regulacija i nadzor prepisuju i restrukturiraju kao odgovor na globalnu finansijsku krizu, njihova primena zahteva složene korake u zavisnosti od nacionalne politike svake zemlje, što bi moglo imati različite efekte na preuzimanje rizika u bankama, a sve u zavisnosti od finansijskog i institucionalnog okruženja u kojem banke posluju. Kontraverze o tačnom uticaju regulatornog kapitala na rezultate bankarskog poslovanja i dalje ostaju uprkos teoretskim i empirijskim interesima koje se stvaraju već nekoliko decenija. Mnoge empirijske studije koje povezuju ove promenljive su mešoviteg karaktera i još više su u sukobu nego u teoriji. Veći skup podataka o poslovanju banaka zemalja Zapadnog Balkana, kao i veći broj determinanti koje bi se uvrstile u model dali bi bolje razumevanje o uticaju bankarske regulacije i supervizije na samu efikasnost poslovanja banaka. Nova istraživanja autora o datoj problematici svakako se mogu proširiti u zavisnosti od izbora i uključivanja velikog broja nezavisnih varijabli. Dakle, upotreba odgovarajućih varijabli mogla bi pružiti osnovu za bolju analizu.

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## Dodatak teksta

### Dodatak 1: Rezultati dobijeni korišćenjem Hausman testa za prvu zavisnu varijablu (ROA) – Model 1

Variables	b(fixed)	B(random)	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
CAR	-0.070349	-0.0706628	0.0003138	0.0006301
LATA	-0.027272	-0.0262629	-0.0010092	0.0014835
BS	0.6873564	0.6903442	-0.0029878	0.0114387

Izvor: Proračun autora

$$\chi^2(3) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 0.61$$

$$\text{Prob}>\chi^2 = 0.8948$$

### Dodatak 2: Rezultati dobijeni korišćenjem Hausman testa za prvu zavisnu varijablu (ZScore) – Model 2

Variables	b(fixed)	B(random)	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
CAR	-0.0104348	-0.101768	-0.000258	0.0000689
LATA	0.1381819	0.137753	0.0004289	-
BS	-0.1861414	-0.1893839	0.0032425	0.0026254

Izvor: Proračun autora

$$\chi^2(3) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 4.51$$

$$\text{Prob}>\chi^2 = 0.2117$$

### Dodatak 3: Rezultati dobijeni korišćenjem Hausman testa za prvu zavisnu varijablu (ROA) – Model 3

Variables	b(fixed)	B(random)	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
CAR	-0.3007562	-0.3012563	0.0005001	0.0023439
LATA	-0.1144843	-0.1150495	0.0005652	0.0057898
BS	3.285395	3.302793	-0.0173983	0.042234

Izvor: Proračun autora

$$\chi^2(3) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 0.30$$

$$\text{Prob}>\chi^2 = 0.9600$$

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# EFFECTS OF BANKING REGULATION ON THE PERFORMANCE OF THE BANKING SECTOR: EVIDENCE OF BANKS IN THE WESTERN BALKANS

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## Summary

The main objective of this quantitative study is to examine the relationship between the following independent variables: capital adequacy ratio (CAR), liquid assets to total assets (LATA) and bank size (BS) and dependent variables: return on assets (ROA), credit worthiness indicator (Zscore) and return on equity (ROE) for selected Western Balkan bank countries. This model was estimated using a panel data methodology based on the assumption of a fixed and a random effect as decided in the Hausman test. The results showed that the variable size of the bank (BS) has a positive effect on the return on assets of banks in the Western Balkans, while the variable liquid assets to total assets (LATA) and capital adequacy ratio (CAR) have a negative impact. The results also showed that the variable share of liquid assets in total assets has a positive impact on the creditworthiness indicator of banks in the Western Balkans (ZScore). The third result is the variable return on equity (ROE) and it had the strongest positive impact with the independent variable size of the bank.

**Keywords:** banking regulation; supervision; return on assets; return on equity; Z-Score.

**JEL classification:** G21, G28, C51

## Introduction

Banking is not a mere activity for which all business decisions should be handed over to the owners or management of such companies. The nature of banking and the accompanying risks for operators and the whole system of economists require certain degrees of uniform operational practice. Banking regulation can be defined as a framework that controls the creation, operation and liquidation of banks in an economy. The need to regulate the activities of the banks becomes an extremely necessary issue after the global trends of collapse and poor management of financial institutions. In recent years, the banking system around the world has been the subject of fierce criticism and supervision. The global financial crisis after the failure of large banks such as the Lehman brothers and others has highlighted the importance of adequate regulation and supervision of banks. The approval of the Basel Committee on Banking Regulation to strengthen global regulations on capital and liquidity in order to promote the banking sector by the G20 is a positive signal in this direction (Klumps and De Haans, 2011). Many partly believe that the lack of regulation and supervisory structures has brought the world to the brink of financial collapse, while many believe that the years of prosperity the world experienced just before the collapse were largely due to partial deregulation, a free almost free market in the financial sector context.

Barth et al (2012) argue that weak regulatory and supervisory frameworks have contributed to the crisis and to reduce crisis impacts it is necessary to take measures such as strengthening incentives for private monitoring. Although banking regulations and supervision are being rewritten and restructured in response to the global financial crisis, their implementation requires complex steps depending on the national policy of each country, which could have different effects on bank risk-taking depending on the financial and institutional environment in which banks operate (Bouheni, 2013).

A number of markets are subject to some degree of regulation for various reasons (Heffernan, 2005):

- The need to protect the consumer (“keep the customer safe”) is considered insufficient to place too much responsibility on the consumer for many goods and services that lack transparency.
- To check the abuse of oligopolistic and monopolistic power: there are many markets in which only one or a few companies operate. The degree of monopoly power of companies affects the prices of their products.
- To protect the public from criminal activity.
- Dealing with the effects of externalities: the effects of the action of one agent in the economy on others, which is not reflected through the price mechanism.

The most basic reason for the introduction of banking regulation is primarily the protection of depositors from inappropriate risk for their deposits. Businesses and individuals hold a significant portion of their assets in banks, where there are fundamental concerns about the protection of their assets. As a result, banking agencies are responding to such concerns with regulations that seek to protect bank depositors. The Deposit Insurance Agency in Bosnia and Herzegovina has been insuring small depositors or clients up to BAM 50.000 since January 2014, they do not have to worry about the quality and the creditworthiness of the bank (Plakalović & Alihodžić, 2015).

Selected Balkan economies (such as the economies of Serbia, Croatia and Bosnia and Herzegovina) had very similar changes in the economic and political system, which means that they had to establish a market economy from the beginning with the return of political and state independence (Kubiszewska, 2016). One of the reasons these countries are being explored is that these countries have a fairly similar modern history and experience in terms of banking applications. The banking sector in these countries is characterized by a high share of foreign banks, where foreign banks have played the role of host country since the 1990s (Karkowska and Pawłowska, 2017). The banking sector in the Western Balkans has undergone significant changes in the context of privatization, legislative, financial and structural reforms, as well as liberalization and capital inflows, which has led to diversification of banking products and services, increased credibility and banking sector performance (Onofrei et al., 2018).

The main goal of this paper is to investigate the impact of banking regulation and supervision on the efficiency of banks in Serbia, Croatia and Bosnia and Herzegovina in the period from 2010 to 2019. In this paper, we will use three indicators as dependent variables, return on assets (ROA), return on equity (ROE) as well as the credit score indicator (Z-score). Explanatory variables in the model include the performance of banking variables and financial structure variables. The rest of the research is organized as follows: Part 2 consists of a review of the literature and the dimensions of various studies conducted on the topic of banking regulation and banking supervision. In part 3 - methodological approach, the sample, collected data and research model are considered. The empirical findings of this study are presented in Part 4. Part 5 consists of conclusions and recommendations.

## Review of Relevant Literature and Research Hypotheses

Traditional approaches to banking regulation highlight the positive characteristics of capital adequacy requirements. Capital serves as protection against losses, and consequently against failure. Further, with limited liability, banks propensity to engage in risky activities is reduced with higher amounts of venture capital. Capital adequacy requirements, especially in deposit insurance, play a crucial role in aligning bank owner incentives with depositors and other creditors (Berger et al. 1995).

Economic theory provides conflicting views on the need and effect of bank entry regulations. Some argue that an effective bank entry review can promote stability. Others emphasize that banks with monopolistic power have a higher franchise value which reinforces prudent risk-taking behavior (Keeley, 1990).

Kasimidou et al. (2006) in their study tested the efficiency of banks in the UK using bank size as a key factor. Also, they categorized banks into two types, large and small banks according to the volume of assets. The results of their study concluded that small banks showed higher performance compared to large banks. Furthermore, it has been proven that the size of a bank affects profitability among other factors such as liquidity. Despite theoretical and empirical interests that have been generated for several decades, there is still controversy about the stagnant impact of regulatory capital on banking outcomes. For example, many studies reveal that higher or stricter capital requirements reduce the profitability of future loans, i.e., banking efficiency (Repullo and Suarez, 2008). Other authors believe that stricter capital requirements improve cost efficiency and have a significant impact on the efficiency of bank allocation (Fare et al. 2004).

Pasiouras et al. (2009) used the Stochastic Boundary Analysis (SFA) model to provide international

evidence on the impact of the regulatory and supervisory framework on bank performance. They investigated the impact of regulations relating to the three pillars of Basel II (i.e., capital adequacy requirements, supervisory power and market discipline) on the costs and efficiency of banks. Their findings suggest that tighter capital requirements improve efficiency but reduce profit efficiency, while restrictions on banking activities have the opposite effect, reducing cost efficiency but improving profit efficiency.

Berger and Bouwman (2011) investigated how bank capital affects the survival, profitability, and market share of banks during crisis and normal time cycles using logit panel regression. The results of the study showed that higher capital increases the survival, market shares and profitability of banks in both normal and crisis times. The given results were achieved in separate panel regressions. It is important to note that this study recognized the existence of potential endogeneity between profits and market shares, and this was resolved using their residual values.

Goddard et al. (2014) tested bank profitability through bank size, risk, diversification, and type of ownership. They concluded that the relationship between bank size and profitability was weak, while on the other hand the correlation between capital adequacy ratio and profitability was positive.

Tran et al. (2016) explored the relationship between regulatory capital, liquidity formation, and profitability in the U.S. banking sector. The study showed that regulatory capital has a positive effect on creating liquidity, and keeping banks profitability constant in the case of small banks in non-crisis periods. Banks that show a high illiquidity risk result in low profitability, where the relationship between regulatory capital and bank profitability is nonlinear and depends on the level of capital.

Arican et al. (2019) conducted a cointegration analysis between 2002 and 2016 in their article examining the effect of Basel criteria on banking profitability in Turkey. According to the findings obtained, they concluded that Credit Risk, Liquidity Risk and Capital Adequacy negatively affect banking profitability, namely Return on Assets and Return on Equity.

Kılıcı (2019) examined the relationship between Capital Adequacy and Profitability between 1980 and 2017 with the Fourier approach and according to the results obtained, cointegration was determined between the equity/total assets and equity/(deposit + non-deposit resources) ratios and the ROE and NFM variables selected as profitability variables has been done.

In order to ensure the efficient transmission of the single monetary policy, better risk diversification, through the member states and adequate financing of the economy, the European Monetary Union needs a Banking Union. In this regard, the completion and further strengthening of the Banking Union will affect the strengthening of financial stability in terms of restoring confidence in the banking sector through an arsenal of measures aimed primarily at reducing risk (Ristić and Živković, 2020).

Based on the goal set in the introductory part of the paper, the following hypotheses will be tested with the help of random and fixed effect models:

### First hypothesis

$H_0/I$ ): There is no significant statistical impact of the factors (capital adequacy ratios - CAR, liquid assets to total assets - LATA and bank size - BS) on the return on assets at  $p \leq 0.05$ . The first hypothesis consists of the following sub-hypotheses:

$H_0/I-1$ - There is no significant statistical impact of capital adequacy ratios on the return on assets (ROA) at  $p \leq 0.05$ .

$H_0/I-2$ - There is no significant statistical impact of liquid assets to total assets on the return on assets (ROA) at  $p \leq 0.05$ .

$H_0/I-3$ - There is no significant statistical impact of bank size on the return on assets (ROA) at  $p \leq 0.05$ .

### Second hypothesis

$H_0/II$ ): There is no significant statistical impact of the factors (capital adequacy ratios - CAR, liquid assets to total assets - LATA and bank size - BS) on the credit worthiness indicator (Zscore) at  $p \leq 0.05$ . The second hypothesis consists of the following sub-hypotheses:

$H_0/II-1$ - There is no significant statistical impact of capital adequacy ratios on the credit worthiness indicator (Zscore) at  $p \leq 0.05$ .

$H_0/II-2$ - There is no significant statistical impact of liquid assets to total assets on the credit worthiness indicator (Zscore) at  $p \leq 0.05$ .

$H_0/II-3$ - There is no significant statistical impact of bank size on the credit worthiness indicator (Zscore) at  $p \leq 0.05$ .

### Third hypothesis

$H_0/III$ ): There is no significant statistical impact of the factors (capital adequacy ratios - CAR, liquid assets to total assets - LATA and bank size - BS) on the return on equity at  $p \leq 0.05$ . The third hypothesis consists of the following sub-hypotheses:

$H_0/III-1$ - There is no significant statistical impact of capital adequacy ratios on the return on equity (ROE) at  $p \leq 0.05$ .

$H_0/III-2$ - There is no significant statistical impact of liquid assets to total assets on the return on equity (ROE) at  $p \leq 0.05$ .

$H_0/III-3$ - There is no significant statistical impact of bank size on the return on equity (ROE) at  $p \leq 0.05$ .

## The Banking Sector of the Western Balkans in Light of the Analysis of Regulatory Business Indicators

The financial model in the Western Balkans is bank-centric and is characterized by a very high level of competition. Observed on the other hand, in addition to competition in the banking system of the observed countries, there is a moderate concentration. Table 1 shows the linear trend of the capital adequacy ratio of selected countries in the Western Balkans (Serbia, Croatia and Bosnia and Herzegovina) for the period: 2010: Q4 - 2020: Q4.

**Table 1:** *Tendency of Capital Adequacy Ratio (CAR) of Serbia, Croatia and Bosnia and Herzegovina for the Period: 2010: Q4 -2020: Q4 (in%)*

	2010:Q4	2011:Q4	2012:Q4	2013:Q4	2014:Q4	2015:Q4	2016:Q4	2017:Q4	2018:Q4	2019:Q4	2020:Q4	Average
Serbia	19.9%	19.1%	19.67%	20.9%	19.96%	20.69%	21.83%	22.61%	22.26%	23.39%	22.40%	21.19%
Croatia	18.8%	20.5%	20.9%	20.9%	21.8%	21.0%	22.5%	23.2%	22.9%	23.2%	24.9%	21.87%
Bosnia and Herzegovina	16.2%	17.1%	17.0%	17.8%	16.3%	14.9%	15.8%	15.7%	17.5%	18.0%	19.2%	16.86%

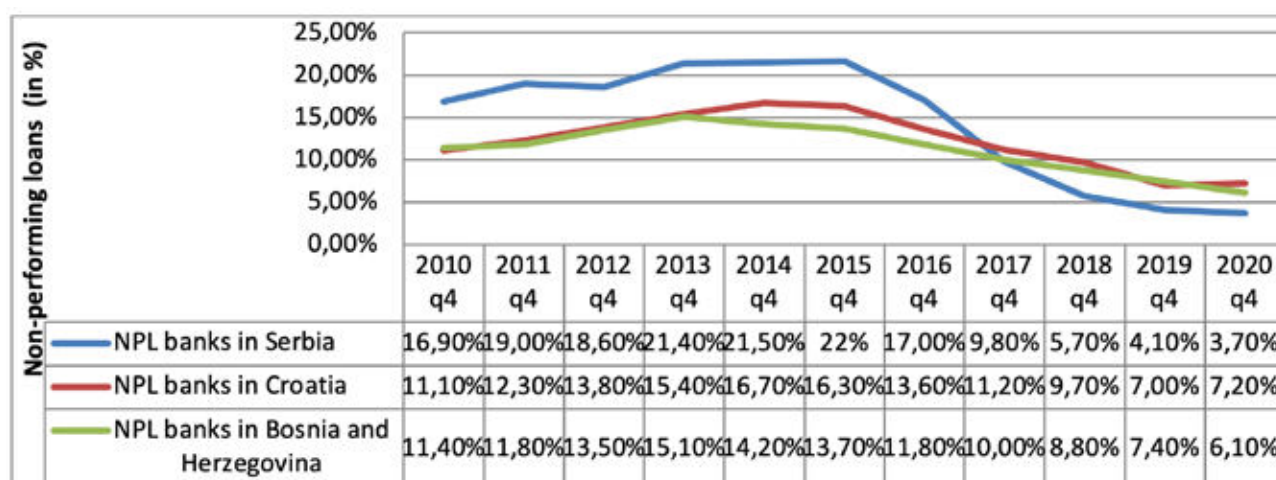
Source: <https://data.imf.org> and [https://nbs.rs/sr\\_RS/drugi-nivo-navigacije/statistika/](https://nbs.rs/sr_RS/drugi-nivo-navigacije/statistika/) (Adapted by the author)

The lowest value of the capital adequacy ratio for banks in Serbia was recorded in the fourth quarter of 2011 (19.1%), while on the other hand the highest value was recorded in the fourth quarter of 2019 (23.39%) and the average value of 21.19%. The lowest value of the capital adequacy ratio for banks in Croatia was recorded in the fourth quarter of 2010 (18.8%), while on the other hand the highest value was recorded in the fourth quarter of 2020 (24.9%) and the average value of 21.87%. The lowest value of the capital adequacy ratio for banks in Bosnia and Herzegovina was recorded in the fourth quarter of 2015 (14.9%), while on the other hand the highest value was recorded in the fourth quarter of 2020 (19.2%) with the average value of 16.86%. The capital adequacy ratio for the banking sector of selected Western Balkan countries (Serbia, Croatia, Bosnia and Herzegovina) is far above the regulatory minimum, both according to domestic regulations of 12% and according to Basel standards of 8%. Therefore, banks in Serbia, Croatia and Bosnia and Herzegovina are adequately capitalized both in terms of the achieved level of capital adequacy indicators, and in terms of the structure of regulatory capital. The capital adequacy ratio tended to decrease slightly at certain time intervals as a result of increased credit risk and risky assets. Maintaining the capital protection threshold above the prescribed regulatory minimum increases banks resilience to losses, reduces excessive exposures and limits the distribution of capital in order to limit systemic risks in the financial system (National Bank of Serbia, 2019).

The results of the network analysis conducted from the end of 2019 do not indicate greater threats to the capitalization of other banks based on interbank exposure. Therefore, if we start from the assumption that due to non-settlement of obligations of one bank, another bank would eventually have a loss in the amount of 100% of its claims against the insolvent bank, but ultimately no bank would have endangered capital adequacy. Also, the results of the analysis show that capital adequacy would not be jeopardized even under the assumption that in addition to the credit shock, there is also a financing shock. This is all the result of the high capitalization of all banks in the system at the end of 2019 (Central Bank of BH, 2019).



**Graph 1:** *Linear Trend of Non-Performing Bank Loans in Serbia, Croatia and Bosnia and Herzegovina for the Period: 2010: q4 - 2020: q4 (in%)*



*Source: Calculation by the author based on data from the International Monetary Fund, the National Bank of Serbia, the National Bank of Croatia and the Central Bank of BH*

The lowest rate of toxic loans for banks in Serbia was recorded in the last quarter of 2020 (3.70%), while on the other hand the highest value was achieved in the fourth quarter of 2014 of about 21.50%, with the average value of about 14.48%. Banks in Croatia achieved the lowest rate of non-performing loans in the fourth quarter of 2019 of about 7.0%, the highest rate in the fourth quarter of 2014 of about 16.70%, with the average rate of about 12.21%. Banks in Bosnia and Herzegovina achieved the lowest rate of non-performing loans in the fourth quarter of 2020 of about 6.10%, the highest rate in the fourth quarter of 2013 of about 15.10% and an average rate of about 11.25%. It is evident that banks in all three countries have had a declining trend in the movement of toxic loans since 2016, especially banks in Serbia, which recorded a significant decrease in toxic loans. In order to prevent the emergence of new problem loans, the Government of the Republic of Serbia in December 2018, adopted the Program for solving problem loans for the period: 2018-2020 (National Bank of Serbia, 2019). In addition to the program, the decline in the level of toxic loans as essential factors was influenced by the write-off of non-performing loans and other monitoring measures and the growth of lending activity

## Regression Model

The following general regression model was used to assess the impact of banking, specific, market and macroeconomic variables on the profitability and creditworthiness of banks in the Western Balkans:

$$Y_{it} = \alpha + \beta'X_{it} + \mu_{it} \quad (1)$$

Where in:  $Y_{it}$  – dependent variable,  $\alpha$  – represents a constant, i.e., the mean value of  $Y$ ,  $\beta$  – is a  $k \times 1$  vector parameters that are estimated on explanatory variables and  $\mu$  is random error (Brooks, 2008). By including all independent and dependent variables in equation (1), model 1 is formulated as follows:

$$ROA_{i,t} = \alpha + \beta_{it}(CAR_{i,t} + LATA_{i,t} + AB_{i,t}) + \mu_{it} \quad \text{Model 1}$$

By including the second dependent (ZScore) and independent variables in equation 1, model 2 is formulated as follows:

$$ZScore_{i,t} = \alpha + \beta_{it}(CAR_{i,t} + LATA_{i,t} + AB_{i,t}) + \mu_{it} \quad \text{Model 2}$$

Finally, by including the third dependent variable (ROE) and independent variables in Equation 1, Model 3 is formulated as follows:

$$ROE_{i,t} = \alpha + \beta_{it}(CAR_{i,t} + LATA_{i,t} + AB_{i,t}) + \mu_{it} \quad \text{Model 3}$$

If the  $p$  - value is statistically significant, the fixed effect model should be used. On the other hand, if the  $p$  - value is not statistically significant, a random effect model should be used. The significance test was performed for all variables using the  $t$  - test at the significance level of 95% (Chmelarova, 2007). The null and the first alternative hypotheses will be tested using the Hausman test.

## Data and Variables

The sample of this survey consists of 10 banks in Bosnia and Herzegovina, then 26 banks in Serbia and 17 banks in Croatia, which is a total sample of 53 banks. Data on banks were collected from the websites of the Banking Agency of the Federation of B&H, the Banking Agency of the Republika Srpska, the Central Bank of B&H, the Croatian National Bank and the National Bank of Serbia. This empirical research uses annual data for a selected (available) group of banks in Bosnia and Herzegovina, Serbia and Croatia. The following were used as dependent variables in this study: return on assets (ROA), return on equity (ROE) and creditworthiness index (ZScore). The following were used as independent variables in the model: capital adequacy ratio (CAR), share of liquid assets in total assets (LATA) and total bank assets (AB). The table shows the variables and the expected effects of the dependent and independent variables.

**Table 2:** A Brief Description of the Dependent and Independent Variables in the Model

VARIABLE	SHORT DEFINITION	EXPECTED SIGN
ROA	Profit to total assets	
ZScore	ZScore is a creditworthiness variable that describes the ratio of value to the mean value of a value group	
ROE	This ratio is obtained by dividing the net profit of the bank by the capital	
CAR	It represents the ratio between the net amount of capital and the assets that are exposed to risk.	+or-
LATA	It represents the ratio of total liquid assets to total assets	-
BS	It is obtained as the logarithm of total bank assets, i.e., as a proxy variable in order to better compare	+

Source: Calculation by the author

**Return on assets (ROA)** - is considered the most appropriate measure to assess the performance of the bank. ROA is obtained by sharing the banks income before interest with its assets. Therefore, ROA measures the efficiency of management in using the banks resources to make a profit. It also assesses the banks efficiency in using actual investments for interest and other fees. This measure of bank profitability is especially important when comparing the operational efficiency of banks (Sinkey, 1989).

**Return on Equity (ROE)** - expresses how much a bank earns based on book value of its investments. This ratio is obtained by dividing the banks net profit by capital, which reflects revenue generation, operational efficiency, leverage and tax planning. For some banks the ROE may be high because the banks do not have an adequate capital ratio. Banks with low returns can increase their return on investment, by using additional leverage, i.e., by increasing the ratio of assets and capital (Koch & MacDonald, 2009).

**ZScore** - index is a measure of a company credit performance. Developed by Edward Altman who used multiple discriminant analysis to predict bankruptcy. With the Zscore model, if the Z score is higher than 2.99, the company has good credit performance and its business is rated as healthy. On the other hand, if the Z score is less than 1.81, the company has no credit performance and its business is on the verge of bankruptcy. Using this model, the bankruptcy of a company for a period of one year can be predicted with a probability of 96%, while for a period of 5 years, bankruptcy can be predicted with a probability of 70% (Rodić et al. 2011).

**Capital adequacy ratio (CAR)** - is determined by comparing the net amount of capital with the asset that is exposed to risk. This applies not only to the banks' balance sheet assets but also to the banks' off-balance sheet items. Therefore, the capital adequacy ratio is calculated based on the net capital ratio (adjusted capital) whose amount is determined as the difference between the amount of capital and deductible items (Plakalović and Alihodžić, 2015).

**Liquid assets to total assets (LATA)** - refers to the share of highly liquid assets held by financial institutions to ensure their continued ability to meet short-term liabilities. This relationship is in fact a generic stress test that aims to predict shocks throughout the market and ensure that the financial institution possesses adequate capital preservation, in order to eliminate any short-term liquidity disruption ([www.investopedia.com](http://www.investopedia.com)).

**Bank size (BS)** - Different methods are used in the literature to determine the size of a company. Bateni et al. (2014) distributed the logarithm of the book value of assets to determine the size of the bank. Many other scholars have used the value of capitalization or market value of capital to determine the size of a firm, while others have used the size of branches and loan portfolios as determinants of bank size (De Jonghe et al., 2015; Laeven et al., 2016). In this study, the logarithm of total assets was used as a proxy variable to approximate the size of other variables for ease of comparison.

## Results

Before testing the hypotheses, the results of correlation and regression are shown in Tables 3-10. The total number of observations is 530, which is a very representative sample both in terms of the banking sector of selected Western Balkan countries and in the time frame.

**Table 3:** Correlation Matrix (Pearson coefficient of correlation) Between Dependent and Independent Variables of Western Balkan Banks for the Period: 2010 - 2019

		ROA	ZS	ROE	CAR	LATA	BS
ROA	Pearson Correlation	1.000	0.065	0.659	-0.320	-0.107	0.210
	Sig. (2-tailed)	-	0.137	0.000	0.000	0.013	0.000
	N	530	530	530	530	530	530
ZS	Pearson Correlation	0.065	1.000	0.074	0.010	0.398	-0.070
	Sig. (2-tailed)	0.137	-	0.091	0.822	0.000	0.105
	N	530	530	530	530	530	530
ROE	Pearson Correlation	0.659	0.074	1.000	-0.333	-0.114	0.235
	Sig. (2-tailed)	0.000	0.091	-	0.000	0.009	0.000
	N	530	530	530	530	530	530
CAR	Pearson Correlation	-0.320	0.010	-0.333	1.000	0.130	-0.214
	Sig. (2-tailed)	0.000	0.822	0.000	-	0.003	0.000
	N	530	530	530	530	530	530
LATA	Pearson Correlation	-0.107	0.398	-0.114	0.130	1.000	-0.079
	Sig. (2-tailed)	0.013	0.000	0.009	0.003	-	0.070
	N	530	530	530	530	530	530
BS	Pearson Correlation	0.210	-0.070	0.235	-0.214	-0.079	1.000
	Sig. (2-tailed)	0.000	0.105	0.000	0.000	0.070	-
	N	530	530	530	530	530	530

Source: Calculation by the author

A strong positive correlation between the first dependent variable in the model (ROA) was observed with the independent variable bank size (0.210) at significance ( $p < 0.05$ ). The strongest negative correlation was recorded between the variable ROA and the capital adequacy ratio (-0.320) at a significance of  $p < 5\%$ , as well as the ratio of liquid assets to total assets (-0.107) at a significance of 0.01. Large banks tend to maintain a high level of liquidity relative to the likelihood of failure or lack of liquidity to overcome any insolvency problems. On the contrary, small banks tend to invest all available liquid assets in order to increase yields.

**Table 4:** Summary Correlation Statistics Between Dependent and Independent Variables of Banks in the Western Balkans for the Period: 2010 – 2019

Dependent variables	R	R Square	Adjusted R Square	Std Error of the Estimate	Durbin - Watson
ROA	0.356	0.127	0.122	3.496	1.888
ROE	0.378	0.143	0.138	14.339	1.812
ZS	0.404	0.163	0.158	2.674	1.938

Source: Calculation by the author

According to Cohen (1988), the obtained values of coefficients of correlation can be interpreted as follows:

- When  $r = 0.10$  to  $0.29$  then the correlation is small.
- When  $r = 0.30$  to  $0.49$  then the correlation is medium.
- When  $r = 0.50$  to  $1.0$  then the correlation is large.

If the Durbin-Watson statistics values are less than 2 then there is a positive serial correlation. The values obtained with respect to the Durbin-Watson correlation are different. All three dependent variables in the model (ROA, ROE and Zscore) had values greater than 1 and less than 2, which leads to the conclusion that this is a positive serial correlation. This research is focused on the analysis of regulatory and specific variables on the efficiency and creditworthiness of banks in the region (Serbia, Bosnia and Herzegovina and Croatia). The regression results for Model 1 are presented in Tables 5 and 6.

**Table 5:** Regression Model of Fixed Effects Between Dependent (ROA) and Independent Variables of Banks in the Western Balkans for the Period: 2010 - 2019 (Model 1)

Fixed-effects (within) regression						Number of obs = 530
R-sq: within = 0.1264						Number of groups = 4
between = 0.6749						
overall = 0.1266						Obs per group: min = 132.5
avg = 132						
max = 134						
F(7,523) = 25.23						
Prob > F = 0.000						
ROA (dependent)	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
CAR	-0.07035	0.10592	-6.64	0.000	-0.09116	-0.04954
LATA	-0.02727	0.01819	-1.50	0.135	-0.06302	0.00847
BS	0.68735	0.19873	3.46	0.001	0.29695	1.07776
_cons	-1.62613	1.24382	-1.31	0.192	-4.06962	0.81736
sigma_u	0.214450					
sigma_e	3.50123					
rho	0.00373					

Source: Calculation by the author

The total number of observations is 530 which makes the model very representative. The empirical value of the F - test for 7 degrees of freedom in numerator and 523 in denominator was 25.23. Also, the probability based on the regression of fixed effects is 0.000, which explains that the model is very significant. By testing the first three sub-hypotheses, it can be concluded that the strongest causality or correlation with the rate of return on assets was recorded by the following variables: regulatory capital (0.000) and bank size (0.001) at p-value less than 0.05. The obtained results lead to the conclusion that the null hypothesis was rejected, and the alternative hypothesis was accepted. The independent variable share of liquid assets to total assets has no significant impact on the return on assets of banks in the Western Balkans. In the second sub-hypothesis, the null hypothesis was accepted, and the alternative hypothesis was rejected.

**Table 6:** *Random Effect Regression (GLS) Between Dependent and Independent Variables of Western Balkan Banks for the Period: 2010 - 2019 (Model 1)*

Random-effects GLS regression						Number of obs = 530
R-sq: within = 0.1264						Number of groups = 4
between = 0.6936						
overall = 0.1266						Obs per group: min = 132.5
avg = 132						
max = 134						
Wald chi2 (3) = 76.28						
Prob > chi2 = 0.000						
ROA (dependent)	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
CAR	-0.07066	0.10573	-6.68	0.000	-0.09139	-0.04994
LATA	-0.02626	0.01813	-1.45	0.148	-0.06181	0.00928
BS	0.69034	0.19840	3.48	0.000	0.30148	1.07920
_cons	-1.65277	1.241733	-1.33	0.183	-4.08653	0.78097
sigma_u	0					
sigma_e	3.501233					
rho	0					

Source: Calculation by the author

The results showed that generalized least squares regression (GLS) better describes the impact of independent variables on return on assets (ROA). The results of the Hausman test showed that  $Prob > chi2 = 0.8948$ , i.e., the random effect model (GLS) gives greater significance than the regression of the fixed effect for the simple reason that the value of  $Prob > chi2 > 0.00$ . The strongest positive impact on the dependent variable (ROA) was achieved by the independent variable bank size - BS (0.690) at a significance of 0.000, while on the other hand the weakest impact on the dependent variable was achieved by the variable capital adequacy ratio - CAR (-0.070) at a significance of 0.000.

In terms of testing the first three sub-hypotheses, the obtained results are the same as in the model of fixed effects with the only difference being reflected in the better prediction of the variable bank size on return on assets. In the literature of many studies, there is a claim that the profitability of banks is positively related to the size of banks assets. Halkos and Salamouris (2004) investigated the impact of bank size on its efficiency for Greek banks. They came to the conclusion that the larger the bank assets, the higher the efficiency of banks operations. With the increase in banking assets the share of both credit placements and securities that can be converted into earnings is growing, which again depends on the effectiveness and efficiency of bank management.

The Z-Score indicator is widely used in the empirical banking literature to reflect the likelihood of banking insolvency. It is also one of the indicators used by the World Bank in its global financial development database to measure the stability of financial institutions.

The traditional Z-Score based on return currently in use can be designed as an indicator of the probability that a bank's capital may be reduced or destroyed due to realized losses. The total number of observations is 530 which makes the model very representative. The empirical value of the F-test for 7 degrees of freedom in numerator and 523 in denominator is 33.86. The probability based on the regression of fixed effects is 0.00, which explains that the model is very significant.

**Table 7:** Regression Model of Fixed Effects Between Dependent (ZScore) and Independent Variables of Banks in the Western Balkans for the Period: 2010 - 2019 (Model 2)

Fixed-effects (within) regression				Number of obs = 530		
R-sq: within = 0.1626				Number of groups = 4		
between = 0.2521						
overall = 0.1630				Obs per group: min = 132.5		
avg = 132						
max = 134						
F(7,523) = 33.86						
Prob > F = 0.000						
ZScore (dependent)	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
CAR	-0.01017	0.00808	-1.26	0.209	-0.02606	0.005707
LATA	0.13775	0.01388	9.92	0.000	0.11046	0.165039
BS	-0.18938	0.15170	-1.25	0.212	-0.48740	0.108636
_cons	0.73458	0.94947	0.77	0.439	-1.13067	2.599846
sigma_u	0.24729					
sigma_e	2.67269					
rho	0.00848					

Source: Calculation by the author

The previous table shows that the independent variable that significantly affects the dependent variable is the share of liquid assets in total assets ( $p < 5\%$ ). By testing the other three sub-hypotheses, it can be concluded that the strongest causality or correlation with the creditworthiness indicator was recorded by the following variable: the share of liquid assets in total assets at  $p$ -value less than 0.05. The obtained result leads to the conclusion that the null hypothesis was rejected and the alternative hypothesis was accepted. Independent variables of capital adequacy ratios and bank size do not have a significant impact on the creditworthiness indicator of banks in the Western Balkans. In the first and third sub-hypotheses, the null hypothesis was accepted, and the alternative hypothesis was rejected. With the increase of liquid assets to total assets by one unit, provided that other factors remain constant, it leads to an increase in the ZScore indicator by about 0.137 units. Therefore, with the increase in liquid assets of banks comes an increase in ZScore indicators and creditworthiness of banks.

On the other hand, the risks of investing in the real sector with banks in the Western Balkans compared to the amounts of money of banking groups have created a kind of cash drag, i.e., liquidity that cannot be placed in the short term to cover costs. As a result of the given situation, banks returned borrowed funds to foreign creditors (Plakalović & Alihodžić, 2015). F statistics and Wald chi2 test are significant at a significance level of less than 5% for the observed data sets, indicating that the proposed model fits the data well. It also shows that 16.30% of the change in the ZScore indicator of selected banks in the Western Balkans is explained by the independent variables used in this model (Table 7).

**Table 8:** Random Effect Regression (GLS) Between Dependent (ZScore) and Independent Variables of Western Balkan Banks for the Period: 2010 - 2019 (Model 2)

Random-effects GLS regression						Number of obs = 530
R-sq: within = 0.1626						Number of groups = 4
between = 0.2532						
overall = 0.1630						Obs per group: min = 132.5
avg = 132						
max = 134						
Wald chi2 (3) = 102.41						
Prob > chi2 = 0.000						
ZScore (dependent)	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
CAR	-0.01043	0.0080	-1.29	0.197	-0.02628	0.00541
LATA	0.13818	0.0138	9.96	0.000	0.11100	0.16536
BS	-0.18614	0.1517	-1.23	0.220	-0.48351	0.11123
_cons	0.71489	0.9496	0.75	0.452	-1.1463	2.57608
sigma_u	0					
sigma_e	2.67269					
rho	0					

Source: Calculation by the author



Z-score measures based on return and regulatory capital may be associated with an unconditional probability of bankruptcy, i.e., the link between Z-score and the probability of bankruptcy may be conditioned by the bank's visible characteristics (e.g. size of the bank) and macroeconomic environment (a reduction in capital could pose a greater challenge for a bank during a period of financial crisis than during normal times). In terms of hypothesis testing, the same results were recorded as in the model of fixed effects, where of the three observed independent variables, the strongest significance was achieved by the variable share of liquid assets to total assets.

**Table 9:** Regression Model of Fixed Effects Between Dependent (ROE) and Independent Variables of Banks in the Western Balkans for the Period: 2010 - 2019 (Model 3)

Fixed-effects (within) regression						Number of obs = 530
R-sq: within = 0.1426						Number of groups = 4
between = 0.9112						
overall = 0.1429						Obs per group: min = 132.5
avg = 132						
max = 134						
F(7,523) = 29.0						
Prob > F = 0.000						
ROE (dependent)	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
CAR	-0.3007	0.43427	-6.93	0.000	-0.38606	-0.215442
LATA	-0.1144	0.74600	-1.53	0.125	-0.26104	0.032068
BS	3.28539	0.81477	4.03	0.000	1.68475	4.886036
_cons	-5.06249	5.09957	-0.99	0.321	-15.0806	4.955659
sigma_u	0.97240					
sigma_e	14.3548					
rho	0.00456					

Source: Calculation by the author

F statistics and Wald chi2 test are significant at the level of 5% for the observed data groups, which indicates that the proposed model corresponds well to the data. It also shows that 14.29% of the changes in the profitability of all banks in the Western Balkans are explained by the variables used in this model. By testing the third three sub-hypotheses, it can be concluded that the strongest causality or correlation with the return on equity indicator was recorded by the following variables: capital adequacy ratio and bank size at the level less than 0.05. The obtained result leads to the conclusion that the null hypothesis was rejected, and the alternative hypothesis was accepted. The independent variable share of liquid assets to total assets has no significant effect on the return on equity of banks in the Western Balkans. In the second sub-hypothesis, the null hypothesis was accepted, and the alternative hypothesis was rejected.

**Table 10:** Random Effects Regression (GLS) Between Dependent and Independent Variables of Western Balkan Banks for the Period: 2010 - 2019 (Model 3)

Random-effects GLS regression						Number of obs = 530
R-sq: within = 0.1426						Number of groups = 4
between = 0.9117						
overall = 0.1429						Obs per group: min = 132.5
avg = 132						
max = 134						
Wald chi2 (3) = 87.73						
Prob > chi2 = 0.000						
ROE (dependent)	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
CAR	-0.30125	0.43364	-6.95	0.000	-0.386248	-0.2162641
LATA	-0.11505	0.74375	-1.55	0.122	-0.260822	0.0307233
BS	3.30279	0.81368	4.06	0.000	1.708003	4.897584
_cons	-5.14001	5.09262	-1.01	0.313	-15.12149	4.841239
sigma_u	0					
sigma_e	14.354					
rho	0					

Source: Calculation by the author

F statistics and Wald chi2 test are significant at the level of 5% for the observed data groups, which indicates that the proposed model corresponds well to the data. It also shows that 14.29% of the changes in the profitability of all banks in the Western Balkans are explained by the variables used in this model. By testing the third three sub-hypotheses, it can be concluded that the strongest causality or correlation with the return on equity indicator was recorded by the following variables: capital adequacy ratio and bank size at the level less than 0.05. The obtained result leads to the conclusion that the null hypothesis was rejected, and the alternative hypothesis was accepted. The independent variable share of liquid assets to total assets has no significant effect on the return on equity of banks in the Western Balkans. In the second sub-hypothesis, the null hypothesis was accepted, and the alternative hypothesis was rejected.

In terms of hypothesis testing, the same results were recorded as for the fixed effects model, where of the three observed independent variables, the following variables achieved the strongest significance: capital adequacy ratio and bank size. Spathis et al. (2002) tested financial markets through a study conducted to investigate Greek banks. Their study focused on the effect of bank asset size, where the aim of the study was to investigate the efficiency of large and small Greek banks by testing ROE as a measure of profitability and relationship to some classification factors such as asset volume, liquidity and risk. Data from 1990 to 1999 were used to discover the success factors of these banks. The results of the study showed that large banks are more efficient than small banks, that small banks are characterized by a high amount of capital, while large banks are also characterized by a high return on assets.

## Conclusion

This paper tests the impact of banking regulation and supervision on the efficiency of banks in Serbia, Croatia and Bosnia and Herzegovina on a sample of a total of 53 banks and 530 observations during the period: 2010 - 2019. The effects of independent variables on the dependent variable were used in the research by using the unified OLS regression model (FE) and the regression model of random effects of GLS using the Hausman test. The following variables had the most significant impact through the OLS and GLS regression models: bank size and capital adequacy ratio. Strong regulatory capital requirements enhance bank development and increase bank efficiency. Therefore, the findings of this study indicate that the following sub-hypotheses were confirmed within the first hypothesis: the first and third sub-hypotheses, i.e., the strongest impact on return on assets, were recorded by the following independent variables: bank size with positive correlation and capital adequacy ratio with negative correlation.

Within the second hypothesis, the following sub-hypotheses were confirmed: the second sub-hypothesis, and the first and third sub-hypotheses were rejected. The strongest impact on the creditworthiness indicator was achieved by the variable share of liquid assets to total assets. With the increase in liquid assets, the value of Z-Score indicators and the creditworthiness of banks consistently increase. Within the third hypothesis, the following sub-hypotheses were confirmed: the first and third sub-hypotheses, and the second was rejected.

The strongest influence on the return on equity was achieved by the variable size of the bank of the Western Balkan countries. Therefore, with the increase of banking assets, the share of both credit placements and securities increases that can be converted into salaries, which again depends on the effectiveness and efficiency of bank management. Although banking regulation and supervision are being rewritten and restructured in response to the global financial crisis, their implementation requires complex steps depending on each country national policy, which could have different effects on bank risk taking, all depending on the financial and institutional environment which banks operate.

Controversy over the exact impact of regulatory capital on banking performance remains despite theoretical and empirical interests that have been created for decades. Many empirical studies linking these variables are of a mixed character and are even more conflicting than in theory. A larger set of data on the operations of banks in the Western Balkans, as well as a larger number of determinants that would be included in the model, would provide a better understanding of the impact of banking regulation and supervision on the very efficiency of banks. The authors' new research on this issue can certainly be expanded depending on the choice and inclusion of a large number of independent variables. Therefore, the use of appropriate variables could provide a basis for better analysis.

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## Appendix

### Appendix 1: Results obtained using the Hausman test for the first dependent variable (ROA) - Model 1

Variables	b(fixed)	B(random)	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
CAR	-0.070349	-0.0706628	0.0003138	0.0006301
LATA	-0.027272	-0.0262629	-0.0010092	0.0014835
BS	0.6873564	0.6903442	-0.0029878	0.0114387

Source: Calculation by the author

$$\chi^2(3) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 0.61$$

$$\text{Prob}>\chi^2 = 0.8948$$

### Appendix 2: Results obtained using the Hausman test for the first dependent variable (ZScore) - Model 2

Variables	b(fixed)	B(random)	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
CAR	-0.0104348	-0.101768	-0.000258	0.0000689
LATA	0.1381819	0.137753	0.0004289	-
BS	-0.1861414	-0.1893839	0.0032425	0.0026254

Source: Calculation by the author

$$\chi^2(3) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 4.51$$

$$\text{Prob}>\chi^2 = 0.2117$$

### Appendix 3: Results obtained using the Hausman test for the first dependent variable (ROE) - Model 3

Variables	b(fixed)	B(random)	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
CAR	-0.3007562	-0.3012563	0.0005001	0.0023439
LATA	-0.1144843	-0.1150495	0.0005652	0.0057898
BS	3.285395	3.302793	-0.0173983	0.042234

Source: Calculation by the author

$$\chi^2(3) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 0.30$$

$$\text{Prob}>\chi^2 = 0.9600$$