KRETANJE REALNOG EFEKTIVNOG DEVIZNOG KURSA KONVERTIBILNE MARKE

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Sažetak: U istraživanju smo ocijenili ravnotežni realni efektivni devizni kurs konvertibilne marke i identifikovali značajno odstupanje realnog efektivnog deviznog kursa konvertibilne marke u odnosu na ravnotežni nivo, posebno tokom perioda pandemije korona virusa i globalnog rasta inflacije. Tokom perioda globalno visoke inflacije glavne determinante apresijacije REER-a bile su brži rast BiH cijena od stranih cijena i sporiji rast produktivnosti u BiH u odnosu na okruženje, te u manjoj mjeri rast domaće realne kamatne stope i promjene u uslovima razmjene. Pored ovih apresijacijskih pritisaka, izražen je uticaj nepokrivenog pariteta kamatnih stopa na depresijaciju REER-a, zbog izuzetno restriktivne monetarne politike ECB i nižeg stepena restriktivnosti monetarne politike u BiH, sa aspekta visine strane i domaće kamatne stope. Volatilnost odstupanja REER-a od ravnotežnog REER veća je u kriznim periodima. Izolovane determinante REER-a konvertibilne marke pružaju dobru analitičku podlogu za kreiranje BiH monetarne politike i regulaciju bankarskog sektora.

Ključne reči: devizni kurs, devizni režim, monetarna politika, valutni odbor, fiksni devizni kurs, realni efektivni devizni kurs.

JEL klasifikacija: E52, F31

Uvod

Svaki režim deviznog kursa se sastoji od bilateralnih deviznih kurseva, koji određuju cijenu strane robe u domaćoj valuti i time najbitniji dio ekonomskih odnosa u razmjeni roba i usluga jedne države sa pojedinačnim državama ili valutnim područjima. Nominalni efektivni devizni kurs (NEER), kao polazni oblik multilateralnog deviznog kursa, daje informaciju o kretanju deviznog kursa zemlje u odnosu na glavne ili sve spoljnotrgovinske partnere, a kao ponderi se uzimaju udjeli u spoljnoj trgovini. Realni efektivni devizni kurs (REER) predstavlja NEER korigovan sa nekim cjenovnim efektom, jediničnim troškovima rada (eng. ULC) ili češće potrošačkim cijenama (CPI). Fiksni devizni kurs BiH valute u odnosu na evro (1 EUR = 1,955830 KM) ustanovljen 1997. godine znači da se većina ostalih deviznih kurseva konvertibilne marke (KM) u odnosu na zakonska sredstva plaćanja drugih država usklađuje sa promjenama u deviznom kursu EURKM. To BiH monetarnoj, i u širem smislu ekonomskoj politici, oduzima mogućnost prilagođavanja na spoljne šokove promjenom deviznog kursa, pa se teret prilagođavanja pomjera na potrošačke cijene, odnosno na REER u koje su one ugrađene. Zato je ekonomski koncept deviznog kursa uspostavljen kroz REER ključan za ocijenu položaja BiH u međunarodnoj podijeli rada.

Cilj nam je da modeliramo kretanje REER-a konvertibilne marke i da u okviru te ocijene odredimo ravnotežni REER ili EREER (eng. equilibrium real effective exchange rate), kao i da utvrdimo determinante REER-a. Pod ravnotežom u ovome istraživanju, po uzoru na(Feyzioglu, 1997), ne podrazumijevamo REER kojim se postiže unutrašnja i spoljnja ekonomska ravnoteža, već dugoročni ravnotežni REER koji se formira pod uticajem glavnih, fundamentalnih, ekonomskih determinanti REER-a (Edwards, 1994). Mi pretpostavljamo da su iznadprosječan rast inflacije u BiH tokom 2022. godine kao i pad produktivnosti doveli do apresijacije REER-a, dok je izuzetno spor rast BiH kamatne stope u poređenju sa kamatnom stopom ECB djelovao na depresijaciju REER-a konvertibilne marke. Želimo i da potvrdimo pretpostavku da REER odstupa od dugoročnog ravnotežnog REER-a, posebno u kriznim periodima poput pandemije i ubrzanog rasta inflacije. S obzirom da se ocijena EREER vrši kroz prognozu REER unutar uzorka (eng. in sample) dodatni rezultat istraživanja je poređenje prognoze REER jedan period izvan uzorka (eng. out of sample). Zato smo postavili i dodatnu pretpostavku istraživanja u kojoj tvrdimo da kombinovana prognoza (eng. combing forecast) daje precizniju prognozu od individualnih prognoza tj. prognoza zasnovanih na jednoj metodologiji.

Istraživanje je planirano kako slijedi. Prvo dajemo kratki pregled referentne literature iz ove oblasti sa posebnim naglaskom na istraživanja koja su BiH autori sproveli na ovu ili granične teme, a u ovom dijelu istraživanja polemišemo i sa samim konceptom EREER. Nakon toga predstavljamo metodološku osnovu rada, opisujemo korištene podatke i dodatno objašnjavamo multilateralne devizne kurseve. Prikazivanje rezultata istraživanja i rasprava o njima su postavljeni u centralni dio rada, nakon čega slijedi zaključak u obliku sumarne rasprave koja se završava iznošenjem preporuka za kreatore ekonomskih politika i određivanjem budućih pravaca istraživanja ove teme.

Literarni pregled

Prvi i jedini, nama poznat, pokušaj modeliranja REER-a konvertibilne marke (Omerbegović, 2006) pomoću VECAM-a uključuje četiri varijable; otvorenost u tekućim cijenama ((izvoz + uvoz/BDP)), spoljnotrgovinski saldo u konstantnim cijenama ((izvoz – uvoz)/BDP), spoljni dug (servis spoljnjeg duga/izvoz) i vladinu potrošnju. Glavni nalaz ovoga istraživanja je da postoji značajno i trajno pozitivno odstupanje ravnotežnog REER (aproksimiran dugoročnom jednačinom REER) u odnosu na REER. Sljedeće istraživanje na temu deviznog kursa konvertibilne marke (Marić, 2012) istražuje nominalni devizni kurs, te zaključuje da režim valutnog odbora vodi ka sistemskoj apresijaciji domaće valute, koja proizvodi dugoročni deficit tekućeg računa. Do sličnog nalaza dolazi i do sada najjača kritika BiH valutnog odbora (Milojević, 2012) u kojem se ističe da je "valutni odbor gori od zlatnog standarda", te da "umjesto platnobilansnog uravnoteženja teče proces uvećanja platnog deficita na osnovu neprekidnog uvećanja precijenjenosti valute". U ovom istraživanju se procijenjuje da je ravnotežni devizni kurs EURKM 3 i da je potrebna depresijacija od 33% radi izjednačenja sa ravnotežnim nominalnim devizni kursem EURKM. Oba ova istraživanja zahtjevaju depresijaciju konvertibilne marke zanemarujući visok stepen evrizacije BiH ekonomije, a propuštaju i da uoče da se u režimu fiksnog deviznog kursa prilagođavanje salda platnog bilansa vrši u mnogo širem kontekstu REER-a. Istražujući vrste deviznih režima grupa BiH autora (Vujanić, Žarković, & Gligorić, 2017) na uzorku od 10 tranzicionih zemalja (2010) pronalaze da je varijabilni devizni kurs, sa aspekta interne i eksterne neravnoteže, bolja opcija za razvijenije zemlje u tranziciji, ali ne i za manje razvijene zemlje u tranziciji, implicitno preporučujući održanje BiH valutnog odbora. U kontekstu odabrane teme istraživanja posebno je zanimljiv nalaz po kojem je realni devizni kurs konvertibilne marke bio podcijenjen za oko 2% u poređenju sa rastom produktivnosti u prvim godinama tranzicije (Čizmović, 2016). Na bazi prethodnih istraživanja dugoročnog ravnotežnog deviznog kursa (Edwards, 1994) razvijena je veza između deviznog kursa i fundamentalnih varijabli na primjeru Finske (Feyzioglu, 1997). U ovome pristupu nema potrebe za definisanje odgovarajućeg nivoa interne i eksterne neravnoteže, jer su one endogene u odnosu na sistem. U ovome istraživanju za formulisanje veze između REER i fundamentalnih varijabli u skraćenoj formi (eng. reduced form) korišteno je pet varijabli i za naše istraživanje ovo istraživanje je referentno. Autor je pronašao snažan uticaj svih odabranih varijabli (uslovi razmjene, diferencija u ostalim cijenama i produktivnosti, realna kamatna stopa i devijacija od nepokrivenog pariteta kamatnih stopa) na odstupanje od dugoročnog ravnotežnog deviznog kursa Finske u periodu od 1975. godine do 1995. godine. Na globalnom nivou, u odnosu na glavne svjetske valute (dolar, jen, marka) istraživane su determinante realnog deviznog kursa (MacDonald, 1997). U pogledu tvrdih valuta, koje čine najveći dio svjetskih deviznih rezervi, autor pronalazi da su ključne determinante ravnotežnih deviznih kurseva, fiskalni balans, neto strana aktiva i realna stopa štednje koje u jednačinu ulaze sa pozitivnim koeficijentom, dok realna cijena nafte i uslovi razmjene mogu imati i pozitivan i negativan parametar. Na uzorku azijskih zemalja (Jongwanich, 2009) u različitim vremenskim periodima, uz primjenu kointegracione tehnike i ukupno 6 varijabli (vladina potrošnja u odnosu na trgovački sektor, vladina potrošnja u odnosu na netrgovački sektor, neto strana aktiva, produktivnost, uslovi razmjene i otvorenost ekonomije) zabilježeno je značajno odstupanje od ravnotežnog REER. U ovom istraživanju, što je vrlo bitno i za BiH, je pronađeno da uslovi razmjene, definisani kao odnos izvoznih i uvoznih cijena mogu imati koeficijent i pozitivnog i negativnog predznaka u jednačini REER. Istraživanje na argentinskoj ekonomiji (Coppola, Lagerborg , & Mustafaoglu, 2017) na bazi četiri ključne varijable (uslovi razmjene, razlika u produktivnosti, devizne rezerve i trgovačka otvorenost) otkrilo je visoku precijenjenost argentinske valute u periodu od 1980. godine do 2015. godine.

Metodologija, podaci i transformacija podataka

Glavne metodološke alatke istraživanja su vektorski autoregresioni model (VAR), višestruki linearni regresioni model (MRM) i deskriptivna statistika. U određivanju poželjnog VAR modela za ocijenu i prognozu EREER upotrijebili smo standardnu proceduru. Prvo smo ispitali postojanje jediničnog korijena I(1) umetnutim Dikcy – Fulerovim testom (eng. Augmented Dicky Fuller test, ADF test), a zatim je konstruisan VAR u nivou i određen optimalan broj vremenskih pomaka u varijablima pomoću informacionih kriterija (Akaike information criterion (AIC), Hannan-Quinn information criterion (HQ), Final prediction error (FPE) sequential modified LR test statistic (LR). Ako su varijable u modelu I(1), a ne stacionarne I(0) VAR mora biti zamjenjen sa VAR sa korigovanom greškom (eng. error correction), koja nastaje zbog kratkoročnog odstupanja od dugoročnog trenda. VECM (eng. vector error correction model) ima za jedan manji broj vremenskih pomaka nego VAR u nivou na osnovu kojeg je konstruisan, a rang VECAM-a kojim se određuje broj kointegracionih jednačina dobija se Johansonovim testom kointegracije (nerestriktivni test kointegracije ranga - maksimalna ajgenvrijednost).

Pretpostavke u vezi reziduala u VAR i VECAM modelu testirali smo na autokorelaciju (Q- stat), serijsku korelaciju (Breusch-Pagan LM test) homoskedastičnost (Breusch-Pagan-Godfrey test) i normalan raspored reziduala (Jarque-Bera test), a stabilnost VAR modela pomoću ajgenvrijednosti kompanion matrice.

Sve varijable su na kvartalnom nivou, a uzorak na osnovu kojega su ocijenjeni modeli obuhvata period od Q1 2014 do Q1 2023. godine. U skladu sa (Feyzioglu, 1997) odabrali smo pet fundamentalnih varijabli (Tabela 1 i grafikoni 1-6) za konstrukciju VAR modela; uslovi razmjene (eng. terms of trade), domaća kamatna stopa, razlika u produktivnosti, razlika u ostalim cijenama, odstupanje od nepokrivenog pariteta kamatnih stopa. Pošto su devizni kursevi u REER konvertibilne marke definisani direktnom notacijom (npr. 1 KM = 0,51 EUR) i odnosom BiH CPI i stranog CPI, uslovi razmjene su određeni kao odnos indeksa BiH cijena izvoza i indeksa BiH cijena uvoza (2015 = 100). Domaća (BiH) kamatna stopa je naknada na sredstva iznad obavezne rezerve banaka kod CBBiH ili na višak rezervi (eng. deposit facility rate). Produktivnost je računata kao realni BDP po zaposlenom ponderisan sa učešćem svakog BiH spoljnotrgovinskog partnera u BiH spoljnotrgovinskoj razmjeni. Prosječna ponderisana vrijednost produktivnosti zemalja koje trguju sa BiH stavljena u odnos sa nivoom produktivnosti u BiH (realni BDP u odnosu na broj zaposlenih) daje razliku u produktivnosti. I CPI BiH spoljnotrgovinskih partnera računat je kao ponderisani prosjek (ponderi su udjeli u spoljnotrgovinskoj razmjeni) pri čemu se razlika u ostalim cijenama (pothdif) dobije kao količnik BiH CPI i stranog CPI. Teorija odnosa (pariteta) kamatnih stopa smatra da razlika u kamatnim stopama među zemljama mora dovesti do depresijacije valute zemlje koja ima višu kamatnu stopu, odnosno do apresijacije valute zemlje koja ima nižu kamatnu stopu i da zato nije moguća stalna arbitraža kamatnih stopa u obliku ulaganja investitora iz zemlje sa nižom kamatnom stopom u zemlju sa višom kamatnom stopom (eng. carry trade). U borbi dvije teorije kamatnih stopa (Krušković, 2014, str. 281) u BiH se ispravnom pokazala treća teorija kojoj je i pored fiksnog deviznog kursa i BiH hroničnog deficita tekućeg računa referentna kamatna stopa BiH niža nego u zemljama rezervne valute (evrozona). Investitori iz BiH zbog nepokrivenog pariteta kupovne moći (eng. uncovered interest rate parity, UIP), koji podrazumijeva razliku u kamatnim stopama i odsustvo apresijacije, depresijacije (zbog fiksnog deviznog kursa) imaju stalno otvorenu opciju arbitraže kamatnih stopa.

Nepokriveni odnos kamatnih stopa ili odstupanje od nepokrivenog pariteta kamatnih stopa (*duip*) računato je kao količnik domaće i strane kamatne stope po formuli $\left(-\left[\frac{1+i_d/100}{1+i_f/100}\right]-1\right)*100$, gdje je i_d domaća (BiH) kamatna i_f opa, a i_ strana kamatna stopa.

Tabela 1 - Deskriptivna statistika varijabli

| Naziv varijable	Prosjek	Maksimum	Minimum	Standardna devijacija	Koeficijent varijacije
Logaritam realnog efektivnog deviznog kursa (*l_reer*)	4,59	4,66	4,54	0,03	0,01
Uslovi razmjene (*tt*)	1,01	1,07	0,96	0,03	0,03
Realna domaća kamatna stopa (*rdir*)	-2,56	2,33	-17,55	5,24	-2,05
Razlika u produktivnosti (*proddif*)	1,01	1,07	0,95	0,03	0,03
Razlika u cijenama (*pothdif*)	1,19	1,36	1,09	0,07	0,06
Nepokriveni paritet kamatnih stopa (*duip*)	0,07	3,38	-0,50	0,69	9,82

Izvor: BHAS, CBBiH, ECB (Obradio autor)

Grafikon 1 - Realni efektivni devizni kurs, 2015 = 100 (l_reer), Q4 2014 – Q1 2023.
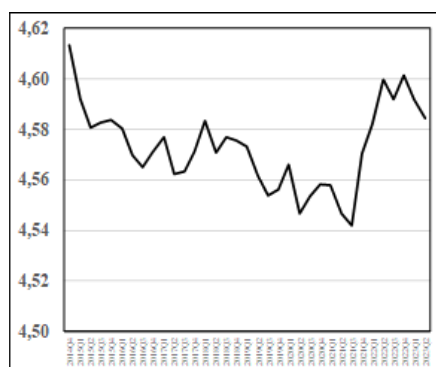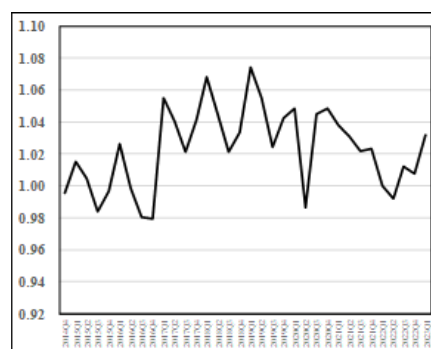

Izvor: CBBiH

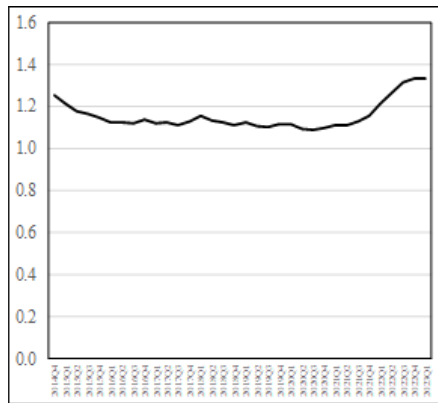Grafikon 2 - Uslovi razmjene (tt) Q4 2014 – Q1 2023.
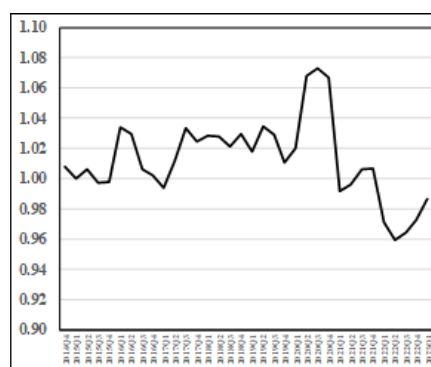
Izvor: BHAS

Grafikon 3 - Realna domaća kamatna stopa, u % (rdir) Q4 2014 – Q1 2023
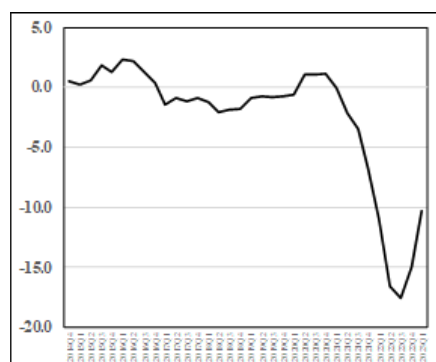
Izvor: CBBiH (Obradio autor)

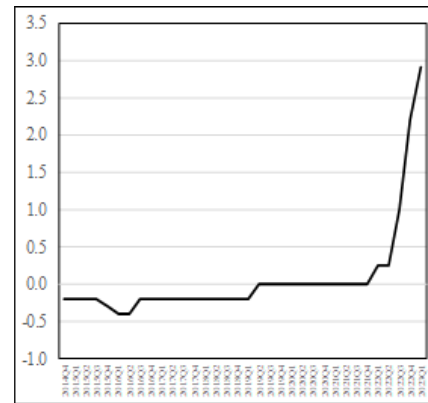Grafikon 4 - Razlika u produktivnosti (proddif) Q4 2014 – Q1 2023

Izvor: BHAS (Obradio autor)

Grafikon 5 - Razlika u ostalim cijenama (pothdif) Q4 2014 – Q1 2023.

Izvor: BHAS (Obradio autor).

Grafikon 6 - Nepokriveni paritet kamatnih stopa, u % (duip) Q4 2014 – Q1 2023.

Izvor: BHAS i CBBiH (Obradio autora).

Istraživanje obiluje brojnim skraćenicama (Tabela 2), neke od njih su manje a neke više poznate, ali sve one olakšavaju praćenje rezultata istraživanja pa ih dajemo u formi pregleda.

Tabela 2 - Pregled skraćenica

Skraćenica	Objašnjenje	Skraćenica	Objašnjenje
CBBiH	Centralna banka BiH	REER	Realni efektivni devizni kurs
CPI	Indeks potrošačkih cijena	REER_MRM	Ocijena REER na osnovu MRM
duip	Devijacija od nepokrivenog pariteta kamatnih stopa	REER_VEC	Ocijena REER na osnovu VECM
ECB	Evropska centralna banka	REER_F_VEC	Prognoza REER na osnovu VECM
I(1)	Jedinični korijen	REER_F_MRM	Prognoza REER na osnovu višestrukog regresionog modela
IRP	Paritet kamatnih stopa	RMSE	Korijen kvadrata prosječne greške
KM, BAM	Oznaka za BiH valutu, konvertibilnu marku	Theil	Tejlov koeficijent nejednakosti
KV	Kointegracioni vektor	tt	uslovi razmjene
l_reer	Logaritam realnog efektivnog deviznog kursa	*duip*	Odstupanje od nepokrivenog pariteta kamatnih stopa
LT_REER, EREER	Ravnotežni ili dugoročni REER	VAR	Vector autoregression
MAE	Srednja prosječna greška	VECAM	Vector Error Correction Model
MAPE	Mean absolute percentage error	MRM	Višestruki regresioni model
pothdif	Diferencija u ostalim cijenama (ostale cijene su potrošačke cijene)	i_d	Domaća (BiH) nominalna kamatna stopa - na višak rezervi banaka kod CBBiH
proddif	Razlika u produktivnosti	i_f	Strana nominalna kamatna stopa - na višak rezervi kod ECB
rdir	Realna domaća (BiH) kamatna stopa		

Izvor: Autor

Rezultati i diskusija

Sve varijable imaju jedinični korijen I(1), nisu stacionarne, a stacionarnost varijabli je osnovni uslov za primjenu VAR (Tabela 3). Dalje modeliranje ide kroz testiranje hipoteze o postojanju kointegracionih vektora kada se, ako se hipoteza potvrdi, upotrebljava VECAM, a u suprotnom modeliranje ekonomskih procesa se vrši pomoću VAR sa diferenciranim varijablama.

Tabela 3 - Augmented Dickey-Fuller test

Varijabla	Kritična vrijednost testa (5%)	T statistika	Vjerovatnoća
l_reer	-2,95	-2,22	0,20
tt	-2,95	-1,18	0,67
rdir	-2,95	-1,76	0,39
pothdif	-2,95	-1,48	0,53
proddif	-2,95	-1,42	0,56
duip	-2,95	1,36	1,00

Izvor: Autor

Razvijeni VAR model sa pet varijabli (*l_reer, tt, rdir, ppoth, proddif* i *duip*) i konstantom sugeriše po jednoj grupi kriterija (AIC i HQ) dva pomaka, a po drugoj grupi kriterija četiri laga (FPE, LR), a mi smo se radi izbjegavanja previše parametara (eng. overparametarisation) opredijelili za VAR sa tri pomaka.

Kvalitet VAR modela smo testirali preko testa homoskedastičnosti reziduala, testa serijske korelacija, testa normalnog rasporeda rezidula i rasporeda ajgenvrijednosti. Nije moguće odbaciti nultu hipotezu o normalnom rasporedu reziduala (Jarque Bera od 5,75 i 10 stepeni slobode daje vjerovatnoću od 0,83), kao ni hipotezu o odsustvu serijske korelacije (sve F statistike za dati broj stepeni slobode daju vjerovatnoću iznad 0,14). Heteroskedastičnost reziduala, koja daje neefikasnu ocijenu parametara osnovnog skupa, nije moguće dokazati, jer se zajedničkom Hi kvadrat statistikom od 454 za 450 stepeni slobode i vjerovatnoćom od 0,43 ne odbacuje nultu hipotezu o homoskedastičnosti reziduala, a visoku vjerovatnoću daje i test individualnih komponenti. Ključni pokazatelj zadovoljavajuće dijagnostike modela je i stepen stabilnosti modela. I VAR model i na osnovu njega sačinjen VECAM model su stabilni (Grafikon 7 i Grafikon 8). Korijeni kompanion matrice su ajgenvrijednosti. Da bi VAR i VECAM model bili stabilni ajgenvrijednosti moraju ležati unutar jediničnog kruga, a taj uslov je ispunjen.

Grafikon 7 - Raspored ajgenvrijednosti za VAR model
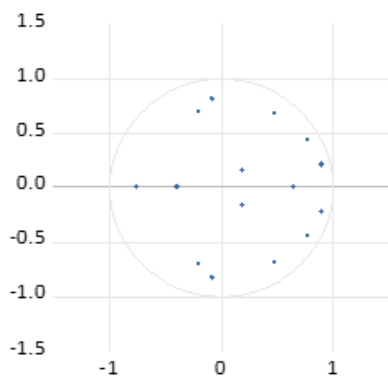
Izvor: Ibid

Grafikon 8 - Raspored ajgenvrijednosti za VECAM model
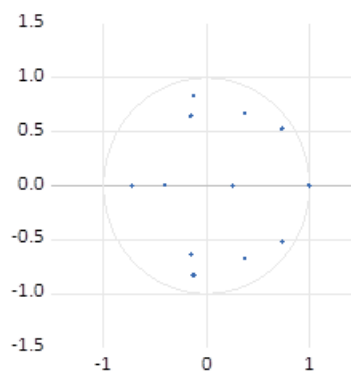
Izvor: Ibid

Broj vremenskih pomaka u VECAM modelu je za jedan manji nego u VAR, a Johansonov test kointe-gracije baziran na restriktivnom testu kointegracije odbacuje hipotezu o nula kointegracionih vektora (Tabela 4) i sugeriše postojanje minimalno jednog kointegracionog vektora.

Tabela 4 - Nerestriktivni test kointegracije ranga (maksimalna ajgenvrijednost)

Hipoteza	Ajgenvrijednosti	Maksimalna ajgenvrijednost	Kritična vrijednost na nivou signifikantnosti od 0,05	Vjerovatnoća
Nijedan KV *	0,68	38,70	33,88	0,01
Najviše 1 KV	0,48	22,15	27,58	0,21
Najviše 2 KV	0,38	16,05	21,13	0,22
Najviše 3 KV	0,25	9,65	14,26	0,24
Najviše 4 KV	0,06	2,24	3,84	0,13

Izvor: Ibid

Napomena: KV – kointegracioni vektor

Svi koeficijenti u kointegracionom vektoru (Tabela 5) imaju t statistiku kojom se odbacuje nulta hipote-za o nesignifikantnosti koeficijenata. U kratkoročnu jednačinu varijable kointegracionog vektora, koji predstavlja ravnotežni ili dugoročni REER sa aspekta fundamentalnih faktora, ulaze sa predznakom mi-nus (podvučeni dio formule 1) i vremenskim pomakom za jedan period, čime se koriguje kratkoročno odstupanje REER od njegovog dugoročnog trenda. Brzina prilagođavanja (eng. speed of adjustment) zavisi od veličine koeficijenta prilagođavanja, koji je -0,24 (Formula 1), uzrokujući da prilagođava-nje traje skoro tačno četiri kvartala (1/0,24). Sa izuzetno visokim nivoom pouzdanosti (t vrijednost od -1,84) odbačena je hipoteza da se je vrijednost koeficijenta prilagođavanja nula.

Tabela 5 - Kointegracioni vektor

	l_reer(-1)	tt(-1)	rdir(-1)	proddif(-1)	pothdif(-1)	c
Koeficjent	1	0,79787	-0,00481	-0,39462	-0,24391	-4,71
Standardna greška		-0,16	0,00	-0,14	-0,06	
t statistika		-4,90	4,30	2,75	4,06	

Izvor: Ibid

Formula 1 - Kratkoročna jednačina REER korigovana sa jednačinom dugoročne neravnoteže

D(L_REER) = - 0.24*(**L_REER(-1) + 0.797*TT(-1) - 0.0048*RDIR(-1) - 0.394*PRODDIF(-1) - 0.244*POTH-DIF_K(-1) - 4.708**) - 0.125*D(L_REER(-1)) - 0.061*D(L_REER(-2)) + 0.247*D(TT(-1)) + 0.282*D(TT(-2)) - 0.003*D(RDIR(-1)) - 0.002*D(RDIR(-2)) - 0.145*D(PRODDIF(-1)) - 0.107*D(PRODDIF(-2)) + 0.098*D(POTHDIF(-1)) - 0.093*D(POTHDIF(-2)) - 0.0028

Dobra dijagnostika VAR modela prenijeta je i na VECAM (Tabela 6). LM test sa vjerovatnoćama značajno iznad 5% ne dopušta odbacivanje nulte hipoteze o nepostojanju serijske korelacije, a varijansa reziduala je homoskedastična (Hi kvadrat statistika od 331,8 za broj stepeni slobode od 330 daje vjerovatnoću od 0,46).

Statistika zajedničkog Jarque-Bera testa za spljoštenost i simetričnost rasporeda ima vrijednost 11,8 i za 10 stepeni slobode daje vjerovatnoću od 0,29, značajno višu od praga za odbacivanje nulte hipoteze o normalnom rasporedu reziduala (0,05).

Tabela 6 - Testovi serijske korelacije i testovi heteroskedastičnosti za VECAM*

Breusch-Godfrey LM test serijske korelacije				Breusch-Pagan-Godfrey test heteroskedastičnosti			
F-statistika	0,41	Prob. F(4,24)	0,80	F-statistika	0,78	Prob. F(5,28)	0,57
Obs*R^2	2,20	Prob. Hi kvadrat (4)	0,70	Obs* R^2	4,14	Prob. Hi kvadrat (5)	0,53

Izvor: Ibid

*Napomena: nulte hipoteze su definisane na način da nema serijske korelacije i da je raspored reziduala homoskedastičan. Obs. – broj opservacija. R – koeficijent determinacije, Prob. – vjerovatnoća

Iz kointegracionog vektora jednačina ravnotežnog REER se dobije izmjenom predznaka ispred koeficijenta jednačine (Formula 2). Sve varijable imaju očekivani predznak, osim varijable koja opisuje promjenu u uslovima BiH spoljnotrgovinske razmjene (tt). Brži rast domaće od strane kamatne stope (rdir) vodi ka rastu tražnje za konvertibilnom markom i ka apresijaciji REER, isto kao i brži rast produktivnosti u BiH spoljnotrgovinskim partnerima u odnosu na BiH (proddif), pa su koeficijenti ispred ovih varijabli pozitivni. Direktna korelacija postoji i između razlike u domaćim i stranim cijenama (pothdif) i pad vrijednosti ove varijable, sporiji rast domaćih od stranih cijena, prouzrokuje depresijaciju REER. Negativna vrijednost koeficijenta za uslove u spoljnotrgovinskoj razmjeni sa obzirom na karakteristike BiH ekonomije ima ekonomski logično i prihvatljivo objašnjenje.

U većini zemalja brži rast izvoznih od uvoznih cijena vodi ka apresijaciji deviznog kursa, jer brži rast vrijednosti izvoza od uvoza povećava tražnju za domaćom valutom tj. valutom izvoznika, a to uzrokuje apresijacije nominalnog deviznog kursa i preko njega, ako je sve ostalo jednako, apresijaciju REER. BiH ima fiksiran devizni kurs u odnosu na evro, a na evrozonu se odnosi oko 50% njenog izvoza, i brži rast izvoznih cijena od uvoznih ne može promjeniti nominalni devizni kurs KM. Promjena bilateralnih nominalnih deviznih kurseva KM u spoljnoj trgovini sa zemljama izvan zone evra ne dešava se samo pod uticajem izvozno-uvoznih cijena, već i pod uticajem promjena deviznih kurseva ovih zemalja u odnosu na evro, koji se potom prenose na devizni kurs konvertibilne marke u odnosu na valute ovih zemalja.

Deficit tekućeg računa platnog bilansa BiH i time deviznog bilansa hroničan je i visok i zato poboljšanje uslova u razmjeni sa inostranstvom ima marginalan uticaj na apresijaciju REER, a efekat može biti i sasvim suprotan iz sljedećeg razloga. Ako je rast izvoznih cijena i rast CPI približno isti, onda brži rast izvoznih od uvoznih cijena, preko sporijeg rasta uvoznih cijena od CPI, smanjuje inflatorne pritiske u BiH, i dovodi do depresijacije REER, čime se da objasniti negativna vrijednost koeficijenta za uslove razmjene. S druge strane pogoršanje uslova razmjene, sporiji rast BiH izvoznih od BiH uvoznih cijena, povećava inflaciju i prouzrokuje apresijaciju REER.

Formula 2. Ravnotežni REER konvertibilne marke

l_reer = -0,79 * tt +0,0048 * rdir + 0,39 * proddif + 0,24 * pothdif + 4,71

U cijelom posmatranom periodu REER odstupa od EREER, a vrijednost odstupanja se povećava tokom pandemije (Q2 2020 – Q1 2022) i u vremenu visoke inflacije (Q2 2022 – Q1 2023). U ova dva perioda standardna devijacija odstupanja REER od EREER značajno je viša od standardne devijacije u cijelom periodu prije izbijanja pandemije korona virusa (Tabela 7).

Periodi vanrednih globalnih ekonomskih okolnosti povaćavaju veličinu odstupanja REER-a od njegove ravnotežne vrijednosti u poređenju sa periodom kada su izostali globalni ekonomski poremećaji. I minimalne i maksimalne vrijednosti odstupanja su veće u kriznim periodima, a raspon između ovih vrijednosti je i do dva puta veći tokom perioda globalnih ekonomskih poremećaja. REER konvertibilne marke najviše je odstupio od ravnotežnog REER u periodu pandemije korona virusa, kada je zabilježena i najveća volatilnost mjerena devijacijom, ekstremnim vrijednostima i njihovim rasponom.

Tabela 7 - Odstupanje REER od njegove ravnotežne vrijednosti (LT_REER)

	Odsustvo globalnih ekonomskih poremećaja	Pandemija korona virusa	Rast inflacije	Pandemija i rast inflacije
Period	Q4 2014 - Q1 2020.	Q2 2020 - Q1 2022.	Q2 2022 - Q1 2023.	Q2 2020 - Q1 2023.
Standardna devijacija (1)	1,2	2,7	2,0	2,5
Maksimalna vrijednost (2)	1,9	2,9	3,7	3,7
Minimalna vrijednost (3)	-2,5	-4,0	-1,2	-4,0
Raspon (4= 2-3)	4,4	6,9	4,9	7,7

Izvor: Ibid

Grafikon 9 - REER i ravnotežni REER, Q4 2014 – Q1 2023.godine, 2015 = 100
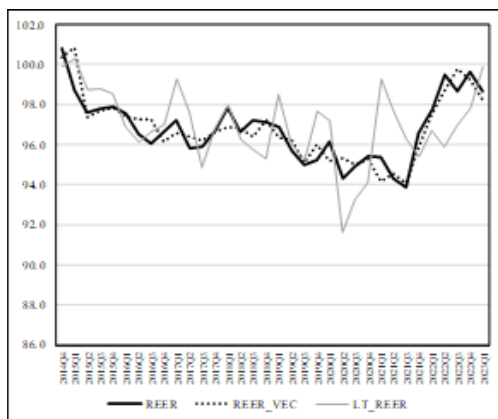
Izvor: Ibid

Grafikon 10 - Odstupanje REER od ravnotežnog REER, u %
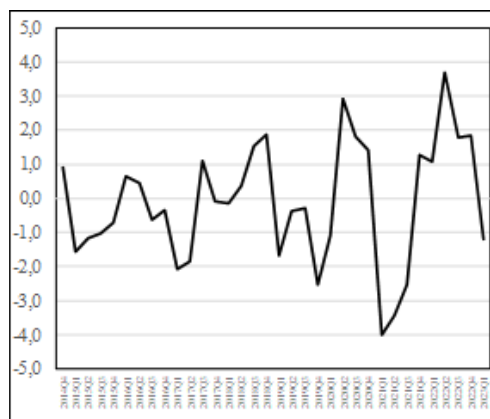
Izvor: Ibid

Ocijena kretanja REER je izvršena na osnovu višestrukog regresionog modela koji ima pet nezavisno promjenljivih varijabli i koji, za razliku od VECAM-a, uključuje i varijablu duip - devijacija od nepokrivenog pariteta kamatnih stopa (Tabela 8). Sa ovih pet varijabli objašnjeno je 87% varijabiliteta REER-a, pri čemu i sama dijagnostika modela pokazuje kvalitet odabrane specifikacije modela. Ne može se odbaciti hipoteza o nepostojanju autokorelacije (vrijednost Q statistike daje vjerovatnoću od 0,55 i iznad), kao ni hipoteza o normalnom rasporedu reziduala (vrijednost Jarque Berra statistike je 0,37, a vjerovatnoća 0,83). U višestrukom regresionom modelu ne postoji serijska korelacija, kao ni heteroskedastičnost. Ni pretpostavka o nepostojanju serijske korelacije ni pretpostavka o homoskedastičnosti reziduala ne mogu biti odbačeni – izračunate statistike imaju niske vjerovatnoće.

Tabela 8 - Višestruki regresioni model, zavisno promjenljiva l_reer

|	Koeficijent	Standardna greška	T-statistika	Vjerovatnoća
c	4,20	0,09	44,57	0,000
tt(-3)	-0,163	0,05	-2,97	0,006
rdir	0,001	0,00	2,85	0,008
proddif	0,113	0,05	2,27	0,030
pothdif	0,367	0,03	10,79	0,000
duip	-0,017	0,00	-6,01	0,000

Izvor: Ibid

Ocijena REER na osnovu višestrukog regresionog modela (RM) i njegova dekompozicija ukazuju na determinate REER-a (Grafikon 11). Sve do kraja 2022. godine ključni pozitivni doprinos rastu-apresijaciji REER daje brži rast domaćih od stranih potrošačkih, cijena (Grafikon 12). U zadnja dva kvartala, uslijed niže inflacije, doprinos rdir (realna BiH kamatna stopa) pozitivan je, kao i uslova razmjene (pad uvoznih cijena) i razlike u produktivnosti. Jaču apresijaciju REER spriječila je razlika u nepokrivenom paritetu kamatnih stopa (duip) sa izraženim negativnim doprinosom promjenama REER. Naime, prva velika razlika između strane (veće) i BiH (niže) kamatne stope, u periodu rasta inflacije, pojavila se u prvom kvartalu 2022. godine kada je kamatna stopa na višak rezervi banaka kod ECB bila -0,5%, a kamatna stopa na višak rezervi kod CBBiH -0,75%, stvarajući nepokriveni odnos kamatnih stopa. Prema teoriji pokrivenog pariteta kamatnih stopa, da bi se spriječila permanentna arbitraža kamatnih stopa (pozajmljivanje u valuti sa nižom kamatnom stopom (BiH) i investiranje u valutu sa višom kamatnom stopom (zona evra)) valuta u prvoj zemlji treba apresirati, a valuta u drugoj zemlji depresirati. U režimu fiksnog deviznog kursa ovakav proces zatvaranja kamatne arbitraže (eng. carry trade) nije moguć i devizni kurs EURKM od 1,95583 viši je od onog koji zahtjeva pokriveni paritet kamatnih stopa. To ostavlja bh valutu podcijenjenom, što je jednako depresijaciji nominalnog deviznog kursa, koja utiče na depresijaciju REER konvertibilne marke. Zato je odnos između nepokrivenog pariteta kamatnih stopa i REER inverzan - njegov rast obara (depresira) REER, a njegov pad povećava (apresira) REER. Postoji još jedno, ekonomsko, objašnjenje inverznog odnosa razlike između strane i domaće kamatne stope, i REER, po kojem rast ove razlike povećava neto odliv sredstava iz BiH i smanjujući kreditni potencijal banaka umanjuje kreditni rast i ponudu novca (M1 i M2). Rast ponude novca manji od potencijalnog stvara manji pritisak na cijene, depresirajući REER (pod uslovom da je sve ostalo jednako).

Grafikon 11 - REER i REER_MRM, 2015 = 100
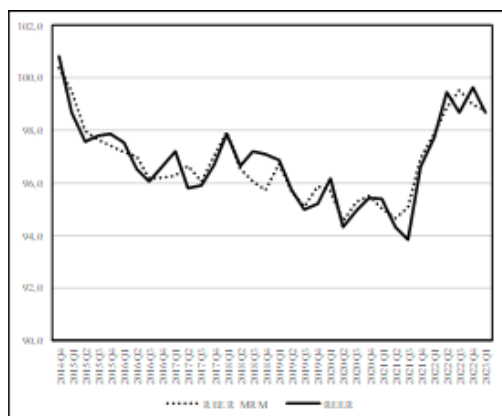
Izvor: Ibid

Grafikon 12 - Doprinosi promjeni REER_MRM
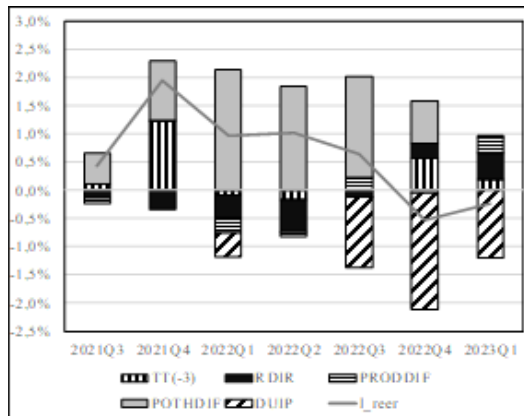
Izvor: Ibid

Opisani mehanizam djelovanja odstupanja od nepokrivenog pariteta kamatnih stopa u režimu fiksnog deviznog kursa, tj. mnogo bržeg rasta strane od BiH kamatne stope bez mogućnosti apresijacije nominalnog deviznog kursa EURKM intenzivno djeluje na REER u drugoj polovini 2022. godine, te u prvom kvartalu 2023. godine. U prosjeku tokom ova tri kvartala strana kamatna stopa viša je od BiH kamatne stope za 129 b.p., a pošto izostaje apresijacija KM u odnosu na evro, postojeći fiksni devizni kurs stimulativno djeluje na depresijaciju REER, pa je doprinos nepokrivenog pariteta kamatnih stopa kretanju REER-a izraženo negativan.

Od početka ubrzanog rasta inflacije apresijaciju REER-a konvertibilne marke determiniše prvo brži rast BiH potrošačkih cijena, pad produktivnosti, pogoršanje uslova razmijene i na kraju rast BiH realne kamatne stope. Zbog ubrzanog rasta kamatnih stopa ECB, te izuzetno niskog stepena restriktivnosti BiH monetarne politike i kamatne diferencije koje su proizvele takve monetarne politike, uticaj duip na depresijaciju REER-a postaje sve izraženiji.

Na osnovu formiranih modela za period Q1 2014 - Q1 2023. godine izvršili smo prognozu kretanja REER jedan period (kvartal) izvan uzorka. Višestruki regresioni model ima u uzorku bolju ocijenu REER i manju grešku prognoze nego VECAM (Tabela 9) po svim pokazateljima (RMSE, MAE, MAPE, Theil). Međutim, izvan uzorka (Q2 2023) REER_F_VECAM daje malo bolju prognozu od višestrukog regresionog modela tj. od REER_F_MRM (Tabela 9) a vrijednost kombinovane prognoze, dobijene iz prosjeka ovih prognoza, na nivou je ostvarenog REER-a u drugom kvartalu 2023. godine.

Tabela 9 - Pokazatelji ocijene REER, Q1 2014 – Q1 2023. god.

	RMSE	MAE	MAPE	Theil
MRM	0,00622	0,004891	0,106918	0,00068
VECAM	0,007394	0,005756	0,125782	0,000808

Izvor: Ibid

Tabela 10 - REER i prognoza REER za Q2 2023. godine

	RERR	REER_F_VEC	REER_F_MRM	Kombinovana prognoza
	98,0	96,8	99,3	98,1
Greška prognoze (prognoza u odnosu na REER)	-	-1,1%	1,4%	0,0%

Izvor: Ibid

Zaključna razmatranja

U režimu fiksnog deviznog kursa jedna od prihvatljivih metoda određivanja spoljnotrgovinske konkurentnosti je promjena u realnom efektivnom deviznom kursu. REER je predstavljen kao suma bilateralnih deviznih kurseva spoljnotrgovinskih partnera ponderisanih odnosom stranih i domaćih cijena, a izražen je u obliku baznog indeksa, na način da rast predstavlja njegovu apresijaciju, a pad njegovu depresijaciju. Njegova se vrijednost može odrediti i na osnovu fundamentalnih ekonomskih varijabli i tako dobijen REER predstavlja ravnotežni ili dugoročni REER, koji zavisno od kretanja njegovih fundamentalnih ekonomskih determinanti može značajno odstupiti od tekućih vrijednosti REER.

Ravnotežni REER konvertibilne marke izveden je iz kointegracionog vektora VECAM modela sačinjenog od pet varijable; REER, uslovi razmjene, realna BiH kamatna stopa, razlike u produktivnosti i razlike u ostalim cijenama (CPI).

Ocijena REER-a za period Q4 2014 - Q1 2023. godine i prognoza REER jedan period-kvartal izvan uzorka izvedena ja na osnovu konstruisanog VECAM modela, kao i na osnovu višestrukog regresionog modela, kojem je dodata i varijabla odstupanje od nepokrivenog pariteta kamatnih stopa.

Tokom perioda pandemije korona virusa i ubrzanog rasta inflacije volatilnost odstupanja REER-a konvertibilne marke od ravnotežnog REER-a mnogo je veća nego u periodu kada nije bilo globalnih ekonomskih poremećaja.

Glavni uzrok nagle apresijacije REER koja je započeta krajem 2021. godine je prije svega brži rast BiH potrošačkih cijena od stranih potrošačkih cijena. Razlika u potrošačkim cijenama stvarala je apresijacijske pritiske, dok je razlika u kamatnim stopama uticala na depresijaciju REER. Do trećeg kvartala 2022. godine domaća realna kamatna stopa je uzrokovala pad REER-a (depresijacija), a nakon njenog rasta ona povećava-apresira REER. Od polovine 2022. godine pogoršanje uslova razmjene, koje djeluje sa vremenskim pomakom, apresira vrijednost REER-a (zbog bržeg rasta cijena uvoza, od cijena izvoza). Takođe od polovine 2022. godine brži rast produktivnosti u inostranstvu u poređenju sa BiH daje pozitivan doprinos vrijednosti REER.

Prognoza REER-a za drugi kvartal 2023. godine izračunata kao prosjek dobijene prognoze pomoću VECAM modela i višestrukog regresionog modela je identična realizovanoj vrijednosti REER. Aritmetička sredina prognoze je izravnala greške u prognozama pojedinačnih modela i dala precizniju vrijednost prognoze od one koju su dali individualni modeli, demonstrirajući viši kvalitet kombinovane prognoze u poređenju sa prognozom koja je dobijena na bazi individualnih modela. Iz dobijenih rezultata istraživanja moguće je i dati prijedloge kreatorima ekonomske politike u Bosni i Hercegovini usmjerene na očuvanje spoljno-trgovinske konkurentnosti na osnovu kretanja REER-a i njegovog odstupanja od ravnotežne vrijednosti. Ključni razlog apresijacije REER-a je brži rast BiH potrošačkih cijena od onih u inostranstvu i zato antiinflaciona politika treba biti osnov svake buduće ekonomske politike u BiH.

Produktivnost kao osnovi ekonomski princip poslovanja, a u vezi njenog sporijeg rasta u BiH u odnosu na okruženje, mora biti predmet stalnog unapređenja i rasta, kako bi se izbjegli apresijacijski pritisci na REER. Rast kamatnih stopa u BiH bilo kroz rast BiH realne kamatne stope, ili kroz smanjenje nepokrivenog pariteta kamatnih stopa sa ciljem smanjenja odliva kapitala iz BiH, izlaže REER apresijaciji. Međutim, monetarna politika vođena kroz povećanje BiH kamatne stope ne bi imala visok stepen efikasnosti zbog izuzetno visoke likvidnosti BiH bankarskog sektora (sredstva iznad obavezne rezerve u Q3 2023. godine čine 7,8% aktive BiH banaka), odsustva kredita Centralne banke BiH i nemogućnosti vršenja sterilizacije primarnog novca.

Od momenta kada je CBBH počela smanjivati kamatne stope (jula 2016. godine) do decembra 2022. godine neto strana aktiva BiH bankarskog sektora (potraživanje prema nerezidentima minus obaveze prema nerezidentima) se sa 75 miliona KM povećala na 3,12 milijarde KM (7% BDP), i ako se želi izbjeći apresijacija REER-a do koje vodi rast BiH kamatne stope, onda je bolje da se umjesto rasta kamatnih stopa ovaj nepovoljni devizni saldo uravnoteži kroz povećanje obaveznih rezervi, ili direktnom ili indirektnom, opreznosnom (prudencionom) regulacijom izloženosti BiH banaka prema inostranstvu. Uslovi razmjene, mjereni kao odnos BiH izvoznih cijena i uvoznih cijena, ne djeluju na način da njihovo poboljšanje (brži rast izvoznih cijena od uvoznih cijena) apresira devizni kurs KM (zbog veće ponude deviza na BiH tržištu).

Čini se da je za depresijaciju deviznog kursa REER-a, u kontekstu uslova razmjene, najbitnije da uvozne cijene rastu sporije od izvoznih cijena. Pošto svaki globalni cijenovni šok (rast uvoznih cijena) vodi ka rastu cijena u BiH i apresijaciji REER-a (sve ostalo jednako) za BiH je izuzetno bitno da takve negativne eksterne šokove apsorbuje kroz efikasnu antiinflacionu politiku i povećanje produktivnosti.

S obzirom da višestruki regresioni model daje vrlo dobru ocijenu ravnotežnog realnog efektnog deviznog kursa, pri čemu se pod ravnotežnim REER podrazumjeva REER određen fundamentalnim faktorima, buduća istraživanja bi se mogla kretati prema određivanju teorijske vrijednosti REER-a koja saldo tekućeg računa BiH svodi na nulu. Na osnovu tako dobijenog teorijskog REER koji uklanja negativni saldo tekućeg računa moguće je odrediti njegove komponente, tj. kompoziciju potrebnu za uravnoteženje tekućeg djela platnog bilansa. Dobijeni rezultati ovih perspektivnih istraživanja bi predstavljali solidnu teoretsku osnovu za koncipiranje politike uravnoteženja salda tekućeg računa Bosne i Hercegovine koji je godinama hroničan i visok.

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MOVEMENT OF THE REAL EFFECTIVE EXCHANGE RATE OF THE CONVERTIBLE MARK

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Summary: In the research, we evaluated the equilibrium real effective exchange rate of the convertible mark and identified a significant deviation of the real effective exchange rate of the convertible mark concerning the equilibrium level, especially during the period of the coronavirus pandemic and global inflation growth. During the period of globally high inflation, the main determinant of REER appreciation was the faster growth of BH price from foreign prices and slower growth of productivity in BH compared to the environment, and to a lesser extent the growth of the domestic real interest rate and changes in terms of exchange. In addition to these appreciation pressures, the impact of uncovered interest rate parity on the depreciation of REER was expressed, due to the extremely restrictive monetary policy of the ECB and the lower degree of restrictiveness of the monetary policy in BH, from the aspect of the level of foreign and domestic interest rates. The volatility of the REER deviation from the equilibrium REER is higher in crisis periods. The isolated determinants of REER of the convertible mark provide a good analytical basis for the creation of BH monetary policy and regulation of the banking sector.

Keywords: exchange rate, exchange rate regime, monetary policy, currency board, fixed exchange rate, real effective exchange rate.

JEL classification: E52, F31

Introduction

Each exchange rate regime consists of bilateral exchange rates, which determine the price of foreign goods in domestic currency and thus the most important part of economic relations in the exchange of goods and services of one country with individual countries or currency areas. The nominal effective exchange rate (NEER), as the initial form of the multilateral exchange rate, provides information on the movement of the country's exchange rate concerning the main or all foreign trade partners, and shares in foreign trade are taken as weights. The real effective exchange rate (REER) represents the NEER corrected with some price effect, unit labor costs (ULC), or more commonly consumer prices (CPI). The fixed exchange rate of BH currency to the euro (1 EUR = 1.955830 KM) established in 1997 means that most other exchange rates of the convertible mark (KM) concerning the legal means of payment of other countries are aligned with changes in the EURKM exchange rate. That BH monetary, and in a broader sense, economic policy, takes away the possibility of adjusting to external shocks by changing the exchange rate, so the burden of adjustment is shifted to consumer prices, that is, to the REER in which they are incorporated. That is why the economic concept of the exchange rate established through the REER is crucial for evaluating the position of Bosnia and Herzegovina in the international division of labor.

Our goal is to model the movement of the REER of the convertible mark and to determine the equilibrium REER or EREER within that assessment, as well as to determine the determinants of the REER. By balance in this research, following the example of (Feyzioglu, 1997) we do not mean REER that achieves internal and external economic balance, but long-term equilibrium REER that is formed under the influence of the main, fundamental, economic determinants of REER (Edwards, 1994). We assume that the above-average growth of inflation in BH during 2022 as well as the drop in productivity led to the appreciation of REER, while the extremely slow growth of BH interest rates compared to the ECB interest rate acted on the depreciation of the REER of the convertible mark. We also want to confirm the assumption that REER deviates from the long-term equilibrium REER, especially in crisis periods such as pandemics and accelerated inflation growth. Given that the EREER assessment is performed through the REER forecast in the sample, an additional result of the research is the comparison of the REER forecast for one period out the sample. That is why we set an additional assumption of the research in which we claim that the combing forecast gives a more accurate forecast than individual forecasts, i.e. trials based on one methodology.

Research is planned as follows. First, we give a brief overview of the reference literature in this area, with a special emphasis on research of BH authors carried out on this or borderline topics, and in this part of the research we discuss the very concept of EREER. After that, we present the methodological basis of the work, describe the data used, and additionally explain the multilateral exchange rates. The presentation of the research results and their discussion are placed in the central part of the paper, followed by a conclusion in the form of a summary discussion that ends with the presentation of recommendations for economic policymakers and the determination of future champions of research on this topic.

Literary Review

The first and only known attempt to model the REER of a convertible mark (Omerbegović, 2006) using VE-CAM includes four variables; openness in current prices ((exports + imports/GDP)), foreign trade balance in constant prices ((exports - imports)/GDP), external debt (external debt service/exports) and government spending. The main finding of this research is that there is a significant and permanent positive deviation of the equilibrium REER (approximated by the long-term REER equation) to the REER. The following research on the subject of the exchange rate of the convertible mark (Marić, 2012) investigates the nominal exchange rate and concludes that the regime of the currency board leads to a systemic appreciation of the domestic currency, which produces a long-term current account deficit. The strongest criticism of the BH currency board so far comes to a similar finding (Milojević, 2012), in which it is pointed out that "the currency board is worse than the gold standard", and that "instead of balancing the balance of payments, there is a process of increasing the payment deficit based on a continuous increase in the overvaluation of the currency". In this research, it is estimated that the equilibrium exchange rate EURKM is 3, and that a depreciation of 50% is needed to equalize with the equilibrium nominal exchange rate. Both of these studies require the depreciation of the convertible mark, ignoring the high degree of euroization of the BH economy, and they also fail to notice that in the fixed exchange rate regime, the adjustment of the balance of payments is done in a much broader context of REER. Investigating the types of foreign exchange regimes of the group of authors from BH (Vujanić, Žarković, & Gligorić, 2017) on a sample of 10 transition countries (2010) find that a variable exchange rate, from the aspect of internal and external imbalance, is a better option for more developed countries in transition, but not for less developed countries in transition, implicitly recommending the holding of BH currency board. In the context of the selected research topic, the finding that the real exchange rate of the convertible mark was underestimated by about 2% compared to productivity growth in the first years of the transition is particularly interesting (Čizmović, 2016). Based on previous research on the long-term equilibrium exchange rate (Edwards, 1994), a link between the exchange rate and fundamental variables was developed in the example of Finland (Feyzioglu, 1997). In this approach, there is no need to define the appropriate level of internal and external imbalance, because they are endogenous to the system. In this research, five variables were used to formulate the relationship between REER and fundamental variables in a reduced form, and for our research, this research is a reference. The author found a strong influence of all selected variables (terms of exchange, differences in other prices and productivity, real interest rate, and deviation from uncovered interest rate parity) on the deviation from the long-term equilibrium exchange rate of Finland in the period from 1975 to 1995. At the global level, the determinants of the real exchange rate were investigated concerning the main world currencies (dollar, yen, marka) (MacDonald, 1997). Concerning hard currencies, which make up the largest part of the world's foreign exchange reserves, the author finds that the key determinants of equilibrium exchange rates are the fiscal balance, net foreign assets, and the real savings rate, which enter the equation with a positive coefficient, while the real price of oil and terms of exchange can have both a positive and a negative parameter. In a sample of Asian countries (Jongwanich, 2009) in different periods, with the application of the cointegration technique and a total of 6 variables (government consumption in relation to the trade sector, government consumption in relation to the non-trade sector, net foreign assets, productivity, terms of trade and openness of the economy) a significant deviation from the equilibrium REER was recorded. In this research, which is very important for Bosnia and Herzegovina, it was found that the terms of exchange, defined as the ratio of export and import prices, can have a coefficient of both positive and negative sign in the REER equation. Research on the Argentine economy (Coppola, Lagerborg , & Mustafaoglu, 2017) based on four key variables (terms of exchange, productivity gap, foreign exchange reserves, and trade openness) revealed a high overvaluation of the Argentine currency in the period from 1980 to 2015.

Methodology, Data, and Data Transformation

The main methodological research tools are the vector autoregression model (VAR), the multiple linear regression model (MRM), and descriptive statistics. In determining the preferred VAR model for EREER assessment and forecasting, we used a standard procedure. First, we examined the existence of a unit root I(1) with the Augmented Dicky Fuller test (ADF test), and then a level VAR was constructed, and the optimal number of time shifts in the variables was determined using the Akaike information criterion (AIC), Hannan-Quinn information criterion (HQ), Final prediction error (FPE) sequential modified LR test statistic (LR). If the variables in the model are I(1) and not stationary I(0) VAR must be replaced by VAR with error correction, which arises due to short-term deviation from the long-term trend. VECM (vector error correction model) has a smaller number of lags than VAR in the level on which it is constructed, and the rank of VECAM, which determines the number of cointegration equations, is obtained by the Johanson cointegration test (non-restrictive rank cointegration test - maximum eigenvalue).

We tested the assumptions regarding the residuals in the VAR and VECAM model for autocorrelation (Q-stat), serial correlation (Breusch-Pagan LM test), homoscedasticity (Breusch-Pagan-Godfrey test), and normal distribution of residuals (Jarque-Bera test), and stability VAR model using the eigenvalues of the companion matrix.

All variables are at the quarterly level, and the sample based on which the models were evaluated covers the period from Q1 2014 to Q1 2023. In accordance with (Feyzioglu, 1997) we selected five fundamental variables (Table 1 and graphs 1-6) for the construction of the VAR model; terms of trade, domestic interest rate, difference in productivity, difference in other prices, deviation from uncovered interest rate parity. Since exchange rates in REER convertible marks are defined by the direct notation (e.g., 1 KM = 0.51 EUR) and the ratio of BH CPI and foreign CPI, terms of exchange are determined as the ratio of the BH export price index and BH import price index (2015 = 100). The domestic (BH) interest rate is a fee on funds above the mandatory reserve of banks with the CBBH or on excess reserves (deposit facility rate). Productivity is calculated as real GDP per employee weighted with the participation of each BH foreign trade partner in Bosnia and Herzegovina. foreign trade exchange.

The average weighted value of the productivity of the countries that trade with BH compared to the level of productivity in BH (real GDP to the number of employees) gives the difference in productivity. And CPI BH of foreign trade partners was calculated as a weighted average (weights are shares in foreign trade exchange), whereby the difference in other prices (pothdif) is obtained as a quotient of BH CPI and foreign CPI. The theory of the ratio (parity) of interest rates considers that the difference in interest rates between countries must lead to the depreciation of the currency of the country that has a higher interest rate, i.e. to the appreciation of the currency of the country that has a lower interest rate and that therefore permanent arbitrage of interest rates in the form of investment by investors is not possible from a country with a lower interest rate to a country with a higher interest rate (carry trade). In the fight between two theories of interest rates (Krušković, 2014, str. 281) in BH, the third theory proved to be correct, which, despite the fixed exchange rate and BH chronic current account deficit, the reference interest rate of BH is lower than in the reserve currency countries (eurozone). Due to the uncovered interest rate parity (UIP), which implies the difference in interest rates and the absence of appreciation and depreciation (due to the fixed exchange rate), investors from Bosnia and Herzegovina have the option of interest rate arbitrage.

The uncovered interest rate parity or deviation from uncovered interest rate parity (*duip*) was calculated as the quotient of domestic and foreign interest rates according to the formula $\left(-\left[\frac{1+i_d/100}{1+i_f/100}\right]-1\right)*100$, where i_d is the domestic (BH) interest rate, and i_f is the foreign interest rate.

Table 1 - Descriptive Statistics of Variables

| Variable	Average	Maximum	Minimum	Standard deviation	Coefficient of variation
The logarithm of the real effective exchange rate (*l_reer*)	4.59	4.66	4.54	0.03	0.01
Terms of Exchange (*tt*)	1.01	1.07	0.96	0.03	0.03
Real domestic interest rate (*rdir*)	-2.56	2.33	-17.55	5.24	-2.05
Productivity difference (*proddif*)	1.01	1.07	0.95	0.03	0.03
Price difference (*pothdif*)	1.19	1.36	1.09	0.07	0.06
Deviation from unocoverd interest rate parity (*duip*)	0.07	3.38	-0.50	0.69	9.82

Source: BHAS, CBBH, ECB (Adapted by the author).

Chart 1 - Real Effective Exchange Rate, 2015 = 100 (l_reer), Q4 2014 – Q1 2023
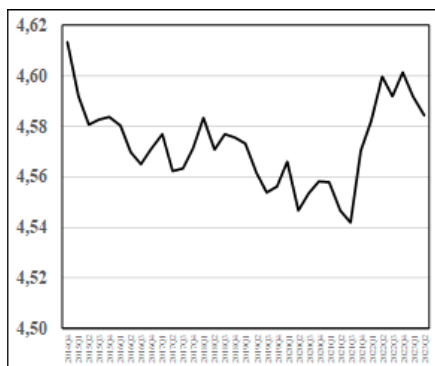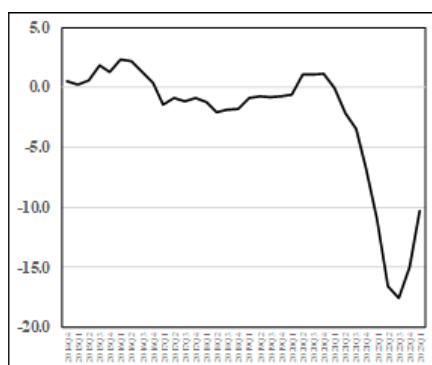

Source: CBBH

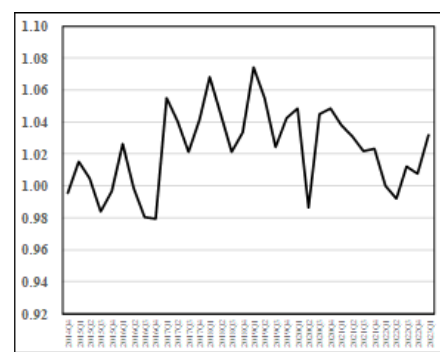Chart 2 - Terms of Trade (tt) Q4 2014 – Q1 2023
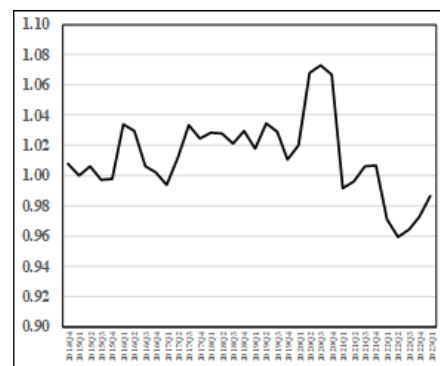
Source: BHAS

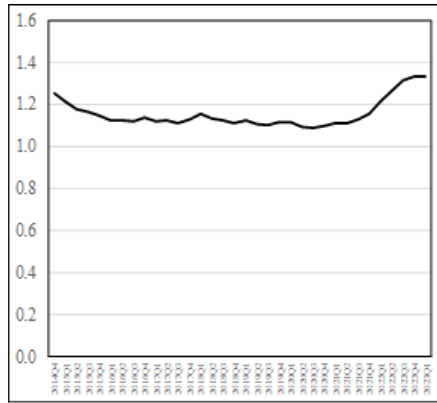Chart 3 - Real Domestic Interest Rate, in % (rdir) Q4 2014 – Q1 2023

Source: CBBH (Adapted by the author)

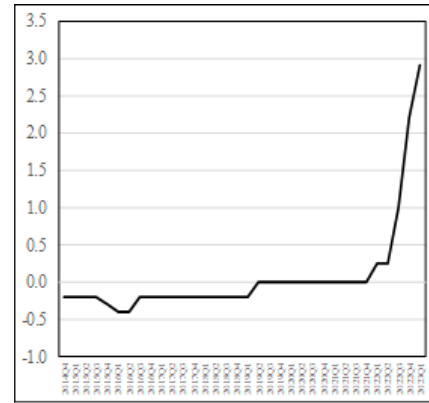Graph 4 - Difference in Productivity (proddif) Q4 2014 – Q1 2023

Source: BHAS (Adapted by the author)

Chart 5 - Difference in Other Prices (pothdif)
Q4 2014 – Q1 2023

Chart 6 - Uncovered Interest Rate Parity,
in % (duip) Q4 2014 – Q1 2023

Source: BHAS (Adopted by the author)   *Source: BHAS and CBBH (Adopted by the author)*

The research is full of numerous abbreviations (Table 2), some of them are less known and some are better known, but all of them make it easier to follow the results of the research, so we give them in the form of an overview.

Table 2 - Overview of abbreviations

Abbreviation	Explanation	Abbreviation	Explanation
CBBiH	Central Bank of Bosnia and Herzegovina	REER	Real Effective Exchange Rate
CPI	Consumer price index	REER_MRM	Estimation of REER based on MRM
duip	Deviation from uncovered interest rate parity	REER_VEC	Estimation of REER based on VECM
ECB	European Central Bank	REER_F_VEC	Forecast REER based on VECM
I(1)	Unit root	REER_F_MRM	REER forecast based on multiple regression model
IRP	Interest rate parity	RMSE	Root mean square error
KM, BAM	BH currency, convertible mark	Theil	Theil coefficient of inequality
KV	Cointegration vector	tt	Terms of exchange
l_reer	The logarithm of the real effective exchange rate	*duip*	Deviation from uncovered interest rate parity
LT_REER, EREER	Equilibrium, or long-term,	VAR	Vector autoregression
MAE	Mean average error	VECAM	Vector Error Correction Model
MAPE	Mean absolute percentage error	MRM	Multiple regression model
pothdif	The difference in other prices (other prices are consumer prices)	i_d	Domestic (BH) nominal interest rate - on excess bank reserves with the CBBH
proddif	The difference in productivity	i_f	Foreign nominal interest rate - on excess reserves with the ECB
rdir	real domestic (BH) interest rate		

Izvor: Autor

Results and Discussion

All variables have a unit root I(1), they are not stationary, and the stationarity of variables is a basic condition for applying VAR (Table 3). Further modeling goes through testing the hypothesis of the existence of cointegration vectors when, if the hypothesis is confirmed, VECAM is used, and otherwise, the modeling of economic processes is performed using VAR with differentiated variables.

Table 3 - Augmented Dickey-Fuller Test

Variable	Variable Critical Test Value (5%) T Statistical Probability	T statistics	Probability
l_reer	-2.95	-2.22	0.20
tt	-2.95	-1.18	0.67
rdir	-2.95	-1.76	0.39
pothdif	-2.95	-1.48	0.53
proddif	-2.95	-1.42	0.56
duip	-2.95	1.36	1.00

Source: Author

The developed VAR model with five variables (l_reer, tt, rdir, pothdif, proddif) and a constant suggests two shifts according to one group of criteria (AIC and HQ), and according to another group of criteria four lags (FPE, LR), and we in order to avoid too many parameters (overparameterization) decided on a VAR with three shifts.

We tested the quality of the VAR model through the test of homoscedasticity of residuals, the test of serial correlation, the test of the normal distribution of residuals, and the distribution of eigenvalues. It is not possible to reject the null hypothesis of a normal distribution of residuals (Jarque Bera of 5.75 and 10 degrees of freedom gives a probability of 0.83) as well as the hypothesis of the absence of serial correlation (all F statistics for a given number of degrees of freedom give a probability above 0.14). Heteroscedasticity of the residuals, which gives an ineffective assessment of the parameters of the basic set, cannot be proven, because the common Chi-square statistic of 454 for 450 degrees of freedom and probability of 0.43 does not reject the null hypothesis of homoscedasticity of the residuals, and high probability is also given by the test of individual components. A key indicator of satisfactory model diagnostics is the degree of model stability. Both the VAR model and the VECAM model based on it are stable (Graph 7 and Graph 8). The companion roots of the matrix are the eigenvalues. For the VAR and VECAM model to be stable, the eigenvalues must lie within the unit circle, and this condition is met.

Chart 7 - Distribution of Eigenvalues for the VAR Model
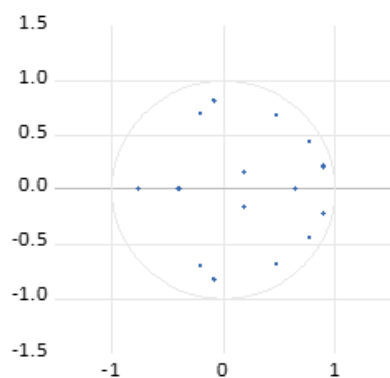
Source: Ibid

Chart 8 - Distribution of Eigenvalues for the VECAM Model
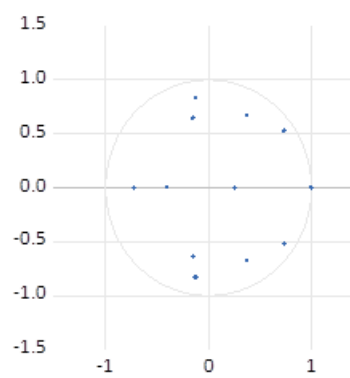
Source: Ibid

The number of lags in the VECAM model is one less than in the VAR, and Johansson's cointegration test based on the restrictive cointegration test rejects the hypothesis of zero cointegration vectors (Table 4) and suggests the existence of at least one cointegration vector.

Table 4 - Non-restrictive rank cointegration test (maximum eigenvalue)

Hypothesis	Eigenvalues	Maximum eigenvalue	Critical value at the significance level of 0.05	Probability
None KV *	0.68	38.70	33.88	0.01
Most 1 KV	0.48	22.15	27.58	0.21
Most 2 KV	0.38	16.05	21.13	0.22
Most 3 KV	0.25	9.65	14.26	0.24
Most 4 KV	0.06	2.24	3.84	0.13

Source: Ibid. Note: CV – cointegration vector

All coefficients in the cointegration vector (Table 5) have a t statistic that rejects the null hypothesis of the coefficients' insignificance. In the short-term equation, the variables of the cointegration vector, which represents the equilibrium or long-term REER from the aspect of fundamental factors, enter with a minus sign (the underlined part of formula 1) and with one lag, which corrects the short-term deviation of REER from its long-term trend. The speed of adjustment depends on the size of the adjustment coefficient, which is -0.24 (Formula 1), causing the adjustment to last almost exactly four quarters (1/0.24). With an extremely high level of reliability (t value of -1.84), the hypothesis that the value of the adjustment coefficient is zero was rejected.

Table 5 - Cointegration vector

	l_reer(-1)	tt(-1)	rdir(-1)	proddif(-1)	pothdif(-1)	c
Coefficient	1	0.79787	-0.00481	-0.39462	-0.24391	-4.71
Standard error		-0.16	0.00	-0.14	-0.06	
t statistic		-4.90	4.30	2.75	4.06	

Izvor: Ibid

Formula 1 - Short-term REER equation corrected with long-term imbalance equation

D(L_REER) = - 0.24*(L_REER(-1) + 0.797*TT(-1) - 0.0048*RDIR(-1) - 0.394*PRODDIF(-1) - 0.244*POTHDIF_K(-1) - 4.708) - 0.125*D(L_REER(-1)) - 0.061*D(L_REER(-2)) + 0.247*D(TT(-1)) + 0.282*D(TT(-2)) - 0.003*D(RDIR(-1)) - 0.002*D(RDIR(-2)) - 0.145*D(PRODDIF(-1)) - 0.107*D(PRODDIF(-2)) + 0.098*D(POTHDIF(-1)) - 0.093*D(POTHDIF(-2)) - 0.0028

The good diagnostics of the VAR model were also transferred to VECAM (Table 6). The LM test with all probabilitiessignificantly above 5% does not allow rejection of the null hypothesis of no serial correlation, and the variance of the residuals is homoscedastic (Chi squared statistic of 331.8 for the number of degrees of freedom of 330 gives a probability of 0.46).

The statistic of the joint Jarque-Bera test for kurtosis and symmetry of the distribution has a value of 11.8 and for 10 degrees of freedom gives a probability of 0.29, significantly higher than the threshold for rejecting the null hypothesis of a normal distribution of residuals (0.05).

Table 6 - Serial correlation tests and heteroscedasticity tests for VECAM*

Breusch-Godfrey LM serial correlation test				Breusch-Pagan-Godfrey heteroskedasticity test			
F-statistics	0.41	Prob. F(4,24)	0.80	F-statistics	0.78	Prob. F(5,28)	0.57
Obs*R^2	2.20	Prob. Hi square (4))	0.70	Obs* R^2	4.14	Prob. Hi square (5)	0.53

Source: Ibid

*Note: The null hypothesis is defined in such a way that there is no serial correlation, and that the distribution of residuals is homoscedastic. Obs. – number of observations. R – coefficient of determination, Prob. - probability.

From the cointegration vector, the equilibrium REER equation (LT_REER) is obtained by changing the sign in front of the coefficient of the equation (Formula 2). All variables have the expected sign, except for the variable that describes terms of trade (tt). Faster growth of the domestic interest rate comparing to foreign interest rate (rdir) leads to an increase in the demand for the convertible mark and to an appreciation of the REER, as well as a faster growth of productivity in BH foreign trade partners in relation to BH (proddif), so the coefficients in front of these variables are positive. There is also a direct correlation between the difference in domestic and foreign prices (pothdif) and the fall in the value of this variable, the slower growth of domestic than foreign prices, causes REER depreciation. The negative value of terms of trade considering the characteristics of the BH economy has an economically logical and acceptable explanation.

In most countries, the faster growth of export than import prices leads to an appreciation of the exchange rate, because the faster growth of the value of exports than imports increases the demand for the domestic currency, i.e. currency of the exporter, and this causes appreciation of the nominal exchange rate and through it, if everything else is equal, appreciation of the REER. Bosnia and Herzegovina has a fixed exchange rate against the euro, and about 50% of its exports go to the eurozone, and the faster growth of export prices than import prices cannot change the nominal KM exchange rate. The change in bilateral nominal KM exchange rates in foreign trade with countries outside the eurozone is not only influenced by export-import prices but also by changes in the exchange rates of these countries to the euro, which are then transferred to the exchange rate of the convertible mark to the currencies of these countries.

The deficit of the current account of the balance of payments of BH, and thus the foreign exchange balance, is chronic and high, and therefore the improvement of terms of exchange with foreign countries has a marginal effect on REER appreciation, and the effect can be quite the opposite for the following reason. If the growth of export prices and the growth of the CPI are approximately the same, then the faster growth of export prices than import prices, through the slower growth of import prices than the CPI, reduces inflationary pressures in BH and leads to REER depreciation, which explains the negative value of the coefficient for terms of exchange. On the other hand, worsening terms of trade, and slower growth of BH export prices and faster growth of import prices, increase inflation and cause REER appreciation.

Formula 2. Equilibrium REER of convertible marks

$$l\_reer = -0{,}79 * tt + 0{,}0048 * rdir + 0{,}39 * proddif + 0{,}24 * pothdif + 4{,}71$$

In the entire observed period, REER deviates from EREER, and the value of the deviation increases during the pandemic (Q2 2020 – Q1 2022) and in the time of high inflation (Q2 2022 – Q1 2023).

In these two periods, the standard deviation of the departure of REER from EREER is significantly higher than the standard deviation in the entire period before the outbreak of the coronavirus pandemic (Table 7). Periods of extraordinary global economic circumstances increase the size of the deviation of REER from its equilibrium value compared to the period when there were no global economic disturbances. Both the minimum and maximum deviation values are higher in crisis periods, and the range between these values is up to two times larger during periods of global economic disturbances. The REER of the convertible mark deviated the most from the equilibrium REER in the period of the coronavirus pandemic when the highest volatility measured by deviation, extreme values, and their range was recorded.

Table 7 - Departure of REER From its Equilibrium Value (LT_REER)

|	Absence of global economic disruptions	Coronavirus pandemic	Rising inflation	Pandemic and rising inflation
Period	Q4 2014 - Q1 2020.	Q2 2020 - Q1 2022.	Q2 2022 - Q1 2023.	Q2 2020 - Q1 2023.
Standard deviation (1)	1.2	2.7	2.0	2.5
Maximum value (2)	1.9	2.9	3.7	3.7
Minimum value (2)	-2.5	-4.0	-1.2	-4.0
Range (4= 2-3)	4.4	6.9	4.9	7.7

Source: Ibid

Chart 9 - REER and Equilibrium REER, Q4 2014 – Q1 2023, 2015 = 100
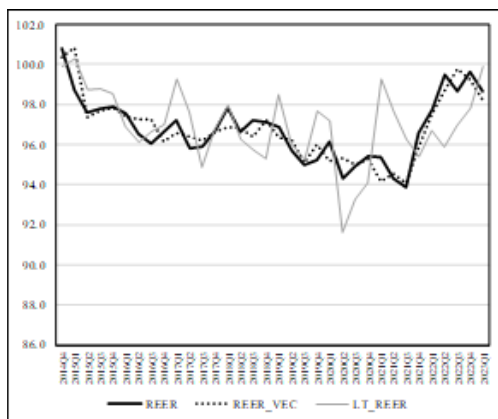
Source: Ibid

Chart 10 - Deviation of REER from Equilibrium REER, in %
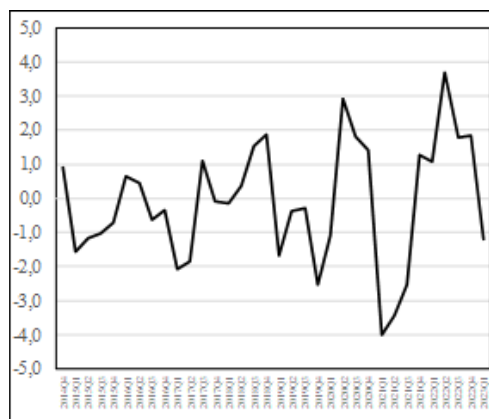
Source: Ibid

The assessment of the REER movement was performed based on a multiple regression model (MRM) that has five independent variables and which, unlike VECAM, also includes the duip variable - deviation from the uncovered interest rate parity (Table 8). With these five variables, 87% of the variability of REER is explained, while the model diagnostics themselves show the quality of the selected model specification. The hypothesis of the absence of autocorrelation cannot be rejected (the value of the Q statistic gives a probability of 0.55 and above), as well as the hypothesis of a normal distribution of the residuals (the value of the Jarque Berra statistic is 0.37 and the probability of 0.83). In the multiple regression model, there is no serial correlation and no heteroskedasticity. Neither the assumption of non-existence of serial correlation nor the assumption of homoscedasticity of the residuals can be rejected - the calculated statistics give very low probabilities.

Table 8 - Multiple regression model, dependent variable l_reer

|	Coefficient	Standard Error	T-statistic	Probability
c	4.20	0.09	44.57	0.000
tt(-3)	-0.163	0.05	-2.97	0.006
rdir	0.001	0.00	2.85	0.008
proddif	0.113	0.05	2.27	0.030
pothdif	0.367	0.03	10.79	0.000
duip	-0.017	0.00	-6.01	0.000

Source: Ibid

The REER assessment based on the multiple regression model (MRM) and its decomposition indicate the determinants of REER (Chart 11). Until the end of 2022, the key positive contribution to the growth-appreciation of REER is the faster growth of domestic than foreign consumer prices (Graph 12). In the last two quarters, due to a decrease in inflation, the contribution of the real domestic interest rate (rdir) is positive, as well as the terms of exchange (fall in import prices) and differences in productivity. A stronger appreciation of REER was prevented by the difference in uncovered interest rate parity (duip) with a pronounced negative contribution to changes in REER. Namely, the first major difference between the foreign (council) and BH (lower) interest rates, in the period of rising inflation, appeared in the first quarter of 2022, when the interest rate on excess reserves of banks at the ECB was -0.5%, and the interest rate on excess reserves at the CBBH was -0.75%, creating an uncovered interest rate parity. According to the theory of covered interest rate parity, to prevent permanent interest rate arbitrage (borrowing in a currency with a lower interest rate (BH) and investing in a currency with a higher interest rate (Eurozone)) the currency in the first country should appreciate, and the currency in the second country to depreciate. In the regime of a fixed exchange rate, this process of closing interest arbitrage (carry trade) is not possible and the EURKM exchange rate of 1.95583 is higher than the one required by the covered interest rate parity. This leaves the BH currency undervalued, which is equal to the depreciation of the nominal exchange rate, which affects the depreciation of the REER convertible mark. Therefore, the relationship between uncovered interest rate parity and REER is inverse - its rise lowers (depresses) REER, and its fall increases (appreciates) REER. There is another, economic, explanation of the inverse relationship between the difference between foreign and domestic interest rates, and REER, according to which the growth of this difference increases the net outflow of funds from BH and, reduces the credit potential of banks, reduces credit growth and money supply (M1 and M2). Less than potential money supply growth creates less pressure on prices, depressing the REER (all else being equal).

Graph 11 - REER i REER_MRM, 2015 = 100
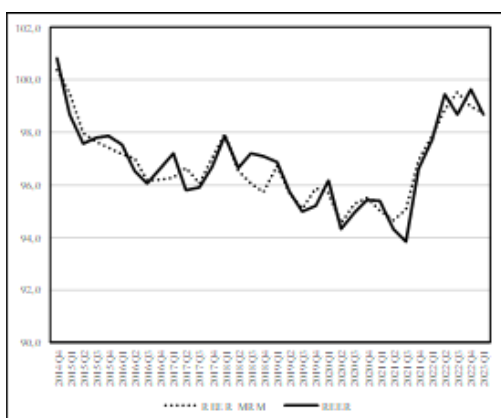
Source: Ibid

Graph 12 - Contributes to Change in REER_MRM
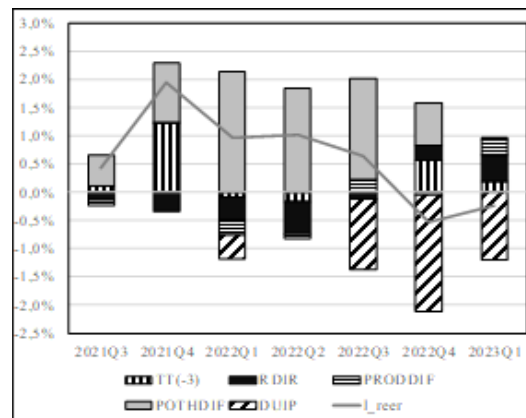
Source: Ibid

The described mechanism of action of the deviation from the uncovered interest rates parity in the fixed exchange rate regime, i.e., much faster growth of the foreign than BH interest rates without the possibility of appreciation of the nominal exchange rate EURKM intensively affects REER in the second half of 2022 and in the first quarter of 2023. On average, during these three quarters, the foreign interest rate is higher than BH interest rates by 129 b.p., and since there is no appreciation of KM to the euro, the existing fixed exchange rate has a stimulating effect on REER depreciation, so the contribution of uncovered interest rate parity to the movement of REER is markedly negative.

Since the beginning of the accelerated growth of inflation, the REER appreciation of the convertible mark has been determined firstly by the faster growth of BH consumer prices, a drop in productivity, a worsening of terms of trade, and, finally, the growth of BH real interest rates. Due to the accelerated growth of ECB interest rates, and the extremely low degree of restrictiveness of BH monetary policies and the interest rate differentials produced by such monetary policies, the impact of duip on REER depreciation becomes more and more pronounced.

Based on the formed models for the period Q1 2014 - Q1 2023, we made a forecast of the REER movement for one period (quarter) outside the sample. In the sample, the multiple regression model has a better REER rating and a smaller forecast error than VECAM (Table 9) by all indicators (RMSE, MAE, MAPE, Theil). However, out of the sample (Q2 2023), REER_F_VECAM gives a slightly better forecast than the multiple regression model i.e. from REER_F_MRM (Table 9), and the value of the combined forecast, obtained from the average of these forecasts, is at the level of the realized REER in the second quarter of 2023.

Table 9 - REER Estimation Indicators, Q1 2014 – Q1 2023

	RMSE	MAE	MAPE	Theil
MRM	0.00622	0.004891	0.106918	0.00068
VECAM	0.007394	0.005756	0.125782	0.000808

Source: Ibid

Table 10 - REER and Forecast REER for Q2 2023

	RERR	REER_F_VEC	REER_F_MRM	Kombinovana prognoza
	98.0	96.8	99.3	98.1
Forecast error (Forecast in in relation to REER)	-	-1.1%	1.4%	0.0%

Source: Ibid

Concluding Considerations

In the fixed exchange rate regime, one of the acceptable methods of determining foreign trade competitiveness is the change in the real effective exchange rate. REER is presented as the sum of bilateral exchange rates of foreign trade partners weighted by the ratio of foreign and domestic prices and is expressed in the form of a base index, in such a way that growth represents its appreciation, and decline represents its depreciation. Its value can also be determined based on fundamental economic variables, and the REER obtained in this way represents an equilibrium or long-term REER, which, depending on the movement of its fundamental economic determinants, can deviate significantly from the current REER values.

The equilibrium REER of the convertible mark is derived from the cointegration vector of the VECAM model made up of five variables: REER, terms of trade, real BH interest rate, and difference in productivity, and difference in other prices (CPI).

The REER assessment for the period Q4 2014 - Q1 2023 and the REER forecast for one period-quarter out of the sample was derived based on the constructed VECAM model, as well as based on a multiple regression model, to which the variable deviation from uncovered interest rate parity was added.

During the period of the coronavirus pandemic and the accelerated growth of inflation, the volatility of the deviation of the REER of the convertible mark from the equilibrium REER is much higher than in the period when there were no global economic disturbances.

The main cause of the sudden REER appreciation that started at the end of 2021 is primarily the faster growth of BH consumer prices from foreign consumer prices. The difference in consumer prices created appreciation pressures, while the difference in interest rates affected REER depreciation. Until the third quarter of 2022, the domestic real interest rate caused a drop in REER (depreciation), and after its growth, it increased REER. From the middle of 2022, the deterioration of terms of trade, which acts with a lag, appreciates the value of REER (due to faster growth of import prices than export prices). Also, from the middle of 2022, the faster growth of productivity abroad compared to BH has made a positive contribution to the REER value.

The REER forecast for the second quarter of 2023, calculated as the average of the obtained forecast using the VECAM model and the multiple regression model, is identical to the realized REER value. Arithmetic mean forecast smoothed out the errors in individual model forecasts and gave a more accurate forecast value than that given by individual models, demonstrating the higher quality of the combined forecast compared to the forecast obtained based on individual models.

From the obtained research results, it is possible to make proposals to the creators of economic policy in Bosnia and Herzegovina aimed at preserving foreign trade competitiveness based on the movement of REER and its deviation from the equilibrium value. The key reason for REER appreciation is the faster growth of BH consumer prices than those abroad, and that is why anti-inflation policy should be the basis of any future economic policy in Bosnia and Herzegovina.

Productivity as the basic economic principle of business, and in connection with its slower growth in BH compared to the environment, must be subject to constant improvement and growth, to avoid appreciation pressures on REER. The growth of interest rates in Bosnia and Herzegovina was either through the growth of BH real interest rates, or through the reduction of uncovered interest rate parity to reduce the outflow of capital from BH, exposes REER to appreciation. However, the monetary policy conducted through the increase of BH interest rates would not have a high degree of efficiency due to the extremely high liquidity of the BH banking sector (excess reserves in Q3 2023 make up 7.8% of the assets of BH banks), the absence of loans from the Central Bank of BH, and the impossibility of sterilization of primary money.

From the moment when CBBH started reducing interest rates (July 2016) until December 2022, the net foreign assets of the BH banking sector (claims against non-residents minus obligations towards non-residents) increased from 75 million KM to 3.12 billion KM (7% of GDP), and if one wants to avoid the REER appreciation that leads to the growth of BH interest rates, then instead of increasing interest rates, it is better to balance this unfavorable foreign exchange balance through an increase in required reserves, or by direct or indirect, prudential regulation of the exposure of BH banks abroad.

Terms of trade, measured as the ratio of BH export prices and import prices, do not act in such a way that their improvement (faster growth of export prices than import prices) appreciates the exchange rate of KM (due to the greater supply of foreign exchange on the BH market). It seems that for depreciation of the REER exchange rate, in the context terms of exchange, the most important thing is that import prices grow more slowly than export prices. Since every global price shock (increase in import prices) leads to an increase in prices in BH and REER appreciation (all other things being equal), BH needs to absorb such negative external shocks through an effective anti-inflationary policy and increase in productivity.

Given that the multiple regression model gives a very good assessment of the equilibrium real effective exchange rate, where the equilibrium REER means the REER determined by fundamental factors, future research could move towards determining the theoretical value of the REER that reduces the current account balance of BH to zero. Based on the thus obtained theoretical REER, which removes the negative balance of the current account, it is possible to determine its components, i.e., the composition needed to balance the current account of the balance of payments. The obtained results of these prospective studies would represent a solid theoretical basis for designing a policy of balancing the current account balance of Bosnia and Herzegovina, which has been chronically high for years.

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