



National Bank
of Ukraine

Inclusion of institutional factors in the REER trend estimates

Results of internship

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EBA (*External Balance Assessment*) Methodology of IMF

1. CA norm regression: next estimation of REER adjustment needed to return “underlying” current account to its normal level
2. REER level regression: direct estimation of REER trend when all regressors are on the long-run levels.
3. Institutional factor in both regressions: the Index of International Country Risk Guide (ICRG) by PRS Group (<https://www.prsgroup.com/explore-our-products/international-country-risk-guide/>)

CA norm regression

Panel of 49 countries, annual data, 1986-2016, last estimates in Cubeddu (2019)

Cyclical variables	Macroeconomic variables	Structural variables	Policy variables
Output Gap #[1]	L. NFA/Y [2]	Oil and Natural Gas Trade Balance * resource temporariness #	L.Public Health Spending/GDP #
Commodity ToT gap*Trade Openness	L. NFA/Y*(dummy if NFA/Y < -60%)	Institutional/Political Environment (ICGR-12) #	Cyclically adjusted Fiscal Balance, instrumented #
	L.Output per worker, relative to top 3 economies	Prime Saver Share #	Detrended Private Credit/GDP #
	L.Relative output per worker*K openness	Life Expectancy at Prime Age #	L.demeaned VIX*K openness (capital account opennes)
	GDP growth, forecast in 5 years #	Life Expectancy at Prime Age # * Future OADR	L.demeaned VIX*K openness*share in world reserves
	Own currency's share in world reserves	Population Growth #	(Δ Reserves)/GDP* K controls, instrumented # (New)
		Old-age Dependency Ratio #	

[1] - relative to a (GDP-weighted) country sample average, in each year

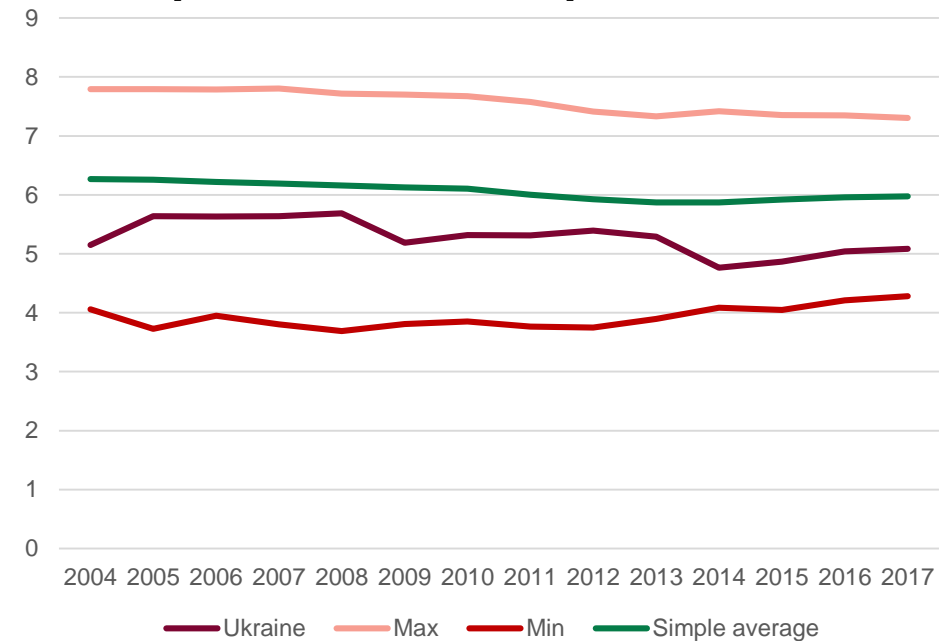
[2] – L. denotes 1 year lag

ICGR-12 Index

POLITICAL RISK COMPONENTS		
Sequence	Component	Points (max.)
* A	Government Stability	12
* B	Socioeconomic Conditions	12
* C	Investment Profile	12
* D	Internal Conflict	12
* E	External Conflict	12
F	Corruption	6
G	Military in Politics	6
H	Religious Tensions	6
I	Law and Order	6
J	Ethnic Tensions	6
K	Democratic Accountability	6
L	Bureaucracy Quality	4
Total		100

* Risk rating subcomponent data available only starting as of May 2001

Average of ICRG sub-indices for Ukraine in comparison with sample countries

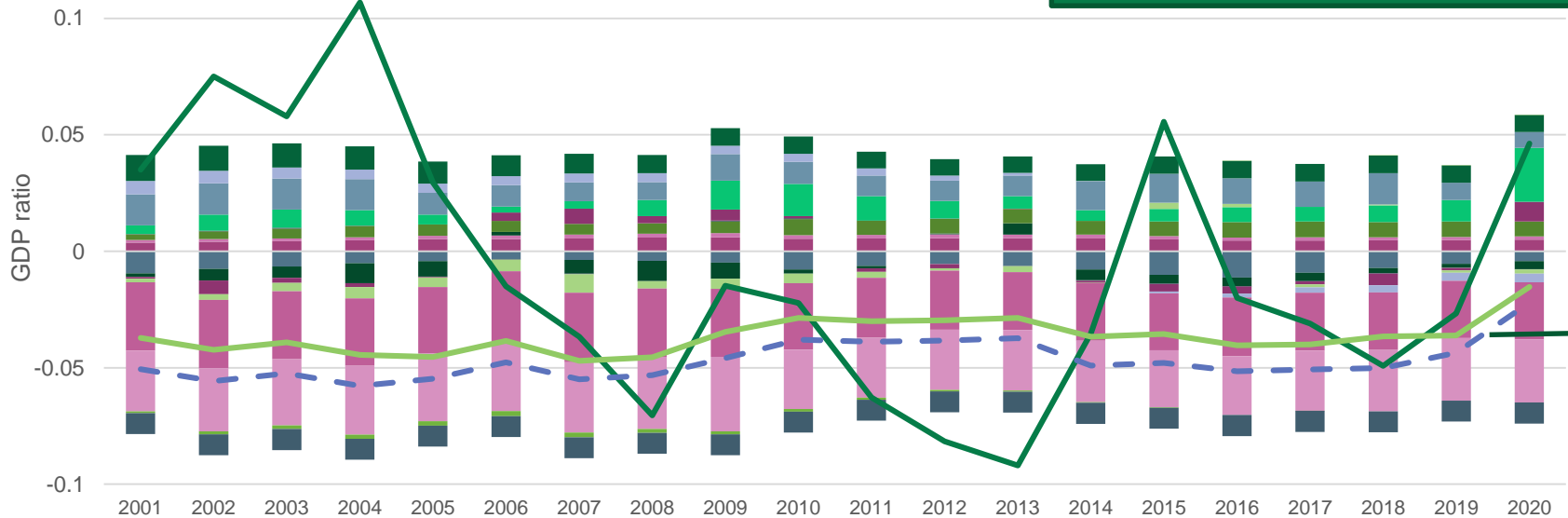


ICGR-12 Index in regression:

- Coefficient is (-0.047**) – higher risks (lower ICGR-12) reduce investments and savings;
- The values are normalized to range between 0 and 1, with higher values signifying less risk. Then reestimated relative to a (GDP-weighted) country sample average, in each year.

CA norm* based on EBA approach

CA norm when the ICGR is on the sample average level



- NFA_to_GDP
- L.Output per worker, relative to top 3 economies
- GDP growth, forecast in 5 years #
- L.demeaned VIX*K openness (capital account openness)
- Commodity ToT gap*Trade Openness
- Cyclically adjusted Fiscal Balance, instrumented #
- Institutional/Political Environment (ICGR-12) #
- Life Expectancy at Prime Age #
- Population Growth #
- Constant
- Modeled CA
- L. NFA/Y*(dummy if NFA/Y < -60%)
- L.Relative output per worker*K openness
- L.Public Health Spending/GDP #
- Output Gap
- Detrended Private Credit/GDP #
- $(\Delta \text{Reserves})/\text{GDP} * K$ controls, instrumented #
- Prime Saver Share #
- Life Expectancy at Prime Age # * Future OADR
- Old-age Dependency Ratio #
- Actual CA
- Modelled CA_star

* cyclical variables are on zero level, policy variables a set at their long-run values

Conclusions

- Improvement of institutional environment shifts CA norm down making REER trend more appreciated
- Numerically REER trend appreciation depends on CA to REER elasticity and export/import to GDP ratio in each year. For instance, in 2019 ICGR improvement to the sample average value would have been appreciated the REER trend by 2.5%



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The impact of REER gap on the GDP growth in Ukraine

Results of internship

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Agenda

1. IMPACT OF REAL EFFECTIVE EXCHANGE RATE MISALIGNMENTS ON ECONOMIC GROWTH OF UKRAINE

- Hypothesis 1 (H1). There is a statistically significant negative relationship between real effective exchange rate misalignments and economic growth.
- Hypothesis 2 (H2). There are nonlinearities in the relationship between real effective exchange rate misalignments and economic growth.

2. DATABASE OF EBA METHODOLOGY

Summary of Empirical Literature

The relationship between REER-misalignment and economic growth

Authors	Sample	Method	Variables	Result
Dollar (1992)	95 Developing Countries, 1976–1985,	Cross Section OLS	Investment, real exchange rate variability, index of real exchange rate distortion	A significant negative relationship between real exchange rate variability and growth
Rodric (2008)	1950-2004, 184 countries	Panel system GMM, cross-section regressions	Government consumption, terms of trade, inflation, gross domestic saving, years of education, institutions (Rule of Law),	Undervaluation has a positive effect on growth but only in developing countries.
Berg – Miao (2010) ¹	1950-2004 181 countries	OLS with time fixed effects	Terms of trade, openness, government expenditure and investment	Undervaluation accelerates, overvaluation decelerates growth, but identification problems. The effect is linear and similar for both under and overvaluation.
MacDonald –Vierra (2010) ²	1980-2004, 90 countries	Panel system GMM	Inflation, government consumption, years of education, institutions (Rule of Law)	A real depreciated (appreciated) exchange rate is associated to higher (lower) growth rates. The estimated coefficients are higher for developing and emerging countries.
Aguirre - Calderón (2006) ³	1965-2003; 60 countries	Panel system GMM	Output Gap, Secondary Enrollment, Private Credit, Trade Openness, inflation rate	The effects of both overvaluation and undervaluation are negative for growth, with overvaluation having a stronger effect. The effect of RER misalignment on growth is non-linear.
Razin and Collins (1997)	1975-1992, 93 countries	GMM, Fixed Effect IV	Terms of trade, government consumption, life expectancy at birth, school enrollments	The effects of both overvaluation and undervaluation are negative for growth, with overvaluation having a stronger effect.

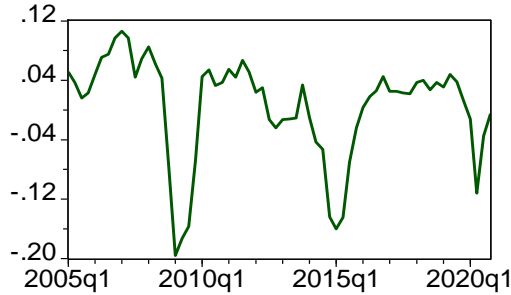
1) Comunale (2017) and Habib et al. (2017); 2) Gala and Lucinda (2006); 3) Schröder (2013)

Growth Linear Regression

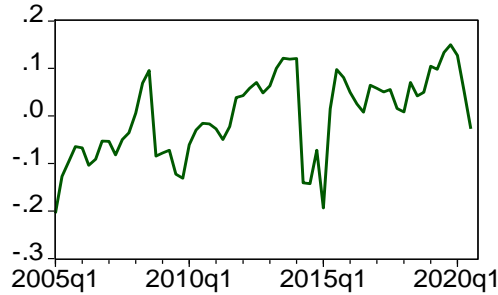
$$GDP_t = \alpha + \beta_1 * REERG_t + \beta_2 * GFCF_t + \beta_3 * GEXP_t + \beta_4 * DOMCR_t + \beta_5 * INTR_t + \beta_6 * CTOT_t + \beta_7 * GDPW_t + \beta_8 * OPEN_t + \varepsilon_t$$

Variables	Formulation	Specification	Sample
<i>GDP</i>	Real GDP growth rate	y-o-y	2005q1-2020q4
<i>REERG</i>	REER gap	%	2005q1-2020q4
<i>GFCF</i>	Gross fixed capital formation/GDP (as a proxy of investment rate)	y-o-y	2005q1-2020q4
<i>GEXP</i>	Government expenditure/GDP (government final consumption expenditure)	y-o-y	2005q1-2020q4
<i>DOMCR</i>	Domestic credit/GDP (finance provided by the banking sector to the private sector)	y-o-y	2005q4-2020q4
<i>INTR</i>	Real interest rate	%	2005q1-2020q4
<i>CTOT</i>	Commodities Terms of Trade	y-o-y	2005q1-2020q4
<i>GDPW</i>	GDP growth partners	y-o-y	2005q1-2020q4
<i>OPEN</i>	Trade openness	y-o-y	2005q1-2020q4

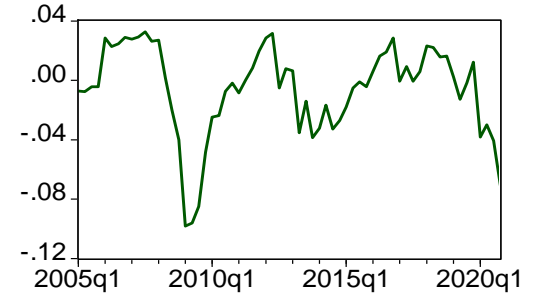
GDP Growth Components



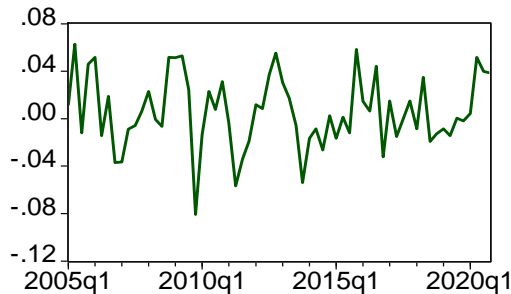
— Real GDP growth, y-o-y



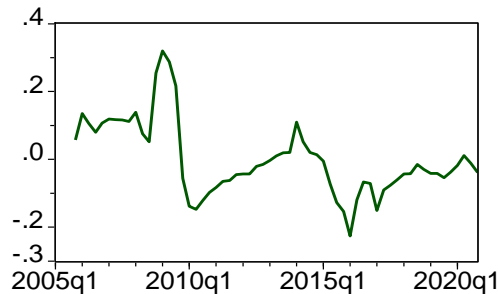
— REER gap, %



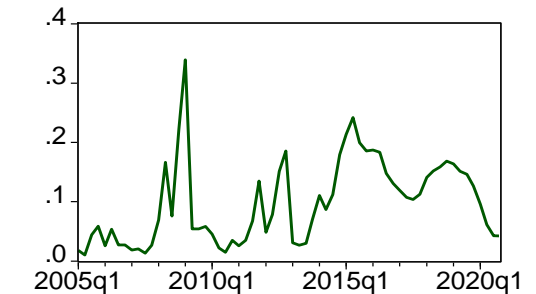
— Gross fixed capital formation/GDP, y-o-y



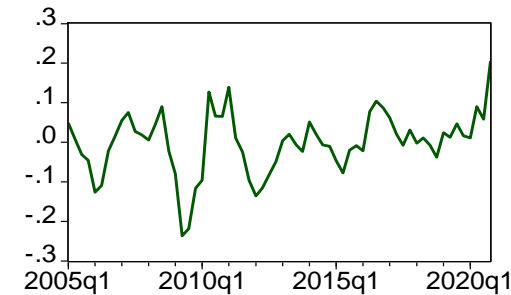
— Government expenditure/GDP, y-o-y



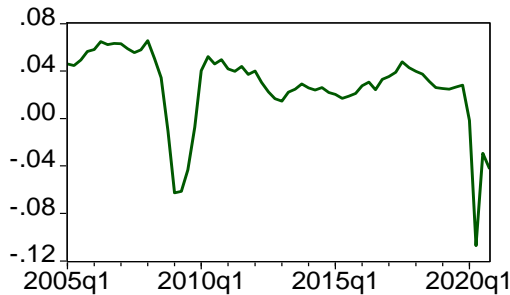
— Domestic credit/GDP, y-o-y



— Real interest rate



— Commodities Terms of Trade, y-o-y



— GDP growth partners, y-o-y

REER Gap and Economic Growth: OLS Regression

Dependent Variable: Growth Rate of Real GDP

	(1)	(2)
GFCF	0.691*** (0.211)	0.681*** (0.211)
DOMCR	0.05 (0.043)	0.047 (0.044)
INTR	-0.31*** (0.061)	-0.272*** (0.064)
CTOT	0.143** (0.061)	0.175*** (0.061)
GDPW	1.003*** (0.197)	1.007*** (0.206)
GEXP		-0.161 (0.145)
OPEN		-0.081 (0.051)
REERG	0.2*** (0.056)	0.145** (0.067)
Constant	0.01 (0.01)	0.006 (0.011)

Observations

60

60

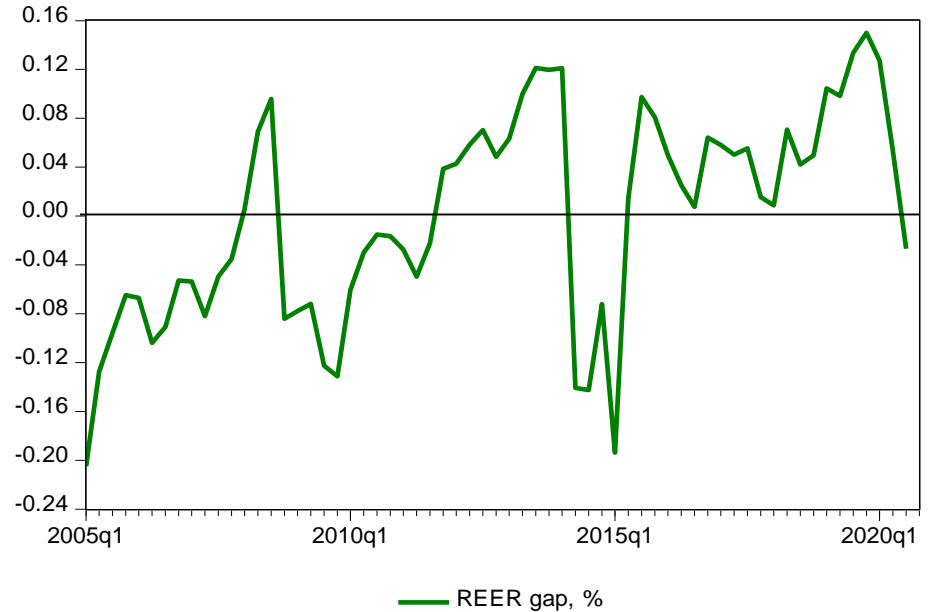
Notes: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Real GDP Growth and REER Gap



Overvaluation and Undervaluation

- A linear view of how misalignment affects growth usually implies that undervaluation promotes growth while overvaluation is harmful for economic activity.
- However, due to crisis periods in the economy, the impact of undervaluation and overvaluation on GDP growth may have asymmetric effects.



Define the dummy variable $Dum_t = \begin{cases} 1, REER\ gap \geq 0 \\ 0, REER\ gap < 0 \end{cases}$

We estimate the following model:

$$GDP_t = \alpha + \beta_1 * GDP_{t-1} + \beta_2 * REERG_t + \beta_3 * GFCF_t + \beta_4 * GEXP_t + \beta_5 * DOMCR_t + \beta_6 * INTR_t + \beta_7 * CTOT_t + \beta_8 * GDPW_t + \beta_9 * OPEN_t + \beta_{10} * Dum_t + \beta_{11} * REER * Dum_t + \varepsilon_t$$

REER Gap and Economic Growth: Threshold Regression

Dependent Variable: Growth Rate of Real GDP

	Dependent Variable < -0.035 Misalignment and Non-stationary regime		-0.035 ≤ Dependent Variable Misalignment and Stationary regime	
	(3)	(4)	(5)	(6)
GFCF	1.329** (0.532)	1.698*** (0.507)	0.187 (0.166)	0.184 (0.189)
DOMCR	0.532*** (0.128)	0.728*** (0.132)	0.013 (0.035)	0.018 (0.038)
INTR	-0.294*** (0.054)	-0.339*** (0.059)	0.026 (0.058)	0.045 (0.069)
GEXP	-1.593*** (0.34)	-1.866*** (0.327)	-0.349*** (0.096)	-0.32*** (0.102)
OPEN	-0.027 (0.079)	-0.048 (0.074)	0.023 (0.035)	0.036 (0.04)
REERG	0.421*** (0.131)	0.261* (0.132)	-0.162*** (0.053)	-0.33* (0.196)
Dum (overval)		0.029 (0.027)		0.003 (0.014)
REERG*Dum		0.456* (0.252)		0.235 (0.223)
Constant	0.016** (0.007)	0.003 (0.012)	0.016** (0.007)	0.003 (0.012)
Non-Threshold Variables				
GDP(-1)	0.24*** (0.076)	0.237*** (0.078)	0.24*** (0.076)	0.237*** (0.078)
CTOT	0.054 (0.043)	0.062 (0.046)	0.054 (0.043)	0.062 (0.046)
GDPW	0.344** (0.157)	0.417*** (0.154)	0.344** (0.157)	0.417*** (0.154)
Observations	12	12	48	48

Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Conclusion

- In a baseline linear OLS regression we have not found a negative relationship between REER gap and GDP growth which is not consistent with results of empirical literature.
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- In a Threshold regression and Stationary regime:
 - 10% decrease in REER gap leads to an increase in growth of 1.62%.
 - 10% undervaluation leads to an increase in growth of 3.3%.
 - 10% overvaluation leads to a decrease in growth of 0.95%
-

Rodrik (2008), Berg and Miao (2010), MacDonald and Vieira (2010), Comunale (2017) and Razin and Collins (1997)

References

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