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# EXPLORING ECONOMY-ENVIRONMENT NEXUS IN CIVETS COUNTRIES

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# Introduction

- Research on the relationship between increasingly pronounced **environmental degradation and economic growth** has been in the focus of scientific and professional discussion and analysis, both theoretically and empirically.
- It is precisely the analysis of the relationship between the quality of the environment and economic growth that allows the creators of different policies to understand the interplay of these variables, and, accordingly, bring about **quality information-based decisions**.
- Long-term harmful effect of environmental pollution is obvious, which may produce destructive effects on human welfare and economy. This can primarily lead to increase of social benefits and health care expenses.

# Introduction

- The purpose of this research is to investigate whether and to what extent a long run relationship is established between CO<sub>2</sub> emissions and selected variables
  - real gross domestic product per capita,
  - inward stock of foreign direct investments,
  - gross fixed capital formation,
  - industry, value added and
  - energy use in kg of oil equivalent per capita
- and if it exists, to analyse the direction of causality for the CIVETS countries in the period 1989 - 2016

# CIVETS

- The acronym CIVETS was coined by Robert Ward, Global Director of the Global Forecasting Team of the Economist Intelligence Unit (EIU) in late 2009, and was further disseminated by Michael Geoghegan, President of the Anglo-Chinese HSBC, in a speech to the Hong Kong Chamber of Commerce in April 2010.
- CIVETS (**Colombia, Indonesia, Viet Nam, Egypt, Turkey and South Africa**) are a group of countries with fast growing economies.
- Economists often call this group “new tiger economies”.
- There is no geographical explanation for the formation of this group, which additionally includes structurally diverse economies. However, despite geographical dispersion and obvious variations, these countries have large and predominantly **young population**, a **high level of domestic consumption**, while their **financial systems are highly developed** and modern.

# CIVETS

- CIVETS countries generally do **not record high inflation** rates. Furthermore, fiscal deficits have increased as a result of global economic crisis, but as **public debt is still fairly low**, and all the countries in this group appeared to be **relatively immune to recent global recession**, which is, generally speaking, only the proof of quality and properly created policy in the previous period.
- Even **political risks** in these countries are not high any more, therefore, although a certain risk is still present, all these countries have good prospects to remain stable.

# Data

- The data for CO<sub>2</sub> emission in metric tons (CO<sub>2</sub>) were taken from Carbon Dioxide Information Analysis Center, derived from UNFCCC and Statistical Review of World Energy. The data for years 2015 and 2016 are preliminary.
- Real gross domestic product per capita (GDP) and inward stock of foreign direct investments (FDI) were taken from UNCTAD STATISTICS.
- In addition, Gross fixed capital formation (GFCF), Industry, value added (IVA) and Energy use in kg of oil equivalent per capita (ENUSE) were taken from the World Development Indicators.

# Methodology

- This research used vector error correction model (VECM) and Granger's causality analysis. In order to approach this analysis of the long-term and short-term interactions of variables, it was necessary first to test the existence of unit roots in the panel data.
- After obtaining the evidence that the data in the panel are non-stationary at level, but stationary when converted to the first difference, the cointegration testing was initiated.
- The results obtained show that the variables are cointegrated, so this allowed us to proceed with causality analysis based on VECM. Granger's causality analysis and Wald test were examined, where the interplay of the variables in the long and short run were examined.

# Panel Unit Root Results

Variable	<b>Levin, Lin &amp; Chu t*</b>			
	Level		First Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
CO <sub>2</sub>	2.09346	-1.23936	-12.2316***	-11.2582***
GDP	4.11602	0.2831	-4.06267***	-5.3271***
FDI	5.14447	1.69278	-2.85824***	-5.01203***
GFCF	0.4066	-0.83271	-2.97153***	-0.97463
IVA	10.0581	0.66383	-3.27668***	-5.20325***
ENUSE	0.5229	-0.57354	-9.98553***	-6.14146***

  

	<b>Im, Pesaran and Shin W-stat</b>			
	Level		First Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
CO <sub>2</sub>	3.77582	-0.52293	-10.6204***	-9.89774***
GDP	5.45752	0.6819	-4.57895***	-4.32813***
FDI	5.54751	2.93134	-5.14796***	-5.75033***
GFCF	2.53015	-0.36257	-4.47899***	-3.44258***
IVA	11.0278	4.07592	-2.07916**	-4.75492***
ENUSE	1.80714	-0.48372	-9.074***	-6.3706***

  

	<b>ADF - Fisher Chi-square</b>			
	Level		First Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
CO <sub>2</sub>	2.07889	12.8011	105.764***	89.4364***
GDP	0.83532	13.5105	45.3783***	39.5901***
FDI	0.87725	6.27896	60.0726***	59.2622***
GFCF	5.52669	10.6198	42.4786***	32.9605***
IVA	3.17152	4.58801	22.2617**	42.6217***
ENUSE	6.83564	15.9273	87.2384***	56.7331***

  

	<b>PP - Fisher Chi-square</b>			
	Level		First Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
CO <sub>2</sub>	1.75661	9.42213	109.055***	97.0565***
GDP	0.54599	7.10987	39.3706***	30.6453***
FDI	1.22254	5.62209	61.28***	62.5156***
GFCF	1.0056	4.96812	44.9487***	31.0865***
IVA	0.00145	1.12608	22.9674**	42.4231***
ENUSE	9.80776	19.1371*	5.6186***	318.615***

Note: \*\*\* denotes statistical significance at 1% level; Schwarz automatic selection of the lag length has been used for the unit root tests; Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.



# Cointegration tests results

## Johansen Fisher Panel Cointegration Test

## Pedroni Residual Cointegration Test

### Linear deterministic trend (restricted)

Null hypothesis: Variables are not cointegrated

Hypothesized No. of CE(s)	Fisher Stat. (from trace test)	Probability	Fisher Stat. (from max-eigen test)	Probability
None	270.8***	0.0000	170.6***	0.0000
At most 1	144.2***	0.0000	90.85***	0.0000
At most 2	123.5***	0.0000	155.1***	0.0000
At most 3	60.8***	0.0000	38.75***	0.0001
At most 4	31.09***	0.0019	23.53**	0.0235
At most 5	16.71	0.161	16.71	0.161

Note: \*\*\* denotes statistical significance at 1% level; Intercept (no trend) in CE and VAR has been used; Lags interval (in first differences): 1 1; Probabilities for Fisher Stat. are computed using asymptotic Chi-square distribution.

Null hypothesis: No cointegration				
Test	Deterministic intercept with no deterministic trend			
	Alternative hypothesis: common AR coefs. (within-dimension)			
	Statistics	Probability	Weighted Statistics	Probability
Panel v-Statistic	0.778522	0.2181	-0.63499	0.7373
Panel rho-Statistic	1.513923	0.935	-0.11889	0.4527
Panel PP-Statistic	-4.76751***	0.0000	-8.00045***	0.0000
Panel ADF-Statistic	-4.37621***	0.0000	-5.55596***	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistics	Probability	Weighted Statistics	Probability
Panel v-Statistic	0.90597	0.8175	-	-
Panel rho-Statistic	-12.5307***	0.0000	-	-
Panel PP-Statistic	-5.54274***	0.0000	-	-
Deterministic intercept and deterministic trend				
Test	Alternative hypothesis: common AR coefs. (within-dimension)			
	Statistics	Probability	Weighted Statistics	Probability
Panel v-Statistic	1.718384**	0.0429	-1.05806	0.855
Panel rho-Statistic	1.023767	0.847	0.475363	0.6827
Panel PP-Statistic	-14.7271***	0.0000	-15.1379***	0.0000
Panel ADF-Statistic	-7.31385***	0.0000	-7.40267***	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistics	Probability	Weighted Statistics	Probability
Panel v-Statistic	1.107974	0.8661	-	-
Panel rho-Statistic	-22.1329***	0.0000	-	-
Panel PP-Statistic	-7.2344***	0.0000	-	-

Note: \*\*\* denotes statistical significance at <1% level; \*\* denotes statistical significance at 5% level; Automatic lag length selection based on SIC with a max lag of 4 has been used; Newey-West Automatic settings for automatic optimal bandwidth selection and Bartlett kernel have been used.

# Causality analysis results

	Short run Granger causality						Error correction	
	$\Delta$ CO2	$\Delta$ GDP	$\Delta$ FDI	$\Delta$ GFCF	$\Delta$ IVA	$\Delta$ ENUSE	ECT(-1)	Coeff.
$\Delta$ CO2	x	14.74988***	1.891007	32.18105***	7.159083**	8.620687**	*-1.682474	-0.014849
$\Delta$ GDP	0.788095	x	33.72814***	1.563988	0.217439	0.17446	-0.737552	-0.041541
$\Delta$ FDI	3.088858	7.605626**	x	19.62085***	8.224097**	7.402544**	** -2.487236	-16.5797
$\Delta$ GFCF	4.225852	0.234265	60.81901***	x	16.27546***	2.626674	-3.348896	-15198739
$\Delta$ IVA	3.857291	6.078387**	4.016639	10.2909***	x	0.84876	*1.919798	3.72E+10
$\Delta$ ENUSE	3.25524	7.165432**	1.187311	4.123385	0.079652	x	***9.780337	2.02E+08

Note: values of the t-statistic are reported, with the accompanying p-values where \*\*\* denotes statistical significance at 1% level; \*\* denotes statistical significance at 5% level;  $\Delta$  is the first difference operator; ECT(-1) represents the error correction term lagged one year.

# Conclusion

- CIVETS countries have to follow and act in accordance with the measures and stimulations of global policies aimed to decrease CO<sub>2</sub> emissions.
- In pursuit of adequate policy measures, CIVETS countries need to work on developing and improving all aspects of mitigating environmental degradation using various economic measures and instruments.
- Continuous work has to be carried out on the introduction of new mechanisms, instruments and actions such as environmental taxes, emission-trading schemes, and carbon capture and storage.

# Conclusion

- Inadequate distribution of resources and increased exploitation of non-renewable energy have to be taken into account in the efforts made against pollution increase. The structure of management and significance of investment in new technologies, together with the need for raising ecological awareness have to be recognized.
- Finally, it is of the utmost importance to underline that these results do not explain the underlying factors of the observed relationships presented here. Future research should introduce new variables and different methodologies to investigate this phenomenon.

Hvala na pažnji!