

# International Portfolio Movements: Panel Data Analysis

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## Abstract

In this study, the effects of GDP per capita growth rates, real exchange rates, Standard and Poor's (S&P) sovereign ratings, the difference between Transition Economies' (TE) interest rates and USA's interest rates on TEs' net portfolio inflows were analyzed. The results showed that GDP per capita growth rates and S&P's sovereign ratings have positive effects on TEs' net portfolio inflows. Negative relationship between real exchange rates and TEs' net portfolio inflows was found. And it was also found that when the positive difference between TEs' and US interest rates getting increase, net portfolio inflows increase to.

**JEL classification numbers:** C32, F31, F32

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## 1 Introduction

After the Berlin Wall fell down, in 1990s many socialist countries started to reform their economies. They tried to build up open marked oriented institutions and corporations. In order to meet households import demand and to obtain production inputs, external financial sources are vitally important in these

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countries. In a comprehensive expression, they need external sources to finance investment and to have sustainable growth rates. One of the important ways to have external sources is international capital market.

International capital movement is classified as foreign direct investments and portfolio movements. Foreign direct investment (FDI) is a long term and physical investments. While the majority of portfolio movements are short term and it can also be called as hot money, some investments are also form of partnership through the stock market. Although, FDI and portfolio movements are total capital movements, the motivation behind them is different. Tax rates, cheap labor and being in contact with production sources as well as market are some of the variables that effect the FDI. The motivations behind the portfolio movements are different from FDI. In this study, we separate the portfolio movement from total capital movement and seek some variables that effect the portfolio movements (Buch and Toubal, 2003: 601).

In this study, it was firstly overviewed the relevant literature. In the empirical part of the study, the stationary properties of the selected explanatory variables were checked through first and second generation unit root tests. After stationary tests were conducted, cross section dependence, long-run and short-run relationships of the variables were analyzed by econometrics methods. Finally, it was discussed on the findings.

## 2 Literature

One of the studies that tried to explain capital movements is Ralhan's (2006) paper. Ralhan states in the study that the effects of interest rates, total external debt, GDP, financial openness, real exchange rates and openness on capital movements for eight countries by cross sections models. The most effective variables that effect the capital movement were found as interest rates, real exchange rate and GDP. Positive relationships were found between capital movements and GDP, and negative relationship between real exchange rate and capital movements.

Chuhan et al (1993) and Calvo and Reinhart (1994) propounded the strong effects of US interest rates on Latin American capital movements. They found in their empirical works that while US interest rates increase, capital inflows to Latin America fall. These findings were corrected by Frankel and Okongwu' (1995) work. In their study, they analyzed the effect of US interest rates on capital flows in Latin America and East Asia between 1987 and 1994. They found strong effects of US interest rates on capital flows. Taylor and Sarno (1997) examined the long and short-run determinants of capital outflows of USA during 1988 and 1992 to the Asia and Latin America. Co-integration tests and seemingly unrelated error correction models were used to check determinants of short and long term capital movements. The study as a result demonstrates that global factors influence the

capital movements much more than domestic factors and the most important factors effective on the short term capital movements are US interest rates.

In addition, some studies suggest that the world capital movements were analyzed under capital supply and demand structure. The demand side of the capital flows is called as push factors. The supply side of the capital movements is called as pull factors. US interest rates, sovereign ratings and the risk factors were taken as the variables of capital supply function in Mody and Taylor's work (2004). The variables of consumer price indexes, national reserves to import ratio, industrial production indexes, local bank credit to GDP ratio and local interest rates were taken as demand function variables.

Brana and Lahet (2009) studied the internal and external factors effecting capital inflows. They used panel data analyses for Asian Economies and the data for the analyses cover the years between 1990 and 2007. In their study, the internal factors were called as pull factors and external factors as push factors. They found in their work that sovereign ratings and interest rates' spread have positive effect while real exchange rates have negative impact on capital inflows.

Çeviş and Kadılar (2001) investigated Turkey's short term capital movements. They checked the effect of government deficit, the real exchange rates, the difference between Turkey's and foreign real interest rates and balance of payment variables on Turkey's short term capital movements with VAR (vector autoregressive technique) models. The VAR model covers the period of 1986:10 and 1997:09. Some of the most effective factors on Turkey's short term capital movements are high interests and low exchange rates mechanism.

### **3 Data and Applications**

29 transition countries were listed by IMF in 2000: Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Cambodia, China, Croatia, Check Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, Kazakhstan, Kyrgyz Republic, Laos, Republic of Macedonia, Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and Vietnam. The transition countries are the countries which transform their economic structure from social economic structure into liberal one. We found sufficient data for only nine of them: Bulgaria, China, Croatia, Czech Republic, Hungary, Poland, Romania, Russian Federation and Slovak Republic.

The application model covers the years between 1992 and 2010. Stata software program and Eviews 7.2 econometrics program were used to analyze the data. The present study analyses by panel data analysis the effect of GDP per capita growth rates (GRWTPC), real exchange rates (REXR), Standard and Poors (S&P) sovereign ratings (SP) and the difference between US interest rates and TE's interest rates (DIFF) on TE's net portfolio inflows (PORT). Only S&P's sovereign ratings were taken as indicator of sovereign ratings. Previous studies

suggested that the best sovereign ratings explained by econometric models were S&P sovereign ratings (Kabadayi, Nisanci and Emsen, 2011; Kabadayi, 2012).

The regression between the variables stated at the equation 1.

$$PORT_{i,t} = c_0 + \beta_1 \cdot GRWTPC_{i,t} + \beta_2 \cdot REXR_{i,t} + \beta_3 \cdot SP_{i,t} + \beta_4 \cdot DIFF_{i,t} + u_{i,t} \quad (1)$$

$$i = 1, 2, \dots, 9; t = 1992, \dots, 2010$$

We examined the stationary properties of the variables by first and second generation unit root tests. Levin Lin and Chu, LLC, (2002) and Im, Pesaran and Shin, IPS, (2003) tests were applied then cross section augmented Dickey Fuller tests, CADF, (Pesaran, 2006) were checked. First generation unit root tests were stated in the Table 1. Mixtures of stationary structures of the variables were reached.

Table 1: First Generation Unit Root Tests

	LLC		IPS	
	Constant	Constant and Trend	Constant	Constant and Trend
<b>Variables</b>				
<b>PORT</b>	-1.78 <sup>B</sup>	-2.63 <sup>A</sup>	-2.45 <sup>A</sup>	-2.983 <sup>A</sup>
<b>GRWTPC</b>	-3.06 <sup>A</sup>	-0.19	-4.07 <sup>A</sup>	-0.860
<b>REXR</b>	0.48	0.30	1.40	-2.30 <sup>B</sup>
<b>SP</b>	-2.00 <sup>B</sup>	-2.01 <sup>B</sup>	-0.24	-0.80
<b>DIFF</b>	-230.12 <sup>A</sup>	-344.305 <sup>A</sup>	-131.93 <sup>A</sup>	-120.16 <sup>A</sup>
<b><math>\Delta</math>PORT</b>	-8.119 <sup>A</sup>	-6.06 <sup>A</sup>	-9.34 <sup>A</sup>	-6.82 <sup>A</sup>
<b><math>\Delta</math>GRWT</b>	-1.05	0.973	-5.51 <sup>A</sup>	-4.51 <sup>A</sup>
<b><math>\Delta</math>REXR</b>	-7.69 <sup>A</sup>	-6.34 <sup>A</sup>	-8.54 <sup>A</sup>	-6.74 <sup>A</sup>
<b><math>\Delta</math>SP</b>	-3.59 <sup>A</sup>	-3.12 <sup>A</sup>	-2.37 <sup>A</sup>	-0.45
<b><math>\Delta</math>DIFF</b>	-279.71 <sup>A</sup>	-215.89 <sup>A</sup>	-91.49 <sup>A</sup>	-79.79 <sup>A</sup>

Notes:  $\Delta$  is first difference operator. C, B and A are level of significance at 10, 5 and 1 percent levels of significance, respectively. Newey-West bandwidth selection with Bartlett kernel is used both LLS and IPS. To determine optimal lags, Schwarz info criteria are selected.

Individuals' time series in the panel data analysis are assumed to be distributed cross sectionally independent. We checked the cross section dependency with, Breush-Pagan (1980) and Frees (1995, 2004) tests.

Table 2: Cross Section Dependence Tests

<b>Frees Test</b>		<b>B-P LM Test</b>	
<b>Stat.</b>	<b>P. Val.</b>	<b>Stat.</b>	<b>P. Val.</b>
1.15	0.43	95.5	0.00

Nevertheless, we could not reject the null hypothesis of cross section dependency so individual time series in the model are cross sectionally independently distributed excepted from B-P LM test. Depending on the B-P LM test results, cross sectionally ADF tests (CADF) introduced by Pesaran (2006) were applied to check stationary properties of the variables. CADF takes into consideration cross section dependency between variables. Estimation results are showed in Table 3.

Table 3: Panel Unit Root Tests Under Cross Section Dependency (CADF Test)

	<b>Level</b>		<b>First Difference</b>	
	<b>Constant</b>	<b>Constant and Trend</b>	<b>Constant</b>	<b>Constant and Trend</b>
<b>Variables</b>				
<b>PORT</b>	-2.02 <sup>B</sup>	-1.03	-4.30 <sup>A</sup>	-3.08 <sup>A</sup>
<b>GRWT</b>	-4.489 <sup>C</sup>	-2.946 <sup>A</sup>	-11.039 <sup>A</sup>	-9.685 <sup>A</sup>
<b>REXR</b>	-3.49 <sup>A</sup>	-1.69 <sup>B</sup>	-5.32 <sup>A</sup>	-3.75 <sup>A</sup>
<b>SP</b>	-3.21 <sup>A</sup>	-2.72 <sup>A</sup>	-2.66 <sup>A</sup>	-0.61
<b>DIFF</b>	-5.19 <sup>A</sup>	-4.30 <sup>A</sup>	-6.56 <sup>A</sup>	-5.57 <sup>A</sup>

When Table 3 is studied it can observed that the series are stationary in level with constant. It is decided to apply static panel data analysis to check relationship between dependent and independent variables. In this study, the cross section sample was composed of a specific group of countries called as Transition Countries. Fixed effect panel data analysis is an appropriate method to apply for TEs (Baltagi, 2008:14).

In order to test time fixed effect, we apply joint tests to see if dummies for all years are equal to zero, if they are so then we don't need time fixed effect (Reyna, 2011). The null hypothesis that there is no time-fixed effect cannot be rejected. Thus, one way fixed effects model was applied. The robust estimators were used and the coefficients of the variables were standardized. Estimation results are given in Table 4.

Table 4: One Way Fixed Effects Panel Data Estimation Results

<b>Dependent Variable: PORT</b>			
	<b>Coef.</b>	<b>t</b>	<b>P. Val.</b>
<b>GRWTPC</b>	1.34	1.52	0.13
<b>SP</b>	9.53	2.58	0.01
<b>REXR</b>	-0.78	-2.31	0.02
<b>DIFF</b>	0.37	1.66	0.10
<b>CONS</b>	-37.26	-1.12	0.26
<b>R<sup>2</sup></b>	0.35	0.07	
<b>A. R<sup>2</sup></b>	0.29		
<b>DW</b>	1.203		
<b>F stat.</b>	5.66	5.17 <sup>A</sup>	
<b>Test Parm Stat.</b>	2,82 <sup>A</sup>		

One way fixed effect panel data analysis showed that all variables' coefficient signs were found theoretically expected. Growth rates and Standard and Poors sovereign ratings changes have positive effects on TEs' net capital inflows. The positive gap between TEs and US interest rates has positive effects on the dependent variable. And there is negative relationship between real exchange rates and net capital inflow.

In order to check the long term relationship between variables, Pedroni (2004) and Engel Granger co-integration tests were applied. Pedroni co-integration tests results are given in Table 5.

Table 5: Pedroni Co-integration Tests Between Variables

<b>Panel Co integration Stat</b>				<b>Group Mean Co integration Stat</b>		
v-Stat	Rho-Stat	PP-Stat	ADF- Stat	Rho-Stat	PP-Stat	ADF- Stat
-2.686	1.526	-8.924	-3.478	2.011	-14.554	-3.128
(0.969)	(0.791)	(0.00)	(0.00)	(0.977)	(0.00)	(0.00)

Seven co-integration statistics were calculated by Pedroni tests. According to the PP, ADF statistics, the null hypothesis of no co integration is strongly rejected but the null hypothesis cannot be rejected with respect to  $v$  and  $\rho$  statistics. Engle Granger co-integration test was also applied. Stationary properties of the residuals obtained from equation 1 were checked by LLC and IPS unit root tests. Estimation results are given in Table 6. The residuals obtained from equation 1 are stationary in level.

Table 6: First Generation Panel Unit Root Tests

Variable	LLC		IPS	
	Constant	Constant Trend	Constant	Constant Trend
RESID	-1.796 <sup>A</sup>	-3.153 <sup>A</sup>	-1.337 <sup>C</sup>	-1.406 <sup>B</sup>

Moreover, the equation 1 is co-integrating regression and it is not spurious. The long-run relationship between variables does exist. In the long-run, there is relationship between variables but in the short-run, there may be disequilibrium. Error correction model (ECM) was used to see short-run relationship of the model. Engle and Granger's ECM (1987) was modeled and it is parameterized at equation 2.

$$\Delta PORT_{i,t} = a_0 + a_1 \cdot \Delta GRWTPC_{i,t} + a_2 \cdot \Delta SP_{i,t} + a_3 \cdot \Delta REXR_{i,t} + a_4 \cdot \Delta DIFF_{i,t} + u_{i,t-2} + \varepsilon_t \quad (2)$$

where,

$$u_{i,t} = PORT_{i,t} - c_0 - \beta_1 \cdot GRWTPC_{i,t} - \beta_2 \cdot REXR_{i,t} - \beta_3 \cdot SP_{i,t} - \beta_4 \cdot DIFF_{i,t} \quad (3)$$

$a_0$  is constant;  $\Delta$  is first difference operator and  $\varepsilon$  is error term. ECM estimation results are given in Table 7. The coefficients were standardized.

In consequence, it is found that error correction coefficient has negative sign and is statistically significant. Possible shocks on the models will tend to equilibrium at 57 percent in a year. In the short-run, all variables' coefficient signs were found as theoretically expected. GDP per capita growth rates and S&P sovereign ratings have positive effect on TEs' net portfolio inflows. The variable of DIFF's coefficient is statistically insignificant. Reel exchange rates have negative effects on growth rates.

Table 7: Error Correction Model

Dependent variable: DPORT		
Variables	Coefficient	t stat
Constant	2.56 <sup>B</sup>	2.406
DGRWTPC	0.64 <sup>B</sup>	2.552
DSP	9.21 <sup>A</sup>	3.032
DREXR	-1.49 <sup>B</sup>	-2.135
DDIFF	-10.09	-0.265
<b>EC</b>	<b>-0.566<sup>B</sup></b>	<b>-2.287</b>
R-squared	0.28	
Adj. R-squared	0.20	
F-statistic	3.434 <sup>A</sup>	
DW	2.20	

Notes: D is first difference operator. B and A are level of significance at 5 and 1 percent levels of significance, respectively. White period standard errors and covariance (d. f. corrected) were used. EC is error correction coefficient.

## 4 Results and Conclusion

In this study, the net capital inflows called also as portfolio movements to transition economies (TEs) was analyzed using one way fixed effect panel data analysis. As a consequence, we found that there exist positive effects of GDP per capita growth rates and sovereign ratings on net capital inflows of TEs. The most effective variable in the model was found as S&P sovereign ratings. The difference between TEs' interest rates and US interest rates has a positive effect on portfolio inflows. When the interest rates in TEs increase or decrease, capital inflows from USA to the TEs are expected vice versa. Obtaining capital at a higher level of interest rates is not a permanent event. It should be taken into consideration that higher interest rates exclude investments and future growth rates depend on today's investment rates. If growth rates decline, net capital inflows decline too.

Other important findings of the study are that real exchange rates have negative effects on capital flows in TEs. When local currencies appreciate, capital inflows increase. It should be considered that overvalued currency will cause chronic current account deficit. Chronic current account deficit will cause higher external debt and external debt cannot be financed forever.

According to the empirical findings of the study, the Transition Economies are obtaining short-term capital by higher interest rates and lower exchange rates.

As briefly explained before, the structure of higher interest rates and lower exchange rates cannot be sustained forever. In case of crowding out effect of private investments and chronic external deficit, TEs should decrease the need for external finance gradually and investment incentive policies should be applied by authorities.

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