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The relationship between economic openness and real exchange rate movement

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An abstract of
A thesis submitted to the Faculty of Emory College of Arts and Sciences
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of the requirements of the degree of
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Abstract

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Among macroeconomic topics, exchange rate literature has been the most challenging subject. Throughout history, economists have been seeking to find a simply structured linear equation to explain and forecast macroeconomic indicators. As a result, they have found groundbreaking equations such as Taylor rule for interest rate. However, despite their rigorous research and efforts, economists did not succeed in finding an equation for predicting exchange rate. The Mundell-Fleming model established a foundation for future economists, yet no one has played an important role except Dornbusch, who wrote his famous overshooting model. In an attempt to locate a simply structured linear equation to explain exchange rate movement, I will add a twist into Mundell-Fleming model. The model suggests a direct effect of real interest rate differential between domestic market and foreign market on real exchange rate. The model has different approaches toward two distinctive situations, the large open economy, and small open economy. My question is how large an economy should be to be considered as the large open economy and vice versa. I will explore this question by implementing key variables, such as trade openness into the Mundell-Fleming model.

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Introduction

After the collapse of Breton-wood system, many countries changed to the floating exchange rate system. This switch induced greater instability for both nominal and real exchange rates (abbreviated RER) (Mussa, 1986). As shown in previous RER research, RER volatility has a negative impact on long-term growth through investments and net export channels (Serven, 1998; Bleany and Greenaway, 2001). Countries with larger RER volatility showed diminished investments and international trade. As a result, economists focus on how much monetary or non-monetary shock would impact RER movement to avoid any damage on their long-term real growth.

Before the 1980s, most literature attributed RER fluctuations to monetary shock, such as Dornbusch's overshooting model. Dornbusch stated the unexpected monetary shock leads to larger fluctuations followed by gradual stabilization in the exchange rate. However, economists argue the role of monetary shock is overstated and there are other factors stimulating RER volatility. They use non-monetary approach, such as supply shock, and other real shocks, to explain the volatility. Some papers have found there is negative relationship between RER fluctuations and trade openness (Hau, 2002; Calderon, 2009).

We assumed a perfectly competitive market for both imported and exported goods and that they are perfectly substitutable for each other. Under these assumptions, we utilized RER movement, which is measured as the difference in real exchange rates from one month to the next, as the dependent variable. For the independent variables, we employed the real interest rate differentials between home and foreign countries and the degree of integration to world goods and services market. The goal of this paper is to embrace both the monetary and non-monetary approach towards RER volatility, thereby achieving the most optimal model to explain RER movement. For the monetary approach, we keenly selected the uncovered interest rate parity

(UIP) theory, which argues that any interest rate differential between two nations is equal to the expected exchange rate movement. Some empirical works demonstrate the UIP does not explain RER volatility, named as *forward premium anomaly*, but others show that there is a positive relationship between interest rate differential volatility and RER fluctuation. As a non-monetary approach, we choose economic openness (or the export, import level) to explain RER movement. According to several papers, the relationship between economic openness and RER volatility is significantly correlated. (Hau, 2002)

As demonstrated in previous work, import goods channel performs as a shock absorber, mitigating the impact on RER volatility. If this argument holds, then correlation between real interest rate and RER movement is related to trade openness, meaning the exchange rate movement of more-open economy can be explained more accurately than that of closed economy.

The other goal of this paper is to find determinants that can explain uncovered interest rate parity theory, based on Mundell-Fleming model. As Mundell-Fleming model states that UIP instrument performs differently depending on the economic condition of the home country, we try to find the determinants that can explain variation in UIP.

To explore determinants of UIP, we define correlation between real interest rate differential and RER movement as UIP mechanism. In this model, we use openness and relative size of home country economy to explain the dependent variable.

Contrary to previous studies, we use both high and low frequency data to implement least squared and panel regression technique. Taking into consideration that the impact on aggregate demand from import goods channel requires certain amount of time due to the law of one price (LOP) deviation, some may argue that long-horizon approach is more plausible for the openness variable. However, due to information technology development and its impact on financial markets, UIP mechanism may work in the short-run as well. Increased integration among countries lessen the LOP effect and induce quicker price adjustment through import channel.

Another critical difference from previous research is the use of bilateral exchange rate between the U.S and foreign countries instead of the effective real exchange rate, or trade-weighted real exchange rate. Although previous studies state that bilateral exchange rate does not represent the relative value of a country's currency due to its limited linkage to other countries that the country trades with, U.S. dollar remains one of the most important reserve currencies among the sample countries in this paper. As a result, a foreign country considers the exchange rate relative to the U.S. as a key measurement. Therefore, we use bilateral exchange rate rather than trade-weighted one.

Literature Review

The Mundell-Fleming model establishes a foundation literature on exchange rates. Under the assumption of sticky price and perfect capital mobility of small open economy, the model finds a relationship between exchange rate and real interest rate. According to the model, there is a strong correlation between exchange rate, net capital outflow, and real interest rate of home country in the short-run. The increase (decrease) in local interest rate would lead to decrease (increase) in capital outflow, thereby causing the appreciation (depreciation) of domestic currency. The model varies into two models according to the size of the economy.

In a small open economy with perfect capital mobility, the local interest rate is exogenously determined by the world interest rate. In comparison, a large open economy, where the financial market size is big enough to influence the foreign interest rate or the capital is not perfectly mobile, has characteristics of both a small open economy and autarky. A large open economy's real interest rate is not equal to that of world interest rate and the net capital outflow and net export are equal in the home country due to its autarky characteristics and small open economy characteristics, respectively.

In a small economy, domestic interest rate and foreign interest are equal, so we define interest rate as an exogenously fixed variable. Assuming sticky price in the short-run, The model sets goods market equation, or IS curve, as the composition of domestic consuming, investment, government spending, and net export[1]. Also, the model presents real money balance as the function of real interest rate and output level[2], or LM curve. The equilibrium level of exchange

[1] $H = C(H-E)+I(\kappa^*)+G+NX(e)$
[2] $M/P = L(r^*, Y)$

rate occurs when LM curve and IS curve intersect. However, since foreign interest rate determines the domestic one, output level is fixed to the foreign interest rate. As a result, output level is exogenous to exchange rate.

For example, the output level does not change relative to any increase (decrease) in government spending but exchange rate does appreciate (depreciate) through export channel and asset channel. As foreign investors seek to purchase (sell) domestic assets denominated in domestic currency, they bid to appreciate (depreciate) the currency. As a result, the domestic exports become more expensive (cheaper), thereby decreasing (increasing) net export, which counteracts to increase (decrease) in government spending.

In a large open economy, the model finds that local interest rate determines the net capital outflow as follows: $CF = \alpha r$, where CF indicates net capital outflows and r indicates local interest rate and α is an arbitrary coefficient. This equation indicates the supply of domestic currency to be exchanged into foreign currency. The model also shows the real exchange rate is determined by the equilibrium between supply of domestic currency and its demand from net export. Since net export (NX) equals net capital outflow (CF), this relationship can be presented as $\varepsilon = \beta(NX)$, where ε is the real exchange rate in the number of foreign currency per one domestic currency, and β is an arbitrary coefficient. Combining the two equations, we can derive a hypothetical relationship between exchange rate and interest rate as: $\varepsilon = \alpha\beta r$. As opposed to a small open economy, a large open economy presents interest rate as differential between domestic and foreign country. Whereas in a small market economy, any interest rate differential is compensated contemporaneously through uncovered interest rate parity, a large open economy results in irreversible real interest rate difference.

According to the theory, the impact of government policy on output level is nonexistent in a small open economy, but significant in a large open economy. Although the model theoretically establishes the relationship between exchange rate and interest rate, it simply bipolarizes various sizes of a country's economy into large and small, leaving uncertainty while applying it in practice. The Mundell-Fleming model does not satisfy the policymakers' needs to clarify the impact of monetary and fiscal policy impact on exchange rate volatility. Modern literature tries to find how interest rate differential caused by monetary shock influences exchange rate volatility.

Based on the Mundell-Fleming model, Dornbusch establishes one of the most critical works of international finance, the overshooting model (Dornbusch 1976). According to this model, exchange rate initially appreciates (depreciates) beyond its long-run level in response to the increase (decrease) of interest rate and over a period of time, gradually normalizes toward the long-run. Under the assumption of rational expectations in asset market, this theory heavily relies on UIP. UIP indicates that any difference in interest rate between two countries is equal to the expected movement of the exchange rate between their currencies. However, various empirical works (Fama, 1984, Engel, 1996) prove that the exchange rate movement tends to be in the opposite direction of UIP, naming as *forward premium anomaly*. In reality, the overshooting model does not explain the exchange rate puzzles, yet leaves possibility to build a theory that may unconditionally hold. Despite its limitation applying to reality, many economists build VAR identification model based on the overshooting model. Several papers using VAR model concluded that interest rate fluctuation induces greater variation in UIP (Faust Roger, 2003). Faust argues that previous works on exchange rate fail to pose recursive identifications. In an open economy setting, one must understand that the short-term rate and exchange rates of each country contemporaneously respond to interest rate change. Faust points out that there are just too many variables that can simultaneous affect exchange rate and questions the validity of VAR specification of the overshooting model.

In the 1970s, many economists attributed the exchange rate volatility to monetary shock, as presented by Dornbusch's overshooting model and UIP. However, the existence of *forward premium anomaly* in empirical testing of the UIP model casts a doubt on the monetary approach. Furthermore, high variation in exchange rate in the industrialized countries from 1980 to 2000, when developed countries enjoyed stable inflation without unanticipated monetary shock, diminishing the role of monetary instability as a main factor of exchange rate volatility.

To explain this phenomenon, a new era of literature named "*New Open Economy Macroeconomics Model*" focuses on non-monetary measures such as productivity shocks, and real demand shocks to explain exchange rate fluctuation. One of the most key variables that many economists, such as Hau and Calderon, focus on is the level of economic integration. According to them, economic openness measures the degree of trade integration for each country. In a more-open economy, aggregate demand and price adjustment have greater flexibility in response to monetary or real shock than in a closed economy. Through imported goods channel, domestic aggregate demand price level is quickly adjusted, lessening the short-term effect of monetary or real shock into consumption and the RER volatility in open economy. As a result, a more-open economy has less volatility in short-horizon RER.

Hau measures a linkage between RER volatility and trade openness of 48 countries, including 24 OECD countries. Using the effective real exchange rates that sum all bilateral real exchange rates into one trade-weighted real exchange rate for each country, he computes the standard deviation of RER over the period of thirty-six months to estimate volatility. He takes the arithmetic mean of volatility from January 1980 to December 2008 and trade openness[3] for each country to perform cross-sectional regression. Using least squared specification[4], Hau finds that negative relation between volatility and trade openness is statistically significant at 1% level. Log per capita GDP, one of the other control variables that measure the development level of countries, is also statistically significant at 1% level. The coefficient is negative, which indicates that more developed countries have less RER volatility.

To check reverse causality between dependent and independent variables, Hau performs instrumental variable regression (IV) using land size as the exogenous variable (Romer, 1993). Hau finds that IV regression result is more pronounced (more negative), explaining the power of openness variable in RER fluctuation. Hau concludes that there is no such feedback effect between dependent and independent variable in this model.

Based on Hau's model, Calderon speculates that openness variable mitigates the impact of external shock on real exchange variation through import channel. Calderon approaches the question in a similar way as Hau did, but there are distinctive features of Calderon's research. Instead of using cross-sectional econometrics, Calderon uses panel regression, which preserves more observation and captures more variation than cross-sectional regression. Contrary to Hau's dataset, which is composed of homogenous countries undergoing similar magnitude of real shock, Calderon's dataset ranges from African countries to most developed countries.

[3]

[4] $Vol_i = \beta_0 + \beta_1 Openness_i + \beta_3 Z + u_i$
(Z denotes different control variables)

DATA DESCRIPTION

We have observed financial data and macroeconomic data for a sample of 13 countries over the period of 1980-2007, excluding some European countries due to the introduction of the Euro as a common currency in the Euro zone in 1999. We established the United States as the foreign country and the rest of them as the home countries. We further separated the home countries into two subsamples: Euro-currency country (ECC) and Non-Euro Currency country (NECC).

The ECC is composed of the following countries: Spain, Netherlands, Belgium, Austria, Germany, France, and Finland. NECC countries are as follows: the Republic of Korea, Australia, Japan, Canada, United Kingdom, and Denmark.

We have collected monthly financial data as high frequency data. Since raw macroeconomic data from the International Monetary Fund (IMF) is only available in quarterly form, we processed the raw data with the computing program, eViews, to derive the monthly data.

We have collected bilateral exchange rate between each home country and the US, local money market rate[5], and consumer price index. For trade openness indicators, we collected each country's nominal GDP and the volume of exports and imports. All macroeconomic data are in each country's national currency. Nominal exchange rate is in unit of the number of US dollars per one home country's currency.

We manipulated various data to acquire measures needed for this research.

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[5] when money market rate unavailable, instead use federal fund rate, treasury bill

Economic Openness: Openness measures how home country is economically integrated into world. We added the volume of exports and imports and then divided them by each country's GDP[6].

Real exchange rate movement (RER movement): This variable measures monthly fluctuation of real exchange rate. We divided the CPI of each home country by the CPI of US and then multiplied it by the nominal exchange rate[7]. Since the real exchange rate is non-stationary, we use the difference from one month to next[8].

Real interest rate: This variable is inflation-adjusted interest rate investors receive when holding interest-bearing assets in the period of one month. We used the Fisher rule to calculate real interest rate[9] for each country.

Real interest rate differentials: This variable represents difference between home and foreign country. By subtracting the US real interest rate from each home country's real interest rate, we derived real interest rate difference between each home country and the US.

Correlation between RER movement and real interest rate differential: This variable measures how much home country's RER movement is consistent with UIP theory. We used both low frequency and high frequency correlations between the real interest rate difference and one period RER movement. For the short-horizon approach, we derived monthly correlations of two variables over the period of the past 12 months. To generate low frequency data, we took the

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[6] $\frac{IM+EX}{GDP}$

[7] $\frac{Foreign\ CPI}{US\ CPI} * e$

[8] $e_t - e_{t-1}$

[9] r = n - i

arithmetic mean of twelve months data to derive a yearly average. By using two different frequency data, we were able to see which approach worked better to explain the correlation.

Relative size of home economy: This variable measures how large each home country's economy size is relative to the world. We found the relative economy size of each country by dividing each GDP_{home} by the GDP_{world}[10]. For the sake of simplicity, we obtained the pseudo world GDP by summing nominal GDP of the 13 countries in the research. We not only used the monthly data but also yearly data by taking arithmetic mean of twelve months.

Import level: This variable measures how much home country relies on import. We derived import shares by dividing the amount of import per month by total GDP per month[11].

Export level: This variable measures how much home country relies on export. We derived the export level by dividing the amount of exports per month by the total GDP per month[12].

We not only used monthly data, but also yearly data by taking the arithmetic mean of twelve months for following variables: export level, import level, relative size of home economy, real interest rate differentials, real interest rate, real exchange rate movement (RER movement), and economic openness

10 $\frac{GDP\ home}{GDP\ world}$

11 $\frac{Import}{GDP}$

12 $\frac{Export}{GDP}$

Methodology

Model specification

In this paper, we tested two different models. The goal of the first model was to find a relationship between RER movement and real interest differential, trade openness, export shares, and import shares. Based on specifications from relevant literature, we established the specifications of model 1 between RER movement and independent variables as

a) $Mov_i = \beta_0 + \beta_1 InterestrateDiff + \beta_2 Openness_i + u_i$.

b) $Mov_i = \beta_0 + \beta_1 InterestrateDiff\, \beta_1 + Import_i + \beta_2 Export_i + u_i$

Specification (a) examines the relationship between openness and RER movement.

Specification (b) tests if import/export level explains variation in RER movement. We expected a positive relationship between export level and RER movement[13] and vice versa for import shares.

Using both pooled and paneled regression, we tested to see if the real interest rate differential and openness variable explained RER movement. We used country-fixed effect on panel regression to control variables that vary across countries but do not vary over time.

The second model sets correlation of real interest differential and RER movement as dependent variables and export/import level, openness and relative size of each country's economy to GDP_{world}. Due to the limitations of collecting data, this model used data from January 1980 to December 1998 for both the ECC and NECC subsamples. We used both short-horizon and long-horizon data to see if there were any differences.

[13] Real Exchange Rate (RER) is defined as national US dollar per one national currency, so RER appreciation indicates increase in value of home currency.

Model 2 specifications are as follows:

a) $Corr_i = \beta_0+\beta_1 Openness_i + \beta_2 Relative\ size\ of\ home\ economy + u_i$

b) $Corr_i = \beta_0+\beta_1 Import_i + \beta_2 Export_i + \beta_3 Relative\ size\ of\ home\ economy + u_i$

In specification (a), we tested if openness played a role in explaining the UIP model. Also, we tested whether import shares, export shares, and economy size have explanatory power of correlation in equation (b).

Joint F-test

We tested whether the country fixed effect is significant enough in panel regression using the joint F-test.

Empirical Results

Model1-(a): $Mov_i = \beta_0 + \beta_1 InterestrateDiff + \beta_2 Openness_i + u_i$.

Mode1-(b): $Mov_i = \beta_0 + \beta_1 InterestrateDiff\, \beta_1 + Import_i + \beta_2 Export_i + u_i$

We looked at a scatter plot between the dependent and independent variables to check for a possible relationship. In this model, we divided home countries into two subsamples, ECC, and NECC. For the ECC sample, we found a rather homogenous pattern of RER movement and real interest rate differentials. Conversely, countries of the NECC exhibited sporadic *forward premium anomalies*, where larger interest rate parity lead home currency depreciation as shown on Figure 3 and 4.

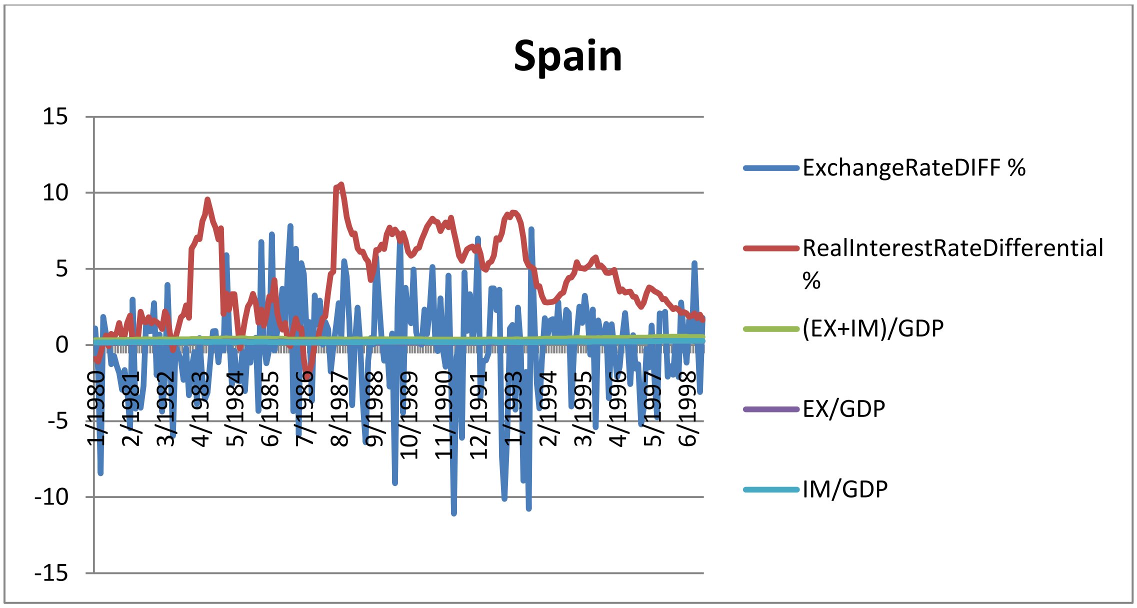

Figure 1. Line graph of Spain RER movement and interest rate Diff and Openness

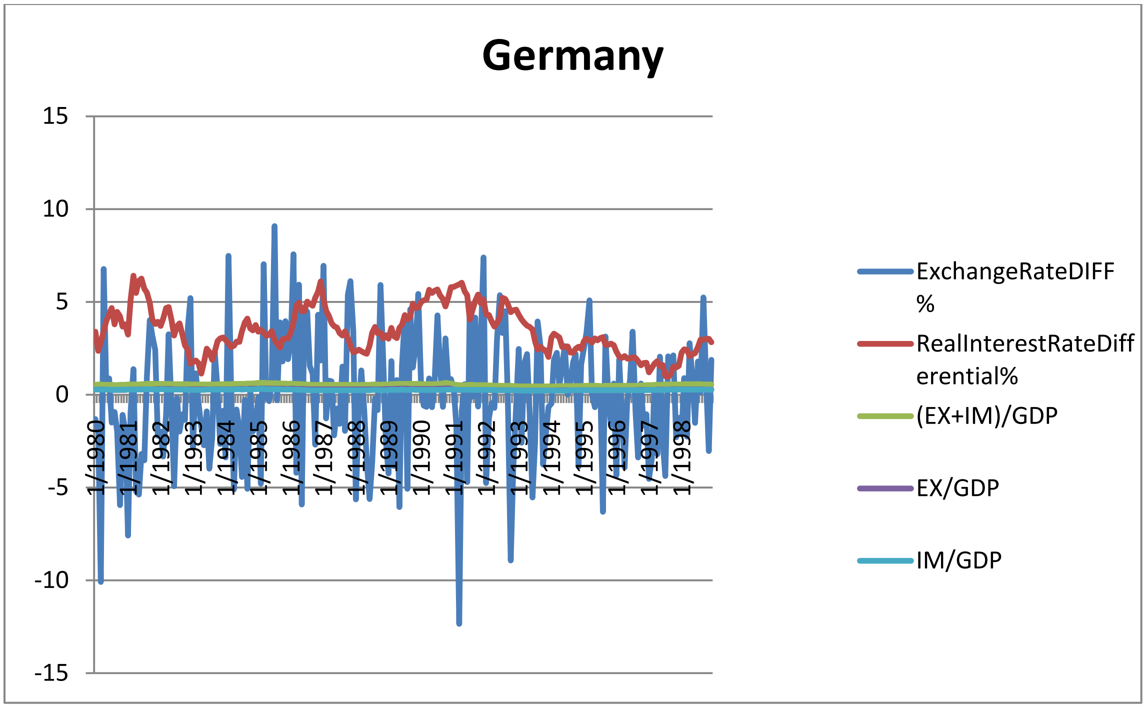

Figure 2. Line graph of Germany RER movement and interest rate Diff and Openness

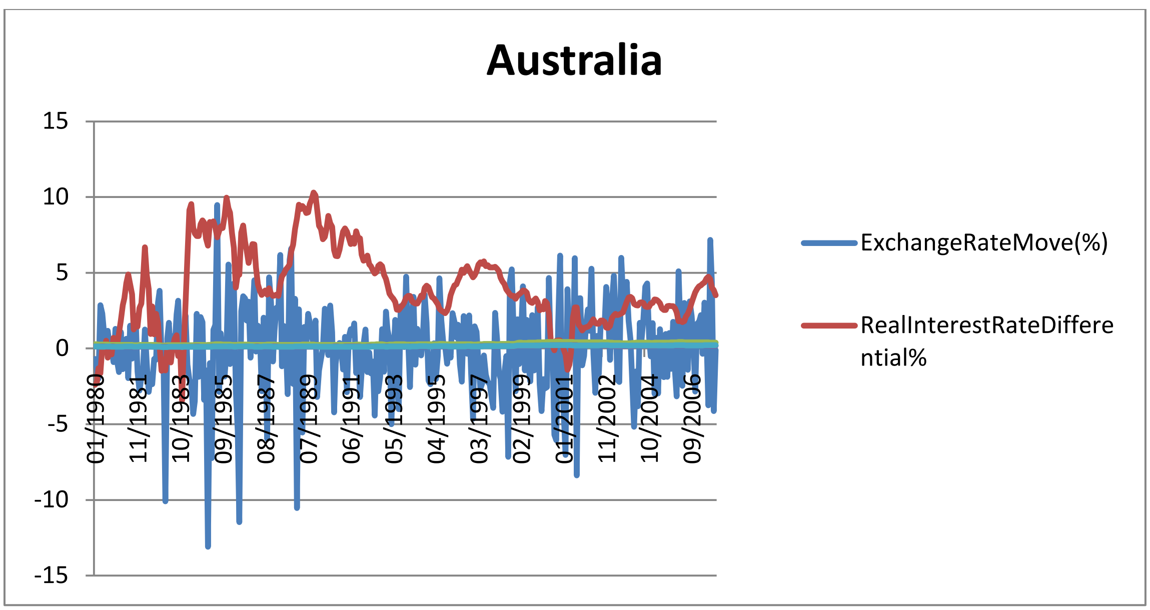

Figure 3. Line graph of Australia RER movement and interest rate parity and Openness

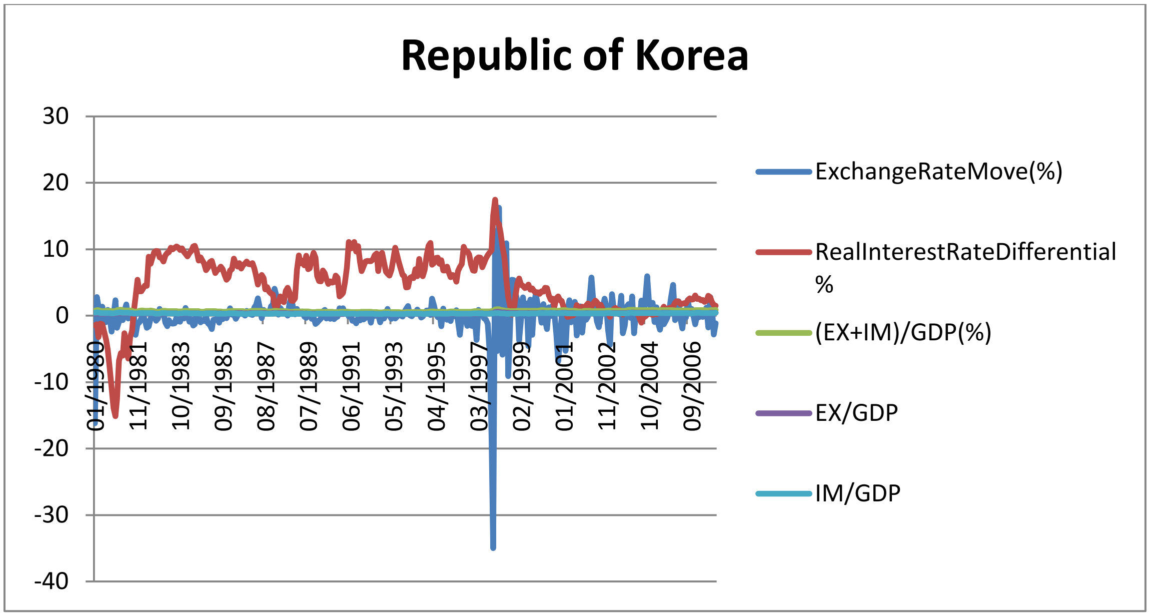

Figure 4. Line graph of Republic of Korea RER movement and interest rate parity and Openness

Table 1

Real Exchange Rate Movement in the ECC (Euro currency Countries) Sample
Least Squared and Panel Regression with country fixed effect
Model 1a: Mov = β0+β1InterestrateDiff + β2Openness + u.
Model 1b: Mov = β0+β1InterestrateDiff + β2Import + β3Export + u.

	1	2	3	4	5	6
Model	(a)	(a)	(a)	(a)	(b)	(b)
Interest rate differnetial	.0867451** (.0352043)	0.0870487** (.0354935)	.0982055** (.0386432)	.0945331*** (.0367002)	.0971026*** (.0355892)	.11146*** (.038567)
openness		.0169313 (.2472974)	.4144258 (1.361802)			
export level					8.824329*** (3.128481)	12.42839*** (3.665336)
import level					-9.308955 (3.316838)	-14.55119*** (4.577296)
Constant	-.4477094*** (.162853)	-.4612865** (.2566382)	-.7961871 (1.055962)	-.4789375*** (.1681446)	-.4244855* (.2564352)	.0612559 (1.073724)
Adj R^2	0.0032	0.0025	-0.0007	-0.0002	0.0088	0.0062
Joint F-test for Country effect			0.128	0.113		0.818
Sample size	1596	1596	1596	1596	1596	1596

Note: The real exchange rate movement from January 1980 to December 1998 is calculated as difference from one month to next month and regressed on a set of independent variables composed of real interest rate differential, trade openness(import and export share of GDP), import level (import shares), export level (export shares) under homoskedascity error assumption. We present standard errors in parenthesis and show significance on a 10% (*), 5% (**), 1% (***)

As shown in Table 1, the relationship between real interest rate differentials between home and US is significant at 5% in pooled regressions and 1% at panel regressions. Since differential variable is defined as i_{home} -i_{US}, our expected outcome of higher real interest leading to the appreciation of home country currency is consistent with the empirical result within the ECC sample. We saw that industrialized countries, which comprise most of the ECC sample, present a pattern that is consistent with uncovered interest rate parity (UIP). We expected export levels to have a positive relationship with RER movement and vice versa for import levels. An increase in exports relative to the GDP induced more demand for home currency, but the supply of money relatively stays the same, resulting in a home currency appreciation. At column 5 and 6, the coefficient of export shares is 8.82 and 12.42, which indicates that a 1% rise in export level affects RER movement by 8% to 12%. The variable is significant at 1% level in both specifications.

According to the F-test, we found that the country fixed effects are not significant, therefore we focused on a pooled regression. It is possible that ECC subsample is composed of relatively homogenous countries in terms of development, so there is no such fixed effect.

From previous studies, we expect that openness may play a role to determine RER movement. Surprisingly, we do not find any relationship between RER movement and economic openness as the variable is not significant across different specifications in ECC sample. Based on the result, we state that openness has impact on RER volatility, but not on RER movement.

Table 2

Real Exchange Rate Movement in the NECC (Non-Euro currency Countries) Sample

Least Squared and Panel Regression with country fixed effect

Model 1a: Mov = β0+β1InterestrateDiff + β2Openness + u.

Model 1b: Mov = β0+β1InterestrateDiff + β2Import + β3Export + u.

	1	2	3	4	5	6
Model	(a)	(a)	(a)	(b)	(b)	(b)
Interest rate differnetial	-.022994 (.0329318)	-.023092 (.021549)	-0.135341 (0.247331)	-.0221454 (.0215269)		-.0217968 (.0248569)
Openness	.1058503 (.1230856)	.1339873 (.2984132)	.7532223 (.8175377)			
export level				5.264346** (2.148186)	5.301145** (2.147919)	8.027985*** (2.668078)
import level				-4.78766** (2.062511)	-4.829051** (2.062148)	-7.214379** (2.899354)
Constant		.0360999 (.1858802)	-.3230599 (.4780473)	-.0372349 (.1881322)	-.1175581 (.171167)	-.1345394 (.4817114)
Adj R^2	0.0006	-0.0003	-0.0023	0.0021	0.0020	0.0013
Joint F-test for Country effect			.202			0.681
Sample size	2016	2016	2016	2016	2016	2016

Note:The real exchange rate movement from January 1980 to December 2008 is calculated as difference from one month to next month and regressed on a set of independent variables composed of real interest rate differential, trade openness(import and export share of GDP), import level (import shares), export level (export shares) under homoskedascity error assumption. We present standard errors in parenthesis and show significance on a 10% (*), 5% (**), 1% (***)

Similar to the results of the ECC subsample, we found that export and import shares are significant enough to explain RER movement, but not openness. In Table 2, export shares are significant across any specifications between 1% and 5%. Its positive relationship with RER movement shows that increased export levels relative to GDP lead the appreciation of home country currency respect to US dollar. Also, the negative relationship between import levels and RER fluctuation indicated that increased imports induce a devaluation of the home currency, leading to price competitiveness of exports, which in turn may boost export levels in the near future.

One interesting result we found in the NECC subsample was that real interest rate parity did not have any impact on the variation of RER movement across all specifications. Since NECC countries are comprised of developing and developed countries, these countries may have had a higher risk premium than ECC subsample countries from the investor's perspective.

For example, the Republic of Korea, one of NECC subsample countries, posed greater political instability due to the presence of North Korea. Also, the Japanese exchange rate and interest rate were deeply distorted due to yen carry trade and bubble blast during the late 1990s. Overall, our finding shows that investors exhibit their behaviors according to UIP model in ECC, whilst not in NECC.

Model 2

a) $Corr_i = \beta_0 + \beta_1 Openness_i + u_i$

Table 3

Correlation btw RER movement and Interest rate parity in the Full Sample

Short-Horizon Approach

Least Squared and Panel Regression with country fixed effect

Model 2a: Corr = β0+β1Openness+ β2EconomySize+ u

Model 2b: Corr = β0+β1Openness+ β2 Import + β3 Export + β4EconomySize+ u

	1	2	3	4	5	6	7
Model	(a)	(a)	(a)	(b)	(b)	(b)	(b)
openness	-.0413359 (.0381584)		-.043412 (.1780495)				
export level				.7446504* (.3972468)	.806391** (.3896923)	.7942063* (.476362)	.8233308* (.4686183)
import level				-.8729028** (.4202075)	-.9535174** (.407984)	-1.07146** (.5399344)	-1.102368** (.5426465)
Size of home economy	.0657379 (.0520405)	.079838* (.0414427)	.0931685 (.0977716)	.0427333 (.0532798)		.0791139 (.0980069)	
Constant	-.0048238 (.0276492)	-.0317045** (.0124216)	-.0061257 (.1108695)	.0044835 (.0279721)	.01373 (.0254843)	.0459925 (.1148438)	.0537432 (.1083699)

Adj R^2	0.0006	0.0005	0.0178	0.0016	0.0018	0.0187	0.0188
Joint F-test for Country effect			5.081***			5.051***	5.052***
Sample size	2808	2808	2808	2808	2808	2808	2808

b) $Corr_i = \beta_0 + \beta_1 Import_i + \beta_2 Export_i + \beta_3 Relative\ size\ of\ home\ economy + u_i$

Note: The correlation between RER movement and real interest rate parity from January 1980 to December 1998 is calculated as twelve month correlation between two variables and regressed on a set of independent variables composed of trade openness(import and export share of GDP), import level (import shares), export level (export shares), and relative size of home economy (GDPhome/GDPworld) in monthly, or high frequency, data. In this paper, the total GDP of world is not equal to actual data, but calculated as the sum of GDP of 13 countries in the sample. We present standard errors in parenthesis and show significance on a 10% (*), 5% (**), 1% (***)

As shown on Table 3, the F-test for country fixed effect is significant at 1% level, so we focused on panel regression. We found that the size of the home economy and openness did not explain the variations in UIP mechanism using short-horizon approach. However, the export and import levels show 5% to 10% significance in explaining why each country has a different UIP pattern. Table 3 presents the coefficient of import level ranges from --.87 to -1.10, which shows its negative impact on UIP mechanism. In other words, increased import levels prevent investors from investing in the home country despite the real interest rate parity between foreign countries and home country. Also, the export level coefficient was positive, indicating increased export levels encourage investors to act in accordance with real interest rate differentials. From the findings, we can make a hypothetical relationship between risk premium and export and import levels. One of the main reasons that investors do not behave in line with uncovered interest rate parity is risk premium they levy on each country. We can argue that investors use export levels and import levels as a key measure to determine how risky a country is.

Table 4

Correlation btw RER movement and Interest rate parity in the Full Sample

Long-Horizon Approach

Least Squared and Panel Regression with country fixed effect

Model 2a: Corr = β0+β1Openness+ β2EconomySize+ u

Model 2b: Corr = β0+β1Openness+ β2 Import + β3 Export + β4EconomySize+ u

	1	2	3	4
Model	(a)	(a)	(a)	(b)
openness	.0195403 (.0536219)	-.295086 (.233329)		
export level			-.1184446 (.5775894)	-.1058383 (.6798537)
import level			.1773734 (.6171408)	-.2775992 (.8319888)
Size of home economy	.0943505 (.0860501)	-2.644234 (1.852139)	.1031602 (.0893333)	-2.483289 (1.868678)
Constant	-.0155713 (.0396796)	.3951086* (.223072)	-.0210372 (.0412446)	.3165523 (.2378746)
Adj R^2	-0.0034	0.1098	-0.0072	0.1013
Joint F-test for Country effect		3.447***		3.314***
Sample size	234	234	234	234

Note: The correlation between RER movement and real interest rate parity from January 1980 to December 1998 is calculated as twelve month correlation between two variables and regressed on a set of independent variables composed of trade openness(import and export share of GDP), import level (import shares), export level (export shares), and relative size of home economy (GDPhome/GDPworld) in yearly, or low frequency, data. In this paper, the total GDP of world is not equal to actual data, but calculated as the sum of GDP of 13 countries in the sample. We present standard errors in parenthesis and show significance on a 10% (*), 5% (**), 1% (***)

Table 4 presents the same specification using low frequency data (yearly average data). On the contrary to most literature work, long-horizon approach did not exhibit any individually significant variable that can explain the UIP patterns. According to previous studies, the long-term approach is more viable for such specifications due to a) law of one price deviation and b) greater fluctuation of financial data than macro data. However, in our studies, short-horizon approach is more viable than long-term one for its larger capacity to capture variation of dependent and independent variables that yearly data could not capture.

Conclusion

This research examined a) the role of openness in the variation of the real exchange rate movement and b) the effect of openness on uncovered interest rate parity, or UIP mechanism. Previous studies suggests that trade openness negatively affects the real exchange rate volatility, which smoothes out the impact of monetary or real shock on real exchange rate. Through import goods channel, openness facilitate aggregate price adjustments, thereby accommodating exogenous shocks.

Based on the real exchange rate volatility and openness literature (Hau, 2002; Calderon 2009), we designed specifications to explain the real exchange rate movement using openness and interest rate differentials. To find an answer for the second question, we tested if openness measure explained the fluctuation of uncovered interest rate parity, or UIP mechanism. We gathered data for 13 countries (of which 7 are industrialized Euro-zone countries) over the period of 1980-1998 on bilateral real exchange rate, trade openness, and economy size.

In general, we found export levels had a positive effect on RER movement while import shares were negatively related to the dependent variable. However, we did not find that openness had any impact on RER movement. Increasing export levels by 1% would induce an 8% appreciation of the home currency. The impact of export and import levels is consistent through euro-zone countries and non euro-zone countries. However, real interest rate differentials had the opposite result between two subsamples. In the euro-zone subsample, which comprised of industrialized countries, the result demonstrated that the real interest rate differential has a strong linkage with RER movement, whereas uncovered interest rate does not hold in the non-euro zone subsample, which contains developing countries. We can attribute this result to the risk premium theory that prevents investors from pursuing uncovered interest rate parity. We would like to further our studies on the relationship between risk premium, development level and *forward premium anomaly*.

The empirical evidence of model 2 is similar to model 1 as openness had a marginal explanatory power but export levels and import levels significantly explained variations in the correlation. The result found that increased export level lead to correlation increments, which in turn facilitates UIP mechanism. On the other hand, import level decreased correlation degree, which indicated less pursuit of uncovered interest rate parity by investors. An interesting result of this specification is that the short-run approach produced reasonable results while long-run approach did not at all.

Several limitations in this paper need to be revisited. The first one is whether bilateral exchange rates between the U.S and home country are a suitable measure for RER movement. Previous literature we cited used real effective trade-weighted exchange rate, which seems more reasonable. Despite our efforts to signify the importance of US dollar, we expect that trade-weighted exchange rate may produce better result than we produced. The second one is simultaneous causality between dependent and independent variables. As previous work noted, it is hard to identify simultaneous causality between variables.(Faust Roger, 2003) In our future research, we would employ instrumental variable analysis to check this issue.

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