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The Forward Premium Puzzle. A matter of time?

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Abstract

This work extends the paper "The forward market in emerging currencies: less biased than in major currencies."of Frankel and Poonawala (2010), which analyzes the role of the forward rate as a predictor of the future change in the spot exchange rate. To do so, they use monthly data of countries with strong and weak currencies from 1997 to 2004, and find a smaller bias for emerging market currencies than for advanced country currencies. Following their same methodology, this article extends the time period until March 2017. The main result is that the relationship between the depreciation rate and the forward rate reverses in the last 13 years for advanced economies.

1 Introduction

Because of our economic policy history, Argentinians have become loyal worshipers of the American dollar. In the last years, with the introduction of a fixed exchange rate combined with a high rate of inflation and the closure of the official dollar market, the black market for dollars strengthened and became a perfect scenario for speculation and premium seeking. As a student in Economics, one became to be constantly consulted by friends to ask whether they should buy or sell dollars. This compromising role increased the interest in possible ways to predict the behavior of the exchange rate.

With the work " The forward market in emerging currencies: less biased than in major currencies."(2010), Frankel and Poonawala cast light on this issue. In the last 40 years, different remarkable economists have worked on the puzzling features of the forward exchange rate. Most specifically, regarding the premium in the forward exchange rate, Frankel (1982) and Domowitz and Hakkio (1985) failed to identify it; while Hsich (1982) and Hansen and Hodrick (1983) found evidence for its existence. Fama (1984) could later conclude that variations of forward rates were due to variations in premiums, and that there was a negative correlation between premiums and expected future spot rate components of forward rates. Hodrick (1987) tested the efficiency of forward markets for forward exchange and found it was a biased predictor of the spot. The literature and evidence continued in the same direction[1], studying why the forward exchange was a biased and usually opposite predictor to the spot. In 2010, Frankel and Poonawala extended the analysis to emerging economies[2] (what had not been done before). The authors find that for this group in average the forward exchange rate is a less biased predictor and often points in the same direction than the spot exchange rate. They suggest this difference between both groups of countries could be due to differences in monetary policies and expectations.

In the following paper, we will analyze if the results also depend on the time period selected. In section 2, we present the model used by Frankel and Poonawala that will also be used in this paper. Section 3 displays the data base and data collection rules. In section 4 we reproduce and compare our own results for the period 12/1996-04/2004 with the original paper results as to validate the data base. Section 5 contains the extension of "The forward market in emerging currencies: less biased than in major currencies." (Frankel & Poonawala;2010) in the periods 5/2004-3/2017. The latter also includes our results, findings and a robustness test that excludes the period of the Subprime crisis. Section 6 concludes.

2 The Model

This paper follows exactly the same model in Frankel and Poonawala (2010). That model combines a rational expectations assumption with a no time-varying risk premium. The regression equation is as follows:

$$\Delta s_{t+1} = \alpha + \beta f d_t + \epsilon_{t+1}$$

[1]Some are Bacchetta and van Wincoop (2005), Backus et al. (2001), Breuer (2000), Verschoor and Wolff (2001), Lustig and Verdelhan (2007), Verdelhan (2006), Lustig et al. (2008), Burnside et al. (2009), Gospodinov (2009), and Farhi and Gabaix (2008)

[2]The categorization was made following the IMF country classification.

,where
• Δs_{t+1} represents $s_{t+1} - s_t$, which is the ex post future percentage depreciation;
• fd_t represents $f_t - s_t$; the forward discount with respect to the spot exchange rate in t;
• s_t the log of the spot exchange rate at t (measured as local units per US dollar);
• f_t the log of the forward exchange rate at time t;
• ϵ_{t+1} is the error term, the unpredicted forward market prediction error.

Under the null hypothesis $\beta = 1$. The latter implies that the forward discount in t is an unbiased predictor of the spot discount in $t + 1$. In this case, there should also be no systematic time-varying components to the prediction errors $E_t\Delta_{t+1} - fd_t = \alpha$. Both rational expectations and no risk premia can be identified under the null hypothesis:
- *Rational expectations*: $E\Delta s_{t+1} = s_t^e$
-*No time varying risk premium*: $rp_t = E_t\Delta_{t+1} - fd_t - \alpha = 0$.

where, $E_t\Delta S_{t+1}$ is the mathematical expectation and Δs_t^e is the investors' expectation. If there was to be a premium there would be no equilibrium in the long run.

3 The data sample

3.1 Data collection and comparison with the original paper

The data collection process followed by the original paper has been rigorously respected here: the exchange rates were collected from the last working day of each month and the forward exchange rate is the one corresponding to one-month future contracts, so that the data does not overlap.
Unfortunately, We had no access to the same database in Frankel and Poonawala (2010). Instead, this paper uses data from Thomson&Reuters. To be able to make a valid extension of the paper it is importnt to ensure that the data is as similar as possible to the original one. Therefore, the first type of exercises to be performed here is to test the database in this paper for the same period as Frankel and Poonawala (2010) did (31/12/1996-30/04/2004). The results resemble the original ones significantly for most countries, what guarantees the veracity of both our base and our extended results (31/05/2004-31/03/2017).

3.2 Differences in country selection

The main difference between the sampling of countries here and the one in the original paper is the extraction of the European Union countries[3] and Indonesia[4] from the beginning. The authors introduce them in the first analysis of country-by-country OLS regressions and later drop them. Additionally, Hungary, Kuwait, Saudi Arabia and South Africa are not included because their data for foreign exchange rate was not available in most of the period 1996-2004. Initial dates differences will be clarified in each section.

[3]Frankel and Poonawala (2010) drop them to avoid an overlapping with the Euro.

[4]In the authors' data base the end date for Indonesia's forward exchange rate did not coincide with the ones of the other countries.

4 The 1996-2004 period

4.1 Country-by-country analysis

Table 1
1996-2004: Individual advanced economies regressions, with robust standard errors and a forecast horizon of 1 month.
$s_{t+1} - s_t = \alpha + \beta(f_t - s_t) + \epsilon_t$

Advanced Economies	β (SE)		t:$\beta = 0$		t:$\beta = 1$		DW		F prob	
	Original	Own	Original	Own	Original	Own	Original	Own	Original	Own
Australia	-5.64	0.02	-2.6	1.99	9.40	7937	1.95	1.84	0.0108	0.094
	(2.1666)	(0.011)								
Canada	-3.2	-3.22	-1.7	-1.68	4.97	4.81	1.96	1.82	0.0927	0.0974
	(1.8926)	(1.9237)								
Denmark	-5.5	-5.4	-2.71	-2.63	10.28	9.75	1.76	2.04	0.0080	0.01
	(2.0319)	(2.0503)								
Japan	-1.28	-1.58	-0.63	-0.77	1.24	1.58	2.14	2.06	0.5333	0.44
	(2.0472)	(2.0552)								
New Zealand	-3.99	0.16	-1.98	1.61	6.15	7199	1.62	1.87	0.0506	0.11
	(2.0142)	(0.0099)								
Norway	-3.85	-3.6	-2.6	-2.5	10.98	10.2	2.18	2.08	0.0101	0.0143
	(1.4636)	(1.4450)								
Sweden	-5.5	-5.4	-3.04	-2.98	12.89	12.64	2.01	2.01	0.0031	0.0037
	(1.8184)	(1.8039)								
Switzerland	-4.3	-4.42	-2.09	-2.12	6.64	6.79	1.85	2.02	0.0395	0.0367
	(2.0588)	(2.0865)								
UK	-3.99	0.021	-1.39	1.16	3.03	2655	2.1	1.43	0.1673	0.2491
	(2.8715)	(0.0189)								

Note on observations and DW: In both databases all countries present 88 observations. As there is only one explanatory variable, the DW test of null hypothesis (no autocorrelation) is rejected if $d < 1.61$ and not rejected if $d > 1.66$ at the 5% significance level for this amount of observations.

Table 1 reflects the country by country original results and the ones using our data base for the regression equation $s_{t+1} - s_t = \alpha + \beta(f_t - s_t) + \epsilon_{t+1}$. Except for Australia, New Zealand and UK, the coefficients have the same sign and are close in magnitude to the original ones. The average is of -2.6. The results for the rejection of the hypothesis $\beta = 1$ are the same that in the paper of Frankel and Poonawala (2010): Japan is the only country for which the coefficient is not statistically different from 1. With respect to the hypothesis that β is zero, the only country which presents changes is New Zealand that does not reject the hypothesis at a 5% level with our data. The remaining countries which are not significantly different from zero in both papers are Canada, Japan and UK.

Table 2 shows the results for the same regressions but for the Emerging Market economies. The main finding in Frankel and Poonawala (2010) was that these coefficients were less negative and less biased than the ones corresponding to the former group of countries. With the database of this paper, the average coefficient for the Emerging Market economies is 0.56. This is consistent with their results. Regarding the hypothesis, the authors highlight the absence of countries whose coefficients are statistically less than zero. In this extension Turkey is the only country forcwhich the hypothesis of $\beta = 1$ is rejected. Hong Kong, Mexico and Turkey maintain the original results, in which they reject the hypothesis that the coefficient is 1. Instead, the results for India and Taiwan change here with respect to the original paper, not rejecting the null hypothesis in these two countries. This implies that the forward market exchange rate continues to be a biased predictor for most of the emerging countries; but is less biased than in the advanced economies.

Figure 1: Spot on forward regression for advanced economies 12/1996-4/2004.

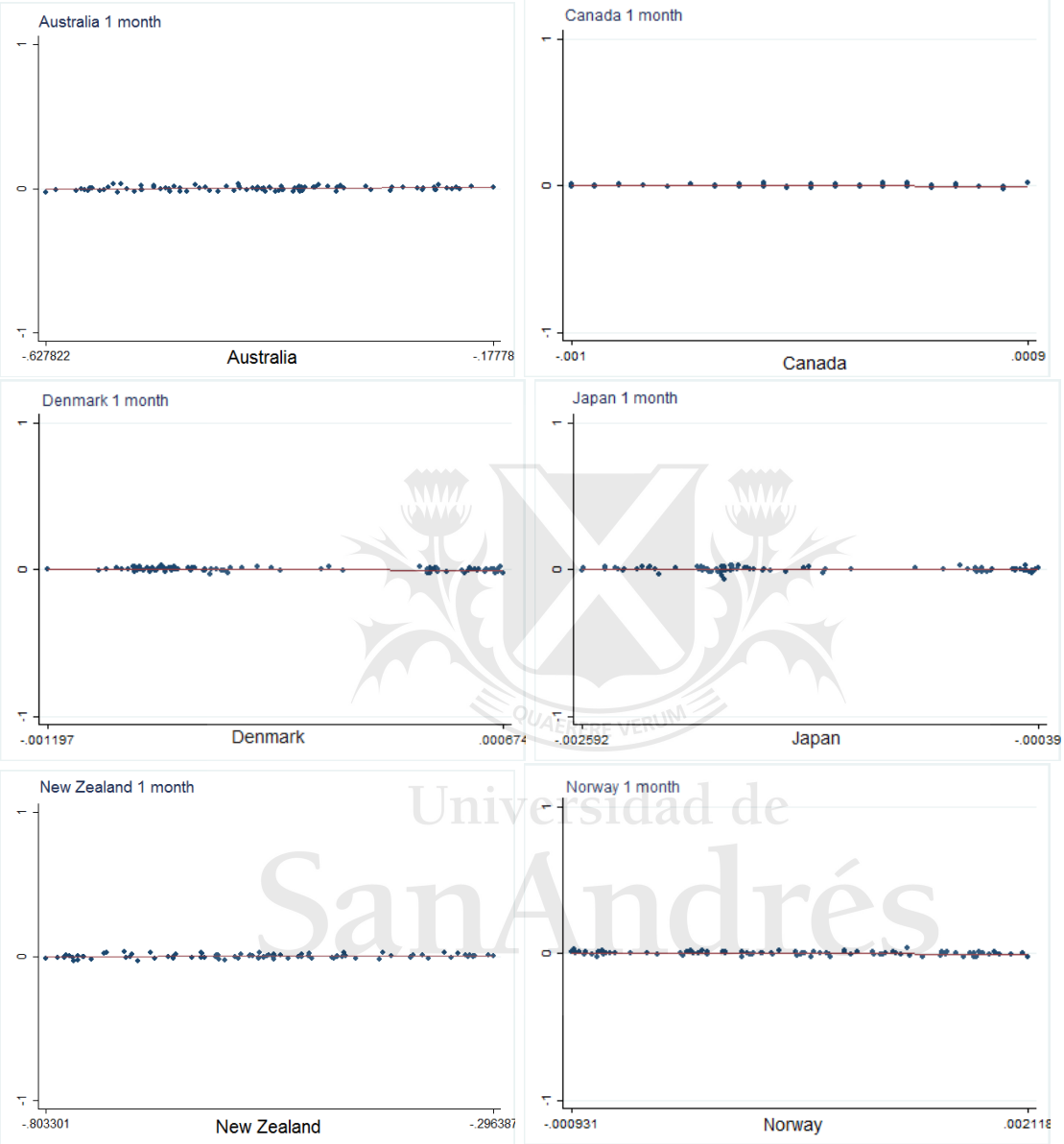


Figure 1 *(continued)*

Both tables include the Durbin-Watson. The statistic can be approximated as $d = 2(1 - r)$, where r is the correlation between two error terms.$d = 2$ would then imply no autocorrelation. The values needed to statistically reject or not the hypothesis of no autocorrelation depend on the amount of variables and time periods. test for autocorrelation. For almost all countries there is no statistical autocorrelation.[5] The no autocorrelation condition is necessary to have consistent coefficients.

Figures 1 and 2[6] illustrate the scatter plots for each country during the corresponding time period using our data base[7].

4.2 SUR & pooled regressions

The presence of unobservable shocks on currencies of different countries would be captured by the error term and threaten the consistency of the coefficient. If there is a correlation in the error terms across countries, the coefficient would not be consistent. Frankel and Poonawala (2010) fear that this problem could arise, so they test the hypothesis with seemingly unrelated regressions (SUR). Their SUR estimation cover data from October 1997 up to April 2004.To keep the same dates, Mexico and Taiwan had to be left aside. Table 3 contains the results for this period in the columns headed with 1997-2004.

[5]Frankel and Poonawala (2010) cannot guarantee no statistical autocorrelation for New Zealand, India, Thailand and Turkey. With the data here the list is shorter: only UK and Hong Kong. Values for the rejection of the no autocorrelation hypothesis are in the table-notes.

[6]Outliers were omitted to enable a clearer and nearer view of the exchange rates relations in each country

[7]The design and axis limits of the graphs were determined following Frankel and Poonawala (2010) to allow an easy comparison between both papers.

Table 2
1996-2004:Individual emerging economies regressions, with robust standard errors and a forecast horizon of 1 month.
$s_{t+1} - s_t = \alpha + \beta(f_t - s_t) + \epsilon_t$

Emerging Economies	β(SE)		t:$\beta = 0$		t:$\beta = 1$		DW		F prob	
	Original	Own	Original	Own	Original	Own	Original	Own	Original	Own
Czech Republic	0.4260	0.76	0.65	0.73	0.76	0.0527	1.90	1.91	0.5206	0.466
	(0.6604)	(1.0450)								
Hong Kong	-0.044	-0.046	-1.17	-1.06	768	572	2.44	1.36	0.2468	0.292
	(0.037)	(0.0437)								
India	-0.6	0.68	-0.72	1.91	3.53	0.8	1.43	1.98	0.4751	0.059
	(0.86)	(0.3582)								
Mexico	-0.6399	-1.39	1.57	-1.96	16.16	11.34	1.99	1.97	0.1204	0.054
	(0.4079)	(0.7098)								
Philippines	1.67	1.45	0.98	0.76	0.16	0.055	1.87	1.92	0.33	0.45
	(1.71)	(1.9145)								
Singapore	0.2	0.6	0.15	0.39	0.39	0.058	1.86	1.85	0.8826	0.697
	(1.29)	(1.6572)								
Taiwan	0.1442	0.45	0.27	0.6	2.65	0.53	1.75	1.85	0.7842	0.541
	(0.5252)	(0.7536)								
Thailand	0.95	2	1.4	1.23	0.00	0.356	1.62	2.12	0.1643	0.223
	(0.68)	(1.6757)								
Turkey	-0.0031	0.54	-0.11	4.98	1241	17.6	1.54	1.78	0.9133	0.000
	(0.0284)	(0.1096)								

Note on observations and DW:For the original data set all countries have 88 observations, except Hungary and India (dates: 10/97-04/4, 78 observations) and Indonesia (date:12/96-12/02, 73 observations). With our data, the countries that do not have 88 observations are the Czech Republic (dates: 01/97-4/04, 87 observations), Mexico (12/98-4/04; 64 observations) and Taiwan (dates: 11/00-4=04, 67 observations). For only one explanatory variable, the DW test of null hypothesis (no autocorrelation) is rejected if $d < 1.61$ and not rejected if $d > 1.66$ at the 5% significance level for 88 observations. For 60-79 observations, $dL = 1.55$ and $dU = 1.62$.

Japan continues to be an exception in the group of advanced economies as its coefficient is positive. Once again, as in the country-by-country analysis, the coefficients for the case of Australia, New Zealand and UK are much the opposite from what they should be if compared with Frankel and Poonawala's work. We believe this happens due to a difference in the measurement of the spot and forward rates. The hypothesis $\beta = 0$ is rejected for the same countries and New Zealand. The proportion of countries rejecting and not rejecting continues being around 50% .

In the case of currencies of Emerging Market countries, the coefficients vary more with respect to the ones in the original paper, but they still remain within one standard deviation. The coefficients for India and Philippines go from not being to being statistically different of zero, while the one corresponding to Turkey makes the inverse change.

All in all, in our results for the SUR the coefficients for the Emerging Market currencies continue to be less negative and less biased that the advanced ones. This is consistent with Frankel and Poonawala's findings.

Figure 2: Spot on forward regression for emerging economies 12/1996-4/2004.

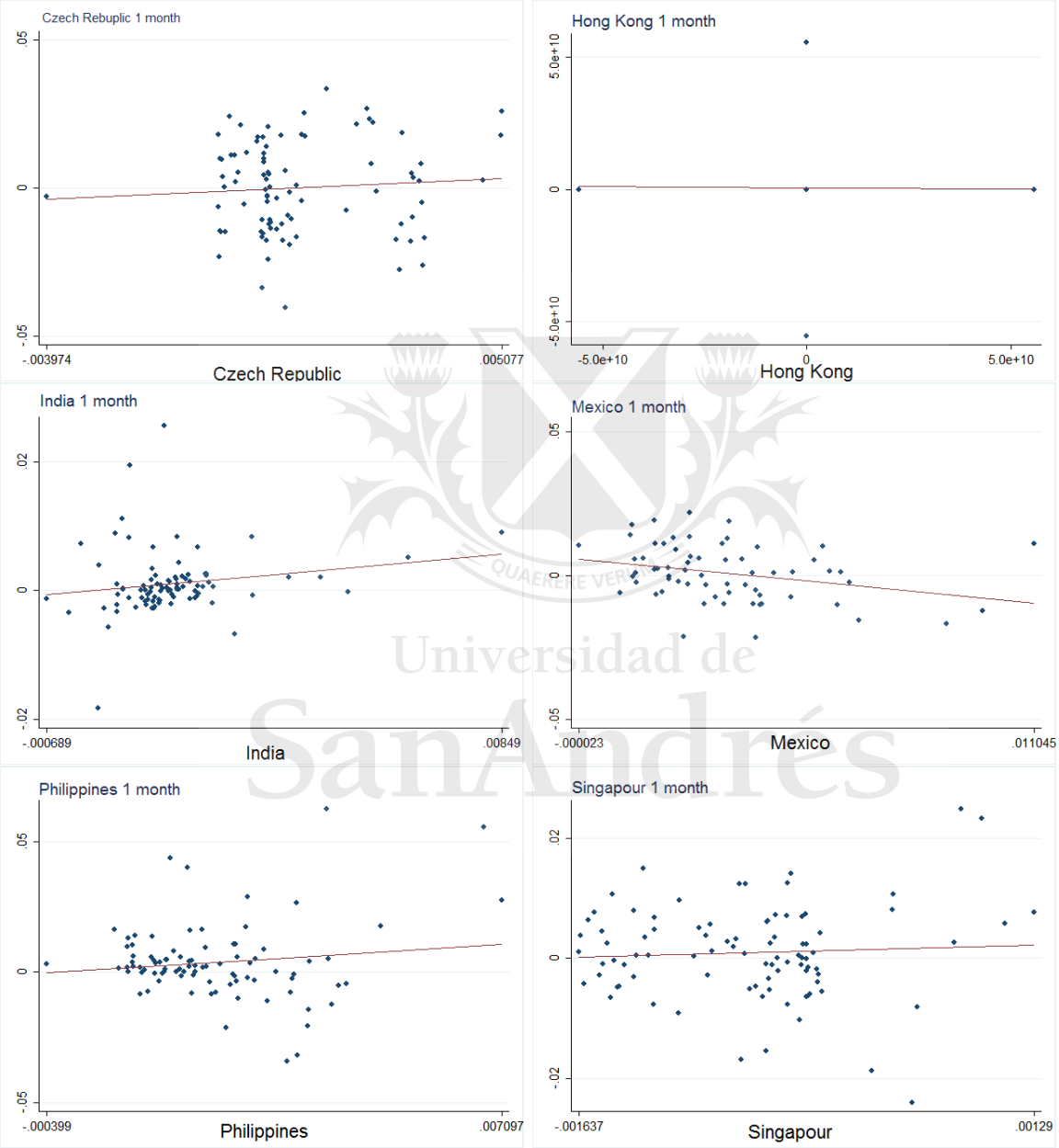
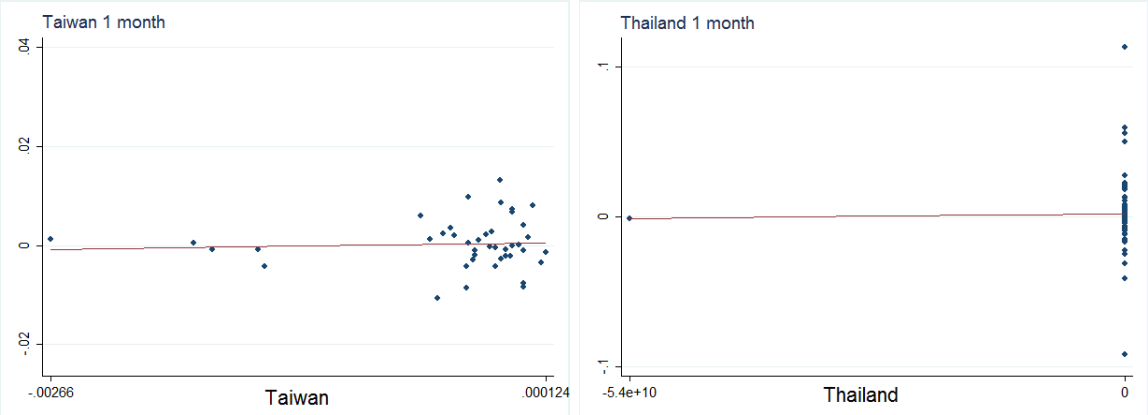


Figure 2*(continued)*



For the pooled analysis Frankel and Poonawala (2010) drop the last three emerging countries so as to have the same amount of countries in both groups. Without these three countries there was a need to eliminate three advanced economies from our list. Australia, New Zealand and UK were the ones selected because of the mismatch between databases. Consequently each group contains six countries. In both pooled OLS and SUR regressions (Tables 4 & 5) the coefficients and significance levels for the group of advanced economies resemble the ones of Frankel and Poonawala (2010). The regressions yield coefficients estimates of -1.87 (OLS) and -1.6 (SUR) which are significant at a 1 % level.The pooled analysis for the group of Emerging Market economies differs more between the two datasets. Still, they are not significant and have a lot of variance. Though the coefficients in the OLS pooled regression are similar, the level of significance varies considerably. The contrary occurs in the pooled and SUR analysis. These inequalities between data bases should not be unexpected due to the high level of variance and statistical noise.

Figure 3: Pooled regressions for 12/1996-4/2004.

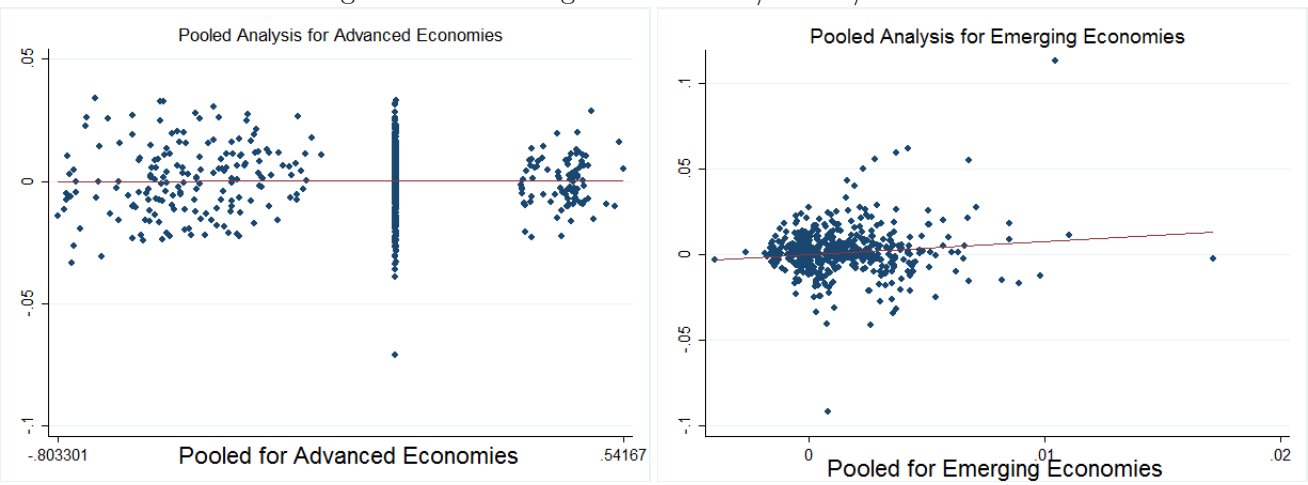


Table3

Seemingly unrelated regressions

Advanced Economies	Coefficient (SE)			z			$P\,z$		
	1997-2004		2004-2017	1997-2004		2004-2017	1997-2004		2004-2017
	Original	Own		Original	Own		Original	Own	
Australia	1.247	0.017	0.012	0.83	1.58	2.08	0.404	0.113	0.038
	(1.494)	(0.011)	(0.0059)						
Canada	-0.011	-0.807	0.8823	-0.01	-0.49	0.41	0.995	0.624	0.682
	(1.738)	(1.644)	(2.15)						
Denmark	-2.190	-3.04	0.406	-3.51	-2.54	0.35	0.000	0.01	0.73
	(0.624)	(1.1940)	(1.178)						
Japan	1.032	0.7	1.927	0.71	0.32	1.68	0.481	0.75	0.092
	(1.463)	(2.2052)	(1.14)						
New Zealand	-1.608	0.023	0.014	-1.20	2.31	1.51	0.229	0.021	0.131
	(1.338)	(0.01)	(0.0092)						
Norway	-2.332	-2.65	1.24	-3.03	-2.65	1.10	0.002	0.008	0.270
	(0.768)	(1.0026)	(1.126)						
Sweden	-2.190	-2.42	1.15	-2.47	-2.30	1.13	0.014	0.021	0.259
	(0.888)	(1.05)	(1.017)						
Switzerland	-1.998	-2.8	0.27	-2.50	-2.17	0.19	0.012	0.081	0.851
	(0.780)	(1.23)	(1.44)						
UK	-2.040	0.01	0.0016	-1.16	0.61	0.24	0.245	0.539	0.797
	(1.756)	(0.015)	(0.0065)						
Developing Economies									
Czech Republic	-0.269	0.378	1.6	-0.43	0.11	1	0.667	0.9	0.317
	(0.626)	(3.3)	(1.5999)						
Hong Kong	-0.026	-0.44	-0.47	-0.47	-1.55	-1.97	0.635	0.122	0.05
	(0.055)	(0.287)	(0.2376)						
India	-0.599	0.82	-0.018	-1.10	1.73	-0.04	0.270	0.083	0.970
	(0.543)	(0.474)	(0.4872)						
Mexico	-0.863		-0.434	-2.12		-0.41	0.034		0.681
	(0.406)		(1.058)						
Philippines	-0.758	-2.7	-1.34	-1.08	-3.18	-1.81	0.280	0.001	0.071
	(0.701)	(0.862)	()						
Singapore	0.174	0.176	-0.2	0.28	0.17	-0.21	0.781	0.868	0.836
	(0.626)	(1.062)	(0.9755)						
Thailand	-0.915	-1.29	0.39	-1.96	-1.52	5	0.050	0.130	0.000
	(0.466)	(0.85)	(0.0782)						
Turkey	-0.029	0.354	0.0	-1.11	0.44	-1.08	0.268	0.657	0.278
	(0.026)	(0.797)	(0.0007)						

a. The columns 1997-2004 include the results for period 31/10/1997-31/4/2004. The ones named 2004-2017 include the results for the period 30/05/2004-31/3/2017.

b. Mexico was excluded for 10/1997-4/2004 because of the late initial dates for its forward exchange variable in the data base. Because its country by country results resembled the original ones, we decided it was secure to include it for this second study.

Table 4
Pooled OLS regressions with robust standard errors and a forecast horizon of 1 month.

	β(SE)	t:$\beta = 0$	t:$\beta = 1$	F prob
Advanced Economies				
1996-2004 Original	-2.0231	3.73	31.04	0.0002
	(0.5426)			
1996-2004 Own	-1.8663	-2.85	19.2	0.005
	(0.6544)			
2004-2017	0.0038057	1.82	225000	0.069
	(0.0021)			
Emerging Economies				
1996-2004 Original	0.0377	0.15	15.604	0.8769
	(0.2436)			
1996-2004 Own	0.019355	4.62	2341	0.000
	(0.0004)			
2004-2017	-0.00056	-0.80	2043102	0.424
	(0.0007)			

Table 5
Pooled seemingly unrelated regressions
(Without Australia, New Zealand,UK, Taiwan, Thailand and Turkey).

	Coef	SE	z	$P > z$
Advanced Economies				
1996-2004 Original	-1.666	0.4503	-3.70	0.000
1996-2004 Own	-1.559643	0.5926562	-2.6	0.008
2004-2017	0.5464986	0.6454765	0.85	0.397
Emerging Economies				
1996-2004 Original	0.152	0.1896	0.80	0.422
1996-2004 Own	-0.04918	0.25136	-0.20	0.845
2004-2017	0.3407825	0.2951	1.15	0.248

5 Extension to the period 2004-2017

The previous section showed that our database produced results that were closely comparable to those in the original paper. This section studies whether the former results depend or not on the time period. This section presents the same regressions for the same specifications but focusing on the period between April 2004 and March 2017. The inclusion of the crisis in the year 2008 is not a minor detail. Although Frankel and Poonawala (2010) analyze if there was an effect of the Asian crisis and find a negative result, the characteristics of the Subprime crisis were non-trivially different (country origin, type of impact and prolongation in Europe, etc). Therefore this section also considers a robustness test, excluding the above-mentioned crisis.

5.1 Country by country

Table 6 displays the results for the country-by-country analysis. At a first sight, the results seem to change significantly for the advanced economies. Within this group, Canada, Denmark, Norway, Sweden and Switzerland's coefficients become much less negative and in most of the cases even reach positive numbers, but also lose significance. Norway and Sweden are the countries that present the biggest differences with respect to the former period, as the values of the coefficients change from -3.6 to 2.87 for the first country and from -5.5 to 1.59 for the second one. Another remarkable difference is the change about the rejection of the $\beta = 1$. The countries listed previously go from easily rejecting this hypothesis to not being able to do so. The results for Japan turn out to be the opposite of the ones obtained for 1996-2004 and they differ from the rest of the group. Because the results for Australia, New Zealand and UK did not coincide with Frankel and Poonawala's in the first period, no certain analysis can be done in this period as all results seem doubtful. The average coefficient for the group is 0.6; which implies an increase of 3.2 units compared to the one of 1996-2004. If the former Commonwealth countries are not taken into account, the average is 0.89.

The change of the time period does not show a clear pattern of changes in results for Emerging Market countries. The only ones that present a different sign in their coefficients are Philippines and Turkey. The probability of rejecting $\beta = 1$ also increases considerably for both countries. Still, the dynamic of the significance level with respect to $\beta = 0$ is the opposite: while the one corresponding to Philippines rises up to a 5%, the one for Turkey drops and stops being significant. The resting countries do not present relevant changes when actualized. The average of all coefficients in this country group is of 0.22, $0,34$ units below the one of 1997-2004.
Using the traditional Durbin-Watson statistic, no statistically relevant serial correlation can be found for the Advanced economies. Much on the contrary, the hypothesis for no autocorrelation is rejected statistically for most of the emerging countries. This makes the coefficients obtained in the group unreliable.
Figures 4 and 5[8] illustrate the scatter plots for each country during this period.

[8]Outliers were omitted to enable a clearer and nearer view of the exchange rates relations in each country

Table 6

Individual regressions 05/2004-03/2017 with robust standard errors and a forecast horizon of 1 month.

$s_{t+1} - s_t = \alpha + \beta(f_t - s_t) + \epsilon_t$

	β(SE)	t:$\beta = 0$	t:$\beta = 1$	DW	F prob
Advanced Economies					
Australia	0.0216	0.91	7484	2.15	0.058
	(0.0113094)				
Canada	-.6230026	-0.13	0.122	1.814	0.893
	(4.63743)				
Denmark	-0.5481326	-0.16	0.449	2.283	0.874
	(3.450147)				
Japan	1.981547	1.95	8.63	2.145	0.053
	(1.014729)				
New Zealand	0.0381864	1.90	2279	2.12	0.060
	(0.0201458)				
Norway	2.870571	1.49	4.04	2.17	0.138
	(1.925276)				
Sweden	1.594018	0.74	1.46	2.17	0.459
	(2.145835)				
Switzerland	0.0513961	0.03	0.226	2.46	0.979
	(1.995669)				
UK	0.0034079	0.40	13446	2.1	0.692
	(0.0085943)				
Emerging Economies					
Czech Republic	0.8643854	0.32	0.0025	0.32	0.753
	(2.73746)				
Hong Kong	-0.3196389	-1.06	19.15	-1.06	0.291
	(0.3015608)				
India	-0.0144246	-0.02	1.93	-0.02	0.984
	(0.7309233)				
Mexico	-0.4052573	-0.24	0.687	-0.24	0.811
	(1.695045)				
Philippines	-1.817381	-2.20	11.6	-2.2	0.030
	(0.8273292)				
Singapore	1.482357	1.01	2.89	1.01	0.312
	(1.460834)				
Thailand	0.4313362	3.02	15.8	3.02	0.003
	(0.1429889)				
Turkey	-0.0009912	-1.34	18243	-1.34	0.183
	(0.0007411)				

Note on observations and DW: All countries have 155 observations. With one variable, the Durbin-Watson test of null hypothesis (no autocorrelation) is rejected if $d < 1.72$ and not rejected if $d > 1.74$ $d > 1.746$ at the 5% significance level for 155 observations

Figure 4: Spot on forward regression for advanced economies 5/2004-3/2017.

Figure 4 *(continued)*

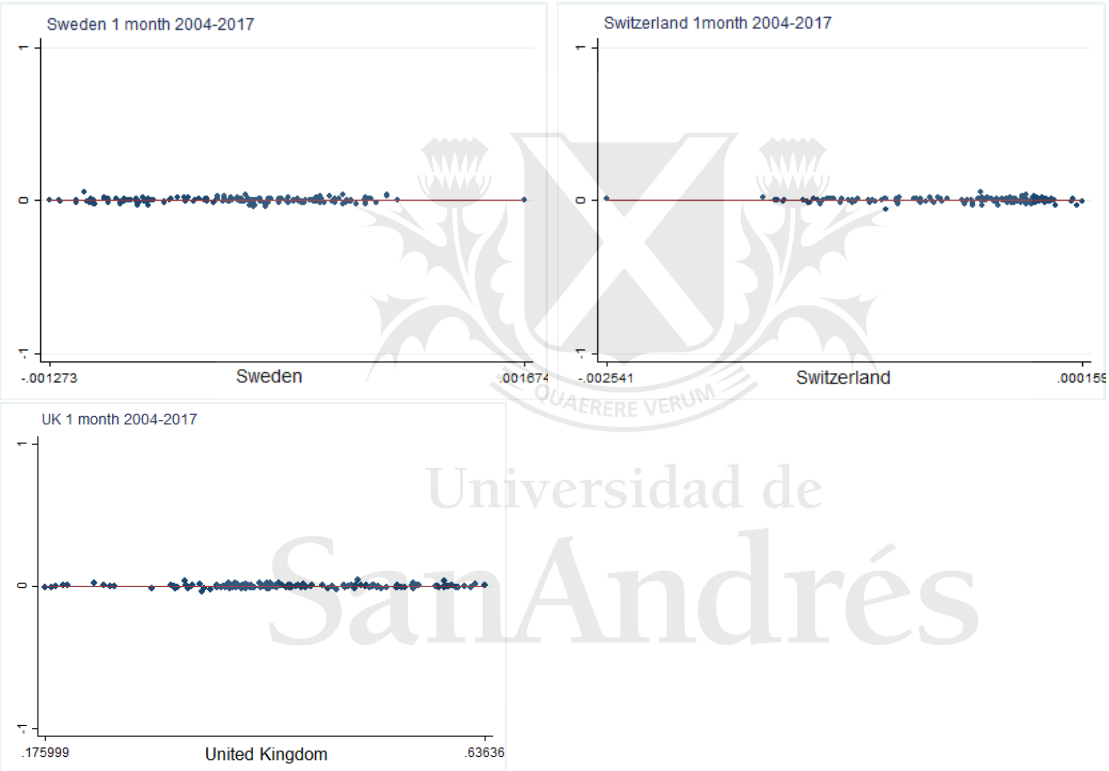


Figure 5: Spot on forward regression for emerging economies 5/2004-3/2017.

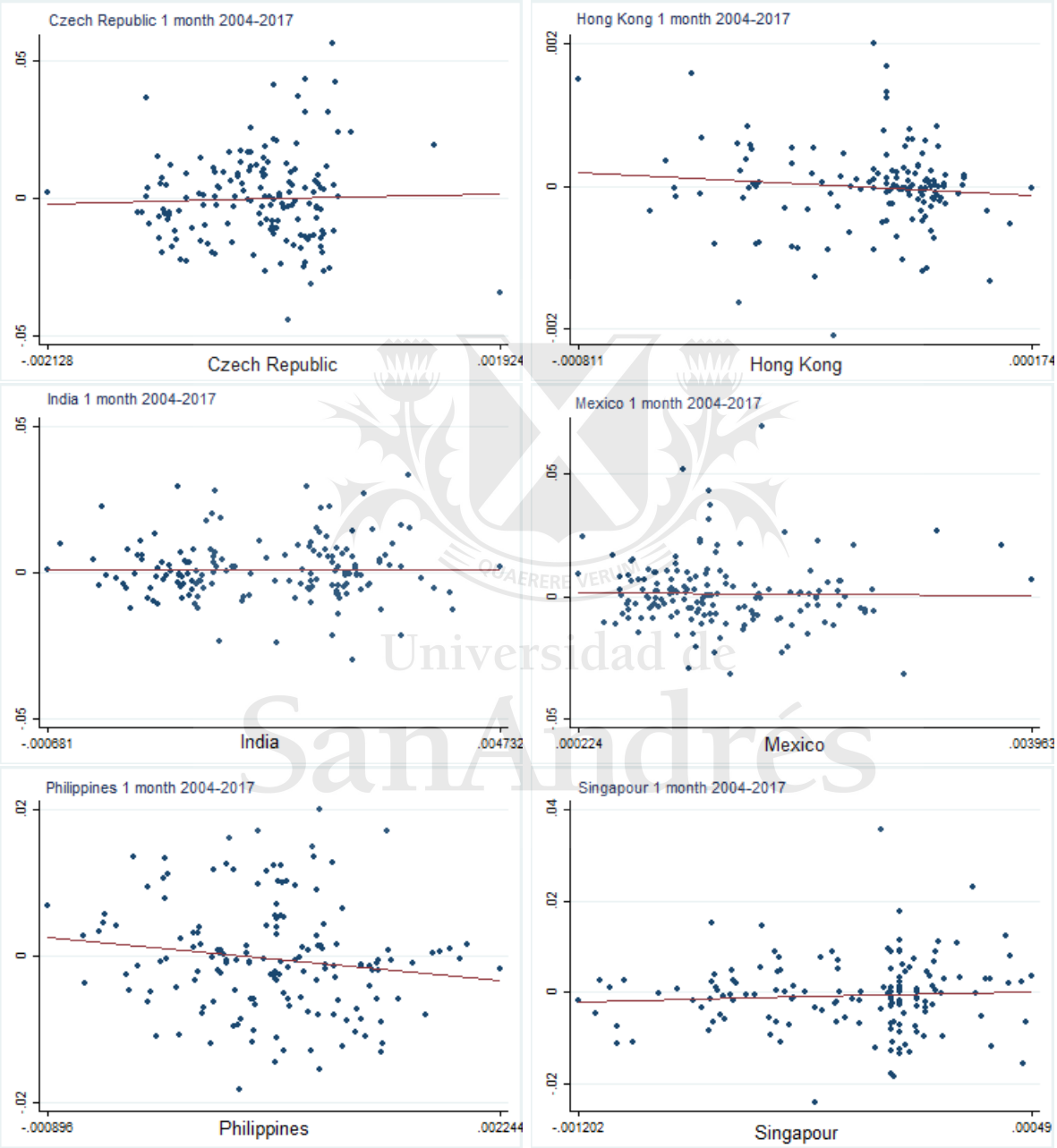
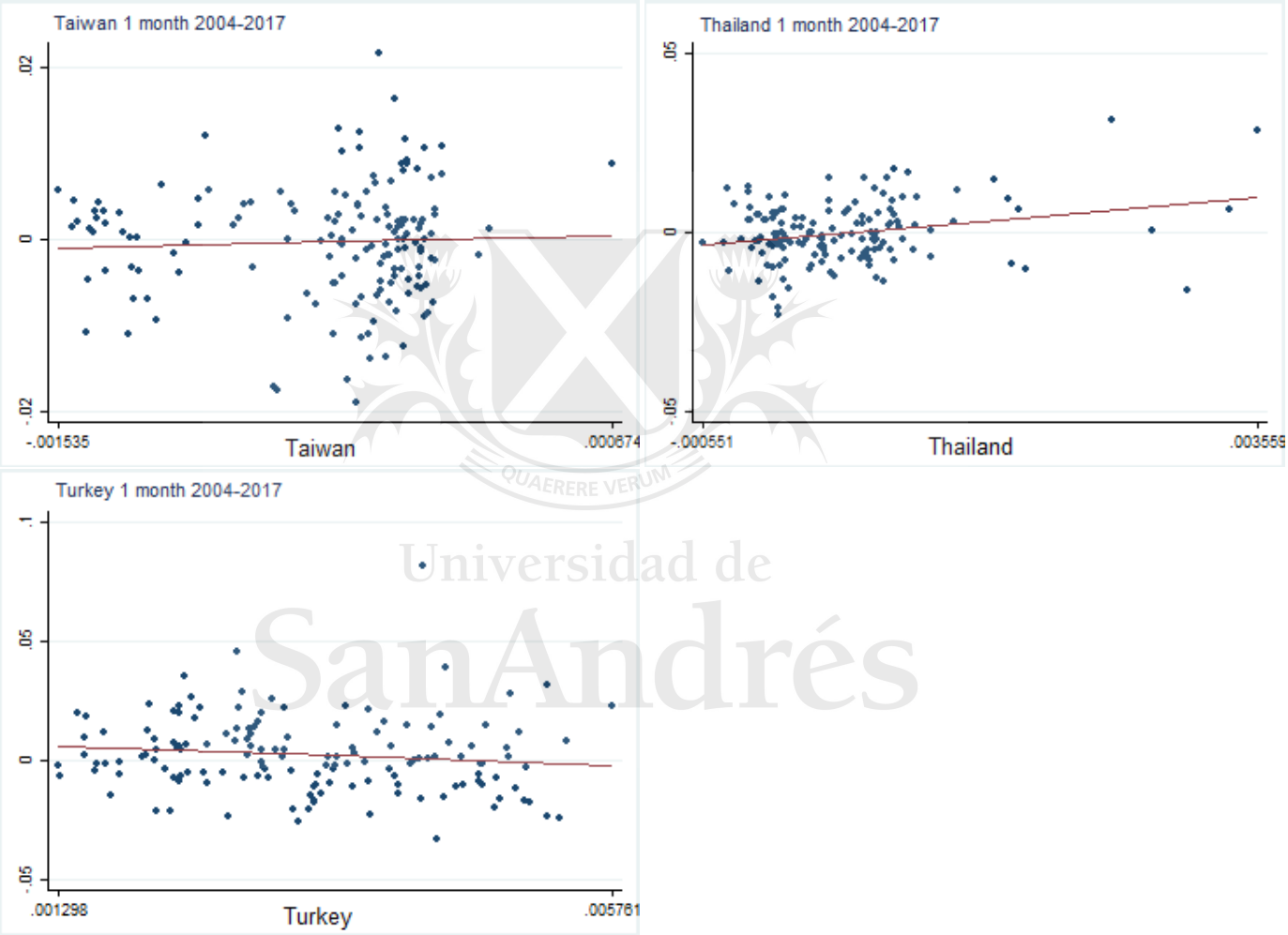


Figure 5 *(continued)*



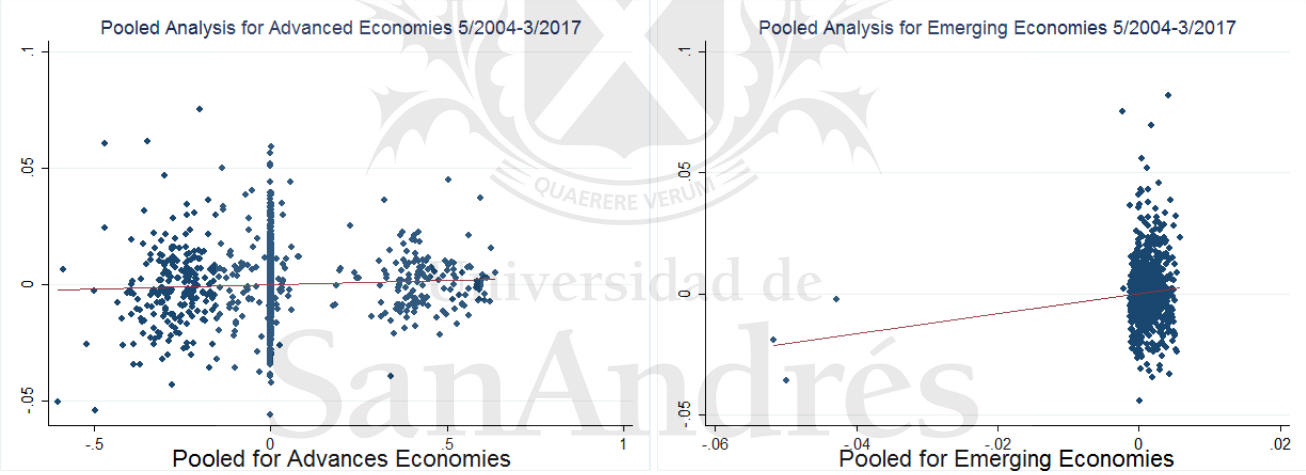
5.2 SUR & pooled

Continuing with the exercises performed in this paper, Table 3 reports the findings for the SUR for the period April 2004-March 2017. All advanced countries yield positive coefficients and except for Australia and Japan, no one is significant at a 5%. There is no clear general change in the Emerging Market economies when comparing both periods. No coefficient is significant at a 5% level, except for Thailand. The variations in the magnitude of the coefficients are small and in most cases stay within the standard error margin.

The pooled OLS and SUR studies illustrate in a summarized and simple way the change in the accuracy of the forward exchange rate as a predictor of the spot in the advanced economies. The coefficient for this group goes from being -1.87 at a 1% significance level to being 0.004 at a 10% in the OLS model. This gap widens in the SUR pooled regression. The coefficient is 0.5464986, when it used to be -1.559643. Although it loses statistical significance, its level is still higher than the one of the emerging economies.

For the emerging economies, the coefficients of both models differ in sign, but are close to zero and far to being significant.

Figure 6: Pooled regressions for 5/2004-3/2017.



5.3 Robustness Test: the post-crisis period 2010-2017

As it is well-known, in 2008 several investment banks were under strong stress (including the historic collapse of Lehman Brothers) and as a consequence the United States of America entered in a recession that would last until June 2009. Being that country one of the main and strongest economies, the subprime mortgage crisis rapidly spread across continents. This calls for a careful inclusion of the aftermath of the crisis in the regressions here. Tables 7, 8 and 9 in the Appendix display the results for this period. The exclusion of the crisis in the analysis causes a change in sign, magnitude and hypothesis rejection. In the pooled OLS study, the hypothesis of $\beta = 1$ cannot be rejected by neither group. Both coefficients are extremely close to zero. The pooled seemingly unrelated regression in both countries produce the same estimated coefficients (-3.18e-20).

6 Conclusion

Historically the forward exchange rate has been found a biased and opposite-sign predictor of the spot rate. Frankel and Poonawala (2010) prove that this conclusion cannot be generalized to all countries. Extending the analysis to Emerging Market economies, they show that in average the forward exchange rate was less biased and often positive for the members of this group. The authors also conclude that the Asian crisis did not affect their results.

This paper has found that the previous conclusions are sensitive to the time period included in the analysis. First the paper tested the performance of the alternative database in this paper against the results in the original paper, showing that the database is consistent with Frankel and Poonawala's. The next step is the update of the period included in this study. During the time lapse between May 2004 and March 2017, the forward exchange rate in Advanced Economies appears to be in average positive and even a less biased predictor than the one in emerging countries. The subprime crisis could be a possible explanation to this. Our robustness test for 2010-2017 yields different results.

Therefore, it is possible to conclude that the accuracy of the forward exchange rate as a predictor of the spot does not seem to depend on the type of country, but on the time period and possible shocks or crisis and their impact on the country group.

There is a void in the literature for the explanation of the different results for the groups of countries. Although some have proposed monetary institutions, inflation scenarios, and expectations as possible reasons, there has been no formal study. It would be interesting for future researches, to cast light on this unresponded issue. Most especially, on the causes of the changes in the results for the period 2010-2017; and why a crisis (the Asian crisis) did not change the results in one period and an other one (Subprime) did.

7 Appendix

Table 7: Without the crisis

Individual regressions 01/2010-03/2017 with robust standard errors and a forecast horizon of 1 month.

$$s_{t+1} - s_t = \alpha + \beta(f_t - s_t) + \epsilon_t$$

	β(SE)	t:$\beta = 0$	F prob
Advanced Economies			
Australia	0.0138	1.06	0.291
	(0.0129917)		
Canada	-.6670317	-0.19	0.854
	(3.602035)		
Denmark	2.51e-13	4.46	0.000
	(5.63e-14)		
Japan	2.643795	0.62	0.537
	(4.265871)		
New Zealand	0.0484058	2.11	0.038
	(0.0229622)		
Norway	-0.9733996	-0.26	0.794
	(3.713451)		
Sweden	-3.18e-14	-0.34	0.736
	(9.40e-14)		
Switzerland	-1.718341	-0.50	0.621
	(3.45925)		
UK	0.0053094	0.33	0.744
	(0.0161781)		
Emerging Economies			
Czech Republic	-1.84e-13	-4.18	0.000
	(4.39e-14)		
Hong Kong	-0.0007564	-0.13	0.894
	(0.0056372)		
India	-0.2607088	-0.16	0.871
	(1.606005)		
Mexico	-6.716433	-1.63	0.108
	(4.129899)		
Philippines	-3.151376	-2.38	0.019
	(1.322713)		
Singapore	-1.76e-14	-0.19	0.853
	(9.45e-14)		
Thailand	3.762892	2.17	0.033
	(1.735476)		
Turkey	-1.784916	-1.02	0.311
	(1.75217)		

Table 8
Pooled OLS regression with robust standard errors and a forecast horizon of 1 month.

	β(SE)	t:$\beta = 0$	t:$\beta = 1$	F prob
Advanced Economies				
2010-2017	-3.18e-20	-1.05	1.9285	0.292
	(3.01e-20)			
Emerging Economies				
2004-2017	4.04e-10	0.41	20431	0.683
	(9.89e-10)			

Table 9
Pooled seemingly unrelated regression
(Without Australia, New Zealand,UK, Taiwan, Thailand and Turkey).

	Coef	SE	z	$P > z$
Advanced Economies				
2010-2017	-3.18e-20	1.44e-19	-0.22	0.825
Emerging Economies				
2004-2017	-3.18e-20	1.44e-19	-0.22	0.825

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