Nonlinearities in Exchange rates: Double EGARCH Threshold Models for Forecasting Volatility

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Abstract

This paper illustrates how to specify and test a Double Threshold EGARCH Model for some important exchange rates. The analysis is monthly and refers to the period 1990.01-2007.06. The procedure involves testing for Threshold effects the residuals of a linear autoregressive model of the exchange rate that is taken as the starting point. If this preliminary testing is favourable to the hypothesis off nonlinearity one then specifies and estimates a threshold model using Tong (1983,1990) algorithm, Tong algorithm allows to specify separately two AR regimes and helps locating both the delay and the parameters of the regimes using a search procedure based on the AIC. Residual for the SETAR model are then further tested for conditional heteroskedasticity. If it is present then a Double symmetric EGARCH is fitted to the data by maximum likelihood. The result is compared with an AR GARCH model both in sample and out of sample to asses whether there is any forecasting superiority of the more complex model.

Reported results favour this outcome.

In the text of the paper we report explicitly the results for the Japanese yen and the British pound exchange rates vis a vis the US dollar, but the same procedure has been applied to many other exchange rate series with results favourable to the double variance model in more than 50% of the cases. We report the complete results in the appendix. We conclude that the proposed model is both feasible and of wide applicability to the analysis of volatility of exchange rates. We add two provisos: data are monthly and the period of estimation reflects only the most recent experience.

KEY WORDS: non linearity; forecasting volatility; exchange rates.

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.....recent research finds correlation among volatility is stronger than that among returns.

Forecasting volatility in Financial Markets, Poon &Granger (2003)

1. Introduction

Threshold models have been often considered in connection with exchange rates. This form of nonlinearity may in fact appear quite natural if one believes that the market or the Central Bank has a depreciation/appreciation target rate in mind. In this case it is sufficient to assume the functioning of the market can be different above or below the target to generate a TAR model with two regimes.

Define s_t as the first difference of the exchange rate x 100. Write:

$$s_t - s_{t-1} = \alpha_1 (s^T - s_{t-1})_{s_{t-1} \le s^T} + \alpha_2 \left(s^T - s_{t-1} \right)_{s_{t-1} \ge s^T} + u_t ,$$

Thus obtaining a SETAR model with two regimes[1] and delay parameter =1. Of course the above model can be generalized, The AR(1) model can be generalized to AR(p) with p possibly different among the two regimes and the delay parameter can take any value between 1 and p.

It can be shown by simulation that SETAR models can generate spurious conditional eteroskedasticity when judged by the conventional LM test.[2]. However, by examining and comparing a number of estimated models, neglected TAR effects do not appear to be the explanation for the presence of ARCH EFFECTS, in fact conditional eteroskedasticity is quite often present in the residuals of fitted SETAR models. The obvious solution would be to model the residuals with a GARCH(1,1) process. However this solution can be quite biased. In fact it is natural to associate two different variances to the two regimes (one regime can be devoid of ARCH effects, one regime can have a much larger and more persistent variance than the other) if it is so estimating an average model can have weak relation with the underlying parameters. Our intuition is that one should be able to reach better forecasting properties for volatility adopting a more elaborated model. One difficulty is that, given the elevated number of parameters is rather likely that the estimation of two separate GARCH(1,1) will fail because inadmissible numerical values are found for the parameters. This difficulty is easily resolved using a logarithmic specification, namely resorting to a symmetric EGARCH specification.

Double threshold ARCH model have in a few cases been proposed in the literature. The earliest example we know is Li&Li (Journal of Applied Econometrics, 1996) who proposed a SETAR ARCH and applied it to the daily Hong Kong Hang Seng Index. More recently C. Brooks Journal of Forecasting (2001) proposed a Double threshold GARCH model for the French/Deutschmark exchange rate also at the daily level. The predictability of the exchange rate by a class of threshold models has been examined by Boero and Marrocu (Journal of forecasting 2002) To our knowledge the present paper reports the first systematic investigation of the forecasting properties both in term of mean and of variance of a SETAR model using a logarithmic double specification for the conditional variance.

2. Data and model selection procedure

The main contribution of this paper is in showing the feasibility and efficiency of the specification procedure that we a have devised to estimate a model that is so heavily parameterized.

The following table will help illustrating the model selection procedure that we have followed.

Data are monthly; from Jan 1990 to June 2007.The period 1990.01-2006.03 has been used for estimation while the remaining 13 observation from 2006.04 to 2007.06 have been used for ex

[1] Others have considered threshold models in connection with the functioning of target zones. In this case the appropriate TAR model is one with a three regimes. This case seems less relevant recent historical setting..

[2] Recently Blake and Kapetanios ("007) have examined the issue first raised by Lumsdaine and NG (1999).

ante forecasting. The choice of the periodicity depends on the fact that we are interested in matching the volatility forecasts with the length of contracts for which forecasting volatility may be of some use. The month, while shorter of most contracts of interest, can be a reasonable compromise between degrees of freedom needed for estimation and realism. We have considered a large number of currencies, about 30. Among them there are two main currencies, the yen and the pound, and a number of regional currencies that in table appear disaggregated for areas. It is noteworthy that in the analysis the euro is missing because of two reasons: the first is that the series is too short at monthly level to allow an efficient estimation, the second is, perhaps surprisingly, that returns not display any sign of conditional eteroskedasticity or of non linearity at least at this level. [3]

On the contrary, one can see from the table reported below and tables 2 & 4 in the appendix that almost all currencies after filtering display conditional eteroskedasticity and some form on non linearity according to the test RESET.

It is important to notice that if the mean equation is misspecified because of serial correlation or nonlinearity the standard ARCH LM test has the tendency to reject the null too often. The circumstance has been evidenced by Lumsdaine and Ng (1999) who have proposed a robust variant of the test.[4] We will not follow this road here since we do not depend in our selection procedure from the result of the ARCH test. We first test for threshold nonlinearity, if the test is positive we estimate the threshold model and only then we test the residuals for ARCH effects.

For the the purpose of testing for threshold nonlinearity the RESET test is known not to be the best suited. We will employ instead the tests proposed by Luukkonen, Saikkonen and Teräsvirta (1988), that are meant for smooth transition non linearity but work equally well for thresholds. With the aid of these tests we find evidence of threshold nonlinearity in 24 currencies out of 32. It is noteworthy to notice that the yen and the pound that were not sensitive to the RESET test respond positively to these more specialized tests. Following the indication of the tests a two regime SETAR has been estimated for the 24 countries. Results of such estimation, performed using Tong (2000) procedure of arranged separate regressions, are in table 7 in the Appendix. Residuals of the SETAR models can be tested for conditional eteroskedasticity by means of the usual ARCH LM test. It turns out that in most cases residual conditional eteroskedasticity is still present. In these cases, 18 out of 24, a Double threshold EGARCH model has been fitted in these cases and exploited in a forecasting comparison against the random walk model and a standard AR-GARCH.

The SETAR-Double EGARCH has been found adequate for more than 50% of the cases examined.

[3] Residuals of an AR(2) fitted to the 98 data available display a LM ARCH test with p-value of 0.94 and a RESET test with 0.32. On the other hand at the daily level GARCH effects are quite detectable.

[4] A different test derived from neural network considerations has been proposed in the cited article by Blake and Kapetanios. The test is very similar to those proposed by Terasvirta and others. In our analysis we have made use of these tests.

ENSEMPLE VIEW of the
MODEL SELECTION PROCEDURE

Cfr.Tables in the Appendix, n.:		2	4	4	6	7	8	9
		Excess kurtosis in returns	AR Residuals Arch effects	AR Residuals Reset test	AR Residual SETAR nonlinear tests	Estimated SETAR	SETAR Residuals LM ARCH test	Estimated SETAR DEGARCH
	Main currencies							
1	Japanese yen	yes	weak	no	yes	yes	no	yes
2	British Pound	yes	yes	yes	yes	yes	yes	yes
	European currencies							
3	Swiss Franc	yes	no	no	yes			
4	Norwegian Krone	yes	weak	no	no			
5	Icelandic krone	yes	yes	yes	yes	yes	yes	yes
6	Hungarian Florint	yes	no	yes	yes			
7	Polish Zloty	yes	yes	yes	yes	yes	yes	yes
8	Turkish Lira	yes	yes	yes	yes	yes	yes	yes
	American currencies							
9	Canadian Dollar	yes	yes	no	no			
10	Bolivian Boliviano	yes	yes	yes	yes	yes	yes	yes
11	Mexican Peso	yes	yes	yes	yes	yes	yes	yes
12	Paraguay Guaranì	yes	yes	yes	yes	yes	yes	yes
13	Venezuelan Bolivar	yes	no	yes	yes			
14	Peruvian New Soles	yes	no	yes	yes			
15	Chilean Peso	yes	yes	no	yes	yes		yes
16	Argentina Peso	yes	yes	yes	yes	yes	no	yes
	Asiatic currencies							
17	Singapore Dollar	yes	yes	no	yes	yes	yes	yes
18	South Korean Won	yes	yes	yes	yes	yes	yes	yes
19	New Taiwan Dollar	yes	yes	yes	yes	yes		yes
20	Ringgit Malaysia	yes	yes	yes	yes	yes		yes
21	Indian Rupee	yes	no	yes	yes			no
22	Sri Lanka Rupee	yes	no	yes	yes			no
23	Thailand Baht	yes	yes	yes	yes	yes		yes
24	Bangladesh Taka	yes	yes	no	yes			no
	African currencies							
25	Cote d'Ivoire – CFA Franc	yes	no	no	no			
26	Congo Franc	yes	no	no	no			no
27	Botswana Pula	yes	yes	no	yes	yes	yes	yes
28	South.African. Rand	yes	yes	no	yes	yes	no	yes
	Other currencies							
29	Australian Dollar	no	yes	no	yes	yes	yes	yes
30	New Zealand Dollar	yes	yes	no	no		no	no
	number of countries	29	22	16	25	18	18	18

2. The AR(p) filtering equations

In the following we report and comment, for every step of the model selection procedure, results for the yen and the pound. Results for the other currencies are reported in the tables in the appendix 1.

	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	Sum	AIC
Pound	-0.0895	0.3570	-0.2417	0.1346				914.576	4.36
	-0.4527	5.1399	-3.4139	1.9654					
Yen	-0.1020	0.2955	-0.0338	0.0670	-0.0868	-0.1744		1247.111	4.71
	-0.5412	4.2204	-0.4671	0.9274	-1.2038	-2.5173			

t-ratios in parenthesis

In both cases the selection of the best AR(p) based on the AIC produces relatively long lags. The models selected may not result the best in forecasting. Remember however that the purpose of this step is to filter away any linear dependence in the data.
For the other currencies results can be observed from table 3. Most returns exhibit AR(1) behaviour, but a few and notably the yen and the Taiwan dollar require up to five lags. The AR models have been estimated minimizing the AIC. Insignificant coefficient have been retained.

3. Generic misspecification residual tests

Residual of the preferred linear filtering equation can be tested for a generic misspecification, namely autocorrelation, autocorrelation in the squares, arch effects and functional form via RESET.

	Ljiung-Box	McLeod-Li	Arch LM	Reset Test
Pound	25.4440	51.1040	14.2212	4.5252
	0.5715	0.0230	0.0002	0.1041
Yen	26.4920	38.6160	5.3645	12.8517
	0.6970	0.1630	0.0684	0.0003

Evidence is mixed. For the pound ARCH effects are present while the RESET test does not signal. In the contrary, for the yen RESET is quite strong while evidence of ARCH effects is weak. For the other currencies, as can be seen from table 4 results are similar there is anyway diffuse evidence of residual ARCH. The RESET test often appears indecisive.

4. Specific tests against threshold effects

The RESET test is known not be powerful against TAR types of nonlinearity. There are a vast number of nonlinearity test devised for threshold models. Here we report results for the well known triplet proposed by Luukkonen, Saikkonen and Terasvirta (1988) that is meant for smooth transition models but is equally well applicable to thresholds. We choose this test because it is easy to apply, it does not require arranged data, and in simulation appear to work quite satisfactorily.

	S_3 Test	S_2 Test	S_3 Test
Pound	7.8924	16.3551	17.7581
Yen	11.2169	39.3102	48.5253

According to its proponents the test S3 is the most powerful in detecting threshold effects especially when intercept of the two AR regimes are different from each other. .As we have already said we rely on these tests to select currencies that may be modelled with a threshold model. 24 currencies, including the pound and the yen, pass this test and can be modelled successfully as a two regimes SETAR as is shown in the next paragraph and in Table 7 in the appendix.

5. Estimation of the SETAR model via Tong procedure

Results of the testing stage encourage to positing a 2 regime SETAR model of unknown delay parameter and orders.

The research of the best fitting model has been carried according the procedure of arranged autoregressions proposed by Tong (1983,1990) using the AIC as the criterion for the best fit. Since Tong's procedure involves estimating separately the two regimes, a combined AIC (as in Tong 1990) has been employed in order to rank different specifications.

Results of this OLS procedure for the pound and the yen are the following:

		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
Pound	Regime 1	193	-0.0811	0,2511	-0.2289	0,1479	0,0946	-0.0609	0,0039	1,9540
			-0.5597	3,0842	-3.0796	2,0603	1,2606	-0.8462	0,0592	
	Regime 2	10	-0.7576	0,4534	0,1194	-1.5713	0,2803	-0.7622		2,4862
			-0.3131	1,1253	0,3631	-2.6293	0,6696	-2.3347		
	d=1	soglia =	3,7556	st. dev. =	1,9834	AIC =	4,2283			
		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
Yen	Regime 1	195	-0.126	0,2903	-0.0355	0,0698	-0.1002	-0.206		2,5139
			-0.6926	4,0632	-0.4809	0,9439	-1.2817	-2.8969		
	Regime 2	8	7,2286	1,2621	-0.3059	0,3105	-1.5847	0,7643	0,0194	0,4228
			3,4565	6,6342	-1.7723	2,7515	-3.8214	7,4782	0,1400	
	d=4	soglia =	3,9463	st. dev. =	2,4595	AIC =	4,5348			

Residual of this threshold model can be tested for conditional heteroskedasticity with the usual LM test.

Result for the test of order 4 are reported below.

	ARCH LM
Pound	2.6156 0.2548
Yen	15.9098 0.0001

The test for the pound is rather inconclusive. As a result we decide to estimate anyway the double SETAR-EGARCH we are investigating also for this currency.

As usual results for the other currencies are in TABLE 8 in the Appendix . Based on these tests we limit to 18 the number of currencies for which a Double TEGARCH may result appropriate.

6. Estimation of the Double SETAR-EGARCH model

Using the SETAR determined by the TONG procedure we now estimate via maximum likelihood the double mean - double variance model under scrutiny. We have chosen a symmetric EGARCH specification for the variance instead of the more common GARCH because the difficulty of obtaining always admissible values for the parameters in the latter specification. The logarithmic specification will always produce admissible values for the parameters even when they are near zero.

Results for the pound and the yen are:

Pound	**Regime 1 193obs**	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**
		-0.0811	0.2572	-0.2397	0.0948	0.0980	-0.0744	-0.0149
		-0.5077	3.0635	-2.8285	1.2272	1.0919	-1.0468	-0.2299
		C	**RESID(-1)^2**	**GARCH(-1)**				
		0.2474	0.1214	0.7365				
		0.6085	0.8126	2.1792				
	Regime 2 10obs	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**
		-0.3373	-0.0853	-0.6294	2.2746	-0.6594	1.0432	
		-0.0395	-0.0401	-0.6687	1.4614	-0.6929	2.7271	
		C	**RESID(-1)^2**	**GARCH(-1)**				
		3.5729	-0.6038	-0.8291				
		1.1478	-0.7825	-0.6057				
	d=1 soglia =	3,7556						
Yen	**Regime 1 195obs**	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**
		-0.0772	0.2283	0.0163	0.0703	-0.0512	-0.2039	
		-0.4268	2.7501	0.2133	0.9439	-0.6191	-3.2812	
		C	**RESID(-1)^2**	**GARCH(-1)**				
		1.1950	0.4217	0.1242				
		2.8424	2.2853	0.5062				
	Regime 2 8obs	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**
		-16.1833	-2.4133	0.3914	-0.8428	3.3961	-1.0190	0.5835
		-0.0862	-0.1002	0.5467	-0.0961	0.0897	-0.1152	0.0527
		C	**RESID(-1)^2**	**GARCH(-1)**				
		-6.3517	4.9647	-1.2899				
		-0.0376	0.2331	-0.0126				
	d=4 soglia =	3,9463						

Results for the pound show quite significant individual coefficients. The threshold value at 3.7 (the plus sign indicates a process of depreciation) separates the two regimes. In practice there is one basic regime that operates most of the times and one that is set up by strong depreciations.

Results for the yen are similar save that the delay parameter is estimated at 4. We interpret this result as indicating that the delay may involve an average of periods of which the 4^{th} is the more important. A further search allowing for this possibility may be appropriate in these cases.

Complete results for the other currencies are in Table 9 in the Appendix.

Examining this table we can make a few observations:

i) About half of the currencies have a delay parameter of one month. However there are many cases for which the delay parameter takes values as high as 5 or 6. We interpret this case as meaning that probably the transition is based on a average of the recent behaviour of which the estimated single value is probably the most important. The intuition will be explored in the next revision of the paper.

ii) Very often the second regime ha a much simpler structure. So the two regimes of variance can be very different. This is confirmed by the forecasting results, the average model (the AR-GARCH) is always inferior to the DTEGARCH.

6. Out of sample Forecasting result

In the forecasting comparison below we compare one year of 1-period in advance forecasts of observed volatility (defined as the square of actual returns) produced by the Double SETAR_EGARCH with forecasts of the same variable obtained with a conventional AR-GARCH or assuming that the observed volatility of next period will be equal to that of the previous period.

Reults for ex ante forecasting

Forecasting

Results for Mean						
	MAE			RMSE		
	RW	GARCH	SETAR_DE GARCH	RW	GARCH	SETAR_DE GARCH
Pound	0.5931	1.3034	1.1943	0.6880	1.4865	1.5065
Yen	0.7198	1.4512	1.3644	0.8298	1.7361	1.6856

Results for Variance									
	MDAPE			MAE			RMSE		
	RW	GARCH	SETAR_DE GARCH	RW	GARCH	SETAR_DE GARCH	RW	GARCH	SETAR_DE GARCH
Pound	21.6425	12.2643	8.9738	3.4947	3.2169	2.6006	4.6522	3.5020	2.9956
Yen	12.8897	18.7530	17.1008	2.6270	4.0526	3.5217	3.5902	4.3305	4.1353

Where:
RW, random walk (the constant drift of the series)
GARCH, the conventional AR-GARCH
MAE, mean absolute error
RMSE, root mean squared error

If we classify with 1,2 and 3 according to the ascending size of the prediction error we can obtain a Table reported below from which one can derive the following conclusions:

a) In predicting the mean the RW is almost never beaten by either the AR-GARCH or by the SETAR-DEGARCH, but the threshold model beats the AR_GARCH almost always. Results vary according to the measure chosen (MAPE or RMSPE) but the general pattern is clear.

b) In predicting the variance the order Is partially reversed the SETAR-DEGARCH comes almost always first and beats the random walk, while the standard AR-GARCH comes invariably third.

Misspecification of the mean appears thus as the most likely cause of the predictive failure of the standard model.

Results for the forecasting competition

	Forecast competition for the mean							
		MAPE				RMSPE		
		RW	GARCH	D_EGARCH		RW	GARCH	D_EGARCH
1	British Pound	1	3	2		1	3	2
2	Giapanese Yen	1	3	2		1	3	2
3	Icelandic Krone	1	3	2		1	3	2
4	Polish Zloty	1	2	3		1	3	2
5	Turkish Lira	1	3	2		1	3	2
6	Bolivian Boliviano	2	3	1		1	3	2
7	Mexican Peso	1	3	2		1	3	2
8	Paraguay Guarany	1	3	2		1	3	2
9	Chilean Peso	1	3	2		1	3	2
10	Argentina Peso	1	3	2		1	3	2
11	Singapore Dollar	2	3	1		3	2	1
12	New Taiwan Dollar					1	3	2
13	Ringgit Malaysia	1	2	3		1	2	3
14	Thailand Bhat	1	2	3		1	2	3
15	South African Rand	1	2	3		1	2	3
16	South Korean Won	1	3	2		1	2	3
17	Botzwana Pula	1	3	2		1	3	2
18	Australian Dollar	1	2	3		1	3	2

	Forecast competition for the variance										
		MedAPE				MAPE				RMSPE	
		RW	**GARCH**	**D_EGARCH**		**RW**	**GARCH**	**D_EGARCH**		**RW**	**GARCH**	**D_EGARCH**
1	British Pound	3	2	1		3	2	1		3	2	1
2	Giapanese Yen	3	2	1		1	2	3		1	3	2
3	Icelandic Krone					3	2	1		3	2	1
4	Polish Zloty	3	2	1		2	3	1		1	2	3
5	Turkish Lira	3		1		3	2	1		3	2	1
6	Bolivian Boliviano	3	2	1		3	2	1		3	2	1
7	Mexican Peso	3	2	1		1	3	2		3	2	1
8	Paraguay Guarany	3	2	1		1	3	2		3	2	1
9	Chilean Peso	2	3	1		1	3	2		2	3	1
10	Argentina Peso	1	3	2		1	3	2		1	3	2
11	Singapore Dollar	3	2	1		3	2	1		3	2	1
12	New Taiwan Dollar	1	3	2		1	3	2		1	3	2
13	Ringgit Malaysia	2	3	1		1	3	2		2	3	1
14	Thailand Bhat	3	1	2		3	2	1		1	3	2
15	South African Rand	1	3	2		1	3	2		2	3	1
16	South Korean Won	2	3	1		1	3	2		2	3	1
17	Botzwana Pula	2	3	1		2	3	1		1	3	2
18	Australian Dollar	3	2	1		3	1	2		3	2	1

7. Conclusions

There are a number of conclusions and observations that we can make on the basis of the above results

i) The SETAR model with two regimes is confirmed to be a model of quite wide applicability in the case of exchange rates. It fits 18 out of 32 cases examined.

ii) Residual of the SETAR model are not in general devoid of conditional eterosckedasticity. The choice to model it with a standard GARCH does not appear warranted. Such solution in fact produces inferior results with respect two the double EGARCH in all cases examined.

iii) Our study considers monthly data while most volatility studies report concentrate of daily behaviour, working with monthly data we could expect to find more easily evidence of threshold effects but less for arch effects. In fact we found that residual conditional eteroskedasticity is present in the majority of the currencies examined. We may notice that are results differ from those of Pippenger and Goering (1998) that also had investigated monthly data in two respects one our data are almost completely non overlapping in time with those used by the authors, it is then possible that there more recent experience reflects more volatility in exchange rates and two our data are from the global economy while the cited authors made reference to European currencies in a period of convergence to the Euro. Is the possible that these data reflect more volatile conditions that those experienced in that period and under those conditions.

iv) Estimating threshold models requires locating the threshold value and the separate regimes. We experienced with various methods but we found that Tong algorithm is quite effective both in locating the delay parameter and in estimating the regimes.

v) Our out of sample forecasting results indicate that the random walk provides the best forecast for the mean, the result is capsized however for the variance where the DTEGARCH is superior in most cases to the random walk. It is noteworthy to notice that the DTEGARCH is always superior to the standard AR-GARCH (the average model) both in mean an variance.

As a general conclusion we may state that it may be worth to invest in the specification of the mean in order to obtain a better forecast of the variance.

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Appendix 1

Table 1
List of Tables

Table 2
Descriptive statistics for many exchange rate series of returns.

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Sum	Sum Sq. Dev.
Pound	-0.0885	-0.0771	11,0760	-5.6548	2,2770	0,8370	6,2651	117,2466	-18.4973	1078,454
Yen	-0.0799	0,0415	8,0641	-10.5212	2,6843	-0.5469	4,2001	22,95885	-16.6935	1498,786
Switzerland Franc	-0.0993	0.1843	9.2763	-8.2425	2.6719	-0.1257	3.4527	2.3346	-20.7614	1484.9520
Norwegian Krone	-0.0418	0.2028	8.2485	-5.6625	2.3938	0.0246	3.0164	0.0234	-8.7459	1191.9260
Icelandic Krone	0.0002	0.0000	0.0951	-0.0673	0.0256	0.4633	4.0250	16.6250	0.0330	0.1365
Hungary Forint	0.5247	0.5773	11.8220	-6.4297	2.3925	0.1572	4.9446	33.7901	109.6553	1190.6370
Polish Zloty	0.5240	0.3501	12.8942	-8.2375	2.6917	0.5258	5.8715	81.4330	109.5062	1506.9980
Turkish Lira	3.0325	2.8994	43.4201	-8.2187	5.1210	2.9409	22.5385	3625.6790	633.7891	5454.6950
Canadian Dollar	-0.0458	-0.0255	3.1576	-5.2225	1.3721	-0.4628	3.4815	9.4785	-9.5643	391.6117
Bolivian Boliviano	0.4644	0.4819	1.9755	-0.2885	0.3586	0.3448	3.8881	11.0092	97.0583	26.7546
Mexican Peso	0.6719	0.1930	33.8320	-6.1905	3.3824	5.5634	49.4385	19857.9500	140.4187	2379.5960
Paraguay Guarani	0.6675	0.4114	13.3984	-5.9026	2.1311	1.7412	11.3607	714.3263	139.5070	944.6065
Venezuelan Bolivar	1.8664	0.4435	39.4067	-7.7549	5.1573	4.0020	22.4920	3866.4970	390.0815	5532.3990
Peruvian New Soles	3.0158	0.3433	190.6585	-3.5932	14.7244	10.3616	128.3495	140569.5000	630.3041	45095.9200
Chilean Peso	0.2745	0.3004	6.3501	-6.1027	1.9621	-0.3736	3.7869	10.2548	57.3745	800.7929
Argentina Peso	1.3892	0.0000	79.9568	-6.7468	7.6703	6.7407	59.4294	29312.5300	290.3382	12237.5000
Singapore Dollar	-0.1062	-0.1525	5.6435	-5.6980	1.3204	0.2313	6.7611	123.8509	-21.9732	359.1416
South Korean Won	0.1444	0.0381	36.8782	-8.9264	3.3485	6.5159	72.3262	43332.1800	30.1752	2332.1280
New Taiwan Dollar	0.1122	0.0231	6.8265	-4.5015	1.3093	0.6812	7.3696	182.4337	23.4512	356.5644
Ringgit Malaysia	0.1158	0.0000	15.1165	-14.4828	2.2473	1.0788	26.3143	4774.0040	24.1981	1050.4370
Indian Rupee	0.4175	0.0557	19.5607	-5.9106	1.9730	4.8772	46.2519	17119.5000	87.2664	809.7042
Sri Lanca Rupee	0.4880	0.3345	4.5319	-5.7155	0.9307	-0.5412	13.4278	957.1339	101.9894	180.1578
Thailand Baht	0.1088	-0.0557	21.0229	-14.1612	2.9997	2.4222	23.0533	3706.2870	22.7384	1871.6350
Bangladesh Taka	0.3632	0.0000	4.5719	-2.6349	0.8667	2.3145	11.9114	878.1613	75.9007	156.2568
Cote d Ivoire - CFA Franc	0.2532	-0.0183	70.5347	-6.4394	5.4446	10.3297	134.2466	153723.6000	52.9145	6165.9230
Congo Franc	0.2532	-0.0183	70.5347	-6.4394	5.4446	10.3297	134.2466	153723.6000	52.9145	6165.9230
Botzwana Pula	0.5752	0.3470	15.9681	-16.3010	2.9849	0.5750	12.8872	862.8093	120.2222	1853.1500
South African Rand	0.4928	0.5424	18.1426	-8.6824	3.1444	1.0865	9.0334	358.1164	102.9975	2056.5050
Australian Dollar	-0.0361	-0.0170	5.9232	-5.8578	2.2310	0.1405	2.8221	0.9631	-7.5433	1035.2510
New Zealand Dollar	-0.1095	-0.0300	6.5198	-7.4126	2.3068	0.0784	3.3595	1.3397	-22.8774	1106.8750

Table 3
AR linear filters

	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	Sum	AIC
Pound	-0.0895	0.3570	-0.2417	0.1346				914.576	4.36
	-0.4527	5.1399	-3.4139	1.9654					
Yen	-0.1020	0.2955	-0.0338	0.0670	-0.0868	-0.1744		1247.111	4.71
	-0.5412	4.2204	-0.4671	0.9274	-1.2038	-2.5173			
Switzerland Franc	-0.0678	0.3377	-0.1748	0.0884	-0.1325			1283.874	4.72
	-0.3376	4.8409	-2.3828	1.2082	-1.9080				
Norwegian Krone	-0.0501	0.3684	-0.1658					1038.690	4.48
	-0.2545	5.3472	-2.4077						
Icelandic Krone	0.0001	0.4536	-0.1597					0.112	-4.65
	0.0439	6.5760	-2.3070						
Hungary Forint	0.5134	0.2652						1103.013	4.53
	2.3514	3.9529							
Polish Zloty	0.5297	0.3190						1353.423	4.73
	2.0295	4.8304							
Turkish Lira	3.0227	0.4759						4222.368	5.87
	5.0462	7.7510							
Canadian Dollar	-0.0650	0.2812						356.737	3.40
	-0.5122	4.1885							
Bolivian Boliviano	0.4381	0.7710						10.592	-0.12
	6.3584	17.4338							
Mexican Peso	0.6680	0.2550						2224.729	5.23
	2.1841	3.7845							
Paraguay Guarani	0.7087	0.3909	-0.1275	0.1120	0.0611	0.1333		737.671	4.18
	2.2556	5.5698	-1.6921	1.4879	0.8192	1.9134			
Venezuelan Bolivar	1.8630	0.3459	-0.2174	0.0828	0.1766			4595.568	6.00
	3.4061	4.9691	-2.9563	1.1262	2.5378				
Peruvian New Soles	2.0394	0.3821	0.0121	0.0388	0.1608			32337.820	7.95
	0.9293	5.5031	0.1633	0.5233	2.3469				
Chilean Peso	0.2766	0.4175	-0.1131					675.505	4.05
	1.5216	6.0059	-1.6252						
Argentina Peso	0.8828	0.6851	-0.1450					3435.071	5.67
	1.4200	10.3036	-3.1058						
Singapore Dollar	-0.0996	0.2578						333.997	3.34
	-0.8291	3.8175							
South Korean Won	0.1362	0.6177	-0.3149					1635.960	4.93
	0.4823	9.2969	-4.7390						
New Taiwan Dollar	0.0873	0.3356	0.0012	0.0095	-0.1890	0.1275		301.025	3.29
	0.7229	4.7588	0.0166	0.1311	-2.6000	1.8215			
Ringgit Malaysia	0.1186	0.2457						987.110	4.41
	0.5893	3.6347							
Indian Rupee	0.4185	0.2429						761.887	4.16
	2.3762	3.5935							
Sri Lanca Rupee	0.4919	0.2216	-0.1273					169.959	2.67
	7.0222	3.1903	-1.8308						
Thailand Baht	0.1067	0.2833						1721.632	4.97
	0.3816	4.2362							
Bangladesh Taka	0.3437	0.1392	-0.0802					135.868	2.45
	5.6987	2.1135	-1.2182						
Cote d Ivoire - CFA Franc	0.2605	0.0460						6150.854	6.24
	0.6558	0.6607							
Congo Franc	0.2605	0.0460						6150.854	6.24
	0.6558	0.6607							
Botzwana Pula	0.5849	0.1035						1830.550	5.03
	2.5368	1.4935							
South African Rand	0.5021	0.3304						1831.525	5.03
	1.6261	5.0228							
Australian Dollar	-0.0547	0.3072	-0.2100	0.1328				921.491	4.37
	-0.2830	4.3865	-2.9268	1.8854					
New Zealand Dollar	-0.1284	0.2944						1008.207	4.44
	-0.5908	4.4080							

Table 4: Standard misspecification tests for AR Residuals

	Ljiung-Box	McLeod-Li	Arch LM	Reset Test
Pound	25.4440	51.1040	14.2212	4.5252
	0.5715	0.0230	0.0002	0.1041
Yen	26.4920	38.6160	5.3645	12.8517
	0.6970	0.1630	0.0684	0.0003
Switzerland Franc	26.3270	15.8290	1.0488	2.9820
	0.7490	0.9930	0.3058	0.3944
Norwegian Krone	16.2810	22.4560	6.4036	1.7620
	0.9960	0.9350	0.6021	0.1844
Icelandic Krone	19.3450	44.2840	10.8185	7.2353
	0.9790	0.1110	0.0010	0.0071
Hungary Forint	32.1590	13.7690	1.1896	11.2772
	0.6060	1.0000	0.2754	0.0103
Polish Zloty	25.4340	35.1500	14.3827	16.1930
	0.8820	0.4610	0.0001	0.0003
Turkish Lira	20.5700	36.9260	11.4407	4.2136
	0.9750	0.3800	0.0007	0.0401
Canadian Dollar	26.6500	58.8500	9.3675	3.2699
	0.8440	0.0070	0.0092	0.1950
Bolivian Boliviano	43.4310	32.1450	13.3467	11.1327
	0.1550	0.6070	0.0003	0.0008
Mexican Peso	34.6100	32.5110	9.9534	20.0101
	0.4870	0.5890	0.0016	0.0000
Paraguay Guarani	31.0260	92.6090	53.1694	22.5856
	0.4650	0.0000	0.0000	0.0000
Venezuelan Bolivar	27.7690	14.2980	0.3236	4.8135
	0.6810	0.9970	0.8506	0.0282
Peruvian New Soles	12.7870	1.9945	1.7330	31.7588
	0.9990	1.0000	0.1880	0.0000
Chilean Peso	40.9220	92.6300	25.2631	4.6612
	0.1930	0.0000	0.0003	0.3239
Argentina Peso	12.9730	21.6690	15.0387	14.9594
	1.0000	0.9500	0.0005	0.0006
Singapore Dollar	28.6710	80.3420	22.0751	2.8157
	0.7660	0.0000	0.0000	0.0933
South Korean Won	34.2960	5.4497	3.9153	150.3979
	0.4540	1.0000	0.0478	0.0000
New Taiwan Dollar	24.4950	67.8250	9.3546	6.3939
	0.7900	0.0000	0.0022	0.0115
Ringgit Malaysia	20.9710	83.1830	37.2898	21.6886
	0.9710	0.0000	0.0000	0.0000
Indian Rupee	23.3780	8.4596	6.3265	5.3184
	0.9330	1.0000	0.6107	0.0211
Sri Lanca Rupee	23.3400	5.8034	0.6342	6.6952
	0.9160	1.0000	0.7283	0.0097
Thailand Baht	40.9320	85.9530	14.9485	8.1140
	0.2260	0.0000	0.0001	0.0044
Bangladesh Taka	18.6940	16.8990	2.8016	2.3209
	0.9850	0.9940	0.0942	0.1276
Cote d Ivoire - CFA Franc	10.0590	0.3191	0.0030	1.5061
	1.0000	1.0000	0.9561	0.2197
Congo Franc	10.0590	0.3191	0.0030	1.5061
	1.0000	1.0000	0.9561	0.2197
Botzwana Pula	9.0532	17.5130	13.4541	3.5919
	1.0000	0.9940	0.0002	0.0581
South African Rand	24.7220	27.3000	4.1594	3.2326
	0.9020	0.8200	0.0414	0.0722
Australian Dollar	25.6700	49.0700	13.9701	1.0999
	0.8150	0.0360	0.0300	0.2943
New Zealand Dollar	34.2600	102.4900	11.8677	10.8793
	0.5040	0.0000	0.0079	0.0922

Table 5: AR-GARCH Models

Pound	C	AR(1)	AR(2)	AR(3)			Sum squared resid	AIC
	-0.0934	0.2577	-0.2179	0.0848			925.0547	4.3041
	-0.5265	2.8436	-2.3971	1.0402				
	C	RESID(-1)^2	GARCH(-1)					
	0.4122	0.1066	0.7910					
	2.0448	2.6352	11.4954					
Yen	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	Sum squared resid	AIC
	-0.0705	0.2539	-0.0006	0.0530	-0.0575	-0.1752	1251.0580	4.6958
	-0.3561	3.1274	-0.0073	0.6779	-0.7131	-2.7787		
	C	RESID(-1)^2						
	5.1337	0.1479						
	6.9334	1.3689						
Norwegian Krone	C	AR(1)	AR(2)				Sum squared resid	AIC
	-0.0239	0.3881	-0.1394				1040.4600	4.4931
	-0.1251	5.3108	-2.6634					
	C	RESID(-1)^2	GARCH(-1)					
	7.9059	0.0939	-0.6700					
	3.3264	1.2037	-1.6656					
Icelandic Krone	C	AR(1)	AR(2)				Sum squared resid	AIC
	0.0013	0.4350	-0.1304				0.1124	-4.7153
	0.6617	5.6163	-1.6209					
	C	RESID(-1)^2	GARCH(-1)					
	0.0000	0.1191	0.8635					
	0.8269	1.7690	10.3002					
Polish Zloty	C	AR(1)					Sum squared resid	AIC
	0.6264	0.3713					1358.2980	4.6067
	2.5484	4.7538						
	C	RESID(-1)^2	GARCH(-1)					
	3.1745	0.4873	0.0747					
	5.8596	4.0277	0.7199					
Turkish Lira	C	AR(1)					Sum squared resid	AIC
	4.1896	0.6503					4423.1650	5.2667
	8.6619	16.7769						
	C	RESID(-1)^2	GARCH(-1)					
	1.5323	0.5939	0.5039					
	3.8590	3.8833	5.7804					
Canadian Dollar	C	AR(1)					Sum squared resid	AIC
	0.0528	0.2209					359.8161	3.3653
	0.4471	2.9638						
	C	RESID(-1)^2	GARCH(-1)					
	0.1808	0.1505	0.7515					
	0.9998	1.8317	4.6134					
Bolivian Boliviano	C	AR(1)					Sum squared resid	AIC
	0.3131	0.8372					10.7775	-0.2323
	4.7442	21.0361						
	C	RESID(-1)^2	GARCH(-1)					
	0.0102	0.6520	0.3143					
	2.8712	3.9034	2.7620					
Mexican Peso	C	AR(1)					Sum squared resid	AIC
	0.5625	0.5416					2420.5720	4.2321
	7.0428	8.3152						
	C	RESID(-1)^2	GARCH(-1)					
	0.0010	0.3489	0.8070					
	0.3610	7.7246	55.2165					
Paraguay Guarani	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	Sum squared resid	AIC
	0.3156	0.5787	-0.0471	-0.0197	0.0824	0.0503	794.8013	3.6567
	1.4526	5.3689	-0.3654	-0.1651	0.8995	0.5694		
	C	RESID(-1)^2	GARCH(-1)					
	0.0325	0.3875	0.7294					
	3.2552	7.6990	40.5843					
Chilean Peso	C	AR(1)	AR(2)				Sum squared resid	AIC
	0.3400	0.4261	-0.1202				675.9668	4.0253
	1.9483	5.5800	-1.5998					
	C	RESID(-1)^2	GARCH(-1)					
	0.1864	0.0549	0.8901					
	1.5897	1.3237	12.7387					

Argentina Peso	C	AR(1)	AR(2)				Sum squared resid	AIC
	0.6028	0.5999	-0.1177				3467.8840	5.2894
	0.4153	2.8774	-0.7968					
	C	RESID(-1)^2	GARCH(-1)					
	3.2820	0.3292	0.5667					
	3.1767	1.4143	4.2187					
Singapore Dollar	C	AR(1)					Sum squared resid	AIC
	-0.2398	0.2310					336.6453	3.0671
	-2.8311	3.1873						
	C	RESID(-1)^2	GARCH(-1)					
	0.2304	0.2875	0.5566					
	1.9568	3.1108	4.0810					
New Taiwan Dollar	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	Sum squared resid	AIC
	-0.0072	0.3750	-0.1133	0.0846	-0.1684	0.0090	311.2736	3.0984
	-0.0688	4.3050	-1.4956	0.9822	-1.9792	0.1247		
	C	RESID(-1)^2	GARCH(-1)					
	0.2366	0.2415	0.5930					
	2.5820	3.1540	5.0169					
Ringgit Malaysia	C	AR(1)					Sum squared resid	AIC
	-0.0043	-0.1996					1199.4220	1.2858
	-0.6086	-1.6994						
	C	RESID(-1)^2	GARCH(-1)					
	0.0011	3.9884	0.2181					
	2.6868	9.4192	7.2959					
Indian Rupee	C	AR(1)					Sum squared resid	AIC
	0.0564	0.2295					778.2199	3.4645
	1.7333	5.8521						
	C	RESID(-1)^2	GARCH(-1)					
	0.0317	1.8563	0.4705					
	3.3767	12.4585	41.6025					
Thailand Baht	C	AR(1)					Sum squared resid	AIC
	0.0216	0.3461					1729.6440	3.4200
	0.3694	4.7764						
	C	RESID(-1)^2	GARCH(-1)					
	0.0086	0.7858	0.5890					
	0.4408	11.7058	20.6456					
South African Rand	C	AR(1)					Sum squared resid	AIC
	0.5012	0.2765					1837.4910	4.7646
	2.3977	4.2731						
	C	RESID(-1)^2	GARCH(-1)					
	0.8474	0.5440	0.4833					
	2.9832	5.3106	4.8316					
South Korean Won	C	AR(1)	AR(2)				Sum squared resid	AIC
	-0.0075	0.3436	-0.1697				1776.0030	3.8731
	-0.0782	6.0957	-7.1183					
	C	RESID(-1)^2						
	1.0441	1.3714						
	10.4658	7.6525						
Botzwana Pula	C	AR(1)					Sum squared resid	AIC
	0.6443	0.0133					1846.3610	4.7399
	9.0397	0.2849						
	C	RESID(-1)^2	GARCH(-1)					
	1.1937	2.4159	0.0052					
	3.7661	12.4766	0.3366					
Australian Dollar	C	AR(1)	AR(2)	AR(3)			Sum squared resid	AIC
	-0.0465	0.3168	-0.1995	0.1248			921.7963	4.3524
	-0.2392	4.2122	-2.6536	1.7039				
	C	RESID(-1)^2	GARCH(-1)					
	0.1628	0.0912	0.8757					
	0.8231	1.6588	12.3415					
New Zealand Dollar	C	AR(1)					Sum squared resid	AIC
	-0.1134	0.3007					1008.2740	4.3425
	-0.5638	3.8641						
	C	RESID(-1)^2	GARCH(-1)					
	0.0631	0.0504	0.9413					
	1.1286	1.7537	27.8641					

Table 6: Misspecification test for threshold effects

	S_3 Test	S_2 Test	S_3 Test
Pound	7.8924	16.3551	17.7581
Yen	11.2169	39.3102	48.5253
Switzerland Franc	8.2660	44.6539	56.9360
Norwegian Krone	1.8241	3.5442	3.6059
Icelandic Krone	6.3604	11.9891	12.7262
Hungary Forint	0.0589	11.8221	12.5382
Polish Zloty	0.1292	17.2360	18.8015
Turkish Lira	7.0131	23.9550	27.0900
Canadian Dollar	2.3388	4.5520	4.6543
Bolivian Boliviano	0.5121	13.8252	14.8147
Mexican Peso	1.8925	9.1852	9.6117
Paraguay Guarani	43.9341	83.0840	138.7908
Venezuelan Bolivar	13.5778	31.9217	37.7419
Peruvian New Soles	146.2708	202.9060	10259.2812
Chilean Peso	0.2529	7.4582	7.7370
Argentina Peso	9.3839	76.3707	121.0197
Singapore Dollar	2.0843	25.0524	28.5018
South Korean Won	6.7195	112.7606	247.6825
New Taiwan Dollar	25.6676	52.5040	70.3470
Ringgit Malaysia	1.4671	99.3658	191.0983
Indian Rupee	4.0464	16.3787	17.7860
Sri Lanca Rupee	14.8899	17.7359	19.3980
Thailand Baht	5.6673	11.7371	12.4426
Bangladesh Taka	10.4430	24.1201	27.3013
Cote d Ivoire - CFA Franc	0.4991	2.8399	2.8794
Congo Franc	0.4991	2.8399	2.8794
Botzwana Pula	3.5992	37.0266	45.0924
Australian Dollar	6.3349	10.4759	11.0343
South African Rand	5.5341	9.5810	10.0459
New Zealand Dollar	0.1572	0.3578	0.3584

Table 7: Two regimes SETAR Specification

		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
Pound	Regime 1	193	-0.0811	0,2511	-0.2289	0,1479	0,0946	-0.0609	0,0039	1,9540
			-0.5597	3,0842	-3.0796	2,0603	1,2606	-0.8462	0,0592	
	Regime 2	10	-0.7576	0,4534	0,1194	-1.5713	0,2803	-0.7622		2,4862
			-0.3131	1,1253	0,3631	-2.6293	0,6696	-2.3347		
	d=1	soglia =	3,7556	st. dev. =	1,9834	AIC =	4,2283			
Yen		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
	Regime 1	195	-0.126	0,2903	-0.0355	0,0698	-0.1002	-0.206		2,5139
			-0.6926	4,0632	-0.4809	0,9439	-1.2817	-2.8969		
	Regime 2	8	7,2286	1,2621	-0.3059	0,3105	-1.5847	0,7643	0,0194	0,4228
			3,4565	6,6342	-1.7723	2,7515	-3.8214	7,4782	0,1400	
	d=4	soglia =	3,9463	st. dev. =	2,4595	AIC =	4,5348			
Icelandic Krone		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
	Regime 1	55	0.006	0.6514	-0.4917	0.3253	-0.3085	0.3065	-0.3218	0.0255
			0.6953	4.7792	-3.3378	1.6969	-1.8071	1.0753	-2.0061	
	Regime 2	149	-0.0011	0.3256						0.022
			-0.6077	4.5768						
	d=5	soglia =	-0.01387	st. dev. =	0.023	AIC =	-4.6762			
Polish Zloty		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
	Regime 1	75	0.3682	0.3246	-0.2843					3.2173
			0.9603	2.5804	-1.8998					
	Regime 2	128	0.5451	0.4136	-0.003	-0.0963	0.0836	-0.1481	0.1246	2.0806
			2.0066	5.1402	-0.0395	-1.2117	0.9499	-1.5798	1.869	
	d=5	soglia =	-0.00538	st. dev. =	2.5579	AIC =	4.6503			
Turkish Lira		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
	Regime 1	184	1.0302	0.7278	-0.1455	0.1394				2.9982
			3.5804	9.5134	-2.3767	2.5398				
	Regime 2	20	7.7711							11.3285
			3.0678							
	d=1	soglia =	6.756947	st. dev. =	4.5486	AIC =	5.3187			
Bolivian Boliviano		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
	Regime 1	181	0.0181	0.5688	0.0008	0.3321	-0.1009	0.1625		0.1915
			0.6801	8.0401	0.0095	3.7646	-1.2826	2.3697		
	Regime 2	23	0.2373	0.334	0.2291	-0.2906	0.4164			0.3247
			0.7865	1.3926	0.846	-0.981	1.7833			
	d=3	soglia =	0.818588	st. dev. =	0.2107	AIC =	-0.2987			
Mexican Peso		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
	Regime 1	179	0.4665	0.2419	-0.1837					1.8355
			3.3411	2.3233	-3.1069					
	Regime 2	25	2.8079							8.1627
			1.72							
	d=1	soglia =	2.292938	st. dev. =	3.3349	AIC =	4.4376			
Paraguay Guarani		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
	Regime 1	146	0.2208	0.4219	0.018	0.0024	0.197	0.025	-0.0953	1.3554
			1.7757	4.2075	0.2883	0.0354	2.4853	0.3679	-1.5298	
	Regime 2	57	1.4175	0.3351	-0.6189	0.4642	-0.1184	0.3563		2.7232
			2.2723	1.9347	-2.7898	2.2138	-0.8167	2.2568		
	d=1	soglia =	1.123042	st. dev. =	1.8428	AIC =	3.8803			
Chilean Peso		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
	Regime 1	134	0.2268	0.3731						1.6565
			1.5808	5.1302						
	Regime 2	70	0.3603	0.449	-0.2556	0.276	-0.0185	-0.3175		2.0709
			0.5657	3.0216	-1.0728	1.7555	-0.1211	-2.2178		
	d=2	soglia =	0.965488	st. dev. =	1.8094	AIC =	4.0383			

		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
Argentina Peso	Regime 1	57	-0.1159	-0.0086	0.087					1.4035
			-0.6129	-0.1955	2.3237					
	Regime 2	146	0.5512	0.9571	-0.2587					4.2182
			1.5509	11.0653	-2.7862					
	d=6	soglia =	-0.00501	st. dev. =	3.6538	AIC =	5.1277			
		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
Singapore Dollar	Regime 1	182	0.0527	0.4019	-0.0082	0.1038	-0.0351	0.0626	0.0831	1.0682
			0.6089	6.1202	-0.1113	1.3748	-0.4263	0.9807	1.2889	
	Regime 2	19	-0.6462							2.3372
			-1.2052							
	d=4	soglia =	1.419637	st. dev. =	1.2432	AIC =	3.1257			
		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
New Taiwan Dollar	Regime 1	112	-0.0628	0.2785						0.9137
			-0.724	3.4051						
	Regime 2	91	0.4034	0.4804	-0.0614	-0.0065	-0.2753	0.3244	-0.2752	1.4886
			1.6865	4.0134	-0.4854	-0.0602	-2.4009	2.6637	-1.7315	
	d=6	soglia =	0.116296	st. dev. =	1.2058	AIC =	3.1378			
		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
Ringgit Malaysia	Regime 1	167	-0.1337	0.1389	0.0308	-0.0373	0.068			0.6396
			-2.4205	3.0192	0.9511	-1.4348	2.2767			
	Regime 2	36	0.1197	0.7294	-1.2867	1.9344	-0.7417	-0.2795	-0.0478	4.204
			0.1226	2.1533	-3.276	4.1824	-2.3764	-1.4286	-0.2538	
	d=1	soglia =	0.259569	st. dev. =	1.8816	AIC =	2.6538			
		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
Thailand Baht	Regime 1	108	-0.111	0.2037	0.0862	0.1318				1.3537
			-0.8509	2.5647	1.0698	2.2208				
	Regime 2	96	0.295	0.2715						4
			0.7218	2.6066						
	d=5	soglia =	-0.00795	st. dev. =	2.9154	AIC =	4.4922			
		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
South African Rand	Regime 1	171	0.2672	0.4388	-0.1754					2.4181
			1.3903	4.8001	-2.8091					
	Regime 2	33	2.9327							4.6383
			3.6322							
	d=1	soglia =	2.693015	st. dev. =	2.8951	AIC =	4.834			
		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
South Korean Won	Regime 1	170	0.0155	0.447	-0.0632	-0.1103	-0.073	0.1364	-0.1264	1.477
			0.1268	5.4294	-0.7352	-1.9836	-1.4566	3.0397	-3.2431	
	Regime 2	33	0.7364	0.6711	-0.6482	0.8717				6.1543
			0.5797	3.4314	-2.7199	1.684				
	d=1	soglia =	1.249916	st. dev. =	2.8206	AIC =	4.1138			
		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
Botzwana Pula	Regime 1	197	0.5752	0.1054						3.0433
			2.6054	1.4769						
	Regime 2	7	-0.1675	0.2198	-0.1108	-0.1688	0.1253	0.3396		0.0543
			-0.6244	6.3384	-6.7682	-26.2406	9.4816	4.5535		
	d=2	soglia =	4.916373	st. dev. =	2.9907	AIC =	4.7892			
		T	C	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)	AR(6)	st. dev.
Australian Dollar	Regime 1	68	-0.1278	0.2558	-0.2887					1.7122
			-0.6151	2.696	-2.9753					
	Regime 2	136	0.0363	0.3578	-0.1557	0.2002				2.3061
			0.1834	3.8008	-1.6556	2.2436				
	d=5	soglia =	-1.14682	st. dev. =	2.1266	AIC =	4.3441			

Table. 8: Testing the residuals for ARCH

	ARCH LM
Pound	2.6156 0.2548
Yen	15.9098 0.0001
Icelandic Krone	6.4841 0.0109
Polish Zloty	8.3080 0.0039
Turkish Lira	14.7302 0.0006
Bolivian Boliviano	12.1590 0.0005
Mexican Peso	5.0131 0.0252
Paraguay Guarani	32.1363 0.0000
Chilean Peso	15.1067 0.0045
Argentina Peso	2.1047 0.7165
Singapore Dollar	13.9028 0.0002
New Taiwan Dollar	6.1687 0.0130
Ringgit Malaysia	20.8581 0.0133
Thailand Baht	15.4992 0.0001
South African Rand	7.6829 0.1746
South Korean Won	4.5543 0.0328
Botzwana Pula	13.3165 0.0003
Australian Dollar	13.6818 0.0334

Table 9: Complete DTEGARCH specification

Pound	**Regime 1 193obs**	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**
		-0.0811	0.2572	-0.2397	0.0948	0.0980	-0.0744	-0.0149
		-0.5077	3.0635	-2.8285	1.2272	1.0919	-1.0468	-0.2299
		C	**RESID(-1)^2**	**GARCH(-1)**				
		0.2474	0.1214	0.7365				
		0.6085	0.8126	2.1792				
	Regime 2 10obs	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**
		-0.3373	-0.0853	-0.6294	2.2746	-0.6594	1.0432	
		-0.0395	-0.0401	-0.6687	1.4614	-0.6929	2.7271	
		C	**RESID(-1)^2**	**GARCH(-1)**				
		3.5729	-0.6038	-0.8291				
		1.1478	-0.7825	-0.6057				
	d=1 soglia =	3,7556						
Yen	**Regime 1 195obs**	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**
		-0.0772	0.2283	0.0163	0.0703	-0.0512	-0.2039	
		-0.4268	2.7501	0.2133	0.9439	-0.6191	-3.2812	
		C	**RESID(-1)^2**	**GARCH(-1)**				
		1.1950	0.4217	0.1242				
		2.8424	2.2853	0.5062				
	Regime 2 8obs	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**
		-16.1833	-2.4133	0.3914	-0.8428	3.3961	-1.0190	0.5835
		-0.0862	-0.1002	0.5467	-0.0961	0.0897	-0.1152	0.0527
		C	**RESID(-1)^2**	**GARCH(-1)**				
		-6.3517	4.9647	-1.2899				
		-0.0376	0.2331	-0.0126				
	d=4 soglia =	3,9463						
Icelandic Krone	**Regime 1 55obs**	**C(10)**	**C(11)**	**C(12)**	**C(13)**	**C(14)**	**C(15)**	**C(16)**
		0.0065	0.5653	-0.4599	0.3113	-0.3243	0.3362	-0.2151
		0.5549	3.5924	-2.9516	2.3790	-2.1555	1.0429	-1.2360
		C(31)	**C(32)**	**C(33)**				
		-9.0536	0.6962	-0.1123				
		-3.4754	1.5888	-0.3140				
	Regime 2 149obs	**C(20)**	**C(21)**					
		-0.0012	0.3426					
		-0.7459	4.9240					
		C(41)	**C(42)**	**C(43)**				
		-4.1368	0.5654	0.5221				
		-3.9050	3.0245	3.9364				
	d=5 soglia =	-0.0139						
Polish Zloty	**Regime 1 75obs**	**C(10)**	**C(11)**	**C(12)**				
		0.3459	0.4601	-0.2833				
		1.0740	2.9361	-1.8065				
		C(31)	**C(32)**	**C(33)**				
		0.8136	0.6951	0.3894				
		0.9814	3.0409	0.9046				
	Regime 2 128obs	**C(20)**	**C(21)**	**C(22)**	**C(23)**	**C(24)**	**C(25)**	**C(26)**
		0.7009	0.3735	-0.0005	-0.0623	0.0646	-0.1448	0.0733
		2.7327	3.5073	-0.0051	-0.7017	0.7081	-1.4101	0.7994
		C(41)	**C(42)**	**C(43)**				
		0.2891	0.3916	0.5144				
		1.0336	1.9853	2.5361				
	d=5 soglia =	-0.0054						
Turkish Lira	**Regime 1 184obs**	**C(10)**	**C(11)**	**C(12)**	**C(13)**			
		1.0386	0.6818	0.0605	0.0351			
		5.4378	6.0961	0.5642	0.3601			
		C(31)	**C(32)**	**C(33)**				
		0.0005	0.6172	0.8104				
		0.0035	2.8367	10.0880				
	Regime 2 20obs	**C(20)**						
		3.8338						
		4.5783						
		C(41)	**-1.9378**	**-2.0346**				
		C(42)	0.9383	5.3930				
		C(43)	1.2227	5.9523				
	d=2 soglia =	6.7569						
Bolivian Boliviano	**Regime 1 181obs**	**C(10)**	**C(11)**	**C(12)**	**C(13)**	**C(14)**	**C(15)**	
		-0.0003	0.6892	-0.1296	0.3699	-0.0323	0.0814	
		-0.0159	10.5704	-1.5800	4.5314	-0.6297	1.3772	
		C(31)	**C(32)**	**C(33)**				
		-0.5988	0.3667	0.9202				
		-3.3900	3.2373	25.9073				
	Regime 2 23obs	**C(20)**	**C(21)**	**C(22)**	**C(23)**	**C(24)**		
		0.3224	0.5902	0.1336	-0.2530	0.1732		
		1.3889	2.9406	1.0866	-1.7439	1.6438		
		C(41)	**C(42)**	**C(43)**				
		1.4198	-2.4285	0.9662				
		1.6297	-2.5599	5.2002				
	d=3 soglia =	0.8186						

Mexican Peso	**Regime 1**	**179obs**	**C(10)**	**C(11)**	**C(12)**								
			0.3525	0.2928	-0.1641								
			3.3511	2.2415	-1.4617								
			C(31)	**C(32)**	**C(33)**								
			-0.2047	0.3218	0.9723								
			-3.1350	3.3009	46.8956								
	Regime 2	**25obs**	**C(20)**										
			1.2075										
			2.2225										
			C(41)	**C(42)**	**C(43)**								
			-0.7630	0.9374	0.8617								
			-1.6791	7.8703	7.0237								
	d=1	soglia =	2.2929										
Paraguay Guarani	**Regime 1**	**146obs**	**C(10)**	**C(11)**	**C(12)**	**C(13)**	**C(14)**	**C(15)**	**C(16)**				
			0.1613	0.4605	0.0906	-0.0806	0.1837	-0.0482	-0.1245				
			3.1811	3.9503	0.9310	-1.1717	2.9555	-0.6060	-3.3718				
			C(31)	**C(32)**	**C(33)**								
			-0.6673	1.1074	0.9834								
			-7.0147	8.1290	25.4708								
	Regime 2	**57obs**	**C(20)**	**C(21)**	**C(22)**	**C(23)**	**C(24)**	**C(25)**					
			1.0250	0.0681	-0.2163	0.1530	-0.0277	0.2923					
			3.0042	0.5464	-4.0084	1.5936	-0.2605	3.9416					
			C(41)	**C(42)**	**C(43)**								
			-0.0211	1.0537	-0.0296								
			-0.0584	5.2879	-0.2183								
	d=1	soglia =	1.1230										
Chilean Peso	**Regime 1**	**134obs**	**C(10)**	**C(11)**									
			0.1667	0.3723									
			1.2086	4.7577									
			C(31)	**C(32)**	**C(33)**								
			1.0784	0.3128	-0.3766								
			2.0525	1.4594	-0.9432								
	Regime 2	**70obs**	**C(20)**	**C(21)**	**C(22)**	**C(23)**	**C(24)**	**C(25)**					
			0.6953	0.5473	-0.4321	0.2361	-0.0485	-0.3249					
			1.0504	2.7895	-1.4714	1.2097	-0.3463	-2.3463					
			C(41)	**C(42)**	**C(43)**								
			0.1814	0.1921	0.8519								
			0.3846	0.4861	2.9027								
	d=2	soglia =	0.9655										
Argentina Peso	**Regime 1**	**57obs**	**C(10)**	**C(11)**	**C(12)**								
			-0.0003	0.0191	0.0302								
			-0.0322	1.5890	1.4825								
			C(31)	**C(32)**	**C(33)**								
			-0.4167	-1.2327	0.7091								
			-6.0788	-15.2037	24.3902								
	Regime 2	**146obs**	**C(20)**	**C(21)**	**C(22)**								
			0.0000	-0.0528	0.3571								
			-0.0003	-0.3371	4.5051								
			C(41)	**C(42)**	**C(43)**								
			-0.3632	0.7623	1.0571								
			-10.0743	55.3582	725.8002								
	d=6	soglia =	-0.0050										
Singapore Dollar	**Regime 1**	**182obs**	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**				
			-0.0719	0.2813	0.0204	0.0713	-0.0121	-0.0342	0.0968				
			-0.8494	3.3932	0.2544	1.1254	-0.1605	-0.5071	1.4160				
			C	**RESID(-1)^2**	**GARCH(-1)**								
			0.2139	-0.2527	0.9843								
			249.1941	-181.8373	33.4262								
	Regime 2	**19obs**	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**				
			-1.0485										
			-8.0561										
			C	**RESID(-1)^2**	**GARCH(-1)**								
			-1.3250	1.5009	1.0812								
			-3.4779	3.8277	10.5905								
	d=4	soglia =	1.4196										
New Taiwan Dollar	**Regime 1**	**112obs**	**C(10)**	**C(11)**									
			-0.0429	0.3073									
			-0.4373	2.3458									
			C(31)	**C(32)**	**C(33)**								
			-0.3588	0.5611	0.1162								
			-2.2034	3.0700	0.5939								
	Regime 2	**91obs**	**C(20)**	**C(21)**	**C(22)**	**C(23)**	**C(24)**	**C(25)**	**C(26)**				
			0.2879	0.4154	-0.1219	0.0824	-0.2616	0.1393	-0.2046				
			1.5101	3.3403	-0.8985	0.8299	-2.8023	1.0919	-1.2742				
			C(41)	**C(42)**	**C(43)**								
			-0.0549	0.1575	1.1327								
			-0.3103	0.9350	5.0773								
	d=6	soglia =	0.1163										

Ringgit Malaysia	**Regime 1**	**167obs**	**C(10)**	**C(11)**	**C(12)**	**C(13)**	**C(14)**						
			-0.0021	-0.3606	-0.2256	0.0133	0.0020						
			-0.3042	-2.1245	-2.9445	0.1892	0.0439						
			C(31)	**C(32)**	**C(33)**								
			-1.1358	1.4546	0.8241								
			-10.1075	11.0031	22.0496								
	Regime 2	**36obs**	**C(20)**	**C(21)**	**C(22)**	**C(23)**	**C(24)**	**C(25)**	**C(26)**				
			-0.3095	0.5707	0.1665	0.1749	-0.4506	-0.0934	-0.1039				
			-2.4669	4.6919	1.5344	1.3303	-2.7180	-1.5876	-1.4818				
			C(41)	**C(42)**	**C(43)**								
			-3.0574	3.8872	0.8340								
			-4.9622	5.8405	4.3282								
	d=1	soglia =	0.2596										
Thailand Baht	**Regime 1**	**108obs**	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**				
			0.0429	0.3545	-0.1028	-0.0019							
			0.5899	3.2650	-1.1451	-0.0166							
			C	**RESID(-1)^2**	**GARCH(-1)**								
			-0.3065	0.3188	0.9356								
			-1.9102	2.1327	14.1023								
	Regime 2	**96obs**	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**				
			-0.0290	0.3498									
			-0.4172	4.1204									
			C	**RESID(-1)^2**	**GARCH(-1)**								
			-0.7027	1.1508	0.9588								
			-5.3707	10.2867	17.9254								
	d=5	soglia =	-0.0079										
South African Rand	**Regime 1**	**171obs**	**C(10)**	**C(11)**	**C(12)**								
			0.4195	0.2778	-0.0405								
			2.5571	2.3997	-0.4106								
			C(31)	**C(32)**	**C(33)**								
			-0.0434	0.4117	0.7853								
			-0.4574	2.2165	13.7535								
	Regime 2	**33obs**	**C(20)**										
			-2.5545										
			-4.5292										
			C(41)	**C(42)**	**C(43)**								
			-0.8325	0.8857	1.2116								
			-0.9031	3.6089	3.9422								
	d=1	soglia =	2.6930										
South Korean Won	**Regime 1**	**170obs**	**C(10)**	**C(11)**	**C(12)**	**C(13)**	**C(14)**	**C(15)**	**C(16)**				
			0.1827	0.2872	0.0501	-0.1717	-0.0591	0.2255	0.0269				
			2.5544	4.9275	0.8071	-2.3323	-0.8850	4.2854	0.6878				
			C(31)	**C(32)**	**C(33)**								
			-0.2465	0.3142	0.9598								
			-4.1218	3.4638	39.2141								
	Regime 2	**33obs**	**C(20)**	**C(21)**	**C(22)**	**C(23)**							
			-0.1894	0.4504	-0.2739	0.3995							
			-0.3922	1.5136	-2.9025	3.1804							
			C(41)	**C(42)**	**C(43)**								
			-3.7323	3.2580	1.0803								
			-4.1528	5.3038	5.8972								
	d=1	soglia =	1.2499										
Botzwana Pula	**Regime 1**	**197obs**	**C(10)**	**C(11)**									
			0.7397	-0.0400									
			12.9863	-1.8549									
			C(31)	**C(32)**	**C(33)**								
			0.7002	1.5025	0.0119								
			3.5743	14.3532	0.1880								
	Regime 2	**7obs**	**C(20)**	**C(21)**	**C(22)**	**C(23)**	**C(24)**	**C(25)**					
			0.4605	0.2496	-0.1765	-0.0633	0.1395	0.1919					
			2826.5970	2292.1410	-17350.8600	-2375.8300	7520.7190	50487.5500					
			C(41)	**C(42)**	**C(43)**								
			2.3059	24.5472	-3.9200								
			0.5043	4.4329	-3.9543								
	d=2	soglia =	4.9164										
Australian Dollar	**Regime 1**	**68obs**	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**				
			-0.0352	0.2998	-0.2861								
			-0.1427	2.0721	-2.3360								
			C	**RESID(-1)^2**	**GARCH(-1)**								
			0.3853	0.1230	0.5388								
			0.7157	0.7149	1.3935								
	Regime 2	**136obs**	**costante**	**AR(1)**	**AR(2)**	**AR(3)**	**AR(4)**	**AR(5)**	**AR(6)**				
			-0.0406	0.3173	-0.1636	0.2086							
			-0.2310	3.1465	-1.8158	2.3155							
			C	**RESID(-1)^2**	**GARCH(-1)**								
			-0.1797	0.1999	1.0744								
			-0.6000	0.9301	5.1588								
	d=5	soglia =	-1.1468										

Table 10
Out of sample forecasting comparison

Forecasting

Results for Mean						
	MAE			RMSE		
	RW	GARCH	SETAR_DEGARCH	RW	GARCH	SETAR_DEGARCH
Pound	0.5931	1.3034	1.1943	0.6880	1.4865	1.5065
Yen	0.7198	1.4512	1.3644	0.8298	1.7361	1.6856
Icelandic Krone	0.0105	0.0278	0.0207	0.0127	0.0330	0.0254
Polish Zloty	0.6534	2.7223	2.8568	0.8600	3.0397	3.2234
Turkish Lira	0.0117	0.0303	0.0274	0.0133	0.0368	0.0340
Bolivian Boliviano	0.0713	0.1123	0.0691	0.0820	0.1504	0.0935
Mexican Peso	0.2161	1.1446	0.9633	0.2661	1.5571	1.3708
Paraguay Guarani	0.7603	1.2176	1.1006	0.8038	1.5126	1.3292
Chilean Peso	0.1466	1.2341	1.1933	0.2221	1.5558	1.5484
Argentina Peso	0.0613	0.5904	0.4062	0.0648	0.6387	0.4901
Singapore Dollar	0.5207	0.5996	0.7456	0.5235	0.7486	0.9082
New Taiwan Dollar	0.7547	0.8510	0.7159	0.9035	1.1887	1.0547
Ringgit Malaysia	0.2500	1.2231	1.5602	0.1985	0.9521	1.0944
Thailand Baht	1.2351	1.3408	1.4694	1.3521	1.6077	1.7346
South African Rand	1.5158	4.0203	4.7450	1.1787	3.1519	3.6444
South Korean Won	0.2582	1.0040	0.9499	0.3078	1.1483	1.2141
Botzwana Pula	0.9337	2.5234	2.4683	0.9371	3.1772	3.2402
Australian Dollar	0.8611	1.6909	1.6988	1.0257	2.1539	2.0921

Results for Variance

	MDAPE			MAE			RMSE		
	RW	GARCH	SETAR_DEGARCH	RW	GARCH	SETAR_DEGARCH	RW	GARCH	SETAR_DEGARCH
Pound	21.6425	12.2643	8.9738	3.4947	3.2169	2.6006	4.6522	3.5020	2.9956
Yen	12.8897	18.7530	17.1008	2.6270	4.0526	3.5217	3.5902	4.3305	4.1353
Icelandic Krone	0.0017	0.0000	0.0000	0.0353	0.0010	0.0006	0.0413	0.0012	0.0009
Polish Zloty	76.3196	67.0317	38.0385	6.6284	6.6723	5.1719	0.8600	8.1873	8.7361
Turkish Lira	0.0014	5.5936E-06	1.3298E-06	0.0284	0.0019	0.0009	0.0374	0.0024	0.0012
Bolivian Boliviano	0.0185	0.0011	0.0010	0.0988	0.0297	0.0209	0.1360	0.0330	0.0312
Mexican Peso	24.8653	17.4300	10.0682	2.6741	3.6229	2.7071	4.9865	4.1749	3.1730
Paraguay Guarani	12.8050	12.4790	11.5007	2.6593	3.1423	2.8481	3.5784	3.5326	3.3913
Chilean Peso	19.8736	21.8853	18.1570	2.9688	3.8402	3.0698	4.4580	4.6782	4.2611
Argentina Peso	0.3429	69.1045	7.4065	0.4835	8.3088	2.2714	0.5856	8.3129	2.7215
Singapore Dollar	2.4429	0.7151	0.5515	1.2254	0.7339	0.6078	1.5630	0.8456	0.7426
New Taiwan Dollar	1.7827	2.8676	2.2202	0.9370	1.3076	1.1237	1.3352	1.6934	1.4900
Ringgit Malaysia	7.1594	71.6426	3.6985	1.4650	5.9807	1.2834	2.6757	8.4642	1.9231
Thailand Baht	44.5672	26.7925	24.9971	6.6759	5.1761	4.9997	4.2963	4.1249	3.4169
South African Rand	920.5422	988.4091	950.4017	17.2818	22.8630	19.2856	30.3404	31.4390	30.8286
South Korean Won	4.3491	8.7837	3.0639	1.4980	2.4626	1.5298	2.0854	2.9637	1.7504
Botzwana Pula	387.5394	499.2529	379.5767	10.3725	14.0261	9.2954	19.6860	22.3440	19.4827
Australian Dollar	49.9634	28.1266	25.5451	4.7748	3.9571	3.9527	7.0685	5.3034	5.0542