Exchange Market Pressure in African Lusophone Countries[1]

Jorge Braga de Macedo,[2] Luís Brites Pereira[3] & Afonso Mendonça Reis[4]

14 September 2007

Abstract

This paper explores the credibility of exchange rate arrangements for the five African Portuguese-speaking (PALOP) countries. Our working hypothesis is that credibility necessarily implies low mean exchange market pressure (EMP), low EMP conditional volatility and low-severity EMP crises. In addition, economic fundamentals must account for EMP dynamics. We also seek evidence of a risk-return relationship for mean EMP and of "bad news" (negative shocks) having a greater impact on EMP volatility than "good news" (positive shocks). Using our econometric models, we are able to rank PALOP countries' conditional volatility in ordinal terms. Our main conclusion is that countries with currency pegs, such as Guinea-Bissau (GB) and Cape Verde (CV), clearly have lower volatility when compared to those with managed floats and are therefore more credible. Moreover, EMP crises episodes under pegs are much less severe. We find that economic fundamentals correctly account for mean EMP in all countries and that the risk-return relationship is much more favourable for investors under currency pegs, as the increase in volatility is lower for the same rate of return. The exception to this finding is Mozambique (MOZ), which apparently has a risk-return profile akin to that enjoyed by countries with pegs. A plausible reason is that MOZ has the only managed float in our sample implementing monetary and exchange rate policy within the confines of an IMF framework, which establishes floors for international reserves and ceilings for the central bank's net domestic assets. This intuition needs to be tested, however. EMP conditional volatility is generally driven by changes in domestic credit (lowers it) and foreign reserve changes (raises it). The first effect is more pronounced under currency pegs, but also under MOZ's managed float. "Bad news" increases volatility more that "good news" only in the case of CV's currency peg, which we take to be another sign of its credibility. A few striking cross-country comparisons also emerge in our analysis. Among countries with managed floats, we find that Angola (ANG) has the most severe EMP crises whilst MOZ has the least severe. São Tomé & Princípe (STP), meanwhile, lies between these two extremes but its EMP crises behaviour is clearly much closer to that of MOZ. STP's credibility may also be improving since its volatility has declined as of 2002 and its level is now much closer to that of MOZ, whose managed float has lowest volatility of such arrangements.

Keywords: Exchange Rate Regime, Exchange Market Pressure, EGARCH-M

JEL Classification: C22, F31, F33

[1] First draft of paper to be presented at the African Economic Conference in Addis Ababa, Ethiopia on 15-17 November 2007.

[2], President of the Tropical Research Institute (IICT), Professor of Economics at Nova University, both in Lisbon.

[3] Research Fellow of the Tropical Research Institute (IICT), Assistant Professor, Faculty of Economics at Nova University. Corresponding author's email address: lpereira@fe.unl.pt

[4] Graduate Student at Nova University, Lisbon

1. Introduction

Global financial markets change the environment for economic policymaking, most visibly in the choice of exchange rate regime. When capital markets are integrated, the main issue becomes that of the relative importance attached to exchange rate stability and domestic monetary independence. At the heart of this issue is the so-called "impossible trinity" dilemma, which holds that a country can only attain two of the following three goals simultaneously: exchange rate stability, monetary independence and financial-market integration. Monetary independence is clearly greater under floating exchange rates, as the value of a currency is allowed to vary continuously in response to prevailing exchange market pressure (EMP), which reflects the excess demand for a currency arising when the total value of foreign goods and assets demanded by domestic residents is higher than that demanded by foreigners at the prevailing exchange rate. However, the benefit of greater independence has to be balanced against the cost of greater volatility and uncertainty in real exchange rates.

For many developing countries, limiting exchange rate variability by fixing a domestic currency's value to that of a sounder foreign currency is often seen as desirable. The reason is that fixing the exchange rate provides a nominal anchor that has two important benefits. First, it fixes the inflation rate for internationally traded goods, and so contributes to controlling inflation. Second, it anchors domestic inflation expectations to the anchor country's inflation rate. As a result, domestic inflation falls in line with that of the anchor country, as do interest rates. Under free capital mobility, a credible currency-peg implies that a country has in effect adopted the anchor country's monetary policy and, consequently, its low expected inflation. Under fixed exchange rates, the burden of adjustment to prevailing EMP thus falls exclusively on foreign reserves and interest rate changes.

With respect to intermediate arrangements, a major policy debate in the literature is whether these are viable or not. Under such arrangements, EMP is relieved by some combination of changes in the exchange rate, in foreign reserves and in domestic credit. The focus on intermediate arrangements is particularly relevant given that almost all currency crises in the past decade took place against a background of fixed but adjustable exchange rates, i.e. arrangements allowing a step change in the value of a currency as a result of a discretionary decision by domestic monetary authorities.

It is noteworthy that currency crises often became financial crises as sovereign credit ratings plummeted and access to international capital was lost following a currency's collapse. In this regard, the East Asian "twin" financial and currency crashes of the 1990s underscored the relative ease with which it was possible to implement the "wrong" combination of currency pegs and economic policy under a given degree of financial-market integration. The commitment of authorities who seek exchange rate stability, through the adoption of fixed but adjustable exchange rate regimes, is therefore likely to be tested under financial-market integration.[5] More recently, this policy debate has become more prominent in connection with the so-called "benign peg" of the Chinese currency to the US dollar.[6]

---

[5] The relevance of the European Payments Union is pointed out in Braga de Macedo & Eichengreen (2001c). The "Eurocentric" view has been presented as evidence of an intermediate exchange rate system which helps acquire financial reputation and is applied to the Franc zone and to Latin America in Braga de Macedo, Cohen & Reisen (2001b). The "Eurocentric" view essentially extends an interpretation of the first European attempts at promoting a multilateral payments system into an argument for improving regional monetary and fiscal surveillance. While the quantitative relevance of multilateral surveillance to international lenders and credit rating agencies' scrutiny has not been tested directly, the European experience does signal when it is bound to be especially intense.

[6] Indeed, a possible explanation of the current international monetary system goes back to the Bretton Woods system. This was discussed at a conference at the University of Santa Cruz in May 2006 on "The Euro and the

The literature also highlights the consensual view that policymakers will always have to take into account financial markets' responses to their policy actions in seeking an optimal trade-off between exchange rate stability and domestic monetary independence. After a country has chosen its exchange rate policy regime (fixed, floating, or fixed-but-adjustable) under a given degree of financial market integration, it then has the task of adapting its domestic economic policy and institutional environment in accordance with that choice. Indeed, the extent to which it is able to establish a credible interaction between a country's financial-market integration, exchange rate arrangements and the accompanying policy and institutional responses will be paramount in establishing its reputation in international financial markets.[7]

For any country, establishing financial reputation is important for two reasons: First, it leads to a low-risk borrower profile and improved credit terms when seeking foreign capital, as reflected in its international credit rating. Second, it is conducive to low and more stable domestic interest rates, especially under fixed exchanges. Given that interest rates are an inter-temporal price, and, as such, heavily influenced by agent's expectations, low interest rate spreads are considered to be an indicator of financial reputation.

The range of reforms required to establish financial reputation is very broad, but the scrutiny of international lenders and credit rating agencies usually focuses on monetary and fiscal issues.[8] Moreover, when the exchange rate regime is chosen based on a social concern for financial reputation, the choice is not necessarily restricted to the two corner solutions of a hard peg or a pure float.[9] Intermediate regimes can thus be justified in spite of the logic behind the so-called "impossible trinity" dilemma, contrary to the dominant conventional wisdom of the late 1990s. Intermediate solutions do, however, raise the issue of the effectiveness and durability of capital controls, an issue we do not pursue here.

The observation that acquiring financial reputation necessarily implies a positive interaction between financial-market integration, exchange rate regime and economic policy motivates our collective research interest. An additional motive is the absence of empirical studies that characterises existing literature, which is especially relevant in the case of many African countries. In the past, we researched the Portuguese Escudo's entry into the Euro, the credibility of Macau's currency board and of Cape Verde's currency peg.[10] Building upon our

---

Dollar in a Globalised Economy", where one of us commented on a presentation by Michael Dooley on Interest rates, Exchange Rates and International Adjustment based on a joint paper with David Folkerts-Landau and Peter Garber. The argument that, under a fixed exchange rate between the Yuan and the US Dollar, China becomes a periphery of the US is based on the persistence of effective capital controls between the two currency areas and on perfect substitutability between euro and dollar denominated assets. As discussed in Kouri & Braga de Macedo (1978) and Krugman (1981), these assumptions are questionable to the extent that there is imperfect substitutability between euro and dollar denominated assets and that capital controls are quickly eroded under financial globalisation.

[7] For a central bank, credibility is usually associated with the perception of inflation aversion, even though other meanings such as incentive compatibility or pre-commitment have been pointed out. See Goldberg & Klein (2006).

[8] Three related points come to mind in this connection. First, the design of reforms may help speed up the process of earning financial reputation, not least by sustaining the growth process, see Braga de Macedo & Oliveira Martins (2006). Second, the scrutiny mentioned in the text has been close enough to reveal a positive relationship between globalisation and governance, measured by trade flows and corruption indices in Bonaglia, Braga de Macedo & Bussolo (2001). Third, the international monetary system may help or hinder the process: an historical perspective between the gold and the euro standards is provided in Braga de Macedo, Eichengreen & Reis (1996).

[9] Monetary transitions on the part of the new EU member states are therefore described as "float in order to fix" in Braga de Macedo & Reisen (2004).

[10] Braga de Macedo (1996, 2001), Braga de Macedo, Catela Nunes and Covas (1999, 2004a), and using intervention data, Braga de Macedo, Catela Nunes & Brites Pereira (2003), and Brites Pereira (2005a, b); Braga de Macedo, Braz, Brites Pereira & Catela Nunes (2006); Braga de Macedo & Brites Pereira (2006);

past experience, we now intend to analyze exchange market pressure (EMP) for the case of African Portuguese-speaking, or Lusophone, countries, namely: Angola (ANG), Cape Verde (CV), Guinea-Bissau (GB), Mozambique (MOZ) and São Tome and Principe (STP), hereafter PALOP countries.[11] While sharing a common development challenge, this group of countries encompasses different institutional options and economic policies.

In particular, their exchange rate arrangements differ. ANG, MOZ and STP operate managed floats with no pre-determined path for the exchange rate. MOZ, in addition, has the only managed float that implements monetary and exchange rate policy within the confines of an IMF framework establishing floors for international reserves and ceilings for the central bank's net domestic assets. CV and GB, meanwhile, both have pegs against the Euro. In the case of GB, this implies the absence of separate legal tender as it is a member of the West African Economic and Monetary Union (WAEMU), whose currency is the West African CFA franc.

As such, it will particularly interesting to assess the credibility of exchange rate arrangements for each PALOP country. Our working hypothesis is that credibility necessarily implies low mean EMP, low EMP conditional volatility and low-severity EMP crises. In addition, economic fundamentals must account for EMP dynamics. We also seek evidence of the risk-return relationship for mean EMP and of "bad news" (negative shocks) having a greater impact on EMP volatility than "good news" (positive shocks), as discussed below.

The rest of the paper is as follows. In section 2, we measure EMP and identify crises episodes for each country. Section 3 looks at the stochastic properties of EMP and explores to what extent these can be explained by economic fundamentals. We present our conclusions in section 4. The appendix contains the country files, each containing tables and figures relating to EMP estimates, EMP descriptive statistics, EMP crises episodes, econometric results and diagnostics, and also the description of data used in the estimations.

2. Measuring EMP

The literature identifies two ways of measuring EMP.[12] The first, following Girton & Roper's (1977) seminal contribution, measures EMP as a weighted sum of changes in foreign reserves and exchange rate changes. The insight underlying this summary statistic is that exchange rate changes necessarily reflect a central bank's passive adjustment to EMP while its purchases/sales of foreign assets are its active response. The precision weights adopted in this measure are typically estimated from a structural model of the economy, implying that these EMP measures are model-dependent.

A second approach, proposed by Eichengreen, Rose & Wyplosz (1995, 1996 – ERW, hereafter), holds that model-dependency is undesirable given the tenuous connection between the exchange rate and economic fundamentals. As such, a model independent or *ad-hoc* EMP measure is calculated based on the channels through which EMP is relieved, which can include the interest rate channel unlike the first approach. EMP is measured as a weighted linear combination of these channels, where the precision weights are typically chosen so as to equalise the conditional volatilities of EMP measure's constituent components.

Our choice of summary statistic falls on the ERW approach for two reasons: first, the importance of the interest rate channel in altering the relative supply of domestic money *vis-*

[11] The acronym is Portuguese for Portuguese-speaking African Countries. All five countries are also members of the Community of Portuguese-Speaking Countries (*Comunidade dos Países de Língua Portuguesa - CPLP*).
[12] For a comprehensive review of EMP literature, refer to Weymark (1995, 98) and Spolander (1999).

à-vis foreign monies, especially under fixed exchange arrangements; second, the severe lack of data needed to estimate structural models, and hence model-based precision weights, for PALOP countries. As such, our EMP summary statistic assumes that the strain on a country's external imbalance is absorbed by changes in the exchange rate (Δe_t[13]), in foreign exchange reserves (Δr_t) and in the interest rate differential $\Delta(i_t - i^*_t)$. It is calculated as a weighted linear combination of these observed changes:

$$EMP_t = \Delta e_t + \eta_r \Delta r_t + \eta_i \Delta(i_t - i^*_t)$$

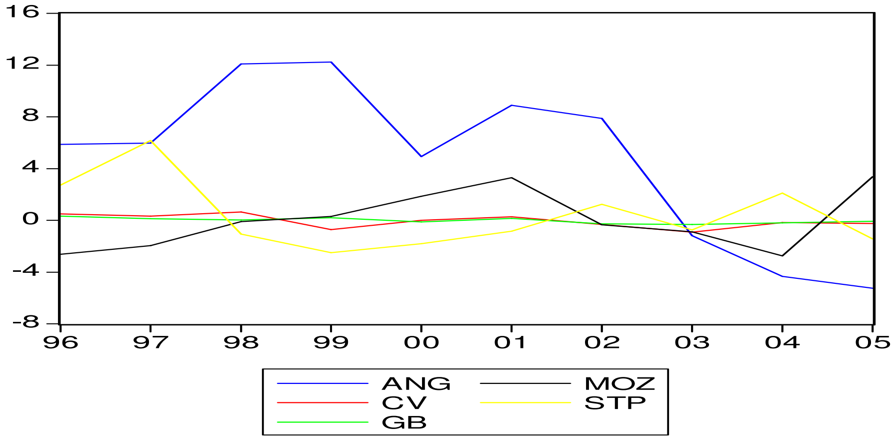
In accordance with the ERW approach, we equalise volatilities of the EMP measure's constituent components because one of the components will dominate EMP measures in the absence of this procedure.[14] Here, Δe_t is the reference variable and so the precision weights are calculated as $\eta_r = -SD(\Delta e_t)/SD(\Delta r_t)$ and $\eta_i = SD(\Delta e_t)/SD(\Delta(i_t - i^*_t))$, where *SD* denotes the standard deviation of the variable under consideration. The weights take on the signs $\eta_r < 0$ and $\eta_i > 0$ as central banks intervene by selling (purchasing) foreign reserves in response positive (negative) EMP while the interest rate differential increases (decreases) as domestic interest rates are raised (lowered).

Table 1 - EMP Descriptive Statistics (% per month)

Country	ANG	CV	GB	MOZ	STP
Mean	5,06	-0,05	-0,01	-0,07	0,43
SD	34,87	1,46	0,73	4,31	7,07
Max	190,66	4,86	3,12	12,84	24,06
Min	-210,6	-5,31	-2.90	-19,85	-27,14

Note: Statistics are calculated using the full sample. See the appendix for additional statistics.

Figure 1 - EMP Mean (% p.a.)



Note: Annual values are calculated as average of monthly EMP estimates.

[13] $\Delta e_t > 0$ denote exchange rate depreciations.

[14] Recent research highlights that EMP summary statistics calculated using the ERW approach are sensitive to the assumptions regarding their constituent components (see Bertoli, *et al.,* 2006 and also Li *et al.,* 2006). The assumptions of relevance to our analysis have to do with the manner in which exchange rate variations are computed (exact formula versus logarithmic approximation), the different definitions of reserves (gross versus net), the constancy of precision weights over time and the choice of anchor currency. Our robustness analysis indicates that EMP summary statistics obtained under a different set of assumptions are broadly similar to the ones used in the analysis. As such, they will not change the ordinal ranking of PALOP countries' conditional volatility presented here. The robustness analysis results, which also include estimated precision weights, are available from the authors upon request.

The descriptive statistics of our estimated EMP measures are given in Table 1.[15] Looking at mean EMP values, we observe that CV, GB and MOZ are characterised by slightly negative EMP (close to zero) over the sample period, which is of a very similar order of magnitude for all these countries. The other two countries, meanwhile, have positive EMP but the mean for ANG is much larger than that of STP, as is also clear from Figure 1. The unconditional standard deviation and EMP range statistics allows us to refine this observation. Indeed, now we are able to classify the five countries into two distinct groups based on the ranking of these last two descriptive statistics. The countries with currency pegs clearly exhibit lower volatility and a smaller range of EMP variation. The countries with managed floats are much more volatile. ANG exhibits the greatest unconditional volatility (34.87%), followed by STP (7.07%) and then MOZ (4.31%). This classification is confirmed upon inspection of Figure 2, which shows the annual average of monthly EMP standard deviations for the two types of exchange rate arrangements.

Figure 2a - EMP Unconditional Volatility (% p.a.)
Managed Floats

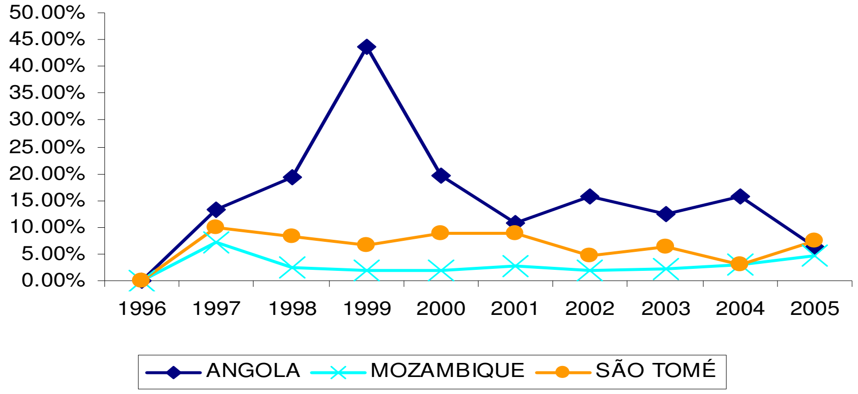
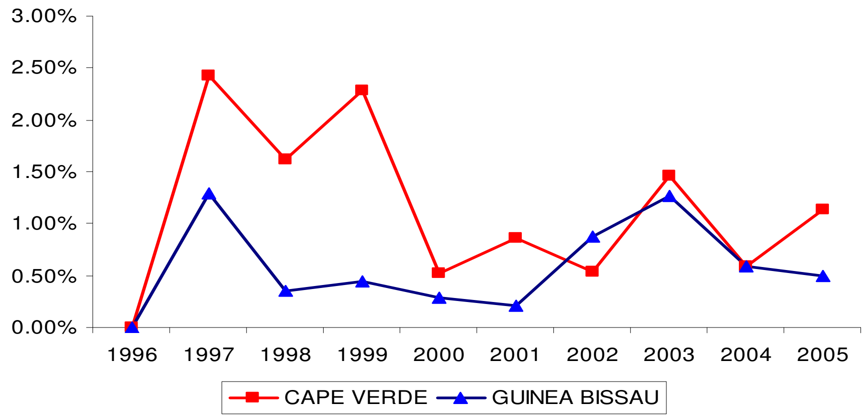


Figure 2b - EMP Unconditional Volatility (% p.a.)
Currency Pegs



Next, we proceed to identify crisis episodes, which we take to be those EMP values exceeding some pre-established critical threshold. We bear in mind, however, that the definition of these thresholds entails using a discretional "rule of thumb". As such, we consider three different thresholds to ensure a more robust analysis. A crisis episode is thus

[15] See the appendix for estimated EMP values, their constituent components and their graphical representation.

identified when an EMP measure exceeds mean EMP by 1.5 SD, 2.5 SD and 3.5 SD respectively. Accordingly, we classify EMP crises as having a low, moderate or high severity. Note that these classifications will not correspond to the same magnitudes of EMP when comparing across countries, given their different levels of mean EMP. The EMP crises statistics are given in Table 2 while EMP crises tables for each country are provided in the appendix.[16]

Table 2 - EMP Crises Statistics

Country	ANG	CV	GB	MOZ	STP
			Low		
EMP Mean	114,56%	3,26%	2.21%	9,48%	17,20%
EMP SD	56.57%	1.13%	0.85%	2.80%	3.37%
Crises	4	7	8	5	7
			Moderate		
Mean EMP	--	4.81%	--	12.05%	24.06%
EMP SD	--	0.08%	--	1.13%	--
Crises	2^{+}	2	1^{+}	2	1
			High		
Mean EMP	156.14%	--	4.22%	--	--
EMP SD	48.82%	--	--	--	--
Crises	2^{+}	0	1^{+}	0	0

Note: The symbol ($^{+}$) denotes that the same events are being considered in the calculations.

Our first observation is that the number of crises varies across countries but not significantly. However, the severity of crises differs substantially. In the case of ANG, for example, we identify four crises at the lower threshold of which two are classified as severe. In contrast, GB experienced eight crises but only one of these was a high-severity crisis having a similar order of magnitude as CV's single moderate-severity crisis. The finding that the severity of crisis differs substantially is reinforced when looking at the average values of EMP during crises episodes. GB and CV had positive EMP crises of magnitude 2.21% and 3.26% respectively at the 1.5SD threshold. The comparable figures for MOZ and STP are 9.48% and 17.20% while that of ANG is 114.56%.

Two findings thus emerge from our crises analysis. First, EMP crises under currency pegs are much less severe than those under managed floats at all threshold levels. Second, ANG has the most severe EMP crises whilst MOZ has the least less severe ones among countries with managed floats. STP, meanwhile, lies between these two extreme but its EMP behaviour is clearly much closer to that of MOZ. We note that these findings corroborate those established in our descriptive analysis above. In order to better understand these findings, we now turn to the study of EMP's stochastic properties in the next section.

3. EMP Dynamics

Our modelling approach is dictated by two concerns: first, we want to capture possible heteroscedasticity effects, volatility clustering and leverage effects associated with asymmetric responses shocks of the EMP series; second, we want to be able to compare EMP behaviour for the five PALOP countries within an economically meaningful framework. Given these objectives and following the modelling approach adopted in related work (Braga de Macedo *et al.* (2006), we estimate exponential GARCH in the mean (EGARCH-M) models. These models allow mean EMP to depend on its own conditional variance à la Engle

[16] In the tables, crises episodes are identified in **bold** type while the colours **black**, **blue** and **red** indicate that EMP exceeds the 1.5 SD, 2.5 SD and 3.5 SD thresholds respectively.

et al. (1987), thereby capturing the basic insight that risk-averse agents will require compensation for holding a country's risky assets, especially as these are typically denominated in domestic currency. Given that an asset's riskiness can be measured by the variance of returns, the risk premium is an increasing function of the returns' conditional variance. The actual specification adopted is as follows:

$$EMP_t = \mu \ln \sigma_t^2 + \theta x_t + \sum_{i=1}^{m} \xi_i EMP_{t-i} + \sum_{j=1}^{n} \psi_j \epsilon_{t-j} + \epsilon_t$$

$$\ln \sigma_t^2 = \lambda s_t + \sum_{j=1}^{p} \beta_j \ln \sigma_{t-j}^2 + \sum_{i=1}^{q} \left(\alpha_i \left| \frac{\epsilon_{t-i}}{\sigma_{t-i}} \right| + \gamma_i \frac{\epsilon_{t-i}}{\sigma_{t-i}} \right)$$

$$\epsilon_t = \sigma_t z_t$$

$$z_t \sim D_{\vartheta}(0, 1)$$

where ϵ_t is the error disturbance term, assumed to have a zero mean and to be serially uncorrelated, and $D_{\Theta}(0, 1)$ is a probability density function with zero mean and unit variance.[17]

The EMP mean equation incorporates the effect of economic fundamentals, whose impact is captured by the $k \times 1$ vector of explanatory variables x_t (includes a constant term where necessary), with θ being the respective $1 \times k$ coefficient vector. The risk-return relationship, meanwhile, is captured by the parameter μ. All explanatory variables are lagged one period in order to avoid the problem of contemporaneous simultaneity with the dependent variable. We also allow for *ARMA (m, n)* terms given the lack of data pertaining to economic fundamentals for all countries in our sample, as discussed below. In the conditional variance equation, s_t is an $r \times 1$ vector of explanatory variables (includes a constant term), and λ is the respective $1 \times r$ coefficient vector. Note that the left-hand side above is the logarithm of the conditional variance, which implies that the associated leverage effect is exponential rather than quadratic. In addition, forecasts of the conditional variance are guaranteed to be non-negative under this specification.

The literature identifies various macroeconomic fundamentals that could be considered as possible explanatory variables in our model. Some of these include:[18] a) the rate of inflation, as it is associated with high nominal interest rates and may proxy macroeconomic mismanagement that adversely affects the economy (Demirguc-Kunt & Detragiache, 1997); b) the real exchange rate, given that currency over-valuations may deteriorate the current account and have historically been associated with currency crises (Berg *et al.*, 1999); c) import and export growth which, when problematic, may lead to current account deteriorations that trigger currency crises (Dowling & Zhuang, 2000, Berg & Patillo, 1999); d) growth in monetary aggregates, e.g. excessive M1 growth might indicate excess liquidity and, hence, increased EMP that leads to speculative attacks (Eichengreen *et al.*, 1995); e) domestic credit, given that high debt levels are conducive to banking sector fragility (Kaminsky & Reinhart, 1998); f) public debt, as higher public indebtedness is expected to raise vulnerability to a reversal in capital inflows, and hence to raise the probability of a crisis (Lanoie & Lemarbre, 1996). g) current account, as deficits are associated with large capital inflows, which indicate a diminished probability to devalue and thus lower the probability of a crisis (Berg & Patillo 1999); h) fiscal balance, as deficits are expected to raise the probability

[17] Optionally, Θ are additional distributional parameters that can be used to describe a distribution's skew and shape. For a full discussion of this class of models, refer to Engle (1982) and Bollerslev (1986). In practice, we found that models were best estimated assuming normally-distributed errors.

[18] For more details, refer to Feridun (2007), who provides a useful summary that also includes several indicators describing banking sector vulnerability. See also Flood & Marion (1998).

of crisis since they increase the vulnerability to shocks and investor's confidence (Demirguc-Kunt & Detragiache, 1997).

For PALOP countries, however, our choice of explanatory variables is severely restricted by the lack of data. At best, the publicly available data have a trimesterly or annual frequency, which is too low to use in our econometric models. More frequently, the data simply do not exist. In practice, we are able to use two fundamentals for the mean equation that have the desired monthly frequency (see the appendix for the data description): domestic credit growth rate (dc_t) and the real depreciation rate (q_t).[19] In the conditional variance equation, we include foreign reserve changes (r_t) in addition to the afore-mentioned variables, given their important role in EMP dynamics, especially under currency pegs.[20] For ANG, changes in oil prices are also used due to the importance of oil exports in its economy. Explanatory variables are lagged at least one period to avoid possible simultaneity bias in our estimations. The presence of a time trend in our monthly model of EMP is meant to capture the lower frequency trend that may exist in exchange rates due to aggregation of data, in particular, and omitted variables, in general.[21]

Where appropriate, we test for the inclusion of dummy variables that are related to the occurrence of known economic events, e.g., CV's adoption of a currency peg in 1999:01, GB's implementation of its accession agreement with the WAEMU in 1997:05, etc. (see appendix the for dummy variable definitions). We also consider dummies that capture observed idiosyncratic events which clearly impact our estimations, e.g. the influx of MOZ's donor aid arrears in late 2004 and the subsequent need for depreciation of the MZM in 2005:04/05. In the conditional variance equation, the dummy variables included are identified using Inclan & Tiao's (1994) CSUM test, which tests for structural breaks in volatility.

Turning to the expected signs of the mean equation's explanatory variables, domestic credit growth necessarily lead to greater EMP, hence estimated coefficients will be positive. On the other hand, real depreciation leads to lower EMP, implying that expected signs are negative. In an EMP context, the risk-return relationship implies that holding assets of a country in which EMP-volatility is high (large σ^2_t) should be compensated by a larger return (lower EMP), implying that μ is negative.[22] Note also that μ is interpretable as the semi-elasticity of changes in EMP for a given percentage change in conditional volatility.

As for conditional variance, the expected signs of the explanatory variables are not easily predictable *a priori* on theoretical grounds but their effects are easily interpretable upon estimation. In the case of foreign reserves, for example, a negative coefficient indicates that an increase in foreign reserves lowers conditional volatility. Finally, the impact of shocks is asymmetric if γ is different form zero while the presence of leverage effects can be tested under the hypothesis that γ is negative, which implies that negative shocks increase volatility more than positive ones of an equal magnitude.[23] A plausible explanation for this asymmetric

---

[19] Note that it was not possible to calculate q_t for STP due to lack of data regarding prices changes for this country.

[20] Changes in reserves and in the interest rate differential are not included in the mean equation as they are already present in the EMP measure.

[21] The first situation may lead to persistence that induces slight regime switching behaviour, due to agents' perceptions of the market and of policy actions, and possibly by the exchange-rate policy stance.

[22] For exchange rates, the risk premium associated with the underlying volatility can be either positive or negative. Engel (1996), for example, shows that the direction of the effect of conditional variance on risk premiums depends on the variance of nominal consumption. Fukuta & Saito (2002), meanwhile, shows that the signs of the coefficients on risk premiums depend on the covariance between consumption growth and inflation, the inter-temporal marginal rate of substitution, and the variances of inflation in Japan and the United States.

[23] Standard GARCH models assume that positive and negative error terms have a symmetric effect on the volatility. i.e. good and bad news have the same effect. In practice this assumption is frequently violated, in particular by stock returns, as noted by Black (1976). A likely reason for stock returns' asymmetric leverage effect

leverage effect in the case of EMP is that risk perceptions of negative EMP tend to increase when upside volatility increases more than downside volatility. Moreover, this behaviour is to be expected mainly in mature financial markets, as opposed to those which are less sophisticated and underdeveloped.

Our econometric analysis comprises the relatively short period of 1996:01 to 2005:09, as the adoption of a common analysis period required for cross-country comparisons reduces the effective sample size. In estimating our EGARCH-M models, we started with a general specification of the mean and variance equations. The orders of the variance equation and ARMA process in the mean equation were determined by the partial autocorrelation and the autocorrelation function of the EMP series. Non-significant variables are excluded from estimated equations where appropriate. We use the Schwartz Information Criterion (SIC) to assess a model's relative fit, implying that we choose those models for which the (negative) SIC is smallest. The final EGARCH-M specifications are decided by looking at the properties of standardised residuals (SR) and squared standardised residuals (SSR).

The models are estimated using E-Views 5.0, and we employ the Marquardt nonlinear optimization algorithm to compute maximum likelihood parameters. Bollerslev & Wooldridge (1992) note that maximising a mis-specified likelihood function in a GARCH framework provides consistent parameter estimates, even though standard errors will be understated. Accordingly, we use their consistent variance-covariance estimator to correct the covariance matrix. As such, we report asymptotic standard errors for estimated parameters which are robust to departures from normality.

Correctly specified EGARCH-M models will have SR and SSR that are white noise, i.e. they are independent and identically distributed random variables with mean zero and variance one. As model diagnostic tools, we use the modified Box-Ljung (B-L) procedure on the SR series to test for remaining serial correlation in the mean equation. To detect remaining ARCH effects in the variance equation, we use the B-L test as well as the ARCH-LM test on SSR. Based on the results of the diagnostic tests, we find ample support for our model specification. The B-L Q-statistics are insignificant at the 5% level for both the mean and variance equation, as are those of the ARCH-LM test.

The summary of our EGARCH-M estimation's results is given in Table 3.[24] For all countries, we find economic fundamentals to be significant in the mean equation, as monetary expansions are associated with higher EMP while real exchange rate depreciations lead to lower EMP. The degree of response appears to differ across countries, however. Our estimations suggest that the effect of a 1% increase in domestic credit on EMP is greatest in CV (5.81%) and MOZ (3.60%, at lag 6).[25] This finding apparently suggests that conditions in monetary and exchange rate markets are more closely related in CV and MOZ than in the other countries.

The fact that we do not any find such evidence for GB is probably not unsurprising given the unit of analysis being considered. We are confident that were we to consider changes in domestic credit for whole of the CFA currency area, instead of only those in GB, similar evidence is likely to emerge. For ANG, the apparent weakness of linkages between these markets is reinforced by the fact that estimated coefficients are only significant at the 5% level, which contrasts with the case of other PALOP countries. With regards to real exchange rate depreciations, the evidence is broadly similar across countries with the exception of GB,

---

is that negative returns imply a larger proportion of debt through a reduced market value of the firm, hence higher volatility.

[24] Full estimation results and diagnostics are provided in the appendix.

[25] A degree of caution must be exercised when interpreting this result, as changes in domestic credit that arise from monetary authorities' sterilisation activities cannot be identified using publicly available data.

where these have a smaller effect on EMP, in all likelihood due to the same reason given above.

Table 3a - Summary of EGARCH-M Estimation Results - Mean Equation

	Variables	ANG	CV	GB	MOZ	STP
Risk-return relationship	Estimated return (%) *(annual equivalent)*	-3.59** *(-43.08)*	-0.23** *(-2.76)*	-0.05** *(-0.60)*	-0,11* *(-1.32)*	-1.58** *(-18.96)*
Economic fundamentals	Effect of 1% increase in domestic credit (%)	*lag(-1)* 0.47* *lag(-8)* 0.35*	*lag(-4)* 5.81**	*lag(-4)* 0.61**	*lag(-6)* 3,60** *lag(-9)* 3,20**	*lag(-8)* 0.48** *lag(-11)* 0.90**
	Effect of 1% real exchange rate depreciation (%)	*lag(-4)* -28.05** *lag(-7)* -15.35**	*lag(-3)* -18.96**	*lag(-7)* -4.65**	*lag(-3)* -23,79** *lag(-8)* -38,95**	--
Dummies	D_ER_LIB	1.27**	--	--	--	--
	D_R_SHIFT	0.45**	--	--	--	--
	D_AID_CONCENT	--	--	--	0.10**	--
	D_05_97	--	--	-0.01**	--	--
	D_08_97	--	--	--	-0.08**	--
	D_12_97	--	--	--	--	-0.10**
Time Trend		- 0.002**	--	--	--	--

Note: (--) not applicable due to lack of data or relevance. A double (single) asterisk indicates that the estimated parameter is significantly different from zero at the 1% (5%) level.

We also find evidence of the risk-return relationship but it differs across countries rather significantly. While GB has the lowest estimate 0.60% p.a., the estimates CV and MOZ's estimates are of a close order of magnitude, as a 1% increase in volatility is associated with a reduction in mean EMP of 2.76% and 1.32% p.a. respectively. In contrast, the risk-return relationship in ANG and STP is clearly more extreme, as our estimates imply that holders of these countries assets would respectively expect to be compensated by a 43.08% and a 18.96% p.a. EMP reduction for the same increase in volatility.

The estimates for dummy variables provide additional insight into mean EMP dynamics. The liberalisation of ANG's exchange rate on 2002:12 (dummy D_ER_LIB), possibly coupled with other foreign exchange-market policy management mechanisms introduced around this period, lead to a strong AOA depreciation and significant positive EMP. In addition, during 1999:05, an unexplained and large reduction in ANG's foreign reserves, which fell from 741.26 to 375.55 million USD, increased EMP (dummy D_R_SHIFT). The same occurs when the MZM depreciates in 2005:04/05 (dummy D_AID_CONCENT), thereby partially reversing the currency's appreciation streak that resulted from the concentration of donors payment arrears at the end of 2004. GB's entry to the WAEMU, agreed upon in 1996:12 but only effective as of 1997:05, is clearly associated with a reduction in EMP volatility (dummy D_05_97) and so is MOZ's substantial reduction in interest rates in 1997:07 (dummy D_8_97). In the case of STP, an inspection of its exchange rate data suggests that some sort of "regime change" takes place toward the end of 1997, which marks the end of period of relatively large STD depreciations (dummy D_12_97). The respective dummy's estimate confirms this intuition, as it indicates that this “regime change” effectively lowered EMP as of 1998:01. There is no evidence of time trend behaviour with the exception of ANG, where the estimated coefficient is significant but has a very small magnitude.

Table 3b - Summary of EGARCH-M Estimation Results - Variance Equation

	Variables	ANG	CV	GB	MOZ	STP
Economic Variables	Changes in domestic credit	*lag(-3)* -0.10**	*lag(-3)* -25.91**	*lag(-3)* -2.86**	*lag(-2)* -3.31** *lag(-3)* -1.27**	*lag(-3)* -0.36**
	Changes in real exchange rate	--	*lag(-1)* -19.97**	--	--	--
	Changes in foreign reserves	--	*lag(-4)* 2.20** *lag(-8)* 3.86**	*lag(-2)* 2.13**	*lag(-1)* 11.30** *lag(-12)* 10.39**	*lag(-6)* -1.48* *lag(-8)* 2.39**
	Changes in oil prices	*lag(-4)* 4.23**	--	--	--	--
Dummies	D_08_97	--	--	--	-2.42**	--
	D_12_97	--	--	--	--	-3.29**
	D_10_99	-1.76**	--	--	--	
	D_06_01	--	--	--	--	-2.86**
Asymmetric Leverage Effect		0.44**	-0.71**	--	0.66**	--
Time Trend		0.02**	-0.03**	--	0.02**	0.04**

Notes: (--) not applicable due to lack of data or relevance. A double (single) asterisk indicates that the estimated parameter is significantly different from zero at the 1% (5%) level.

Addressing the conditional variance, we find that increases in domestic credit are always associated with lower volatility. This effect seems to be more pronounced in CV, GB and MOZ, as was also the case for mean EMP, and is less pronounced in ANG and STP. Real exchange rate changes have the same effect but only for CV. Foreign reserve changes generally increase volatility with the exception of ANG, where changes oil prices have the same impact.[26] Evidence of asymmetric effects of shocks on volatility is found for ANG, CV and MOZ while negative shocks increase volatility more that positive ones only for CV. The absence of the last effect for GB is again probably due to the reason earlier.

Various structural breaks are also found to be associated with lower volatility: 1999:10 (ANG), 1997:08 (MOZ), 1997:12 and 2001:06 (STP). Some of these breaks appear to be associated with known economic events. For instance, the break identified for MOZ in 1997:08 in all likelihood reflects the introduction of the Maputo inter-bank offered rate (MAIBOR) during the previous month, which fell substantially from 35.80% to 13.35%. With the exception of GB, time trend variables are significant for PALOP countries, which

[26] STP presents mixed results as foreign reserve changes *decrease* volatility at lag 6 but increase it at lag 8.

suggests that our model of conditional volatility will benefit from the inclusion of other economic variables should these become available.

Finally, we look at the conditional volatility series resulting from our model estimations in order to determine whether our initial finding that countries with currency pegs have lower volatility is confirmed. In Figure 3, we again group countries according to their exchange rate regime but now include MOZ in both in order to facilitate comparisons. Overall, we confirm this finding and the ordinal ranking that emerges from observing unconditional volatility (Figure 2). Moreover, two additional observations can be made. First, “pre-peg” CV and MOZ exhibit similar volatility prior to 1999. CV’s currency peg has had markedly lower volatility since then, with the exception of 2000. Since 2002, this difference has been accentuated as MOZ’s volatility has increased further. While the reason for this is unclear, this change might reflect the economic aftermath of the 2000-1 floods that severely affected MOZ. Second, STP’s volatility level has declined since 2002 and is now much closer to that of MOZ, which has the managing float with the lowest conditional volatility.

Figure 3a - EMP Conditional Volatility (% p.a.)
Managed Floats

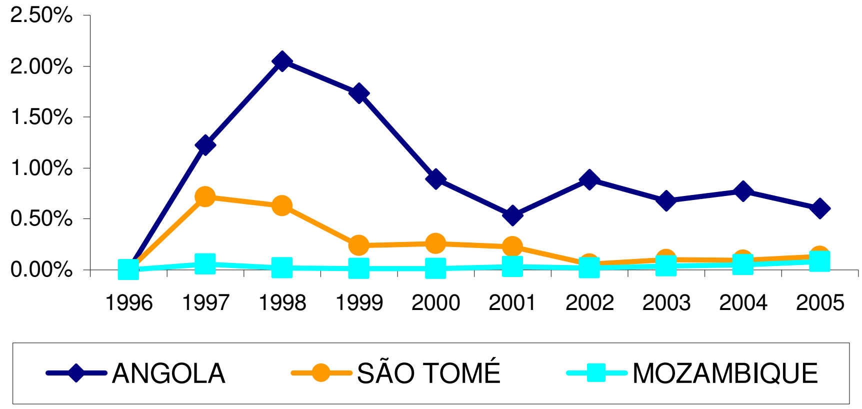
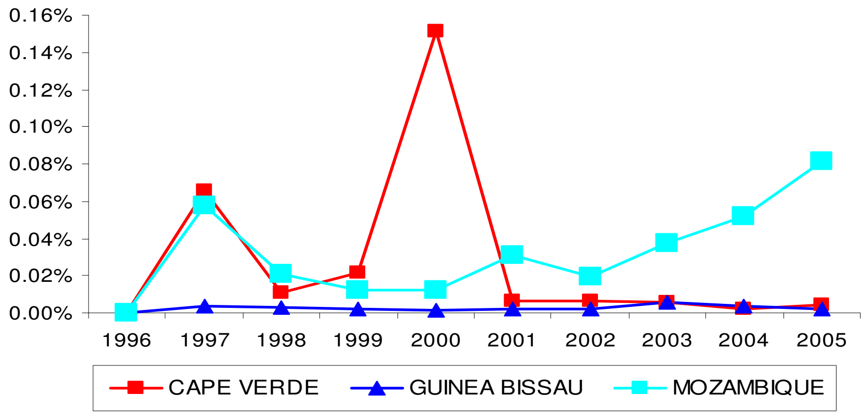


Figure 3b - EMP Conditional Volatility (% p.a.)
Two Currency Pegs, One Managed Float



4. Conclusion

Our main conclusion is that PALOP countries with currency pegs clearly have lower volatility when compared to those with managed floats. Moreover, EMP crises under pegs are much less severe. We find that economic fundamentals correctly account for mean EMP for all countries. The response of mean EMP to changes in domestic credit, however, is greatest in CV and MOZ, which apparently suggests that conditions in monetary and exchange rate markets for these countries are closely related. While the evidence is not as strong for GB, this is possibly due to the fact that this country is the only one in our sample which formally belongs to a monetary and currency union having the same legal tender for its members.

We also find that the risk-return relationship is much more favourable for investors under currency pegs, as the increase in volatility is lower for the same rate of (EMP) return. The exception to this finding is MOZ, which apparently has a risk-return profile akin to that enjoyed by countries with pegs. A plausible reason is that MOZ has the only managed float in our sample implementing monetary and exchange rate policy within the confines of an IMF framework, which establishes floors for international reserves and ceilings for the central bank's net domestic assets. This intuition needs to be tested, however, and as such is included in our future research agenda.

EMP conditional volatility, meanwhile, is generally driven by changes in domestic credit (lowers it) and foreign reserve changes (raises it). The first effect is more pronounced under currency pegs, but also under MOZ's managed float. Evidence of asymmetric effects of shocks on volatility is found for ANG, CV and MOZ while "bad news" increase volatility more that "good news" only for CV's currency peg, which we take to be a further sign of its credibility.

A few striking cross-country comparisons also emerged in our analysis. We find that ANG has the most severe EMP crises whilst MOZ has the least severe among countries with managed floats. STP, meanwhile, lies between these two extremes but its EMP crises behaviour is clearly much closer to that of MOZ. Our econometric models also permit us to rank PALOP countries' conditional volatility in ordinal terms. Based on these findings, it appears that MOZ's managed float has the greatest credibility for such arrangements as it has lowest volatility while ANG has the highest. STP's credibility may also be improving since its volatility has declined as of 2002 and its level is now much closer to that of MOZ.

Our future research agenda seeks to refine the above insights by seeking more data and better institutional knowledge for PALOP countries. This will allow us, for example, to fully explore crises episodes and structural breaks, and then relate these to policy and institutional changes. We also plan to undertake a comparative analysis using multivariate techniques, which might be instructive in terms of better policy design in the future. Hopefully, the techniques developed for this undertaking will also allow us to investigate other cases of interest in Africa, such as the CFA arrangement and the South African Rand's monetary zone.

References

Andreou, E. and E. Ghysels (2002) "Detecting Multiple Breaks in Financial Market Volatility Dynamics", available at http://ssrn.com/abstract=313639.

Berg, A., and C. Pattillo (1999) "Predicting Currency Crises: the Indicators Approach and an Alternative", *Journal of International Money and Finance*, Vol. 18, No. 4, (August), pp. 561-586.

Bertoli, S., Gallo G. M. and G. Ricchiuti (2006) "Exchange Market Pressure: Some Caveats in Empirical Applications", Working Paper 2006/17, Department of Statistics, University of Florence, Italy.

Black, F. (1976) "Studies in Stock Price Volatility Changes", *Proceedings of the 1976 Meeting of the Business and Economic Statistics Section*, American Statistical Association, pp. 177-181.

Bollerslev, T. (1986) "Generalized Autoregressive Conditional Heteroscedasticity", *Journal of Econometrics*, No. 31, pp. 307-27.

Bollerslev, T. and J. Wooldridge (1992) "Quasi-Maximum Likelihood Estimation and Inference in Dynamic Models with Time Varying Covariances", *Econometric Reviews*, No. 11, pp. 143-172.

Bonaglia, F., Braga de Macedo, J. and M. Bussolo (2001) "How Globalisation Improves Governance", CEPR Discussion Paper, No. 2992, October.

Braga de Macedo, J., Eichengreen B. and J. Reis (1996) editors, *Currency Convertibility: The Gold Standard and Beyond*, London: Routledge.

Braga de Macedo, J. (2001a) "Crises? What Crises? Escudo from ECU to EMU", in *Short-Term Capital Flows and Economic Crises*, edited by Stephany Griffith-Jones, Manuel Montes and Anwar Nasution, study prepared for UNU/WIDER, Oxford University Press, pp.253-260.

Braga de Macedo, J., Cohen, D. and H. Reisen (2001b), editors, *Don't Fix Don't Float*, Paris: OECD Development Centre.

Braga de Macedo, J. and B. Eichengreen (2001c) "The European Payments Union and its Implications for the Evolution of the International Financial Architecture", in *Fragility of the International Financial System - How Can We Prevent New Crises in Emerging Markets?*, edited by Alexandre Lamfalussy, Bernard Snoy and Jérôme Wilson, Brussels: PIE Peter Lang for Fondation Internationale Robert Triffin, pp. 25-42.

Braga de Macedo, J., Nunes, L. C. and L. Brites Pereira (2003) "Central Bank Intervention Under Target Zones: The Portuguese Escudo in the ERM", *FEUNL Working Paper,* No. 345, Lisbon: Universidade Nova de Lisboa.

Braga de Macedo, J., Catela Nunes, L. and F. Covas (2004a) "Moving the Escudo into the Euro" in chapter 8 of *Shaping the New Europe: Economic Policy Challenges of EU Enlargement*, edited by Michael Landersmann and Darius Rosati, Palgrave, forthcoming (an earlier version appeared as CEPR Discussion Paper, No. 2248, October 1999).

Braga de Macedo, J. and H. Reisen (2004b), "Float in Order to Fix: Lessons from Emerging Markets for New EU Member Countries", in *Monetary Strategies for Joining the Euro*, National Bank of Hungary, pp. 109-113.

Braga de Macedo, J. and M. Grandes (2005) "Argentina and Brazil Risk: a Eurocentric Tale", in Rolf Langhammer e Lucio Vinhas de Souza, editors *Monetary Policy and Macroeconomic Stabilization in Latin America*, Berlin: Springer, pp. 153-172.

Braga de Macedo, J., Braz, J., Brites Pereira, L. and L. C. Nunes (2006) Report to the Monetary Authority of Macau on "Macau's Currency Board", FEUNL Working Paper No. 492, Lisbon: Universidade Nova de Lisboa.

Braga de Macedo, J. and J. Oliveira Martins (2006) “Growth, Reform Indicators and Policy Complementaries, FEUNL Working Paper No. 484, Lisbon: Universidade Nova de Lisboa.

Braga de Macedo, J. & L. Brites Pereira, (2006) “The Credibility of Cape Verde’s Currency Peg”, FEUNL Working Paper No. 494, Lisbon: Universidade Nova de Lisboa.

Brites Pereira (2005a), “The Effectiveness of Intervention: Evidence from a Markov-Switching Analysis”, Manuscript, Doctoral Thesis, Lisbon: Universidade Nova de Lisboa.

Brites Pereira (2005b), “Relieving Exchange Market Pressure”, Manuscript, Doctoral Thesis, Lisbon: Universidade Nova de Lisboa.

Bubula, A. and I. Otker-Robe (2006) “Are Pegged and Intermediate Exchange Rate Regimes More Crisis Prone?, IMF Working Paper No. 03/223, Washington: International Monetary Fund.

Collier, P. (2006) “Angola: Options for Prosperity”, Department of Economics, Oxford University, available at users.ox.ac.uk/~econpco/research/Africa.htm.

Demirguc-Kunt, A. and E. Detragiachhe (1997) “The Determinants of Banking Crises in Developing and Developed Countries”, IMF Working Paper No. 106, Washington: International Monetary Fund, pp. 34-56.

Dooley, M. Folkerts-Landau, D. and P. Garber (2005) “Interest rates, Exchange Rates and International Adjustment”, NBER Working Paper, No. 11771.

Dowling, M. and J. Zhuang (2000) “Causes of the 1997 Asian financial crisis: What More Can We Learn from an Early Warning System Model?”, Department of Economics, Melbourne University, Australia Working Paper No. 123, pp. 54-76.

Engel, C., (1996), “The Forward Discount Anomaly and the Risk Premium: A Survey of Recent Evidence”, *Journal of Empirical Finance,* No. 3, pp.123-192.

Engle, R. (1982) “Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation”, *Econometrica*, No. 50, pp. 987-1007.

Engle, R., Lilien, D. and R. Robins (1987) “Estimating Time Varying Risk Premia in the Term Structure: The ARCH-M Model”, *Econometrica*, No. 55, pp. 391-407.

Eichengreen, B., Tobin, J. and C. Wyplosz (1995) “Two Cases for Sand in the Wheels of International Finance”, *Economic Journal*, Vol. 105, pp. 162-172.

Eichengreen, B., Rose, A. K. and C. Wyplosz (1995) “Exchange Market Mayhem: The Antecedents and Aftermath of Speculative Attacks”, *Economic Policy,*Vol. 21, pp. 249-312.

Eichengreen, B., Rose, A. K. and C. Wyplosz (1996) “Speculative Attacks on Pegged Exchange Rates: An Empirical Exploration with Special Reference to the European Monetary System”, in Canzoneri, M.B., Ethier W.J. and V. Grilli (eds.) *The New Transatlantic Economy,* Cambridge University Press, Cambridge.

Feridun, M. (2007) “An Econometric Analysis of the Mexican Peso Crisis of 1994-1995”, *Doğuş Üniversitesi Dergisi*, No. 8 (1), pp. 28-35.

Flood, R. and N. Marion (1998) “Perspectives on Recent Currency Crisis Literature”, NBER Working Paper No. 6380, Cambridge, MA: National Bureau of Economic Research.

Fukuta, Y. and M. Saito (2002) “Forward Discount Puzzle and Liquidity Effects: Some Evidence from Exchange Rates among the United States, Canada, and Japan”, *Journal of Money, Credit and Banking*, Vol.34, pp. 1014-1033.

Girton, L. and D. Roper (1977) "A Monetary Model of Exchange Market Pressure Applied to the Postwar Canadian Experience", *American Economic Review*, Vol. 67, No. 4, pp. 537-48.

Goldberg, L. and M. Klein (2006) "Establishing Credibility: Evolving Perceptions of the European Central Bank", paper presented at the NBER Summer Institute, July.

Inclán, C. and C. Tiao (1994) "Use of Cumulative Sums of Squares for Retrospective Detection of Changes of Variance", *Journal of the American Statistics Association*, Vol. 89, pp. 913-23.

Kaminsky, G.L. and C.M. Reinhart, (1999) "The Twin Crises: The Causes of Banking and Balance of Payments Problems", *American Economic Review*, Vol. 89 (June), pp. 473-500.

Kim, K. and P. Schmidt (1993) "Unit root tests with Conditional heteroskedasticity", *Journal of Econometrics* 59, 287-300.

Kose, M., Prasad, E., Wei, S. and K. Rogoff (2006) "Financial Globalization: A Reappraisal", IMF Working Paper No. 06/189, Washington: International Monetary Fund.

Kouri, P. and J. Braga de Macedo (1978) "Exchange Rates and the International Adjustment Process", Brookings Papers on Economic Activity.

Krugman, P. (1981) "Oil and the Dollar", in J. Bhandari and J. Putnam, *Interdependence under Flexible Exchange Rates*, Cambridge: MIT Schuler, K. (2004) *Tables of Modern Monetary History, available at* http://users.erols.com/kurrency/afrca.htm

Lanoie, P. and S. Lemarbre (1996) "Three Approaches to Predict the Timing and Quantity of LDC Debt Rescheduling", *Applied Economics*, No. 28 (2), pp. 241-246.

Li, J. Rajan, R.S and T. Willett (2006) Measuring Currency Crises using Exchange Market Pressure Indices: the Imprecision of Precision Weights, available at www.princeton.edu/~pcglobal/conferences/IPES/papers/chiu_willett_S1100_1.pdf

Spolander, M. (1999) "Measuring Exchange Rate Pressure and Central Bank Intervention", *Bank of Finland Studies*, Series E, No. 17.

Veyrune, R. (2007) "Fixed Exchange Rate and the Autonomy of Monetary Policy: The Franc Zone Case", IMF Working Paper, No. 07/34

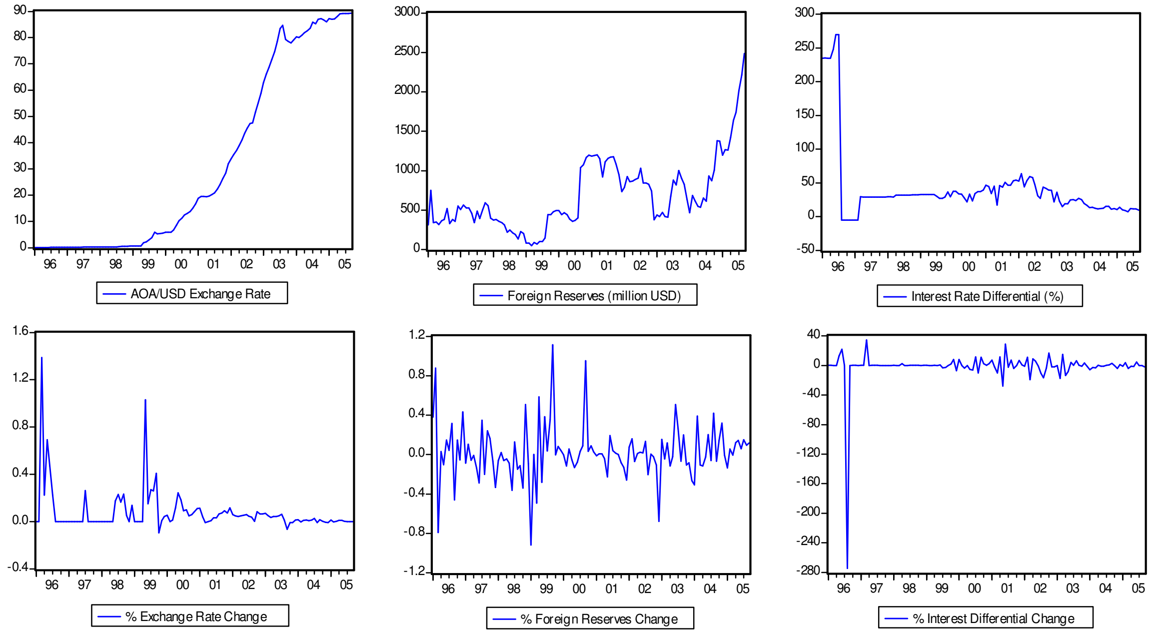
Weber, R. (2005) "Cape Verde's Exchange Rate Policy and its Alternatives", BCL Working Paper No. 16, Banque Central du Luxembourg.

Weymark, D. N. (1995) "Estimating Exchange Market Pressure and the Degree of Exchange Market Intervention for Canada", *Journal of International Economics*, Vol. 39, pp. 273-295.

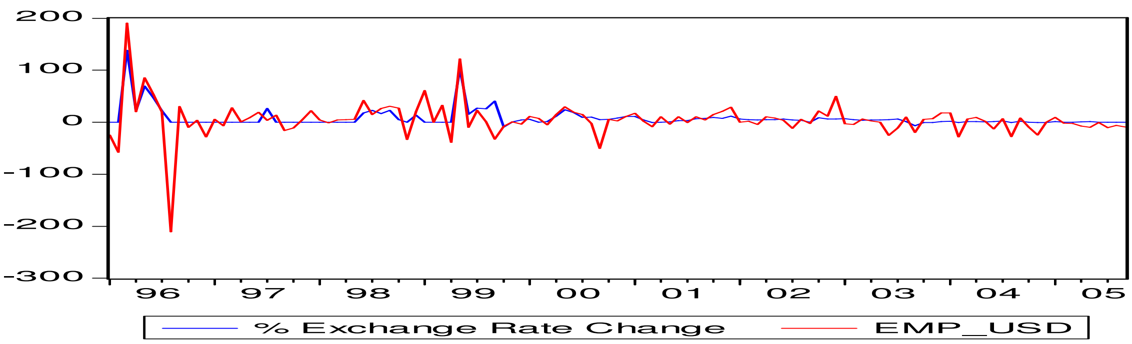
Weymark, D. N. (1998) "A General Approach to Measuring Exchange Market Pressure", *Oxford Economic Papers*, Vol. 50, pp. 106-121.

APPENDIX – Country Files

ANG – EMP Constituent Components



ANG – EMP and Changes in Exchange Rate (%)



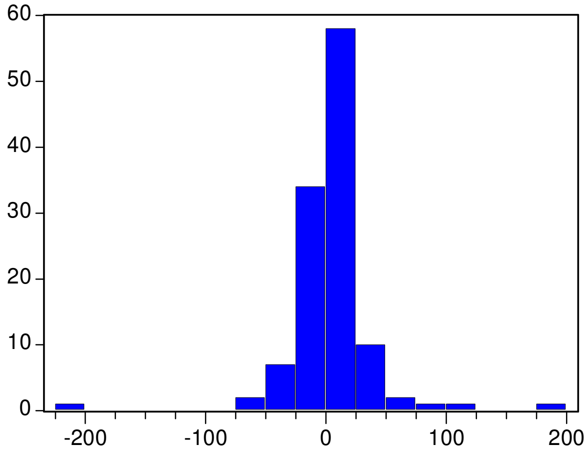
ANG – EMP Estimates & Crises

Date	EMP	Δe	Δr	Δ(i-i*)
1996 JAN	-24.844	0.000	37.994	0.230
1996 FEB	-57.623	0.000	87.816	0.240
1996 MAR	190.662	138.629	-79.215	-0.140
1996 APR	20.368	22.314	2.883	-0.070
1996 MAY	**85.290**	**69.315**	**-10.550**	**13.000**
1996 JUN	52.617	47.000	14.587	21.900
1996 JUL	19.585	22.314	4.073	-0.070
1996 AUG	-211.421	0.000	31.586	-274.370
1996 SEP	30.281	0.000	-46.129	-0.110
1996 OCT	-9.561	0.000	14.633	0.100
1996 NOV	3.597	0.000	-5.434	0.030
1996 DEC	-28.335	0.000	42.993	-0.060
1997 JAN	5.729	0.000	-8.696	0.010
1997 FEB	-6.816	0.000	10.421	0.060
1997 MAR	27.743	0.000	-5.901	34.340
1997 APR	0.478	0.000	-0.917	-0.180
1997 MAY	8.958	0.000	-13.602	0.010
1997 JUN	19.113	0.000	-29.002	0.040
1997 JUL	3.424	26.236	34.729	0.060
1997 AUG	13.270	0.000	-20.164	0.000
1997 SEP	-15.705	0.000	23.865	0.000
1997 OCT	-10.749	0.000	16.281	-0.050
1997 NOV	4.331	0.000	-6.676	-0.090
1997 DEC	21.921	0.000	-33.374	-0.060
1998 JAN	4.292	0.000	-6.248	0.260
1998 FEB	-1.217	0.000	1.849	0.000
1998 MAR	4.071	0.000	-6.229	-0.040
1998 APR	4.779	0.000	-4.622	2.500
1998 MAY	5.710	0.000	-8.687	-0.010
1998 JUN	41.480	17.589	-36.314	-0.010
1998 JUL	14.700	22.957	12.559	0.010
1998 AUG	26.276	16.508	-14.833	0.010
1998 SEP	30.750	23.180	-11.323	0.170
1998 OCT	27.474	5.043	-33.874	0.200
1998 NOV	-33.241	0.000	50.481	-0.030
1998 DEC	20.061	13.762	-9.466	0.100
1999 JAN	**60.676**	**0.000**	**-91.937**	**0.250**
1999 FEB	-0.120	0.000	0.172	-0.010
1999 MAR	32.356	0.000	-49.177	-0.010

Date	EMP	Δe	Δr	Δ(i-i*)
1999 APR	-38.439	0.000	58.443	0.030
1999 MAY	121.620	102.962	-28.395	-0.040
1999 JUN	-9.801	15.123	38.307	0.410
1999 JUL	22.567	27.110	3.493	-3.230
1999 AUG	0.979	26.056	35.287	-2.670
1999 SEP	-32.434	40.890	111.325	-0.090
1999 OCT	-7.974	-9.514	-0.365	1.870
1999 NOV	1.001	0.750	7.939	7.880
1999 DEC	-3.524	4.209	4.044	-7.300
2000 JAN	11.271	5.407	-0.327	8.130
2000 FEB	7.720	0.000	-11.794	-0.060
2000 MAR	-4.751	1.349	5.490	-3.580
2000 APR	14.931	11.685	-5.481	-0.520
2000 MAY	29.424	24.233	-13.304	-5.130
2000 JUN	19.169	18.427	-7.716	-6.240
2000 JUL	15.037	9.194	3.031	11.280
2000 AUG	-2.749	9.958	8.814	-9.940
2000 SEP	-50.139	4.860	95.199	11.010
2000 OCT	5.433	5.797	3.224	2.530
2000 NOV	2.702	8.243	8.609	0.180
2000 DEC	11.250	11.186	2.436	2.400
2001 JAN	17.114	11.288	-1.336	7.120
2001 FEB	2.188	4.059	0.784	-1.950
2001 MAR	-8.344	-0.665	0.805	-10.290
2001 APR	10.268	-0.103	-4.072	11.070
2001 MAY	-3.587	0.870	-22.822	-28.030
2001 JUN	10.521	3.159	19.241	28.820
2001 JUL	-0.915	3.301	3.851	-2.420
2001 AUG	10.532	6.517	1.310	7.020
2001 SEP	4.469	7.456	0.199	-4.110
2001 OCT	14.687	9.236	-8.314	-0.030
2001 NOV	20.786	7.511	-13.024	6.770
2001 DEC	29.104	11.532	-25.921	0.740
2002 JAN	0.127	5.865	7.400	-1.250
2002 FEB	1.827	4.755	15.842	10.790
2002 MAR	-4.460	4.243	-7.152	-19.300
2002 APR	10.477	4.870	0.983	9.000
2002 MAY	7.968	5.255	2.170	5.960
2002 JUN	3.991	5.916	1.680	-1.180

Date	EMP	Δe	Δr	Δ(i-i*)
2002 JUL	-11.569	-11.569	1.680	-10.510
2002 AUG	5.631	5.631	13.345	-16.730
2002 SEP	-2.357	-2.357	-20.393	-3.620
2002 OCT	21.353	21.353	0.368	16.470
2002 NOV	11.875	11.875	-2.183	-2.160
2002 DEC	49.677	49.677	-10.784	-2.070
2003 JAN	-3.268	-3.268	-67.996	-0.270
2003 FEB	-4.117	-4.117	15.307	-17.660
2003 MAR	6.278	6.278	-4.668	14.830
2003 APR	2.687	2.687	11.573	-13.430
2003 MAY	-0.151	-0.151	-11.803	-8.420
2003 JUN	-25.482	-25.482	-2.220	4.250
2003 JUL	-10.865	-10.865	50.768	0.080
2003 AUG	10.013	10.013	25.976	6.030
2003 SEP	-19.647	-19.647	-6.717	0.180
2003 OCT	5.531	5.531	19.956	-1.110
2003 NOV	6.765	6.765	-10.828	3.020
2003 DEC	17.857	17.857	-8.333	-1.560
2004 JAN	17.880	17.880	-26.614	-5.880
2004 FEB	-27.926	-27.926	-31.013	-2.830
2004 MAR	5.825	5.825	38.765	-3.310
2004 APR	9.306	9.306	-10.646	0.270
2004 MAY	1.697	1.697	-11.914	-1.180
2004 JUN	-12.716	-12.716	-2.531	-0.910
2004 JUL	7.000	7.000	20.118	0.110
2004 AUG	-27.743	-27.743	-6.288	0.820
2004 SEP	8.115	8.115	41.994	2.740
2004 OCT	-9.049	-9.049	-6.686	-0.100
2004 NOV	-24.442	-24.442	14.116	-4.200
2004 DEC	0.151	0.151	31.851	0.940
2005 JAN	9.424	9.424	-0.451	-1.400
2005 FEB	-1.454	-1.454	-13.693	3.530
2005 MAR	-2.375	-2.375	5.657	-4.140
2005 APR	-7.516	-7.516	-0.622	-1.010
2005 MAY	-9.576	-9.576	11.935	-1.660
2005 JUN	-0.462	-0.462	14.446	4.620
2005 JUL	-9.981	-9.981	5.922	-0.450
2005 AUG	-6.148	-6.148	14.725	-0.030
2005 SEP	-8.903	-8.903	9.311	-1.850

ANG – EMP Descriptive Statistics



Series: EMP_USD
Sample 1996M01 2005M09
Observations 117

Mean	5.063191
Median	4.291403
Maximum	190.6627
Minimum	-210.6031
Std. Dev.	34.82329
Skewness	-0.376357
Kurtosis	21.51951
Jarque-Bera	1674.751
Probability	0.000000

ANG – EGARCH-M Estimation Results

$$EMP_t = \mu \ln\sigma^2 + \text{Dummies} + \theta_1 \Delta dc_{t-1} + \theta_2 \Delta dc_{t-8} + \theta_3 q_{t-4} + \theta_4 q_{t-7} + \theta_5 trend + \xi_1 EMP_{t-2} + \xi_2 EMP_{t-3} + \varepsilon_t + \xi_3 \varepsilon_{t-2}$$

Parameter	Estimate	Std. Error	t-Statistic	p-value
μ	-0.035880	0.005544	-6.471381	0.0000**
D_ER_LIB	1.266598	0.093339	13.56991	0.0000**
D_R_SHIFT	0.450566	0.017936	25.12039	0.0000**
θ_1	0.004743	0.002137	2.219570	0.0264*
θ_2	0.003540	0.001580	2.241065	0.0250*
θ_3	-0.280504	0.081915	-3.424354	0.0006**
θ_4	-0.153451	0.056601	-2.711125	0.0067**
θ_5	-0.001997	0.000353	-5.663922	0.0000**
ξ_1	-0.621861	0.096220	-6.462932	0.0000**
ξ_2	-0.171173	0.045946	-3.725557	0.0002**
ε_{t-2}	0.756265	0.090967	8.313628	0.0000**

$$\ln\sigma_t^2 = \text{DUMMY} + \lambda_0 + \lambda_1 \Delta dc_{t-3} + \lambda_2 \Delta oil_{t-4} + \alpha_1 \left|\frac{\varepsilon_{t-1}}{\sigma_{t-1}}\right| + \alpha_2 \ln\sigma_{t-1}^2 + \gamma_1 \frac{\varepsilon_{t-1}}{\sigma_{t-1}}$$

D_10_99	-1.776190	0.435467	-4.078814	0.0000**
λ_0	-6.140849	0.417547	-14.70697	0.0000**
λ_1	4.232692	1.351095	3.132786	0.0017**
λ_2	-0.095852	0.020470	-4.682682	0.0000**
$\ln\sigma^2_{t-1}$	-0.634700	0.097083	-6.537693	0.0000**
α_1	0.320883	0.148388	2.162460	0.0306*
γ_1	0.442317	0.090149	4.906518	0.0000**

Diagnostics

	L-B Standardised Residuals		L-B Squared Residuals		ARCH-LM Statistic	
Lag	**Q**	**p-value**	**Q^2**	**p-value**	**LM**	**p-value**
Lag4	2.0716	0.150	1.8103	0.178	0.135892	0.2705
Lag5	2.0751	0.354	1.8394	0.399	0.000934	0.9926
Lag6	2.3794	0.497	1.9752	0.578	-0.024754	0.7787
Lag7	2.8713	0.580	2.0955	0.718	-0.055129	0.6503
Lag8	7.1675	0.208	3.3038	0.653	0.027496	0.8028
Lag9	8.8914	0.180	3.3038	0.770	0.019331	0.8729
Lag10	11.338	0.125	3.3226	0.854	-0.026169	0.8375
Lag11	11.346	0.183	3.6091	0.891	0.043421	0.7131
Lag12	11.360	0.252	4.3461	0.887	0.066988	0.5932
Lag13	11.773	0.301	5.2516	0.874	-0.156820	0.0759
Lag14	13.228	0.279	7.2139	0.782	-0.143736	0.1594
Lag15	13.336	0.345	7.9415	0.790	-0.025106	0.8390
	No. of Observations		**Log-Likelihood**		**SIC**	
	117		78.96751		-0.698048	

ANG – Data Description[27]

Variables	
e_t	Bilateral AOA/USD exchange rate. Source: IMF – International Financial Statistics
Δe_t	Depreciation rate of AOA vis-à-vis the USD (log).
Δr_t	Change in ANG's international reserves (log). Source: IMF – International Financial Statistics.
i_t	ANG 3-Month Deposit Rate (%). Source: IMF – International Financial Statistics.
i_t^*	USA 3-Month CDs (secondary market), an average of dealer bid rates on nationally traded certificates of deposit (%). Source: US Federal Reserve.
$\Delta(i_t - i_t^*)$	Change in interest rate differential (%).
p_t	ANG Consumer Price Index. Source: IMF – International Financial Statistics.
Δp_t	$\Delta p_t = (p_t - p_{t-1})/p_{t-1}$
p_t^*	US Consumer Price Index. Source: Bureau of Labour Statistics - All Urban Consumers - (CPI-U) U.S. city average. All items 1982-84=100.
Δp_t^*	$\Delta p_t^* = (p_t^* - p_{t-1}^*)/p_{t-1}^*$
q_t	Real exchange rate depreciation = $\Delta e - \Delta p_t + \Delta p_t^*$
dc_t	Domestic credit growth rate. Source: IMF – International Financial Statistics.
Δdc_t	$\Delta dc_t = (dc_t - dc_{t-1})/dc_{t-1}$
oil_t	Crude Oil (Petroleum), Simple Average Of Three Spot Prices; Dated Brent, West Tx Intermediate, & The Dubai Fateh, USD per Barrel – World. Source: Wood Mackenzie.
Δoil_t	$\Delta oil_t = (oil_t - oil_{t-1})/oil_{t-1}$
D_10_99	Dummy variable that takes on value one for all t ≥ 1999:10 and zero otherwise.
ER_LIB	Dummy variable that takes on value one for all t = 1999:05 and zero otherwise.
D_ER_SHIFT	Dummy variable that takes on value one for all t = 2002:12 and zero otherwise.

Unit Root Test: MacKinnon Critical Values

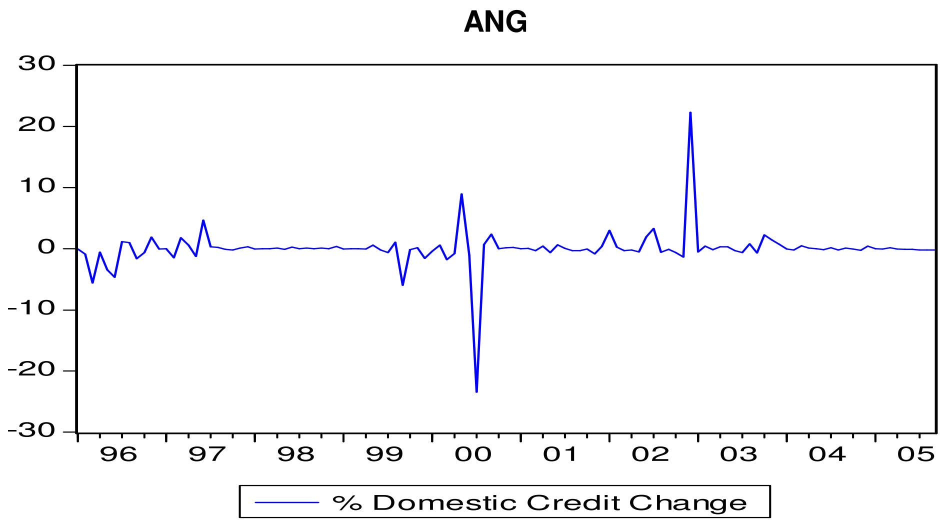
Significance Level	No Intercept or Trend	Intercept	Intercept and Trend
1%	-2.5830	-3.4861	-4.0373
5%	-1.9426	-2.8857	-3.4478
10%	-1.6171	-2.5795	-3.1488

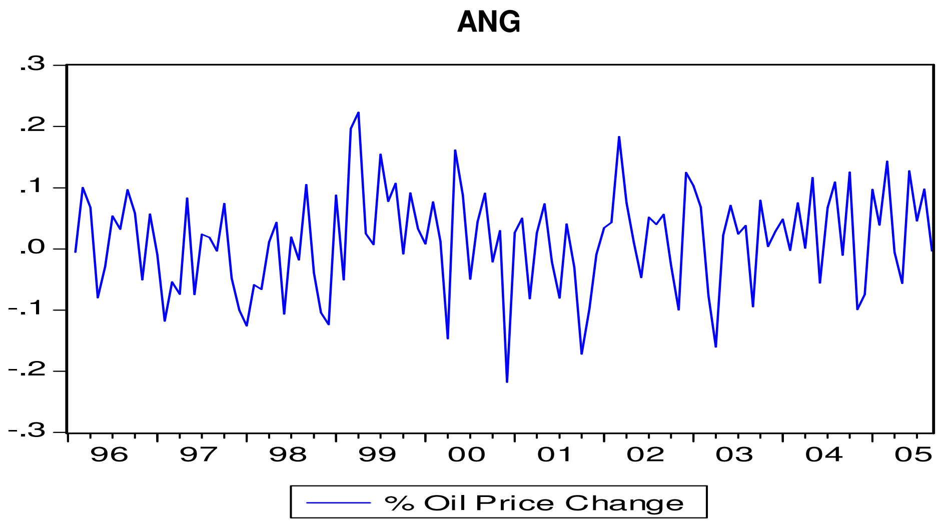
[27] The data used in the analysis are monthly and the sample period runs from 1996:01 until 2005:09. Where appropriate, Δ denotes percentage changes between two consecutive months, which are calculated using the exact formula or log difference approximation (excepting interest rate data).

ANG – Phillips-Perron Test Statistic

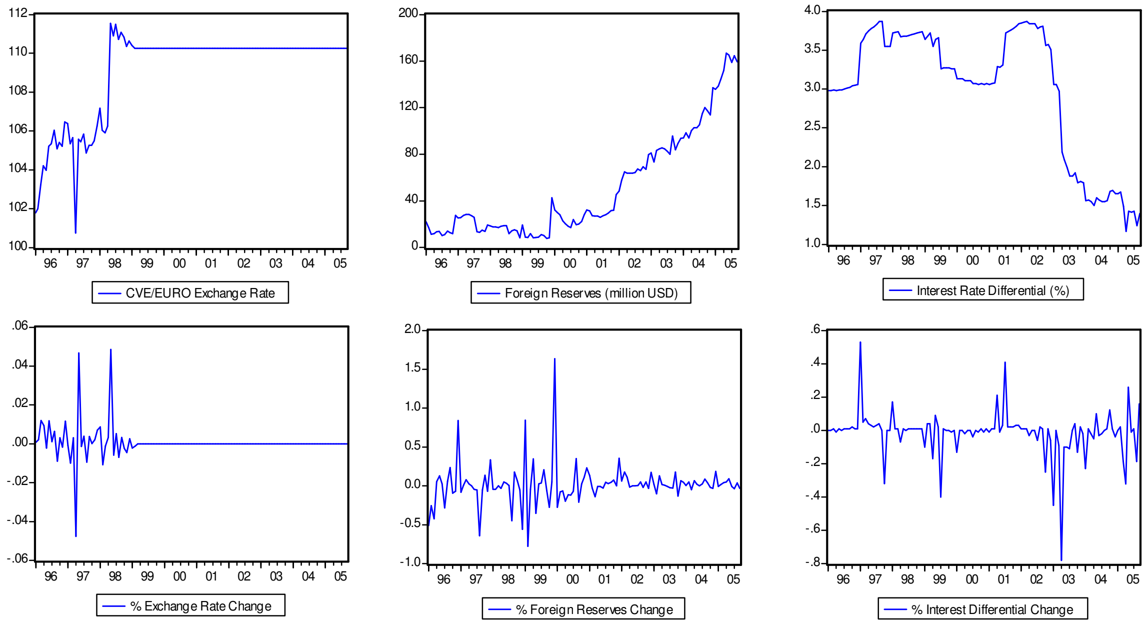
Series	Level	Test Specification	First Difference	Test Specification
p_t	-1.219924	Intercept & Trend	-4.870490**	Intercept & Trend
p_t^*	-0.382614	Intercept & Trend	-4.732785**	No Intercept or Trend
e_t	-2.456632	Intercept & Trend	-8.137548**	No Intercept or Trend
i_t-i_t^*	-3.757466**	Intercept & Trend	-10.97336**	No Intercept or Trend
r_t	-0.731256	Intercept & Trend	-11.03994**	No Intercept or Trend
dc_t	-2.032350	Intercept & Trend	-11.61337**	No Intercept or Trend
oil_t	-0.252769	Intercept & Trend	-10.25041**	No Intercept or Trend

Notes: The Phillips-Perron procedure tests the null hypothesis of a unit root. All tests were conducted using four lags. A double (single) asterisk indicates that the test statistic is significant at the 1% (5%) level.

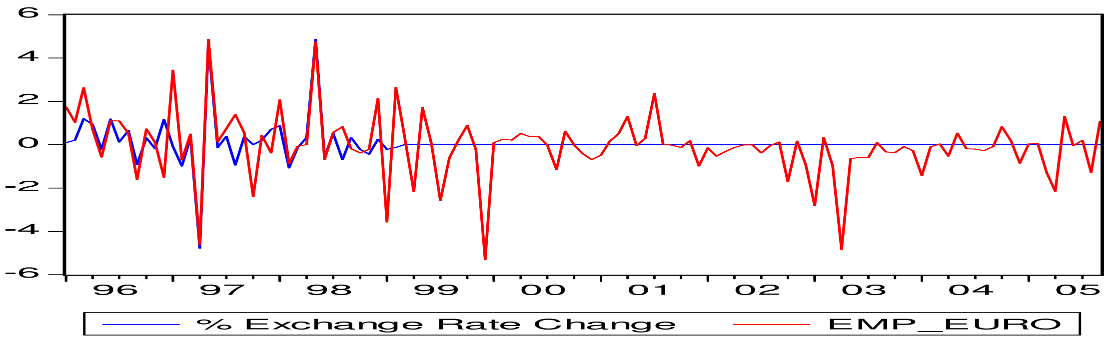




CV – EMP Constituent Components



CV – EMP and Changes in Exchange Rate (%)



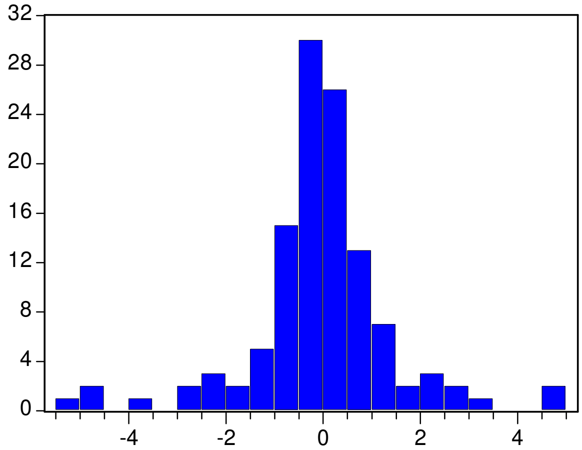
CV – EMP Estimates & Crises

Date	EMP	Δe	Δr	Δ(i-i*)
1996 JAN	1.750	0.085	-51.300	0.000
1996 FEB	1.040	0.216	-25.378	0.000
1996 MAR	**2.634**	**1.201**	**-42.249**	**0.010**
1996 APR	0.692	0.929	5.415	-0.010
1996 MAY	-0.570	-0.219	12.706	0.010
1996 JUN	1.106	1.183	2.367	0.000
1996 JUL	1.097	0.123	-28.094	0.010
1996 AUG	0.526	0.653	5.792	0.010
1996 SEP	-1.602	-0.902	23.454	0.010
1996 OCT	0.732	0.313	-9.154	0.020
1996 NOV	0.107	-0.177	-6.853	0.010
1996 DEC	-1.498	1.173	84.154	0.010
1997 JAN	**3.438**	**-0.080**	**-8.233**	**0.530**
1997 FEB	-0.700	-0.983	0.702	0.050
1997 MAR	0.487	0.309	7.743	0.070
1997 APR	-4.615	-4.776	2.582	0.040
1997 MAY	**4.862**	**4.688**	**0.303**	**0.030**
1997 JUN	0.134	-0.128	-4.300	0.020
1997 JUL	0.740	0.392	-5.065	0.030
1997 AUG	1.386	-0.941	-64.110	0.040
1997 SEP	0.547	0.378	-5.204	0.000
1997 OCT	-2.390	0.006	13.349	-0.320
1997 NOV	0.432	0.214	-6.727	0.000
1997 DEC	-0.371	0.714	33.429	0.000
1998 JAN	2.071	0.878	-4.631	0.170
1998 FEB	-0.872	-1.076	-4.380	0.010
1998 MAR	-0.072	-0.124	0.314	0.010
1998 APR	0.003	0.327	-3.247	-0.070
1998 MAY	**4.755**	**4.863**	**5.231**	**0.010**
1998 JUN	-0.684	-0.575	3.335	0.000
1998 JUL	0.568	0.522	0.454	0.010
1998 AUG	0.828	-0.688	-44.798	0.010
1998 SEP	-0.187	0.330	17.805	0.010
1998 OCT	-0.380	-0.223	6.750	0.010
1998 NOV	-0.220	-0.446	-5.055	0.010
1998 DEC	**2.144**	**0.262**	**-56.080**	**0.010**
1999 JAN	-3.567	-0.214	84.379	-0.100
1999 FEB	**2.639**	**-0.124**	**-77.547**	**0.040**
1999 MAR	0.398	0.000	-4.692	0.040

Date	EMP	Δe	Δr	Δ(i-i*)
1999 APR	-2.169	0.000	34.695	-0.170
1999 MAY	1.708	0.000	-35.614	0.090
1999 JUN	0.042	0.000	2.497	0.020
1999 JUL	-2.575	0.000	3.769	-0.400
1999 AUG	-0.617	0.000	20.897	0.010
1999 SEP	0.193	0.000	-5.929	0.000
1999 OCT	0.890	0.000	-27.413	0.000
1999 NOV	-0.215	0.000	4.745	-0.010
1999 DEC	-5.312	0.000	163.606	0.000
2000 JAN	0.091	0.000	-27.361	-0.130
2000 FEB	0.251	0.000	-7.718	0.000
2000 MAR	0.213	0.000	-6.574	0.000
2000 APR	0.518	0.000	-19.742	-0.020
2000 MAY	0.378	0.000	-11.649	0.000
2000 JUN	0.384	0.000	-11.825	0.000
2000 JUL	-0.017	0.000	-7.026	-0.040
2000 AUG	-1.140	0.000	35.095	0.000
2000 SEP	0.625	0.000	-21.132	-0.010
2000 OCT	-0.017	0.000	2.419	0.010
2000 NOV	-0.428	0.000	11.300	-0.010
2000 DEC	-0.689	0.000	23.123	0.010
2001 JAN	-0.489	0.000	13.167	-0.010
2001 FEB	0.152	0.000	-2.787	0.010
2001 MAR	0.509	0.000	-13.802	0.010
2001 APR	1.308	0.000	-0.627	0.210
2001 MAY	-0.034	0.000	-0.857	-0.010
2001 JUN	0.281	0.000	-2.989	0.030
2001 JUL	**2.368**	**0.000**	**4.511**	**0.410**
2001 AUG	0.029	0.000	2.871	0.020
2001 SEP	-0.025	0.000	4.532	0.020
2001 OCT	-0.124	0.000	7.594	0.020
2001 NOV	0.181	0.000	0.078	0.030
2001 DEC	-0.978	0.000	35.783	0.030
2002 JAN	-0.143	0.000	6.306	0.010
2002 FEB	-0.521	0.000	17.924	0.010
2002 MAR	-0.303	0.000	11.225	0.010
2002 APR	-0.137	0.000	-1.451	-0.030
2002 MAY	-0.004	0.000	0.114	0.000
2002 JUN	-0.003	0.000	0.087	0.000

Date	EMP	Δe	Δr	Δ(i-i*)
2002 JUL	-0.384	0.000	0.485	-0.060
2002 AUG	-0.030	0.000	4.716	0.020
2002 SEP	0.131	0.000	-2.139	0.010
2002 OCT	-1.700	0.000	5.134	-0.250
2002 NOV	0.167	0.000	-3.253	0.010
2002 DEC	-0.926	0.000	17.191	-0.060
2003 JAN	-2.809	0.000	1.519	-0.450
2003 FEB	0.324	0.000	-9.982	0.000
2003 MAR	-0.970	0.000	12.865	-0.090
2003 APR	-4.834	0.000	1.568	-0.780
2003 MAY	-0.646	0.000	1.009	-0.100
2003 JUN	-0.581	0.000	-0.978	-0.100
2003 JUL	-0.590	0.000	-2.595	-0.110
2003 AUG	0.095	0.000	-2.912	0.000
2003 SEP	-0.330	0.000	17.728	0.040
2003 OCT	-0.367	0.000	-13.239	-0.130
2003 NOV	-0.086	0.000	6.423	0.020
2003 DEC	-0.271	0.000	4.555	-0.020
2004 JAN	-1.424	0.000	0.405	-0.230
2004 FEB	-0.095	0.000	4.826	0.010
2004 MAR	0.034	0.000	-4.822	-0.020
2004 APR	-0.522	0.000	6.638	-0.050
2004 MAY	0.543	0.000	2.150	0.100
2004 JUN	-0.188	0.000	0.113	-0.030
2004 JUL	-0.206	0.000	2.569	-0.020
2004 AUG	-0.283	0.000	8.713	0.000
2004 SEP	-0.079	0.000	4.335	0.010
2004 OCT	0.831	0.000	-2.227	0.124
2004 NOV	0.164	0.000	-3.171	0.010
2004 DEC	-0.852	0.000	18.672	-0.040
2005 JAN	0.029	0.000	-0.883	0.000
2005 FEB	0.064	0.000	1.797	0.020
2005 MAR	-1.274	0.000	4.306	-0.185
2005 APR	-2.145	0.000	5.163	-0.323
2005 MAY	1.299	0.000	9.111	0.260
2005 JUN	-0.032	0.000	-0.908	-0.010
2005 JUL	0.189	0.000	-3.940	0.010
2005 AUG	-1.270	0.000	3.690	-0.188
2005 SEP	1.089	0.000	-3.310	0.160

CV – EMP Descriptive Statistics



Series: EMP_EURO
Sample 1996M01 2005M09
Observations 117

Mean	-0.054409
Median	-0.017172
Maximum	4.862051
Minimum	-5.312469
Std. Dev.	1.463486
Skewness	-0.297722
Kurtosis	6.751392
Jarque-Bera	70.33402
Probability	0.000000

CV – EGARCH-M Estimation Results

$$EMP_t = \mu \ln\sigma^2 + \theta_0 + \theta_1 \Delta dc_{t-4} + \theta_2 q_{t-3} + \varepsilon_t + \xi_1 \varepsilon_{t-1} + \xi_2 \varepsilon_{t-3}$$

Parameter	Estimate	Std. Error	t-Statistic	p-value
μ	-0.002277	0.000386	-5.897669	0.0000**
θ_0	-0.024604	0.004236	-5.809010	0.0000**
θ_1	0.058132	0.019334	3.006672	0.0026**
θ_2	-0.189549	0.040841	-4.641149	0.0000**
ξ_1	-0.138642	0.054641	-2.537328	0.0112*
ξ_2	0.166011	0.043016	3.859268	0.0001**

$$\ln\sigma_t^2 = \lambda_0 + \lambda_1 \Delta rer_{t-1} + \lambda_2 \Delta dc_{t-3} + \lambda_3 \Delta r_{t-4} + \lambda_4 \Delta r_{t-8} + \lambda_5 trend + \alpha_1 \left|\frac{\varepsilon_{t-1}}{\sigma_{t-1}}\right| + \gamma_1 \frac{\varepsilon_{t-1}}{\sigma_{t-1}}$$

Parameter	Estimate	Std. Error	t-Statistic	p-value
λ_0	-7.968517	0.288702	-27.60115	0.0000**
λ_1	-19.57058	7.308292	-2.677860	0.0074**
λ_2	-25.91903	2.776526	-9.335060	0.0000**
λ_3	2.198588	0.329649	6.669473	0.0000**
λ_4	3.858875	0.411063	9.387552	0.0000**
λ_5	-0.027584	0.004062	-6.789853	0.0000**
α_1	0.591598	0.200617	2.948892	0.0032**
γ_1	-0.705408	0.107218	-6.579214	0.0000**

Diagnostics

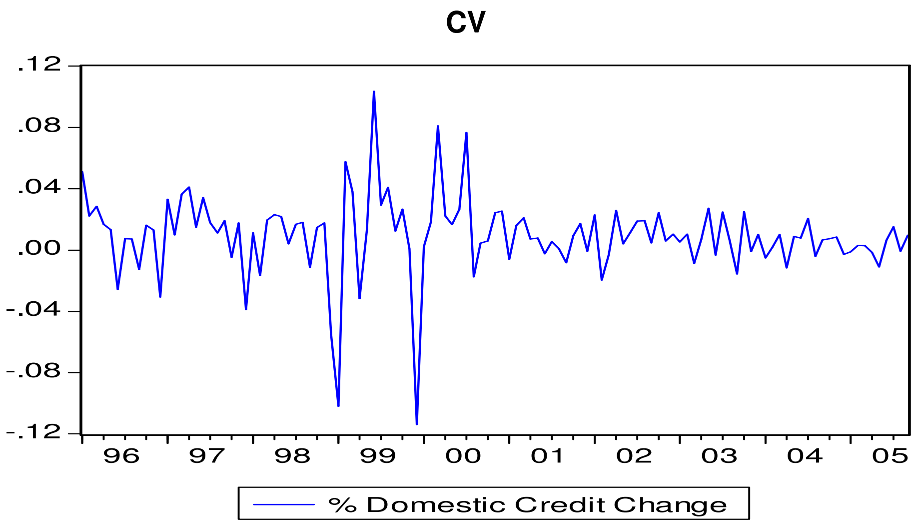
	L-B Standardised Residuals		L-B Squared Residuals		ARCH-LM Statistic	
Lag	Q	p-value	Q^2	p-value	LM	p-value
Lag3	1.6805	0.195	3.2580	0.071	0.023585	0.8099
Lag4	1.8140	0.404	3.9167	0.141	-0.062074	0.5390
Lag5	1.8140	0.612	3.9216	0.270	0.041375	0.6311
Lag6	3.7235	0.445	3.9216	0.417	-0.080680	0.4229
Lag7	5.0334	0.412	3.9491	0.557	0.031201	0.8111
Lag8	5.0407	0.539	4.1989	0.650	-0.071455	0.6091
Lag9	5.5784	0.590	4.2108	0.755	-0.067852	0.4711
Lag10	6.0199	0.645	5.2979	0.725	-0.128773	0.1187
Lag11	7.1475	0.622	5.6028	0.779	-0.046155	0.7623
Lag12	7.8967	0.639	5.9442	0.820	-0.043482	0.6835
Lag13	7.9255	0.720	6.1949	0.860	-0.075333	0.4101
Lag14	7.9256	0.791	6.4396	0.892	-0.061972	0.4485
	No. of Observations		**Log-Likelihood**		**SIC**	
	117		350.2359		-5.8238	

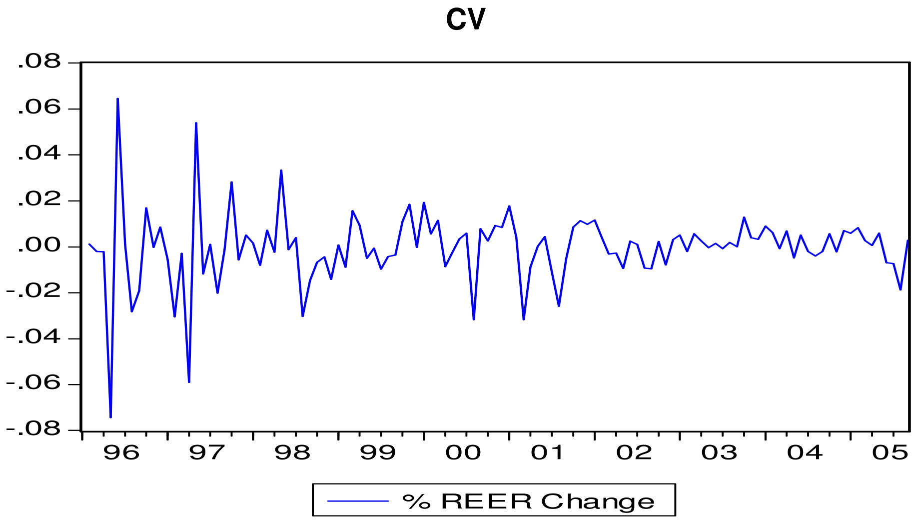
CV – Data Description

Variables	
e_t	Bilateral CVE/EUR exchange rate. Source: Banco de Cabo Verde (BCV).
Δe_t	Depreciation rate of CVE vis-à-vis the EUR (log).
Δr_t	Change in CV's international reserves (log) Source: BCV.
i_t	CV 3-Month Deposit Rate (%). Source: BCV.
i_t^*	Eurozone 3-Month Deposit Rate (%). Source: European Central Bank.
$\Delta(I_t - i_t^*)$	Change in interest rate differential (%).
p_t	CV Consumer Price Index. Source: BCV.
Δp_t	$\Delta p_t = (p_t - p_{t-1})/p_{t-1}$
p_t^*	German Consumer Price Index Source: Deutsche Bundesbank.
Δp_t^*	$\Delta p_t^* = (p_t^* - p_{t-1}^*)/p_{t-1}^*$
q_t	Real exchange rate depreciation = $\Delta e - \Delta p_t + \Delta p_t^*$
dc_t	Domestic credit. Source: BCV.
Δdc_t	$\Delta dc_t = (dc_t - dc_{t-1})/dc_{t-1}$
D_1_99	Dummy variable that takes on value one for all t ≥ 1999:01 and zero otherwise.

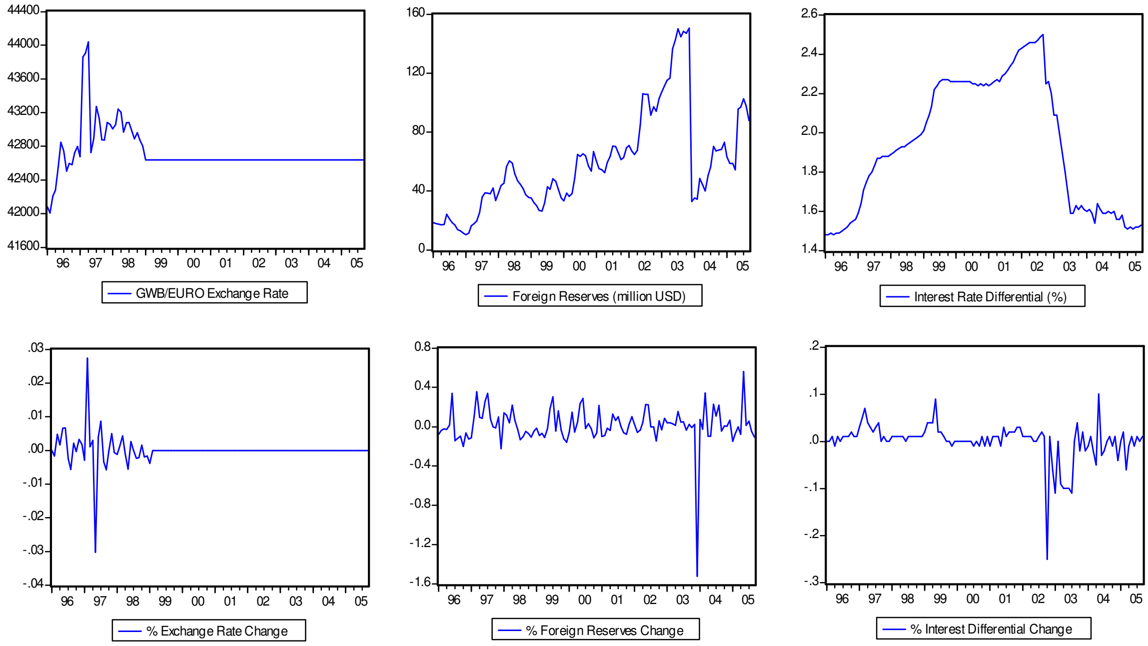
CV – Phillips-Perron Test Statistic

Series	Level	Test Specification	First Difference	Test Specification
p_t	-3.087410	Intercept & Trend	-10.75042**	No Intercept or Trend
p_t^*	-2.383996	Intercept & Trend	-11.04016**	No Intercept or Trend
e_t	-3.261669***	Intercept & Trend	-15.70297**	No Intercept or Trend
i_t-i_t^*	-1.747065	Intercept & Trend	-10.40285**	No Intercept or Trend
r_t	-1.239519	Intercept & Trend	-12.31291**	No Intercept or Trend
dc_t	-2.899659	Intercept & Trend	-9.234167**	No Intercept or Trend

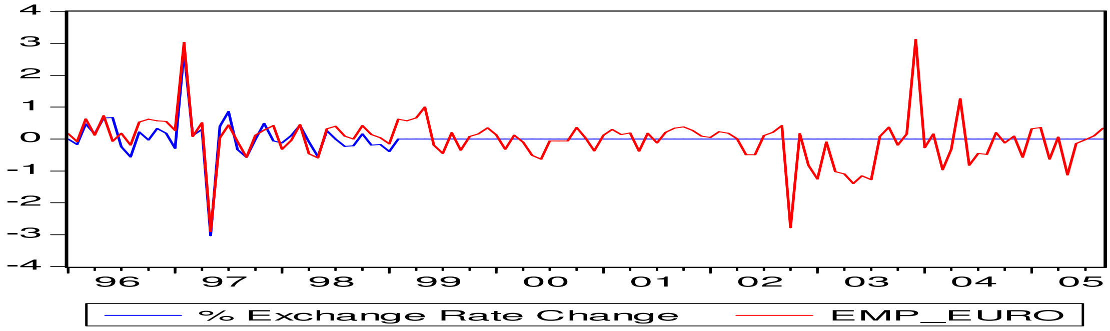



CV
.08
.06
.04
.02
.00
-.02
-.04
-.06
-.08
96
97
98
99
00
01
02
03
04
05
% REER Change

GB – EMP Constituent Components



GB – EMP and Changes in Exchange Rate (%)



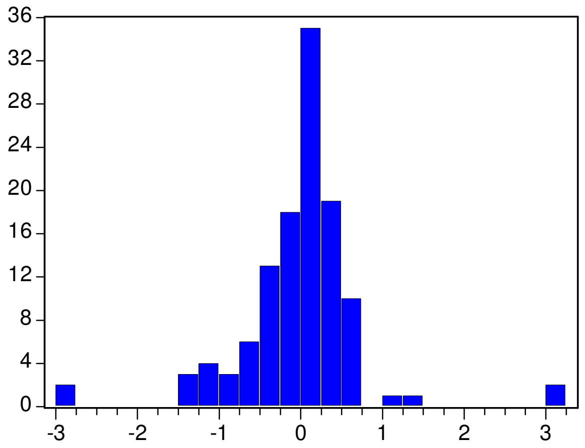
GB – EMP Estimates & Crises

Date	EMP	Δe	Δr	Δ(i-i*)
1996 JAN	0.172	0.000	-7.848	0.000
1996 FEB	-0.083	-0.171	-4.029	0.000
1996 MAR	0.632	0.477	-2.247	0.010
1996 APR	0.119	0.163	-2.824	-0.010
1996 MAY	0.735	0.665	1.623	0.010
1996 JUN	-0.071	0.668	33.787	0.000
1996 JUL	0.179	-0.237	-14.165	0.010
1996 AUG	-0.193	-0.561	-11.985	0.010
1996 SEP	0.533	0.215	-9.670	0.010
1996 OCT	0.622	-0.031	-20.152	0.020
1996 NOV	0.574	0.329	-6.373	0.010
1996 DEC	0.555	0.175	-12.537	0.010
1997 JAN	0.275	-0.287	-11.184	0.030
1997 FEB	3.030	2.742	11.010	0.050
1997 MAR	0.074	0.110	35.467	0.070
1997 APR	0.512	0.297	9.525	0.040
1997 MAY	-2.899	-3.026	8.697	0.030
1997 JUN	0.043	0.399	25.935	0.020
1997 JUL	0.438	0.867	34.100	0.030
1997 AUG	-0.079	-0.337	7.564	0.040
1997 SEP	-0.570	-0.575	-0.207	0.000
1997 OCT	0.120	-0.014	-1.277	0.010
1997 NOV	0.277	0.493	9.855	0.000
1997 DEC	0.427	-0.060	-22.231	0.000
1998 JAN	-0.325	-0.120	14.221	0.010
1998 FEB	-0.038	0.114	11.787	0.010
1998 MAR	0.454	0.433	3.882	0.010
1998 APR	-0.462	-0.087	21.944	0.010
1998 MAY	-0.597	-0.553	6.813	0.010
1998 JUN	0.318	0.262	-2.575	0.000
1998 JUL	0.401	0.004	-13.295	0.010
1998 AUG	0.089	-0.232	-9.853	0.010
1998 SEP	0.000	-0.211	-4.788	0.010
1998 OCT	0.420	0.160	-7.051	0.010
1998 NOV	0.143	-0.194	-10.587	0.010
1998 DEC	0.036	-0.170	-4.564	0.010
1999 JAN	-0.148	-0.389	-1.351	0.020
1999 FEB	0.619	0.000	-8.949	0.040
1999 MAR	0.571	0.000	-6.764	0.040

Date	EMP	Δe	Δr	Δ(i-i*)
1999 APR	0.664	0.000	-10.998	0.040
1999 MAY	1.003	0.000	-2.322	0.090
1999 JUN	-0.193	0.000	18.491	0.020
1999 JUL	-0.456	0.000	30.493	0.020
1999 AUG	0.203	0.000	-4.439	0.010
1999 SEP	-0.353	0.000	16.127	0.000
1999 OCT	0.080	0.000	-3.639	0.000
1999 NOV	0.162	0.000	-12.245	-0.010
1999 DEC	0.345	0.000	-15.755	0.000
2000 JAN	0.126	0.000	-5.746	0.000
2000 FEB	-0.323	0.000	14.765	0.000
2000 MAR	0.121	0.000	-5.510	0.000
2000 APR	-0.106	0.000	4.861	0.000
2000 MAY	-0.517	0.000	23.640	0.000
2000 JUN	-0.628	0.000	28.712	0.000
2000 JUL	-0.066	0.000	-1.823	-0.010
2000 AUG	-0.062	0.000	2.822	0.000
2000 SEP	-0.061	0.000	-2.055	-0.010
2000 OCT	0.356	0.000	-11.412	0.010
2000 NOV	0.031	0.000	-6.263	-0.010
2000 DEC	-0.370	0.000	21.743	0.010
2001 JAN	0.114	0.000	-10.049	-0.010
2001 FEB	0.301	0.000	-8.920	0.010
2001 MAR	0.137	0.000	-1.423	0.010
2001 APR	0.189	0.000	-3.783	0.010
2001 MAY	-0.387	0.000	12.841	-0.010
2001 JUN	0.179	0.000	6.340	0.030
2001 JUL	-0.122	0.000	10.418	0.010
2001 AUG	0.215	0.000	-0.142	0.020
2001 SEP	0.342	0.000	-5.975	0.020
2001 OCT	0.379	0.000	-7.649	0.020
2001 NOV	0.270	0.000	2.159	0.030
2001 DEC	0.094	0.000	10.220	0.030
2002 JAN	0.055	0.000	2.305	0.010
2002 FEB	0.232	0.000	-5.746	0.010
2002 MAR	0.181	0.000	-3.455	0.010
2002 APR	0.012	0.000	4.271	0.010
2002 MAY	-0.495	0.000	22.621	0.000
2002 JUN	-0.489	0.000	22.347	0.000

Date	EMP	Δe	Δr	Δ(i-i*)
2002 JUL	0.114	0.000	-0.359	0.010
2002 AUG	0.214	0.000	-0.095	0.020
2002 SEP	0.419	0.000	-14.328	0.010
2002 OCT	-2.777	0.000	5.980	-0.250
2002 NOV	0.174	0.000	-3.136	0.010
2002 DEC	-0.825	0.000	8.681	-0.060
2003 JAN	-1.257	0.000	4.251	-0.110
2003 FEB	-0.087	0.000	3.997	0.000
2003 MAR	-1.021	0.000	3.142	-0.090
2003 APR	-1.091	0.000	1.492	-0.100
2003 MAY	-1.398	0.000	15.517	-0.100
2003 JUN	-1.159	0.000	4.598	-0.100
2003 JUL	-1.272	0.000	4.944	-0.110
2003 AUG	0.079	0.000	-3.622	0.000
2003 SEP	0.368	0.000	2.531	0.040
2003 OCT	-0.193	0.000	-0.873	-0.020
2003 NOV	0.160	0.000	2.377	0.020
2003 DEC	3.118	0.000	-152.195	-0.020
2004 JAN	-0.267	0.000	7.352	-0.010
2004 FEB	0.160	0.000	-2.488	0.010
2004 MAR	-0.959	0.000	34.151	-0.020
2004 APR	-0.320	0.000	-9.580	-0.050
2004 MAY	**1.267**	**0.000**	**-9.520**	**0.100**
2004 JUN	-0.819	0.000	22.935	-0.030
2004 JUL	-0.454	0.000	11.067	-0.020
2004 AUG	-0.485	0.000	22.155	0.000
2004 SEP	0.202	0.000	-4.385	0.010
2004 OCT	-0.123	0.000	0.798	-0.010
2004 NOV	0.092	0.000	0.631	0.010
2004 DEC	-0.570	0.000	6.705	-0.040
2005 JAN	0.322	0.000	-14.729	0.000
2005 FEB	0.365	0.000	-7.009	0.020
2005 MAR	-0.635	0.000	-0.017	-0.060
2005 APR	0.061	0.000	-7.612	-0.010
2005 MAY	-1.124	0.000	56.216	0.010
2005 JUN	-0.137	0.000	1.402	-0.010
2005 JUL	-0.018	0.000	5.655	0.010
2005 AUG	0.106	0.000	-4.822	0.000
2005 SEP	0.338	0.000	-10.620	0.010

GB – EMP Descriptive Statistics



Series: EMP_EURO	
Sample 1996M01 2005M09	
Observations 117	
Mean	-0.011675
Median	0.089224
Maximum	3.118420
Minimum	-2.898738
Std. Dev.	0.726165
Skewness	0.103766
Kurtosis	10.38594
Jarque-Bera	266.1512
Probability	0.000000

GB – EGARCH-M Estimation Results

$$EMP_t = \mu \ln\sigma^2 + \text{DUMMY} + \theta_1 \Delta dc_{t-4} + \theta_2 q_{t-7} + \varepsilon_t$$

Parameter	Estimate	Std. Error	t-Statistic	p-value
μ	-0.000536	8.62E-06	-62.25163	0.0000**
D_5_97	-0.006708	0.000206	-32.63759	0.0000**
θ_1	0.006067	0.001566	3.874420	0.0001**
θ_2	-0.046472	0.002107	-22.05940	0.0000**

$$\ln\sigma_t^2 = \lambda_0 + \lambda_1 \Delta dc_{t-3} + \lambda_2 \Delta r_{t-2} + \alpha_1 \left|\frac{\varepsilon_{t-1}}{\sigma_{t-1}}\right| + \alpha_2 \ln\sigma_{t-1}^2 + \alpha_3 \ln\sigma_{t-2}^2$$

λ_0	-13.58991	0.005822	-2334.153	0.0000**
λ_1	-2.856574	0.609767	-4.684695	0.0000**
λ_2	2.130448	0.320162	6.654273	0.0000**
α_1	1.698640	0.055331	30.69965	0.0000**
α_2	-0.355731	0.001158	-307.1049	0.0000**
α_3	0.182010	4.36E-05	4177.698	0.0000**

Diagnostics

	L-Bo Standardised Residuals		L-B Squared Residuals		ARCH-LM Statistic	
Lag	**Q**	**p-value**	**Q^2**	**p-value**	**LM**	**p-value**
Lag1	1.4940	0.222	0.6428	0.423	-0.093768	0.2277
Lag2	1.4985	0.473	1.9863	0.370	0.119513	0.4922
Lag3	1.5744	0.665	2.4040	0.493	0.074359	0.4551
Lag4	3.8546	0.426	2.9722	0.562	-0.050547	0.5907
Lag5	4.7447	0.448	2.9826	0.703	-0.000852	0.9926
Lag6	6.9611	0.324	3.2093	0.782	0.066816	0.4312
Lag7	7.0170	0.427	3.2186	0.864	0.053219	0.5359
Lag8	7.5428	0.479	3.3680	0.909	0.057482	0.4945
Lag9	7.5534	0.580	3.3731	0.948	0.009046	0.9030
Lag10	9.5067	0.485	5.9059	0.823	-0.177390	0.0272
Lag11	11.055	0.439	5.9071	0.879	-0.040061	0.5147
Lag12	11.245	0.508	7.2679	0.839	0.140196	0.4831
	No. of Observations		**Log-Likelihood**		**SIC**	
	117		426.6483		-7.3980	

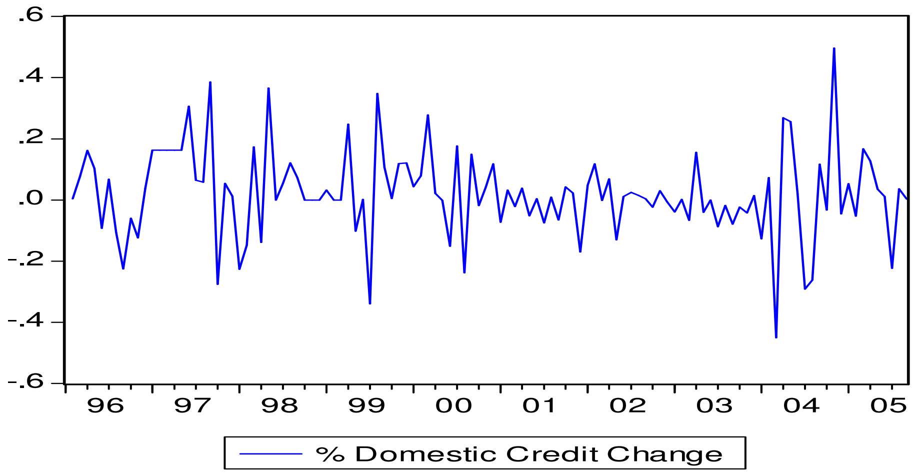
GB – Data Description

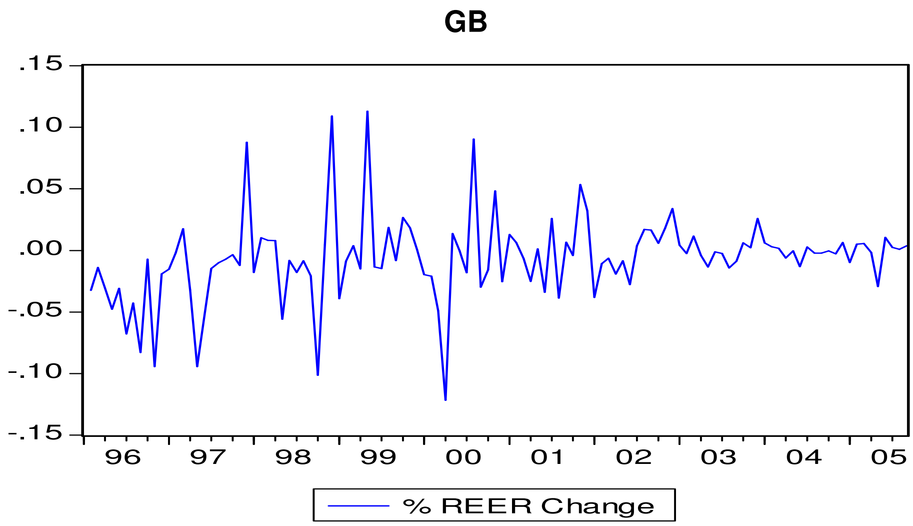
Variables	
e_t	Bilateral GBW/EUR exchange rate. Source: Calculated using data from http://www.oanda.com/convert/fxhistory
Δe_t	Depreciation rate of GWB vis-à-vis the EUR (log).
Δr_t	Change in GB's international reserves (log). Source: IMF – International Financial Statistics.
i_t	GB 3-Month Deposit Rate (%). Source: IMF – International Financial Statistics.
i_t*	Eurozone 3-Month Deposit Rate (%). Source: European Central Bank.
$\Delta(i_t - i_t^*)$	Change in interest rate differential (%).
p_t	GB Consumer Price Index. Source: IMF – International Financial Statistics.
Δp_t	$\Delta p_t = (p_t - p_{t-1})/p_{t-1}$
p_t*	German Consumer Price Index. Source: Deutsche Bundesbank.
Δp_t*	$\Delta p_t^* = (p_t^* - p_{t-1}^*)/p_{t-1}$
q_t	Real exchange rate depreciation = $\Delta e - \Delta p_t + \Delta p_t^*$
dc_t	Domestic credit. Source: IMF – International Financial Statistics.
Δdc_t	$\Delta dc_t = (dc_t - dc_{t-1})/dc_{t-1}$
D_5_97	Dummy variable that takes on value one for all t ≥ 1997:05 and zero otherwise.

GB – Phillips-Perron Test Statistic

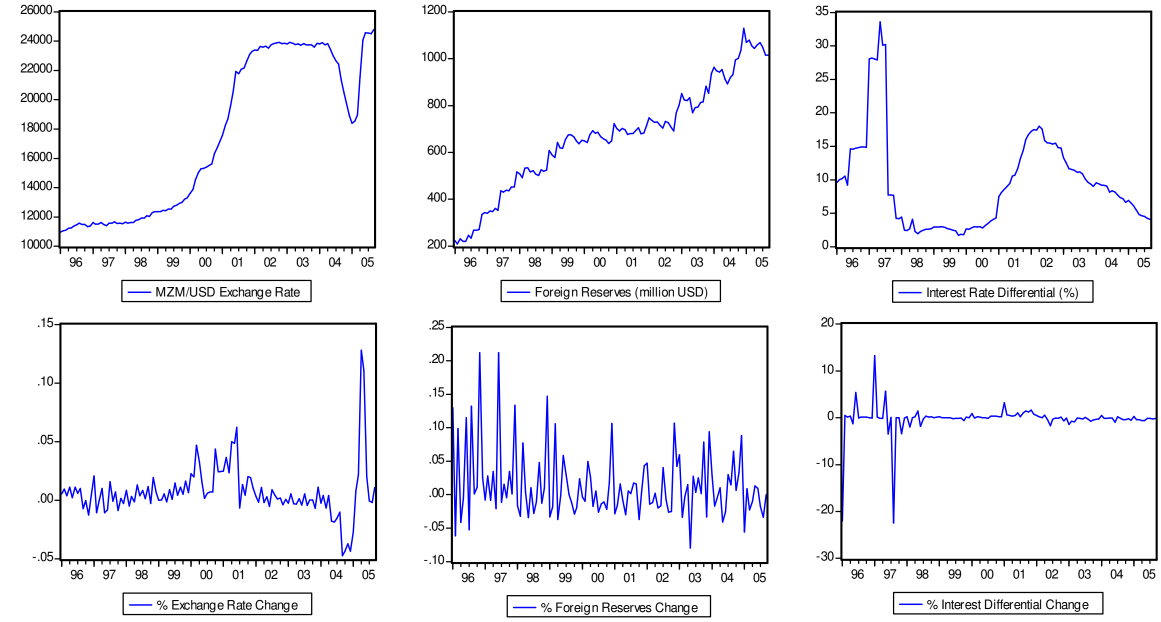
Series	Level	Test Specification	First Difference	Test Specification
p_t	-3.656467**	Intercept	-10.50532**	No Intercept or Trend
p_t^*	-2.383996	Intercept & Trend	-11.04016**	No Intercept or Trend
e_t	-4.275929**	Intercept	-13.06109**	No Intercept or Trend
i_t-i_t^*	-1.32507	Intercept & Trend	-8.621472**	No Intercept or Trend
r_t	-3.129516	Intercept & Trend	-10.57881**	No Intercept or Trend
dc_t	-1.418726	Intercept & Trend	-13.62803**	No Intercept or Trend

GB

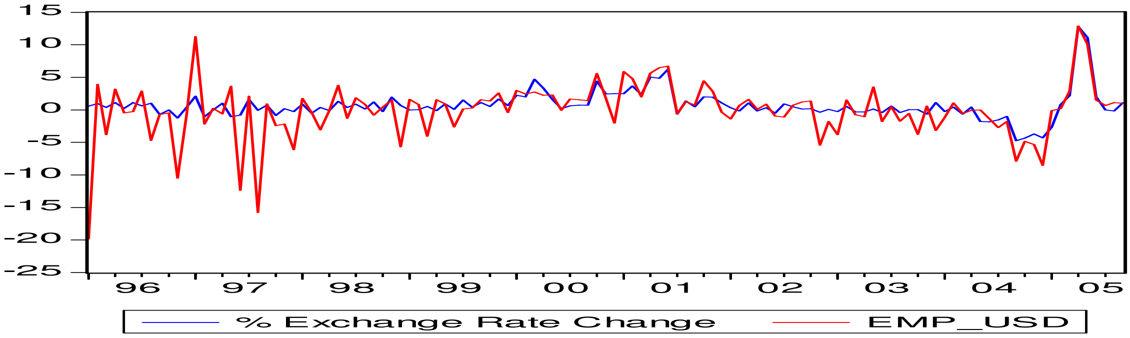



GB
.15
.10
.05
.00
-.05
-.10
-.15
96
97
98
99
00
01
02
03
04
05
% REER Change

MOZ – EMP Constituent Components



MOZ – EMP and Changes in Exchange Rate (%)



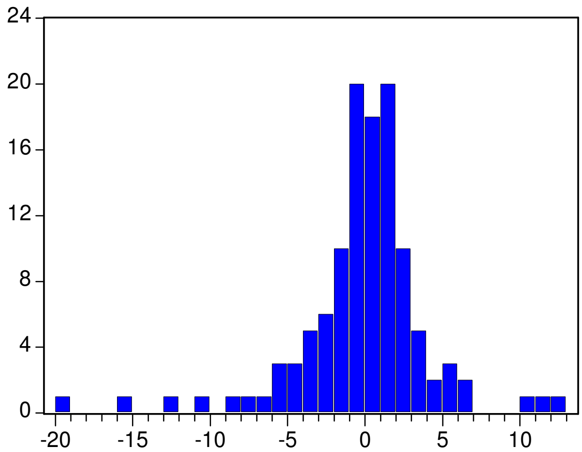
MOZ – EMP Estimates & Crises

Date	EMP	Δe	Δr	Δ(i-i*)
1996 JAN	-19.846	0.568	12.988	-22.070
1996 FEB	3.914	0.945	-6.133	0.440
1996 MAR	-3.804	0.397	9.879	0.160
1996 APR	3.168	1.129	-4.170	0.330
1996 MAY	-0.446	0.214	-0.480	-1.300
1996 JUN	-0.280	1.131	11.511	5.400
1996 JUL	2.858	0.613	-5.255	-0.070
1996 AUG	-4.674	1.017	13.249	0.130
1996 SEP	-0.724	-0.720	0.145	0.090
1996 OCT	-0.447	-0.035	1.097	0.100
1996 NOV	-10.470	-1.245	21.200	0.030
1996 DEC	-0.806	0.361	2.585	-0.060
1997 JAN	**11.251**	**2.079**	**-0.788**	**13.210**
1997 FEB	-2.162	-1.047	2.802	0.160
1997 MAR	0.237	-0.017	-0.830	-0.160
1997 APR	-0.618	1.004	3.444	-0.180
1997 MAY	3.643	-1.065	-2.047	5.710
1997 JUN	-12.368	-0.795	21.233	-3.460
1997 JUL	2.117	1.593	-1.110	0.060
1997 AUG	-15.755	-0.060	1.554	-22.470
1997 SEP	0.909	0.723	-0.425	0.000
1997 OCT	-2.415	-0.870	3.466	-0.050
1997 NOV	-2.167	0.173	0.124	-3.420
1997 DEC	-6.138	-0.268	13.367	-0.060
1998 JAN	1.740	0.845	-1.653	0.260
1998 FEB	-0.403	-0.491	-3.252	-1.990
1998 MAR	-3.044	0.353	7.729	-0.040
1998 APR	-0.128	-0.121	0.384	0.240
1998 MAY	3.783	1.335	-3.408	1.440
1998 JUN	-1.305	0.390	1.052	-1.850
1998 JUL	1.860	0.843	-2.791	-0.300
1998 AUG	0.837	0.151	-1.082	0.320
1998 SEP	-0.791	1.191	4.807	0.170
1998 OCT	0.412	-0.265	-1.246	0.200
1998 NOV	1.512	1.965	0.993	-0.030
1998 DEC	-5.651	0.690	14.693	0.100
1999 JAN	1.616	0.000	-3.322	0.250
1999 FEB	0.803	0.032	-1.783	-0.010
1999 MAR	-4.066	0.548	10.566	-0.010

Date	EMP	Δe	Δr	Δ(i-i*)
1999 APR	1.531	-0.113	-3.724	0.030
1999 MAY	0.926	0.897	-0.126	-0.040
1999 JUN	-2.615	0.080	5.858	-0.210
1999 JUL	0.143	1.495	2.932	-0.110
1999 AUG	0.295	0.431	0.052	-0.170
1999 SEP	1.563	1.112	-1.173	-0.090
1999 OCT	1.359	0.517	-2.898	-0.630
1999 NOV	2.572	1.640	-1.937	0.130
1999 DEC	-0.437	0.641	2.397	-0.050
2000 JAN	2.981	2.260	-0.320	0.870
2000 FEB	2.409	2.016	-0.995	-0.060
2000 MAR	2.722	4.707	4.920	0.240
2000 APR	2.250	3.312	2.666	0.150
2000 MAY	2.316	1.583	-1.742	-0.040
2000 JUN	-0.068	0.163	0.547	0.010
2000 JUL	1.644	0.619	-2.581	-0.150
2000 AUG	1.526	0.712	-1.346	0.340
2000 SEP	1.386	0.707	-1.068	0.320
2000 OCT	5.565	4.378	-2.155	0.370
2000 NOV	1.788	2.434	1.847	0.240
2000 DEC	-2.032	2.478	10.649	0.200
2001 JAN	5.857	2.486	-2.824	3.200
2001 FEB	4.818	3.682	-1.625	0.640
2001 MAR	1.982	2.364	1.596	0.470
2001 APR	5.624	5.026	-0.820	0.360
2001 MAY	**6.489**	**4.867**	**-2.954**	**0.500**
2001 JUN	**6.708**	**6.231**	**0.530**	**1.060**
2001 JUL	-0.619	-0.664	0.173	0.180
2001 AUG	1.248	1.352	1.770	1.000
2001 SEP	0.703	0.440	1.604	1.440
2001 OCT	4.453	2.026	-3.694	1.220
2001 NOV	2.808	1.943	0.531	1.640
2001 DEC	-0.369	1.036	4.325	0.720
2002 JAN	-1.365	0.349	4.727	0.520
2002 FEB	0.655	-0.148	-1.441	0.260
2002 MAR	1.588	1.089	-1.189	-0.030
2002 APR	0.083	-0.180	0.226	0.540
2002 MAY	0.885	0.308	-1.981	-0.430
2002 JUN	-0.954	-0.523	-1.647	-1.720

Date	EMP	Δe	Δr	Δ(i-i*)
2002 JUL	-1.093	0.897	4.042	-0.340
2002 AUG	0.703	0.443	-0.719	-0.080
2002 SEP	1.186	0.120	-2.597	-0.100
2002 OCT	1.364	0.195	-2.482	0.130
2002 NOV	-5.438	-0.364	10.655	-0.640
2002 DEC	-1.796	0.076	4.200	-0.060
2003 JAN	-3.827	-0.247	5.941	-1.480
2003 FEB	1.516	0.536	-3.381	-0.740
2003 MAR	-0.776	-0.296	-0.263	-0.890
2003 APR	-1.044	-0.318	1.526	-0.090
2003 MAY	3.512	0.127	-7.990	-0.150
2003 JUN	-1.793	-0.411	2.724	-0.290
2003 JUL	0.455	0.565	0.345	0.060
2003 AUG	-1.740	-0.440	2.520	-0.300
2003 SEP	-0.555	0.021	0.172	-0.750
2003 OCT	-3.732	0.025	7.880	-0.480
2003 NOV	0.558	-0.667	-3.315	-0.330
2003 DEC	-3.181	1.114	9.389	-0.300
2004 JAN	-1.132	-0.248	2.794	0.500
2004 FEB	1.080	0.423	-1.689	-0.120
2004 MAR	-0.569	-0.641	-0.441	-0.180
2004 APR	-0.067	0.424	1.033	-0.060
2004 MAY	-0.029	-1.774	-4.108	-0.070
2004 JUN	-1.356	-1.833	-2.551	-0.950
2004 JUL	-2.708	-1.531	2.990	0.190
2004 AUG	-1.765	-1.009	1.487	-0.160
2004 SEP	-7.863	-4.729	6.496	-0.450
2004 OCT	-4.860	-4.338	0.629	-0.370
2004 NOV	-5.298	-3.717	3.302	-0.210
2004 DEC	-8.514	-4.320	8.819	-0.520
2005 JAN	-0.093	-2.699	-5.562	0.270
2005 FEB	0.170	0.817	0.903	-0.380
2005 MAR	2.866	2.192	-2.236	-0.450
2005 APR	**12.843**	**12.806**	**-1.021**	**-0.610**
2005 MAY	**10.088**	**11.093**	**1.339**	**-0.630**
2005 JUN	1.509	2.025	0.906	-0.180
2005 JUL	0.662	-0.043	-1.799	-0.120
2005 AUG	1.092	-0.179	-3.359	-0.290
2005 SEP	0.983	1.095	-0.004	-0.170

MOZ – EMP Descriptive Statistics



Series: EMP_USD
Sample 1996M01 2005M11
Observations 117

Mean	-0.069004
Median	0.294741
Maximum	12.84318
Minimum	-19.84583
Std. Dev.	4.313411
Skewness	-1.119534
Kurtosis	8.230905
Jarque-Bera	157.8320
Probability	0.000000

MOZ – EGARCH-M Estimation Results

$$EMP_t = \mu \ln\sigma^2 + \text{Dummies} + \theta_1 \Delta dc_{t-6} + \theta_2 \Delta dc_{t-9} + \theta_3 q_{t-3} + \theta_4 q_{t-8} + \xi_1 EMP_{t-1} + \xi_2 EMP_{t-2} + \xi_3 EMP_{t-4} + \varepsilon_t$$

Parameter	Estimate	Std. Error	t-Statistic	p-value
μ	-0.001111	0.000408	-2.720960	0.0065**
D_AID_CONC	0.095706	0.013277	7.208212	0.0000**
D_8_1997	-0.083265	0.020951	-3.974368	0.0001**
θ_1	0.036008	0.006675	5.394406	0.0000**
θ_2	0.032004	0.005957	5.372645	0.0000**
θ_3	-0.237890	0.072678	-3.273214	0.0011**
θ_4	-0.389466	0.080988	-4.808910	0.0000**
ξ_1	0.171410	0.056766	3.019601	0.0025**
ξ_2	0.271044	0.067864	3.993912	0.0001**
ξ_3	0.247548	0.029615	8.358759	0.0000**

$$\ln \sigma_t^2 = \text{Dummy} + \lambda_0 + \lambda_1 \Delta dc_{t-2} + \lambda_2 \Delta dc_{t-3} + \lambda_3 \Delta dr_{t-1} + \lambda_4 \Delta dr_{t-12} + \lambda_5 trend + \alpha_1 \left|\frac{\varepsilon_{t-1}}{\sigma_{t-1}}\right| + \gamma_1 \frac{\varepsilon_{t-1}}{\sigma_{t-1}}$$

Parameter	Estimate	Std. Error	t-Statistic	p-value
D_8_97	-2.421679	0.425431	-5.692299	0.0000**
λ_0	-7.405693	0.366634	-20.19912	0.0000**
λ_1	-3.307525	0.606509	-5.453378	0.0000**
λ_2	-1.272954	0.468581	-2.716614	0.0066**
λ_3	11.29571	3.171785	3.561309	0.0004**
λ_4	10.39159	1.984151	5.237297	0.0000**
λ_5	0.027186	0.004597	5.914081	0.0000**
α_1	0.230000	0.150110	1.532214	0.1255
γ_1	0.662871	0.122989	5.389698	0.0000**

Diagnostics

	L-B Standardised Residuals		L-B Squared Residuals		ARCH-LM Statistic	
Lag	**Q**	**p-value**	**Q^2**	**p-value**	**LM**	**p-value**
Lag4	3.0904	0.079	0.7990	0.371	-0.016112	0.8938
Lag5	3.7874	0.151	0.8002	0.670	0.002794	0.9824
Lag6	4.1964	0.241	0.8612	0.835	-0.009189	0.9192
Lag7	4.2347	0.375	1.2024	0.878	0.045356	0.7130
Lag8	4.2788	0.510	1.2220	0.943	-0.067660	0.4516
Lag9	4.6136	0.594	2.4725	0.872	-0.114566	0.2387
Lag10	4.9034	0.672	2.5249	0.925	-0.085440	0.3958
Lag11	4.9066	0.768	2.7913	0.947	0.024275	0.7777
Lag12	5.2214	0.815	3.1857	0.956	-0.090433	0.3921
Lag13	5.2710	0.872	4.3555	0.930	-0.055324	0.6045
Lag14	5.4720	0.906	4.3555	0.958	0.003271	0.9771
Lag15	5.5001	0.939	5.9249	0.920	0.203304	0.1424

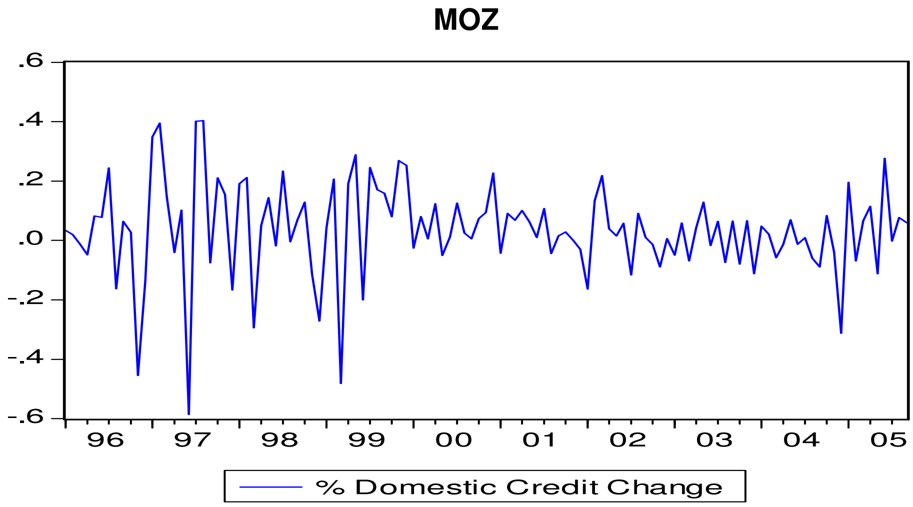
	No. of Observations	Log-Likelihood	SIC
	117	253.9199	-4.034581

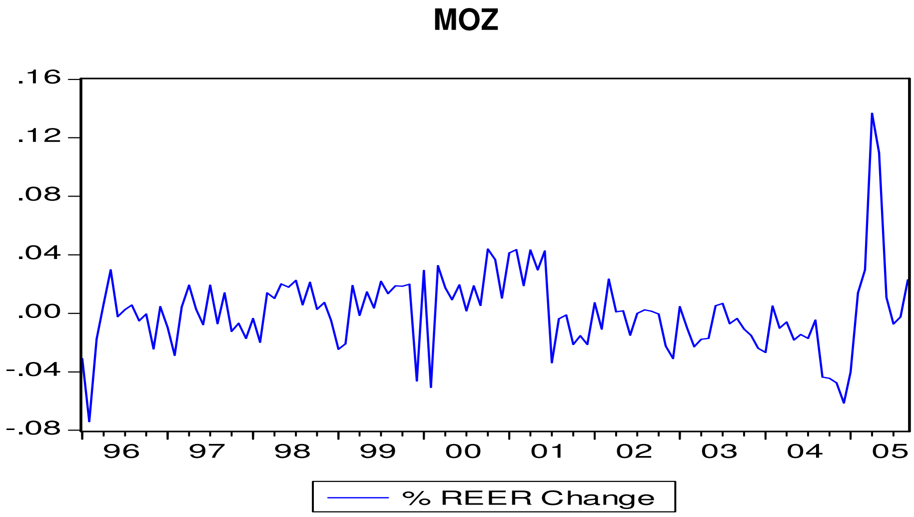
MOZ – Data Description

Variables	
e_t	Bilateral MZM/USD exchange rate. Source: IMF – International Financial Statistics
Δe_t	Depreciation rate of MZM vis-à-vis the USD (log).
Δr_t	Change in MOZ's international reserves (log). Source: IMF – International Financial Statistics.
i_t	MOZ 3-Month Deposit Rate (%). Source: IMF – International Financial Statistics.
i_t*	USD America's 3-Month CDs (secondary market), an average of dealer bid rates on nationally traded certificates of deposit (%). Source: US Federal Reserve.
$\Delta(i_t - i_t*)$	Change in interest rate differential (%).
p_t	MOZ Consumer Price Index. Source: IMF – International Financial Statistics.
Δp_t	$\Delta p_t = (p_t - p_{t-1})/p_{t-1}$
p_t*	USA's Consumer Price Index. Source: Bureau of Labour Statistics - All Urban Consumers - (CPI-U) U.S. city average. All items 1982-84=100.
Δp_t*	$\Delta p_t* = (p_t* - p_{t-1}*)/p_{t-1}*$
q_t	Real depreciation rate = $\Delta e - \Delta p_t + \Delta p_t*$
dc_t	Domestic credit growth rate. Source: IMF – International Financial Statistics.
Δdc_t	$\Delta dc_t = (dc_t - dc_{t-1})/dc_{t-1}$
D_8_97	Dummy variable that takes on value one for all t ≥ 1997:08 and zero otherwise.
D_AID_CONCENT	Dummy variable that takes on value one for all t = 2005:04/5 and zero otherwise.

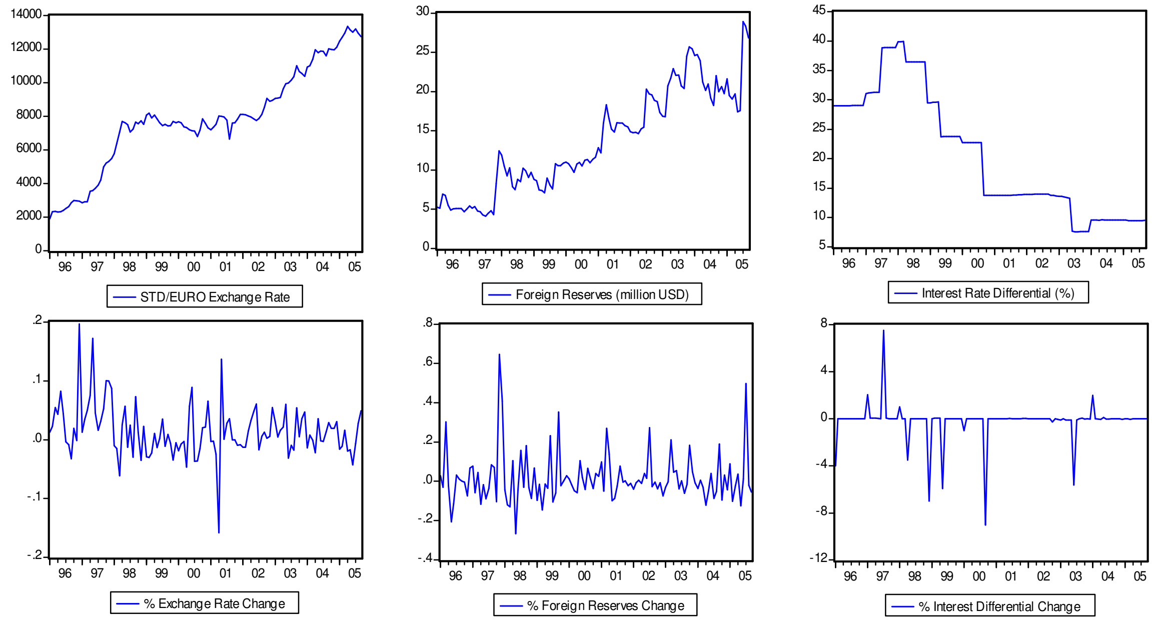
MOZ – Phillips-Perron Test Statistic

Series	**Level**	**Test Specification**	**First Difference**	**Test Specification**
p_t	-1.160281	Intercept	-7.134658**	No Intercept or Trend
p_t^*	-0.382614	Intercept & Trend	-4.732785**	No Intercept or Trend
e_t	-1.772598	Intercept & Trend	-4.800054**	No Intercept or Trend
i_t-i_t^*	-2.321646	Intercept & Trend	-10.88693**	No Intercept or Trend
r_t	-2.811424	Intercept & Trend	-11.63864**	No Intercept or Trend
dc_t	-1.951027	Intercept & Trend	-13.10733**	No Intercept or Trend

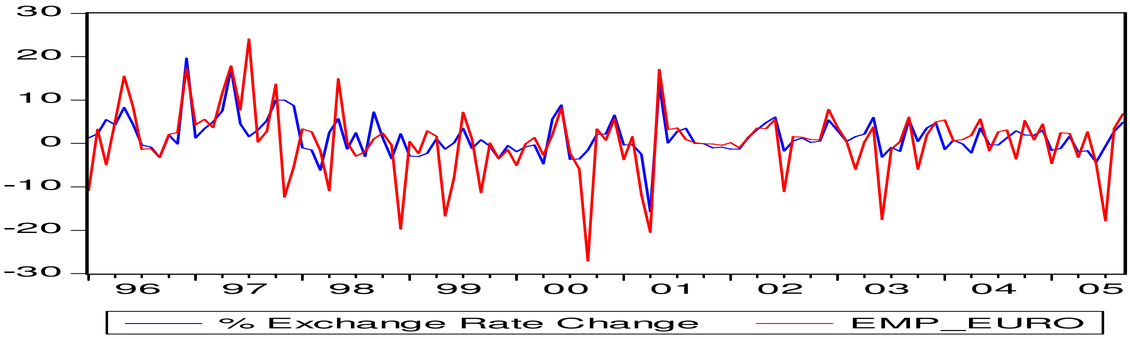

MOZ
.6
.4
.2
.0
-.2
-.4
-.6
96
97
98
99
00
01
02
03
04
05
% Domestic Credit Change


MOZ
.16
.12
.08
.04
.00
-.04
-.08
96
97
98
99
00
01
02
03
04
05
% REER Change

STP – EMP Constituent Components



STP – EMP and Changes in Exchange Rate (%)



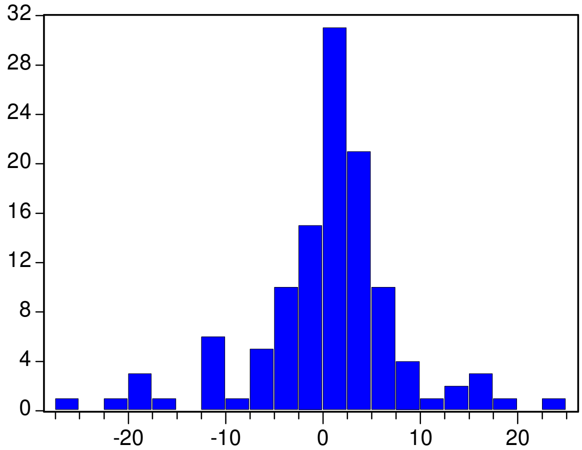
STP – EMP Estimates & Crises

Date	EMP	Δe	Δr	Δ(i-i*)
1996 JAN	-10.892	1.279	2.687	-3.770
1996 FEB	3.275	2.212	-3.077	0.240
1996 MAR	-4.948	5.486	30.271	-0.140
1996 APR	5.143	4.313	-2.484	-0.070
1996 MAY	**15.480**	**8.260**	**-20.809**	**0.000**
1996 JUN	8.405	4.405	-11.574	-0.100
1996 JUL	-1.402	-0.386	3.021	-0.070
1996 AUG	-1.204	-0.890	0.987	0.130
1996 SEP	-3.198	-3.226	0.000	-0.110
1996 OCT	2.109	1.916	-0.394	0.100
1996 NOV	2.522	-0.125	-7.578	0.030
1996 DEC	**17.315**	**19.632**	**6.786**	**-0.060**
1997 JAN	4.343	1.282	7.652	2.010
1997 FEB	5.574	3.402	-5.878	0.060
1997 MAR	3.635	4.957	4.394	-0.160
1997 APR	11.694	7.543	-11.685	-0.180
1997 MAY	**17.856**	**17.185**	**-1.695**	**0.010**
1997 JUN	7.662	4.518	-8.935	0.040
1997 JUL	24.063	1.582	-3.810	7.560
1997 AUG	0.334	3.116	8.377	0.000
1997 SEP	2.806	5.262	7.107	0.000
1997 OCT	**13.686**	**10.024**	**-10.513**	**-0.050**
1997 NOV	-12.364	9.999	64.707	-0.090
1997 DEC	-5.365	8.718	40.748	-0.060
1998 JAN	3.334	-1.040	-4.442	1.260
1998 FEB	2.692	-1.535	-12.147	0.000
1998 MAR	-1.658	-6.166	-12.960	-0.040
1998 APR	-10.901	2.524	10.460	-3.500
1998 MAY	**14.942**	**5.670**	**-26.744**	**-0.010**
1998 JUN	0.272	-1.302	-4.555	-0.010
1998 JUL	-2.928	2.444	15.624	0.010
1998 AUG	-1.902	-2.969	-3.006	0.010
1998 SEP	1.033	7.259	18.095	0.170
1998 OCT	2.408	1.280	-3.184	0.200
1998 NOV	-0.410	-3.506	-8.876	-0.030
1998 DEC	-19.725	2.247	6.730	-6.900
1999 JAN	0.485	-2.944	-9.759	0.250
1999 FEB	-2.362	-3.030	-1.607	-0.010
1999 MAR	2.894	-2.247	-14.551	-0.010

Date	EMP	Δe	Δr	Δ(i-i*)
1999 APR	1.642	1.064	-1.348	0.030
1999 MAY	-16.709	-1.339	-3.592	-6.040
1999 JUN	-7.808	0.167	23.238	-0.210
1999 JUL	7.193	3.482	-10.573	-0.110
1999 AUG	0.964	-1.138	-6.001	-0.170
1999 SEP	-11.310	0.867	35.232	-0.090
1999 OCT	0.118	-0.658	-2.245	-0.630
1999 NOV	-3.497	-3.436	0.095	0.130
1999 DEC	-1.472	-0.506	2.796	-0.050
2000 JAN	-5.078	-1.889	1.097	-0.900
2000 FEB	-0.124	-0.790	-1.928	-0.060
2000 MAR	1.387	-0.320	-4.939	-0.130
2000 APR	-2.679	-4.688	-5.813	-0.140
2000 MAY	2.009	5.661	10.567	-0.430
2000 JUN	8.214	8.913	2.022	-0.020
2000 JUL	-2.199	-3.648	-4.276	0.060
2000 AUG	-5.871	-3.615	6.525	0.060
2000 SEP	-27.139	-1.510	0.886	-8.990
2000 OCT	3.355	2.054	-3.682	-0.070
2000 NOV	0.764	2.156	3.947	0.020
2000 DEC	5.742	6.525	2.347	0.200
2001 JAN	-3.739	-0.319	9.812	0.830
2001 FEB	1.531	-0.264	-5.113	0.360
2001 MAR	-11.757	-2.500	26.865	0.370
2001 APR	-20.518	-15.780	13.791	0.360
2001 MAY	**17.056**	**13.656**	**-9.919**	**0.510**
2001 JUN	3.210	0.078	-8.816	0.280
2001 JUL	3.593	2.760	-2.331	0.080
2001 AUG	0.900	3.510	7.714	0.180
2001 SEP	0.183	-0.003	-0.375	0.610
2001 OCT	-0.069	-0.060	0.188	0.560
2001 NOV	-0.125	-0.973	-2.212	0.280
2001 DEC	-0.432	-0.894	-1.092	0.200
2002 JAN	0.131	-1.286	-4.020	0.090
2002 FEB	-0.967	-1.298	-0.878	-0.080
2002 MAR	1.381	1.516	0.474	-0.090
2002 APR	3.606	3.178	-1.155	0.040
2002 MAY	3.450	4.793	3.885	0.050
2002 JUN	5.535	6.054	1.500	0.010

Date	EMP	Δe	Δr	Δ(i-i*)
2002 JUL	-11.098	-1.725	27.203	0.020
2002 AUG	1.601	0.559	-2.851	0.060
2002 SEP	1.455	1.234	-0.560	-0.030
2002 OCT	0.897	0.251	-3.902	0.030
2002 NOV	0.852	0.566	-0.745	0.340
2002 DEC	7.879	5.439	-7.547	0.050
2003 JAN	3.715	2.993	-2.984	0.050
2003 FEB	0.568	0.466	-0.297	0.020
2003 MAR	-5.954	1.568	21.032	0.040
2003 APR	0.297	2.160	4.575	-0.010
2003 MAY	3.815	5.987	5.472	0.020
2003 JUN	-17.567	-3.137	-3.871	-5.330
2003 JUL	-1.307	-0.951	0.136	-0.010
2003 AUG	0.371	-1.794	-6.264	-0.030
2003 SEP	6.064	5.380	-1.654	0.000
2003 OCT	-5.917	0.486	18.363	-0.020
2003 NOV	1.964	3.547	4.743	-0.010
2003 DEC	4.961	4.720	-0.860	0.010
2004 JAN	5.451	-1.400	-3.638	2.040
2004 FEB	0.590	0.772	0.609	0.010
2004 MAR	0.926	-0.098	-3.124	0.000
2004 APR	1.844	-2.231	-12.197	-0.030
2004 MAY	5.609	3.572	-5.080	-0.120
2004 JUN	-1.677	-0.230	3.941	-0.260
2004 JUL	2.678	-0.333	-8.875	-0.110
2004 AUG	3.105	1.311	-5.190	-0.110
2004 SEP	-3.603	2.919	18.953	-0.180
2004 OCT	5.213	1.932	-9.576	-0.180
2004 NOV	0.812	1.889	3.198	-0.220
2004 DEC	4.447	3.037	-4.406	-0.190
2005 JAN	-4.637	-1.592	8.811	-0.160
2005 FEB	2.472	-1.140	-10.289	-0.160
2005 MAR	2.264	1.625	-2.338	-0.200
2005 APR	-3.223	-1.963	3.564	-0.120
2005 MAY	2.654	-1.702	-12.523	-0.130
2005 JUN	-4.714	-4.291	1.144	-0.160
2005 JUL	-17.823	-0.667	49.720	-0.190
2005 AUG	3.447	2.734	-2.061	-0.200
2005 SEP	6.835	4.914	-5.477	-0.100

STP – EMP Descriptive Statistics



Series: EMP_EURO
Sample 1996M01 2005M09
Observations 117

Mean	0.431140
Median	0.925789
Maximum	24.06257
Minimum	-27.13908
Std. Dev.	7.649228
Skewness	-0.495508
Kurtosis	5.335611
Jarque-Bera	31.38129
Probability	0.000000

STP – EGARCH-M Estimation Results

$$EMP_t = \mu \ln\sigma^2 + \text{DUMMY} + \theta_1 \Delta dc_{t-8} + \theta_2 \Delta dc_{t-11} + \xi_1 EMP_{t-2} + \varepsilon_t + \xi_2 \varepsilon_{t-2}$$

Parameter	Estimate	Std. Error	t-Statistic	p-value
μ	-0.015778	0.001181	-13.36239	0.0000**
DUMMY (d_12_97)	-0.100697	0.009560	-10.53324	0.0000**
θ_1	0.004815	0.001550	3.107102	0.0019**
θ_2	0.009001	0.001437	6.263291	0.0000**
ξ_1	-0.820385	0.052763	-15.54838	0.0000**
ξ_2	0.857573	0.054739	15.66662	0.0000**

$$\ln\sigma_t^2 = \text{Dummies} + \lambda_0 + \lambda_1 \Delta dc_{t-3} + \lambda_2 \Delta r_{t-6} + \lambda_3 \Delta r_{t-8} + \lambda_4 trend + \alpha_1 \left|\frac{\varepsilon_{t-1}}{\sigma_{t-1}}\right| + \alpha_2 \ln\sigma_{t-1}^2$$

D_12_97	-2.859691	0.641670	-4.456639	0.0000**
D_6_01	-3.285768	0.469490	-6.998586	0.0000**
λ_0	-8.379134	0.802998	-10.43482	0.0000**
λ_1	-0.358151	0.052207	-6.860237	0.0000**
λ_2	-1.482998	0.618503	-2.397722	0.0165*
λ_3	2.392812	0.841404	2.843834	0.0045**
λ_4	0.035233	0.009529	3.697295	0.0002**
α_1	0.814423	0.156087	5.217762	0.0000**
α_2	-0.594424	0.062765	-9.470581	0.0000**

Diagnostics

	L-B Standardised Residuals		L-B Squared Residuals		ARCH-LM Statistic	
Lag	**Q**	**p-value**	**Q^2**	**p-value**	**LM**	**p-value**
Lag3	2.0558	0.152	2.9084	0.088	-0.034395	0.7137
Lag4	3.5552	0.169	3.0871	0.214	-0.090009	0.3061
Lag5	3.5827	0.310	3.5895	0.309	0.157226	0.3461
Lag6	4.2890	0.368	5.8949	0.207	-0.041139	0.7874
Lag7	5.7630	0.330	7.1629	0.209	-0.129071	0.0563
Lag8	7.1623	0.306	7.5241	0.275	0.155879	0.1869
Lag9	9.4233	0.224	7.5989	0.369	0.104902	0.3420
Lag10	9.6555	0.290	9.8810	0.273	-0.003631	0.9732
Lag11	11.385	0.250	9.9344	0.356	-0.102794	0.3163
Lag12	11.387	0.328	9.9642	0.444	-0.217494	0.0069
Lag13	11.408	0.410	10.035	0.527	-0.029446	0.7454
Lag14	13.778	0.315	10.172	0.601	-0.081835	0.4781
	No. of Observations		**Log-Likelihood**		**SIC**	
	117		161.6857		-2.464568	

Notes: The parameters are as defined in the main text. A double (single) asterisk indicates that the estimated parameter is significantly different from zero at the 1% (5%) level.

STP – Data Description

Variables	
e_t	Bilateral STD/USD exchange rate. Source: IMF – International Financial Statistics
Δe_t	Depreciation rate of STD vis-à-vis the USD (log).
Δr_t	Change in STP's international reserves (log). Source: IMF – International Financial Statistics.
i_t	STP3-Month Deposit Rate (%). Source: IMF – International Financial Statistics.
i_t^*	USD 3-Month CDs (secondary market), an average of dealer bid rates on nationally traded certificates of deposit (%). Source: Source: US Federal Reserve.
$\Delta(i_t - i_t^*)$	Change in interest rate differential (%).
p_t	STP Consumer Price Index. Source: IMF – International Financial Statistics.
Δp_t	$\Delta p_t = (p_t - p_{t-1})/p_{t-1}$
p_t^*	US Consumer Price Index. Source: Bureau of Labour Statistics - All Urban Consumers - (CPI-U) U.S. city average. All items 1982-84=100.
Δp_t^*	$\Delta p_t^* = (p_t^* - p_{t-1}^*)/p_{t-1}^*$
q_t	Real exchange rate depreciation = $\Delta e - \Delta p_t + \Delta p_t^*$
dc_t	Domestic credit growth rate. Source: IMF – International Financial Statistics.
Δdc_t	$\Delta dc_t = (dc_t - dc_{t-1})/dc_{t-1}$
D_12_97	Dummy variable that takes on value one for all t ≥ 1997:12 and zero otherwise.
D_6_01	Dummy variable that takes on value one for all t ≥ 2001:06 and zero otherwise.

STP – Phillips-Perron Test Statistic

Series	Level	Test Specification	First Difference	Test Specification
e_t	-4.386125**	Intercept	-8.847658**	No Intercept or Trend
i_t-i_t^*	-1.967276	Intercept & Trend	-10.58118**	No Intercept or Trend
r_t	-4.263279**	Intercept & Trend	-11.17796**	No Intercept or Trend
dc_t	-2.548944	Intercept & Trend	-11.66125**	No Intercept or Trend

STP