UNITED KINGDOM · CHINA · MALAYSIA

Discussion Papers in Economics

Discussion Paper
No. 14/02

Classifying Exchange Rate Regimes by Regression Methods

Michael Bleaney and Mo Tian

April 2014

Annual regime classifications from M. Bleaney and M. Tian – Classifying Exchange Rate Regimes by Regression Methods, University of Nottingham School of Economics Discussion Paper no. 14/02, 2014.

Classifying Exchange Rate Regimes by Regression Methods

Michael Bleaney and Mo Tian

School of Economics, University of Nottingham

Abstract

A new and easily implemented regression method is proposed for distinguishing floating from pegged regimes, whilst simultaneously identifying anchors of pegged currencies. The method can distinguish pegs with occasional devaluations from floats, and can be used to generate annual regime classifications. The method largely confirms the accuracy of the IMF's de facto classification, but also shows that a significant minority of managed floats is close to being US dollar pegs. Even flexible managed floats have a strong tendency to track the US dollar.

Keywords: exchange rates, currency pegs, trade

JEL No.: F31

Corresponding author: Professor M F Bleaney, School of Economics, University of Nottingham, Nottingham NG7 2RD. e-mail: michael.bleaney@nottingham.ac.uk. Tel. +44 115 951 5464. Fax +44 116 951 4159.

1 Introduction

Until 1998 the International Monetary Fund reported only a country's self-declared exchange rate regime, chosen from amongst a defined set of categories such as various types of peg, managed floating or independently floating (see Habermeier *et al.*, 2009, Appendix B, for a brief history of the IMF classification system). Dissatisfaction with the resulting outcomes, eloquently expressed by Calvo and Reinhart (2002), led to the development of alternative methods based on factual data such as exchange rate movements, reserve volatility and interest rate differentials (Levy-Yeyati and Sturzenegger, 2005; Reinhart and Rogoff, 2004; Shambaugh, 2004). The IMF also began to record its own *de facto* assessment of the regime, alongside the reported *de jure* classification, using the same taxonomy. The weakness of this effort is that it conspicuously failed to develop a new consensus in classifying exchange rate regimes, since the new systems showed a low correlation with one another (Bleaney and Francisco, 2007; Frankel and Wei, 2008).

The schemes that seek to produce an alternative to the IMF classification by calendar year use different statistical criteria. Levy-Yeyati and Sturzenegger (2005) use cluster analysis based on movements in exchange rates, international reserves and interest rates. Reinhart and Rogoff (2004) prefer to use parallel-market exchange rates (if they exist), and discount large movements in up to 20% of observations, in an attempt to distinguish one-time devaluations from floats. Shambaugh (2004) defines a peg by small monthly exchange rate movements in up to eleven out of twelve months.

None of these approaches uses regression methods. Regression methods have been successfully used to identify the basket of anchor currencies to which a currency is pegged (Frankel and Wei, 1995). More recently, Bénassy-Quéré *et al*. (2006) and Frankel and Wei (2008) have independently suggested that similar regression methods can distinguish pegs from floats as well. In this paper, we pursue a similar line of inquiry that, in our view, improves on previous work. We show that regression analysis can be used to generate statistics that distinguish floats from pegs, including those with occasional devaluations, with a high degree of accuracy. It is also a simple way of generating annual regime classifications, requiring only end-of-month exchange rate data.

The rest of the paper is organised as follows. In Section Two, previous approaches to exchange rate regime classification by regression methods are reviewed. Our alternative is presented in Section Three. Section Four shows the results of our method by IMF *de facto* regime category, applied to two separate periods: 1999-2005 and 2006-13. Some illustrative examples are given in Section Five. In Section Six robustness to the choice of *numéraire* currency is discussed. Section Seven examines managed floats more deeply. Section Eight investigates whether the system can be used to generate annual regime classifications. Conclusions are presented in Section Nine.

2 Literature Review

The standard regression specification for identifying the basket of currencies to which currency *i* is pegged (e.g. Frankel and Wei, 1995) relates exchange rate movements of currency *i* against some *numéraire* currency *N* to movements of potential anchor currencies against *N*:

$$\Delta \ln E(i,N)_t = a + b\Delta \ln E(USD,N)_t + c\Delta lnE(EUR,N)_t + d\Delta lnE(YEN,N)_t + u_t \qquad (1)$$

where *USD* is the US dollar, *EUR* is the euro, *YEN* is the Japanese yen, $E(i, N)$ is the number of units of currency *i* per unit of currency *N*, and Δ is the first-difference operator. If currency *i* is pegged to a single one of these currencies, the coefficient of that currency should be one, and of the others zero; if the basket is correctly identified, the three coefficients should sum to one.

The issue is whether a similar equation can also distinguish floats from pegs. Bénassy-Quéré *et al*. (2006) avoid the choice of a *numéraire* currency by noting that, if $b+c+d = 1$, then a weighted average of exchange rates of currency i against the three anchors should remain unchanged:

$$b\Delta \ln E(i,USD)_t + c\Delta lnE(i,EUR)_t + d\Delta lnE(i,YEN)_t = 0 \qquad \text{if } b+c+d = 1 \qquad (2)$$

After estimating equation (2), the authors focus on the estimates of the individual coefficients b, c and d. They identify a currency as floating only if none of them is significantly different from zero. This approach appears to suffer from two drawbacks. One is that, because of the focus on statistical significance, the standard errors of the coefficients could have as much influence on the result as the point estimates. The other is that, given the constraint that the estimated coefficients must sum to one, the test is biased towards rejecting the null; and indeed less than 10% of the sample is identified as floats (Bénassy-Quéré *et al*., 2006, Table 3). As we shall see later, even freely floating currencies tend to co-move with others with which they have strong trading links, and are therefore likely in many cases to have non-zero euro or US dollar coefficients.

Frankel and Wei (2008) augment equation (1) with an exchange market pressure variable (*EMP*), which is equal to the log changes in the exchange rate of currency i against N minus changes in the logarithm of the ratio of international reserves to the monetary base. They thus estimate:

$$\Delta \ln E(i,N)_t = a + b\Delta \ln E(USD,N)_t + c\Delta lnE(EUR,N)_t + d\Delta lnE(YEN,N)_t + fEMP_t$$

$$+u_t \tag{3}$$

In fact Frankel and Wei arrive at this specification by including the British pound as an additional anchor, and then subtracting the pound-*numéraire* exchange rate from all the other exchange rate variables to impose the condition that the basket weights sum to one, without noticing that this procedure is equivalent to estimating a regression with unrestricted basket weights using the pound as *numéraire*.[1] They focus on the coefficient of this *EMP* variable, arguing that it will be close to zero for pegs, and significantly different from zero for floats. They broadly confirm this pattern using twenty example currencies. Slavov (2013) applies this method to investigate the behaviour of nominally floating currencies in sub-Saharan Africa.

Apart from the fact that the test is not infallible (Australia is an example, as Frankel and Wei point out), there are some econometric problems here. One component of the *EMP* variable is the dependent variable itself, so that component should always have a coefficient of one, as well as being necessarily correlated with the error term, which introduces bias into the estimates. The reserves component is also endogenous to exchange rate changes because the money supply is denominated in domestic currency and reserves in foreign currency. When the exchange rate depreciates, the ratio of reserves to the monetary base will tend to increase even if reserves remain unchanged.

3 A New Approach

In this paper we start from the position that, for identifying the type of regime (as opposed to the possible basket of anchor currencies), the appropriate statistics from a regression equation

[1] This arises because, for any currency *j*, ln *E(j, N)* – ln *E(GBP, N)* = ln *E(j, GBP).* The original *numéraire* simply disappears from the estimated equation, which reduces to an unrestricted regression with the *GBP* as *numéraire.*

like (1) should be based on the volatility and pattern of *residuals* rather than the estimated *coefficients*. At a second stage, if the relevant statistics indicate a peg by whatever criterion is chosen, *then* the coefficients can be used to identify the anchor basket.

Our baseline regression is:

$$\Delta \ln E(i,N)_t = a + b\Delta \ln E(USD,N)_t + c\Delta lnE(EUR,N)_t + u_t \tag{4}$$

The *numéraire* currency is the Swiss franc. Initially we included the Japanese yen as well, as in equation (1), but its coefficients were almost always insignificant. Instead we use the yen as an alternative *numéraire*, to check the sensitivity of the results to the choice of *numéraire*. For some currencies we added other potential anchor currencies to the equation, as follows:

South African Rand – added for Botswana, Lesotho, Namibia and Swaziland.

Indian Rupee – added for Bangladesh, Bhutan, Maldives, Nepal, Pakistan, Seychelles and Sri Lanka.

Australian and New Zealand Dollars – added for Fiji, Kiribati, Samoa, Solomon Islands, Tonga and Vanuatu.

Singapore Dollar – added for Brunei.

We have also experimented with adding the change in the ratio of international reserves to the monetary base (lagged, over months *t-4* to *t-1*, to deal with the endogeneity issue). Since this variable was rarely significant, we decided to omit it; doing so helps to reduce the data requirements for implementing our procedure.

To measure volatility, we use the root mean square error (RMSE) and the R-squared of equation (4). We expect the RMSE to be low and the R-squared to be high for pegs, and *vice versa* for floats. In the remainder of the paper we discuss the performance of these statistics in distinguishing floats from pegs.

4 Main Results by IMF *de facto* Regime

In this section we show the results of estimating equation (4) for two separate periods: January 1999 to December 2005 (83 months), and January 2006 to June 2013 (90 months). We omitted any countries which had switched *de facto* regime, according to the IMF, during the period. These periods give us two samples of more than 80 monthly observations each. Table 1 shows the means by IMF *de facto* regime. The top panel of Table 1 refers to the earlier period and the bottom panel to the later period.

What emerges quite clearly is that floats look different from pegs. Pegs tend to have RMSEs below or close to 0.01, whereas for independent floats the RMSE tends to be above 0.02, and the average in each period is above 0.025. This pattern is mirrored in the R-squareds. For independent floats the R-squared averages below 0.5 in each period. For pegs of any kind, the average R-squared is always greater than 0.8, and in most cases considerably closer to one than that. For pegs and bands as a whole, the average RMSE is 0.0044 in 1999-2005 and 0.0055 in 2006-13, and the average R-squared is 0.93 in each period. Managed floats have an average RMSE of 0.0205 in 1999-2005 and 0.0245 in 2006-13, with average R-squareds of 0.622 and 0.630 respectively.

Table 1. Regression statistics by IMF *de facto* regime

IMF *de facto* regime	No. currencies	Mean RMSE	Mean R-squared
	January 1999 to December 2005 (83 months)		
Currency board	7	0.0037	0.870
Conventional peg	24	0.0013	0.968
Basket peg	5	0.0208	0.837
Horizontal band	3	0.0058	0.835
Crawling peg	3	0.0018	0.995
All pegs and bands	*42*	*0.0044*	*0.929*
Managed float	22	0.0205	0.622
Independent float	15	0.0256	0.475
	January 2006 to June 2013 (90 months)		
Currency board	7	0.0023	0.975
Conventional peg	28	0.0051	0.938
Basket peg	4	0.0092	0.844
Horizontal band	2	0.0062	0.917
Crawling peg	3	0.0102	0.903
All pegs and bands	*44*	*0.0054*	*0.932*
Managed float	28	0.0439	0.560
Independent float	10	0.0258	0.414

Notes. The statistics refer to the estimation of equation (4) for each currency. Currencies for which the IMF *de facto* classification records a regime change are omitted.

This difference in means is encouraging but not necessarily compelling. It does not tell us how much overlap there is between the distributions. For example the high average RMSE of 0.0208 for the five basket pegs in the 1999-2005 period suggests that one or two of them may look quite similar to floats according to these statistics. Indeed that is the case: the Libyan dinar has an RMSE of 0.081 and an R-squared of 0.021 in that period. A particular issue is the devaluation of a pegged currency. This is not a regime change, but in the regression it would produce a large residual for that month. This would raise the RMSE and reduce the R-squared, and could distort the other coefficients, as we show by an example in the next section.

A symptom of one or more devaluations should be a distinctive pattern of residuals. In the event of a devaluation, positive residuals (representing a depreciation relative to the Swiss franc that is not explained by movements in the US dollar or the euro against the Swiss franc) should be relatively infrequent but occasionally large, and negative residuals should be on average much smaller but much more numerous. In other words, the residuals in this case should be markedly positively skewed. For genuine floats, we do not expect the residuals to be skewed in this way. In fact in the sample shown in Table 1, skewness never exceeds two in absolute value for independent floats, but quite frequently does so for other regimes.

This suggests that the skewness of residuals can be used to identify months with possible parity changes. For each of these months, a dummy variable that is equal to one for that month only, and zero otherwise, can be added to the regression. The regression can then be rerun, and the RMSE and R-squared re-examined. For pegs with occasional devaluations, the resulting statistics should now be in the expected range for pegs; for floats that just happened to have an usually large movement in one month, these statistics should be much less markedly affected by the inclusion of the dummies.

Table 2. Regression statistics by IMF *de facto* regime
with a dummy for a single outlying month

IMF *de facto* regime	No. currencies	Mean RMSE	Mean R-squared
	January 1999 to December 2005 (83 months)		
Currency board	7 (2)	0.0034	0.884
Conventional peg	24 (6)	0.0008	0.973
Basket peg	5 (2)	0.0090	0.932
Horizontal band	3 (1)	0.0057	0.845
Crawling peg	3 (0)	0.0018	0.995
All pegs and bands	*42 (11)*	*0.0026*	*0.946*
Managed float	22 (5)	0.0185	0.680
Independent float	15 (0)	0.0256	0.475
	January 2006 to June 2013 (90 months)		
Currency board	7 (2)	0.0022	0.975
Conventional peg	28 (6)	0.0030	0.970
Basket peg	4 (1)	0.0044	0.967
Horizontal band	2 (0)	0.0062	0.917
Crawling peg	3 (1)	0.0086	0.910
All pegs and bands	*44 (10)*	*0.0035*	*0.964*
Managed float	28 (9)	0.0222	0.662
Independent float	10 (2)	0.0252	0.439

Notes. The statistics refer to the estimation of equation (4) for each currency, with the addition of the most significant dummy variable for a single outlying month if the F-statistic for that dummy variable's exclusion from the regression exceeds 30. Figures in parentheses are the number of currencies for which a dummy was included, using this criterion. Currencies for which the IMF *de facto* classification records a regime change are omitted.

Table 2 shows what happens if we include a dummy for a single outlying month in cases where that dummy is highly significant. The procedure is as follows: if the sample is *T* months in length, we run *T* extra regressions for each country, each with a dummy =1 in just one month of the sample added to equation (4). If the highest F-statistic for the addition of a dummy does not exceed 30 (equivalent to a *t*-statistic of $\sqrt{30} = 5.48$), no dummies are added. If at least one F-statistic does exceed 30, we include a dummy for the month which yields the highest F-statistic, and no other dummies. The presumption is that there was a parity change in that month. Then we use the statistics from this augmented regression instead of the original one.[2]

In the case of Libya in the 1999-2005 period, the relevant month is January 2002, and the inclusion of a dummy for that month reduces the RMSE from 0.081 to 0.025, and raises the R-squared from 0.021 to 0.906. Thus the R-squared is now solidly in the range for a peg, but the RMSE is still more typical of a float.

Table 2 shows that the dummy met the criterion for inclusion for eleven out of 42 pegs and bands in 1999-2005, and for seven out of 44 in 2006-13. The dummy was also included for five out of 22 managed floats in the first period, and for six out of 28 managed floats in the second, implying a significant parity change. The dummy never met the criterion for inclusion for independent floats. The inclusion of the dummy reduces the average RMSE for managed floats from 0.0205 to 0.0185 in 1999-2005, and from 0.0245 to 0.0230 in 2006-13. The R-squared for managed floats is 0.680 in the early period and 0.671 in the later period, compared with 0.622 and 0.630 respectively in Table 1. The average RMSE for all pegs and bands in Table 2 is 0.0026 in 1999-2005 and 0.0031 in 2006-13, compared with 0.0044 and 0.0055 respectively in Table 1, so the proportionate reduction in RMSE from the inclusion of the dummies is greater for pegs and bands than for managed

[2] Simulations show that an F-statistic of 30 results in the incorrect inclusion of a dummy less than 1% of the time.

floats. The 1999-2005 average R-squared for all pegs and bands rises from 0.929 in Table 1 to 0.941 in Table 2, and the 2006-13 average R-squared for all pegs and bands rises from 0.942 to 0.971.

Overall, these results suggest that a search for outlying residuals in equation (4) should enable pegs with occasional devaluations to be distinguished from genuine floats.

Managed floats are difficult to evaluate in general, because their behaviour depends very much on how they are managed. As we shall show later, our methodology reveals that, while some seem relatively lightly managed, others are quite close to a form of peg, usually to the US dollar.

5 Some Examples

Table 3 gives some examples for pegs and bands (target zones wider than ±1%). In the first column, the CFA franc from 1999 to 2005 is typical of an exact peg to a single currency: the US dollar coefficient is zero, the euro coefficient is exactly 1.00, the R-squared is 1.00 and the RMSE is 0.000. Typical of a slightly looser peg is China from 1999 to 2005, shown in column (2): the US dollar coefficient is 1.001, with a *t*-statistic of 693, the euro coefficient is 0.015 and insignificant, the R-squared is 0.99 and the RMSE is 0.0023.

An example of a basket peg (Fiji 1999-2005) is given in column (3): all four currencies have weights significantly different from zero, the R-squared is 0.98 and the RMSE is 0.0035. In column (4), Tonga 2006-13 shows the difference between a peg and a band. The US dollar, the Australian dollar and the New Zealand dollar all have significant coefficients, but the R-squared is lower than for Fiji, at 0.85, and the RMSE is higher (0.0099). In column (5), China 2006-13 is a good example of a crawling peg (in this case an appreciating one). The constant is significant and implies an appreciation of about 0.3% per month, but the other statistics are typical of a peg, with an R-squared of 0.99 and an RMSE of 0.0041.

In all of these cases except China 1999-2005, the skewness of the residuals is small in absolute terms, which suggests that there was no parity change during the period. In the case of China 1999-2005, skewness is -8.76, which indicates an appreciation at some date. Table 4 shows the effects of introducing a dummy for an outlying month for two cases: the CFA franc, which was devalued by a very large amount in January 1994, from January 1990 to December 1998, and China 1999-2005. It can be seen that, for the CFA franc, the January 1994 episode greatly affects the results: without the dummy variable for that month (column 1), the R-squared is only 0.08, and the RMSE is extremely high, at 0.0670. Even the French franc coefficient is distorted, at 1.566 rather than 1.00. Only the residual skewness of 10.08 indicates that this is the effect of one or more large devaluations rather than floating. Once the January 1994 dummy is included (column 2), the fit is perfect and the French franc coefficient is exactly one.

In the case of China 1999-2005, introducing a dummy for July 2005 (column 4 of Table 4) reduces skewness from -8.76 to -0.58, even though the estimated appreciation in that month is very small (2.1%).

Table 3. Some examples of pegs and bands

Episode IMF regime	CFA franc 1999-2005 Conv'l peg (1)	China 1999-2005 Conv'l peg (2)	Fiji 1999-2005 Basket peg (3)	Tonga 2006-13 Band (4)	China 2006-13 Crawling peg (5)
US dollar	0.000	1.001***	0.298***	0.515***	0.957***
	(0.83)	(693)	(18.0)	(12.9)	(57.6)
Euro	1.00***	0.015	0.122**	-0.094	0.031
	(28413)	(0.97)	(2.31)	(-1.03)	(1.43)
AU dollar			0.331***	0.173***	
			(16.9)	(3.48)	
NZ dollar			0.210***	0.235***	
			(8.92)	(4.88)	
Constant	-0.000	-0.000	-0.000	-0.000	-0.003***
	(-0.00)	(-1.20)	(-0.36)	(-0.26)	(64.84)
Obs.	83	83	83	90	90
R-squared	1.00	0.99	0.98	0.85	0.99
RMSE	0.0000	0.0023	0.0035	0.0099	0.0041
Skewness	0.303	-8.758	0.408	-0.963	-0.697

Notes. The table refers to equation (4), with the monthly change in the log of the number of currency units per Swiss franc as the dependent variable. Figures in parentheses are t-statistics. *, **, *** denote significant at 10, 5 and 1% respectively. For 1990-98 the French franc is used in place of the euro.

Table 4. Introducing a dummy for a single outlying month

Episode IMF regime	CFA franc 1990-98 Conv'l peg		China 1999-2005 Conv'l peg	
	(1)	(2)	(3)	(4)
US dollar	-0.053	-0.000*	1.001***	1.000***
	(-0.249)	(-1.69)	(109.093)	(1068.43)
Euro (FR franc)	1.566	1.000***	0.015	0.000
	(2.818)***	(509181.46)	(0.522)	(0.17)
Outlying Dummy		0.693***		-0.021***
		(2914011.62)		(-87.21)
Constant	0.006	-0.000	-0.000	-0.000**
	(0.932)	(-0.09)	(-1.230)	(-2.12)
Obs.	108	108	83	83
R-squared	0.08	1.00	0.99	1.00
RMSE	0.0670	0.0000	0.0023	0.0002
Outlying Month		1994m1		2005m7
Skewness	10.082	0.000	-8.758	-0.574

Notes. See notes to Table 3.

Table 5 shows some examples of floats, all from 2006-13. In the first two columns, Japan and Brazil are both classified as independent floats. For Japan the R-squared is 0.53 and the RMSE is 0.0274. For Brazil the R-squared is very low, at 0.19, and the RMSE is 0.0397. Skewness is 0.600 and 1.023 respectively, so not particularly high. Japan has a surprisingly high US dollar coefficient, at 0.885, but a negative euro coefficient.[3] Brazil has significant positive coefficients for both (0.348 for the US dollar and 0.564 for the euro).

The remaining four columns of Table 5 are all examples of managed floats. India looks very similar to the independent floats: low R-squared (0.47), high RMSE (0.0233) and low skewness (0.074). The US dollar and euro coefficients are significant, but overall the management appears to be quite light: the exchange rate displays much more variation than under a peg. Kenya shows a similar pattern (R-squared of 0.12, RMSE of 0.0309 and skewness of 0.697), but only the euro coefficient is significant, and the US dollar coefficient is quite low. The last two columns show two cases where the managed float appears more like a target zone for the exchange rate against the US dollar. In the case of Bangladesh, the US dollar coefficient is 0.996, the R-squared is 0.88 and the RMSE is 0.0126 – much closer to the peg range than one would expect for a float. Jamaica is essentially similar, with a US dollar coefficient of 0.913, an R-squared of 0.89 and an RMSE of 0.0113. For Jamaica there is also a marked trend depreciation, with a significant intercept term of 0.5% per month.

Table 6 shows that in both of these last two cases there seems to have been an outlying month with a devaluation of about 6% (December 2011 for Bangladesh and January 2009 for Jamaica). Inclusion of the dummy makes their attachment to the US dollar look even stronger.

[3] In 1999-2005, Japan shows a similar pattern: a US dollar coefficient of 0.649 and a negative euro coefficient.

Table 5. Some examples of independent and managed floats

Episode:	Japan 2006-13	Brazil 2006-13	India 2006-13	Kenya 2006-13	Bangladesh 2006-13	Jamaica 2006-13
IMF regime	Indep't Float	Indep't float	Managed float	Managed float	Managed Float	Managed float
	(1)	(2)	(3)	(4)	(5)	(6)
US dollar	0.885***	0.348***	0.530***	0.158	0.996***	0.913***
	(9.88)	(2.68)	(6.96)	(1.57)	(19.363)	(24.713)
Euro	-0.365**	0.564**	0.363***	0.419**	0.029	0.074
	(-2.40)	(2.56)	(2.80)	(2.44)	(0.400)	(1.182)
Indian rupee					-0.030	
					(-0.509)	
Constant	-0.001	0.000	0.004	0.004	0.002	0.005***
	(-0.23)	(0.09)	(1.59)	(1.08)	(1.419)	(4.270)
Obs.	90	90	90	90	90	90
R-squared	0.53	0.19	0.47	0.12	0.88	0.89
RMSE	0.0274	0.0397	0.0233	0.0309	0.0126	0.0113
Skewness	0.600	1.023	0.074	0.697	1.714	1.943

Notes. See notes to Table 3.

Table 6. Introducing a dummy for a single outlying month

Episode	Bangladesh 2006-13		Jamaica 2006-13	
IMF regime	Managed Float		Managed float	
	(1)	(2)	(3)	(4)
US dollar	0.996	1.018***	0.913***	0.970***
	(19.363)***	(23.02)	(24.713)	(29.99)
Euro	0.029	-0.005	0.074	0.056
	(0.400)	(-0.07)	(1.182)	(1.05)
Indian rupee	-0.030	-0.031		
	(-0.509)	(-0.63)		
Outlying Dummy		0.062***		0.061***
		(5.68)		(6.14)
Constant	0.002	0.001	0.005***	0.004***
	(1.419)	(1.07)	(4.270)	(4.22)
Obs.	90	90	90	90
R-squared	0.88	0.91	0.89	0.92
RMSE	0.0126	0.0108	0.0113	0.0095
Outlying Month		2011m12		2009m1
Skewness	1.714	0.362	1.943	1.281

Notes. See notes to Table 3.

6 The Choice of Numéraire

How much difference does the choice of *numéraire* make? Table 7 shows the correlation of various regression statistics using other independently floating currencies as alternative *numéraires* to the Swiss franc. The correlations are generally high. The R-squared, RMSE and skewness always have correlations above 0.8, and in more than half the cases above 0.9. The correlations for the intercept coefficient are particularly high, always exceeding 0.95. The correlations for the US dollar coefficient always exceed 0.9, except in the case of the SDR, for which the correlation is 0.722 in 1999-2005 and 0.760 in 2006-13. These lower correlations no doubt reflect the weight of the US dollar in the SDR basket. For the euro coefficients, the correlations are also lower for the SDR than for the other currencies, although to a lesser degree, probably because the weight of the euro in the SDR basket is less than that of the US dollar. For the euro coefficient, there is a marked difference between the two periods. In 2006-13 the euro coefficient correlations for currencies other than the SDR always exceed 0.9, whereas in 1999-2005 they lie in the range 0.66 to 0.73. This may reflect the fact that the Swiss franc was particularly stable against the euro in this period, making the euro coefficient harder to estimate when the Swiss franc is used as the *numéraire*.

Table 7. Correlations between statistics with different *numéraires*

Alternative *numéraire*:	Japanese yen	British pound	Canadian Dollar	Chilean peso	Special drawing rights
			1999/01 - 2005/12		
US$ coefficient	0.969	0.970	0.905	0.925	0.722
Euro coefficient	0.722	0.685	0.663	0.683	0.607
Intercept	0.999	0.999	0.995	0.998	0.998
R-squared	0.852	0.921	0.830	0.803	0.833
RMSE	0.996	0.998	0.997	0.995	0.999
Skewness	0.933	0.914	0.894	0.947	0.934
			2006/01 - 2013/06		
US$ coefficient	0.955	0.981	0.970	0.986	0.780
Euro coefficient	0.943	0.906	0.915	0.926	0.825
Intercept	0.989	0.984	0.985	0.984	0.984
R-squared	0.835	0.947	0.969	0.947	0.838
RMSE	0.981	0.991	0.986	0.972	0.995
Skewness	0.742	0.993	0.747	0.987	0.992

Notes. The statistics are the correlation coefficients between two alternative versions of equation (4), estimated with either the Swiss franc or the currency listed at the top of the column as *numéraire*, and with the inclusion of a dummy for an outlying month if the criteria described in Section 4 are met.

Nevertheless it is vital that the *numéraire* currency should float relative to the anchor currencies used in the regression, and therefore it is always wise to test the robustness of results to alternative *numéraires*. It is also important to identify anchor currencies correctly. If currency A is pegged to currency B, but currency B is omitted from the regression, currency A will tend to appear to have a regime similar to currency B, which may not be a peg.

7 What Are Managed Floats Doing?

Managed floats are a bit of a black box. Calvo and Reinhart (2002) suggested that many were not floating in any meaningful sense. Bleaney and Tian (2012) showed that managed floats tend to have quite low bilateral volatility against the US dollar. Slavov (2013) finds a high degree of attachment to the US dollar amongst floating sub-Saharan African countries.

It seems likely that many managed floats are quite lightly managed, whilst others are rather close to pegs of some kind. Suppose that we define managed floats that have an RMSE of less than 0.015 (greater than virtually all pegs but less than virtually all independent floats) and a regression coefficient of greater than 0.90 for the US dollar or the euro as a quasi-peg to that currency. Then we find that, for the sample used in Tables 1 and 2, five out of 22 managed floats in 1999-2005 and two out of 28 in 2006-13 qualify as quasi-pegs to the US dollar. Thus a minority – but a diminishing minority – of managed floats appear to fall into this category. Table 8 shows that the quasi-pegs also have much higher R-squareds than is typical of other managed floats.

Table 8. Different Types of Managed Floats

	Number	Average RMSE	Average R-squared
		1999-2005	
Quasi-Pegs to US$	5 (1)	0.0080	0.924
Other Managed Floats	17 (4)	0.0217	0.608
		2006-13	
Quasi-Pegs to US$	4 (1)	0.0132	0.861
Other Managed Floats	24 (8)	0.0237	0.629

Notes. The statistics are based on equation (4) with the inclusion of a dummy for an outlying month if the criteria described in Section 4 are met. The number in parentheses indicates the number of countries for which a dummy was included. "Other" managed floats are those that are not quasi-pegs to the US dollar or the euro.

A separate question is whether even managed floats that are not quasi-pegs to the US dollar are managed with particular attention to the bilateral rate against the US dollar. This question can be addressed by comparing the US dollar coefficients of these managed floats with those of independent floats (see Table 9). In the 1999-2005 period, the average US dollar coefficient of "other" managed floats is 0.781, which is slightly higher than the average of 0.697 for independent floats. In 2006-13, the average US dollar coefficient of "other" managed floats is still quite high, at 0.686, wheareas the average for independent floats is much lower, at 0.205. The euro coefficients are very similar across the two periods for each group (0.315 and 0.347 for "other" managed floats; 0.700 and 0.720 for independent floats), but much lower for independent floats. Of course geographical factors may be involved here, as we investigate below.

The bottom panel of Table 9 shows the average coefficients for the seven currencies that were independent floats in the IMF *de facto* classification throughout the 1999-2013 period. The difference between the US dollar coefficients in the two periods is now much smaller, but a large difference now appears between the euro coefficients in the two periods. Considerable volatility in the coefficients of equation (4) is to be expected for genuinely floating countries.

Table 9. Average US$ and Euro Coefficients of Different Types of Floats

	Number	Average US$ coefficient	Average euro coefficient
		1999-2005	
Quasi-Pegs to US$	5 (1)	0.997	0.040
Other Managed Floats	17 (4)	0.781	0.315
Independent Floats	15 (0)	0.697	0.700
		2006-13	
Quasi-Pegs to US$	4 (1)	0.919	0.091
Other Managed Floats	24 (8)	0.668	0.340
Independent Floats	10 (2)	0.187	0.680
		Statistics for the same seven independent floats	
1999-2005	7 (0)	0.51	0.93
2006-13	7 (1)	0.32	0.50

Notes. See notes to Table 8. The seven countries in the bottom panel are: Australia, Canada, Chile, Japan, New Zealand, Sweden and the United Kingdom.

We now investigate the relationship between the US dollar coefficients and euro coefficients of “other” managed floats and independent floats and trade flows with the United States and the Euro Area. One would expect that, where trade flows with a region are higher, that region would have a greater weight in a country’s effective exchange rate, and a higher coefficient in equation (4). Table 10 shows that this is true, although the standard errors of the trade coefficients are quite large, which is understandable in the case of floating currencies. The coefficient of the US dollar increases significantly with trade flows to and from the United States as a share of the country’s total trade (column (1)). The effect is absent for “other” managed floats, although the difference in coefficients is not significant at the 5% level. In column (2) the effect is smaller for the euro coefficients, and not statistically significant. In column (3) (the difference between the US dollar and the euro coefficients) the effect is almost as large as for the US dollar coefficient alone, and significant at the 5% level. In columns (2) and (3) the trade coefficient is only very slightly smaller for “other” managed floats than for independent floats.

The managed float dummy in Table 10 tells us the estimated difference in coefficients between “other” managed floats and independent floats for given trade shares. If floats are managed with more of an eye to the US dollar exchange rate and less to the euro exchange rate, we would expect to see positive coefficients for this dummy in columns (1) and (3), and a negative coefficient in column (2). This is exactly what we observe: the positive coefficients in columns (1) and (3) have *t*-statistics that exceed four. The negative coefficient in column (2) is only significant at the 10% level but almost as large in absolute value as that in column (1). These results confirm the suggestion of Bleaney and Tian (2012) and Slavov (2013) that managed floats pay close attention to exchange rate stability against the US dollar.

Table 10. Coefficients and Trade Shares for Different Types of Floats

	Dependent Variables		
	b_USD	b_EUR	b_USD – b_EUR
	(1)	(2)	(3)
TradeShare_US	0.722		
(TSUS)	(2.94)***		
TradeShare_Euro		0.436	
(TSEU)		(0.94)	
TSUS - TSEU			0.710
			(2.17)**
Managed Float Dummy	0.448	-0.375	0.728
(MFDUM)	(4.05)***	(-1.76)*	(4.12)***
MFDUM * TSUS	-0.928		
	(-1.80)*		
MFDUM * TSEU		-0.012	
		(-0.02)	
MFDUM *			-0.052
(TSUS – TSEU)			(-0.08)
Dummy 2006-13	-0.215	0.001	-0.216
	(-3.03)***	(0.01)	(-1.44)
Constant	0.441	0.585	-0.064
	(4.72)***	(2.70)***	(-0.37)
Observations	67	67	67
R-squared	0.31	0.19	0.29
RMSE	0.289	0.4415	0.6257

Notes. Robust t-stats in parentheses. The dependent variables are the US dollar coefficient (b_USD) in column (1), the euro coefficient (b_EUR) in column (2), and the difference between them in column (3), using the same regression as used for Table 7. The sample consists of "Other" Managed Floats (MFDUM = 1) and Independent Floats (MFDUM =0) without regime switches 1999-2005 and 2006-13. Trade Share variables are the share of the US/Euro Area in the country's trade, or in column (3) the difference between them. "Dummy 2006-13" is equal to one if the coefficient is from 2006-13, and equal to zero if the coefficient is from 1999-2005. ***, **, *: significantly different from zero at the 1%, 5% and 10% levels respectively.

8 Generating an Annual Classification

It is often useful to have an annual classification of exchange rate regimes, in order to assess how macroeconomic variables such as growth, inflation and fiscal balances vary across regimes, to capture trends in regime choice over time, or simply to provide a comparison with earlier classification schemes that are organized by calendar year. The main issue for any regression method applied to a relatively short period is the loss of degrees of freedom. Applied to twelve monthly changes, equation (4) would have only nine degrees of freedom (fewer if extra potential anchor currencies are included), and only eight once a parity change in one month is allowed for.

In order to generate an annual classification for each country-year observation, we adopt the following algorithm.

1) Estimate equation (4) for the twelve monthly exchange rate changes in the year, adding potential anchor currencies to the US dollar and the euro as appropriate. If the RMSE ≤ 0.01, define that country-year observation as a PEG; if the RMSE > 0.01, go to step 2.
2) Add a dummy for January to the regression, then replace that with a dummy for February, and so on. If the RMSE ≤ 0.01 in any of these twelve regressions, define that country-year observation as a PEG WITH A PARITY CHANGE; otherwise define it as a FLOAT.

Table 11 gives the number of countries in each of these categories, plus those with no separate legal tender, in every year from 1970 to 2012. The number of countries with no separate legal tender has increased to nearly 25% of the total. Floats increased up to the 1990s, but not since. Pegs with parity changes have decreased as inflation rates have declined; pegs without parity changes remain the most frequent category, but with some tendency to decline.

Table 11. Chronological Distribution of Regimes

Year	Regime: No Legal Tender	Peg without Parity Change	Peg with Parity Change	Float	Total
1970	24	122	10	1	157
1971	24	81	45	7	157
1972	24	101	29	4	158
1973	24	62	42	30	158
1974	23	87	21	27	158
1975	23	91	23	19	156
1976	23	98	17	18	156
1977	23	95	25	13	156
1978	23	89	20	24	156
1979	23	98	20	15	156
1980	23	106	9	18	156
1981	23	81	21	31	156
1982	23	88	24	21	156
1983	23	82	27	24	156
1984	24	85	19	28	156
1985	25	73	23	35	156
1986	25	68	25	39	157
1987	25	85	20	27	157
1988	25	76	27	29	157
1989	25	73	19	41	158
1990	25	75	18	43	161
1991	24	72	26	38	160
1992	24	72	27	48	171
1993	24	70	22	58	174
1994	24	78	20	54	176
1995	24	89	22	44	179
1996	24	104	9	42	179
1997	25	88	17	50	180
1998	25	82	16	57	180
1999	38	78	16	51	183
2000	38	76	12	57	183
2001	40	75	15	52	182
2002	40	81	13	49	183
2003	40	73	11	59	183
2004	40	82	11	50	183
2005	40	78	18	47	183
2006	40	86	9	48	183
2007	41	85	8	49	183
2008	43	70	12	58	183
2009	44	66	15	58	183
2010	44	73	11	56	184
2011	45	69	11	58	183
2012	45	78	10	50	183
Total	1,272	3,541	815	1,627	7,255

Figure 1 shows the number of floats and pegs with and without parity changes as a share of all *currencies* (i.e. countries with a separate legal tender). Floats have increased to about 40% of the total in recent years, at the expense of pegs both with and without parity changes.[4]

When we disaggregate Figure 1 by type of country, it is clear that oil exporters and offshore financial centres remain wedded to pegs (Figures 2 and 3), whilst emerging markets have exhibited a steady trend towards floating (Figure 4). Other developing countries were shifting towards floating up to the mid-1990s, but that trend has stopped since, without being significantly reversed (Figure 5).

How does our annual classification compare with others? Table 12 shows a summary comparison of our classification with the IMF's *de facto* classification for the years 1980-2011. The comparison is based on currencies rather than countries (i.e. the CFA franc, for example, is counted only once for each year). Overall, we identify 33.4% of the observations as floats compared with the IMF's 36.9%, which is quite a close match. The difference arises mainly because we categorise 44.4% of IMF managed floats as pegs, and that is not fully compensated for by the proportion of IMF pegs and bands that we classify as floats (5.2% for conventional pegs, 17.7% for basket pegs, 23.6% for bands and 32.6% for crawls). Our overall agreement rate with the IMF classification is 77.0%.

Our disagreements with the IMF classification are difficult to evaluate. Even if managed floats are not in reality quasi-pegs (and some are, as our previous analysis showed), they might be quite tightly managed for limited periods, and therefore show up in our annual classification as a peg in some years. Likewise, bands and crawls may have a wider range of fluctuation in some years, and appear in our analysis as floats. Some discrepancies can arise

[4] Our annual regime classifications are publicly available at http://www.nottingham.ac.uk/economics/people/michael.bleaney.

because the IMF focuses on the most recent six-month period, rather than the calendar year (see the Appendix for details).

Table 13 reports the results of a similar exercise for the Shambaugh (2004) classification over the same period. Here the disagreements are much more unbalanced. Only 1.4% of Shambaugh pegs are floats in our classification, but we classify 49.2% of Shambaugh non-pegs as pegs. Overall the agreement rate is quite a bit lower than for the IMF classification, at 68.5%. The concentration of disagreements in the south-west cell of the table reflects the stringency of the Shambaugh definition of a peg, compared with us or the IMF, so that 63.0% of the observations are classified as non-pegs, nearly twice as many as we do.

In the case of the Reinhart and Rogoff (2004) classification, the picture is more or less the opposite (Table 14). That classification has a very low proportion of floats (17.6%), compared with our 32.1% for an identical sample. The disagreements are therefore mainly cases where we identify a float and they identify a peg or band of some type. The overall agreement rate is 73.6%, somewhat lower than for the IMF classification.

As explained in the Appendix, both Shambaugh and Reinhart and Rogoff consider only single-currency or SDR anchors for pegs. In addition, Reinhart and Rogoff also prefer to use parallel exchange rates where available.

In summary, therefore, our classification is closer to the IMF *de facto* classification than to those of Shambaugh (2004) and Reinhart and Rogoff (2004), in terms of both overall agreement rates and the proportion of floats identified.

Table 12. Comparison with the IMF *de facto* Classification1980-2011

IMF category	Our category Peg	Our category Float	Total	Agreement rate (%)
Conventional peg	1208*	66	1274 (30.7%)	94.8
Basket peg	419*	90	509 (12.3%)	82.3
Band	201*	62	263 (6.3%)	76.4
Crawl	388*	188	576 (13.9%)	67.4
Managed float	445	558*	1003 (24.2%)	55.6
Independent float	103	425*	528 (12.7%)	80.5
Total	2764 (66.6%)	1389 (33.4%)	4153 (100%)	77.0

Notes. * denotes agreement.

Table 13. Comparison with the Shambaugh Classification 1980-2011

Shambaugh category	Our category Peg	Our category Float	Total	Agreement rate (%)
Peg	1545*	22	1567 (37.0%)	98.6
Non-peg	1314	1357*	2671 (63.0%)	50.8
Total	2858 (67.4%)	1379 (32.6%)	4238 (100%)	68.5

Notes. * denotes agreement. The Shambaugh data are from Jay Shambaugh's website.

Table 14. Comparison with the Reinhart-Rogoff Classification 1980-2010

RR category	Our category Peg	Our category Float	Total	Agreement rate (%)
Peg	1969*	650	2619 (82.4%)	75.2
Float	191	370*	561 (17.6%)	66.0
Total	2160 (67.9%)	1020 (32.1%)	3180 (100%)	73.6

Notes. * denotes agreement. A Reinhart-Rogoff float is a managed or independent float according to their fine classification (source: ***).

9 Conclusions

A simple and reliable regression method is used to identify the exchange rate regime. The method is not data-intensive and could easily be applied by other researchers. Monthly exchange rate movements of a currency against a floating *numéraire* currency are regressed on movements of the euro and the US dollar against the *numéraire* currency. Where relevant, other potential anchor currencies are added to the regression. Pegs are characterised by a low RMSE and a high R-squared, with the estimated coefficients indicating the anchor basket. Results are robust to the choice of *numéraire* (except that the SDR tends to be misleading because of its correlation with the anchor currencies). The thorny question of distinguishing floats from pegs with occasional parity changes can be addressed by examining the skewness of residuals; floats have relatively symmetric residuals whereas pegs with occasional parity changes do not. The procedure can be repeated with outlying observations dummied out to distinguish pegs with parity changes from genuine floats. A useful by-product of this procedure is that it also distinguishes "fixed" pegs (those without parity changes) from "variable" pegs (those with parity changes).

Managed floats have become increasingly popular amongst emerging markets and developing countries in the 21st century. In a small but diminishing minority of cases, our results show that these are quasi-pegs to the US dollar, often with slightly wider target zones than announced pegs. An increasing proportion of managed floats has similar volatility to independent floats, but even these have a tendency to track the US dollar.

The method can be used to generate an annual classification. It could also be used by the IMF's Monetary and Exchange Affairs Department (or country desks themselves) to verify country desks' identification of the exchange rate regime. The simple criterion of

RMSE > or < 0.01 in twelve-month data, after allowing for a possible parity change, yields a reasonably high correlation with the IMF *de facto* classification. The agreement rate of our system with alternative classification schemes, such as those of Shambaugh (2004) or Reinhart and Rogoff (2004), is lower than with the IMF *de facto* classification. In particular, our estimate of the overall frequency of floating is much closer to that of the IMF than of the alternatives. Thus our approach may be regarded as providing a solid statistical foundation for the IMF *de facto* classification.

References

Bénassy-Quéré, A., B. Coeuré and V. Mignon (2006), On the identification of de facto currency pegs, Journal of the Japanese and International Economies 20, 112-127

Bleaney, M.F. and M. Francisco (2007), Classifying exchange rate regimes: a statistical analysis of alternative methods, Economics Bulletin 6 (3), 1-6.

Bleaney, M.F. and M. Tian (2012), Currency networks, bilateral exchange rate volatility and the role of the US dollar, Open Economies Review 23 (5), 785-803

Calvo, G. and C.M. Reinhart (2002), Fear of floating, Quarterly Journal of Economics 117 (2), 379-408

Frankel, J. and S.-J. Wei (1995), Emerging currency blocs, in The International Monetary System: Its Institutions and its Future, ed. H. Genberg (Berlin, Springer)

Frankel, J. and S.-J. Wei (2008), Estimation of de facto exchange rate regimes: synthesis of the techniques for inferring flexibility and basket weights, IMF Staff Papers 55 (3), 384-416

Habermeier, K., A. Kokenyne, R. Veyrune and H. Anderson (2009), Revised system for the classification of exchange rate arrangements, IMF Working Paper no. 09/211

Levy-Yeyati, E. and F. Sturzenegger (2005), Classifying exchange rate regimes: deeds versus words, European Economic Review 49 (6), 1173-1193

Reinhart, C.M. and Rogoff, K. (2004), The modern history of exchange rate arrangements: a re-interpretation, Quarterly Journal of Economics 119 (1), 1-48

Shambaugh, J. (2004), The effects of fixed exchange rates on monetary policy, Quarterly Journal of Economics 119 (1), 301-352

Slavov, S.T. (2013), *De jure* versus *de facto* exchange rate regimes in sub-Saharan Africa, Journal of African Economies 22 (5), 732-756

Tavlas, G., H. Dellas and A.C. Stockman (2008), The classification and performance of alternative exchange-rate systems, European Economic Review 52, 941-963

Appendix

10 Summaries of Classification Schemes

10.1 IMF Classification

The *de facto* classification is based on the *ex post* evaluation of each country's report (*de jure* classification*)* against the expected behaviour of some selective measures usually for at least six months. If these *ex post* measures disagree with the *de jure* classification, the country will be re-classified into the actual category. Detailed criteria for each category are summarised as follows:

- No Separate Legal Tender and Currency Board: These regimes are usually defined explicitly by country's exchange rate policy.
- Conventional Pegs / Stabilised Arrangement: The spot market rate vis-à-vis the anchor(s) fluctuates within ±1% around a central rate or within a 2% margin for at least six months, allowing for some occasional outliers as exceptions. The anchor(s), usually reflecting the major trade partners in goods, services, and capitals, would be verified by statistical techniques (the details are not given).
- Crawls/Crawl-like Arrangement: The exchange rate fluctuates within a margin about a predetermined trend (identified by using ``statistical methods''): either around a time trend for at least six months with the overall changes larger than 2% or within the boundary created by *ex post/*projected inflation differentials against the country's major trading partners, or it exhibits seemingly single-side changes with the annual size larger than 1%.
- Pegged within Horizontal Bands: The exchange rate fluctuates around a central rate greater than ±1% or exceeding the 2% max-min margin, but within a certain margin (upper boundary not specified).
- Managed Floating: Those currencies do not satisfy any of the other categories (usually for those with frequent policy shifts) or exhibit some managing behaviours by using some ``broadly-judgemental'' indicators (e.g. balance of payment position, international reserves, parallel market developments). Since 2009 this category has been split into "Floats" and "Other Managed Arrangements".
- Free/Independent Floating: Either the authority provides information that the exchange rate interventions only aims to ``address disorderly market conditions'', or data can confirm that within the previous six months there are no more than three interventions with each lasting less than three business days.

10.2 Reinhart and Rogoff's Classification

Reinhart and Rogoff's classification method also embeds a statistical *de jure* verification procedure, but this is conditioned upon the non-existence of the parallel exchange rate market rates. If the parallel rates are available, they will be directly evaluated to generate the classification result. The verification/evaluation procedure generally employs the mean absolute percentage changes of monthly exchange rates mainly over a 5-year rolling-window (if not, a 2-year window instead), accompanied by inflation data and various sources of documents. The potential anchors are chosen either based on the authority's pre-announcement, or from a basket proxied by a single dominant currency or the SDR. Detailed criteria for each category are summarised as follows:

- Pegs/Crawling/Moving Pegs: The mean absolute percentage changes of exchange rates stay zero for more than 4 months, or within a ±1% band for more than 80% of cases over the 5-year rolling window
- Bands/Crawling/Moving Bands: The mean absolute percentage changes of exchange rates stays within ±5% band for more than 80% cases over the 5-year rolling window.
- Freely Falling/Hyperfloat: Those failed to be classified as a peg and exhibiting a 12-month inflation higher than 40% (Freely Falling) or further has a single month inflation larger than 40% (Hyperfloat)
- Managed Float/Free Floating: The residuals from the above categories. Based on the empirical distribution of the ratio defined as the 5-year mean absolute percentage changes of exchange rates to the proportion of the cases within ±1% band, a Free Float episode lies in the 99 percent upper tail of the distribution of the floater's group.

10.3 Shambaugh's Classification

Shambaugh's dichotomy classification mainly investigates the currency's official end-of-month bilateral exchange rates against a single anchor within a calendar year. The anchor is chosen by utilising historical documents as well as by examining the bilateral exchange rates against all global and regional major currencies to identify the potential pegging behaviours. Detailed criteria for each category are summarised as follows:

- Pegs: The exchange rate fluctuates within a ±2% band throughout the entire year or there are 11 months zero changes.
- Non-Pegs: Those that do not satisfy the criteria for Pegs.

10.4 Our Regression Method

Our annual classification is based on a regression using the log-changes of the currency value on a potential anchor basket of currencies, all measured in terms of a common numeraire (the end-of-month official exchange rates against CHF). See Section 2 for the anchor list. Our data covers the period 1970-2012 and a currency-year list is presented in Section 3.

An outlier month dummy is introduced and tested each throughout the year to capture one-time parity change. A month dummy is accepted if its t-statistics in magnitude is the larger than those for the other months tests and is above 5.48 (equivalent to 30 for the F-statistics), in which the episode is coded as Peg with Parity Change.

For the residual episodes, a Peg is coded if the rooted mean square error of the regression is smaller than 1%. Otherwise it is regarded as a Float.

A separate No Legal Tender category is constructed, based on various documents and listed in Section 3.

11 Potential Anchor List Introduced in the Regression

11.1 The following anchors are added in the regressions until 1998

- DEM
  All Currencies except those having FRF
- FRF:
  Benin, Burkina Faso, CAEMU, Cameroon, Central African Republic, Chad, Comoros, Congo, Cote d'Ivoire, Equatorial Guinea, Gabon, Guinea, Guinea-Bissau, Madagascar, Mali, Mauritania, Niger, Senegal, Togo, WAEMU
- GBP:
  Anguilla, Antigua and Barbuda, Australia, Bahamas, Bahrain, Bangladesh, Barbados, Belize, Botswana, Brunei, Cyprus, Dominica, Egypt, Fiji, Gambia, Ghana, Grenada, Guyana, Hong Kong, Iceland, India, Iraq, Ireland, Israel, Jamaica, Jordan, Kenya, Kiribati, Kuwait, Lesotho, Libya, Malawi, Malaysia, Maldives, Malta, Mauritius, Montserrat, Namibia, New Zealand, Oman, Pakistan, Papua New Guinea, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Seychelles, Sierra Leone, Singapore, Solomon Islands, Somalia, South Africa, Sri Lanka, Sudan, Swaziland, Tonga, Trinidad and Tobago, Uganda, United Arab Emirates, Zambia
- PTE
  Angola, Cape Verde, Guinea-Bissau, Mozambique, Sao Tome and Principe
- ITL
  Albania, San Marino
- BEF
  Luxembourg

11.2 The following anchors are added from 1999

- EUR
  All currencies

11.3 The following anchors are added throughout the sample period

- USD
  All currencies
- AUD
  Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu
- NZD
  Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu
- ZAR
  Botswana, Lesotho, Namibia, Swaziland
- INR
  Bangladesh, Bhutan, Maldives, Nepal, Pakistan, Seychelles, Sri Lanka
- SGD
  Brunei

11.4 The regimes for the following currencies are underdetermined

- USD SWF EUR FRF DEM

12 No Legal Tender Espisodes

Table. No Legal Tender

Name	Period	Name	Period
Anguilla	1970-2012	Kiribati	1970-2012
Antigua and Barbuda	1970-2012	Luxembourg	1999-2012
Austria	1999-2012	Mali	1984-2012
Belgium	1999-2012	Malta	2008-2012
Benin	1970-2012	Mauritania	1970-1973
Burkina Faso	1970-2012	Micronesia	1970-2012
Cameroon	1970-2012	Montenegro	1999-2012
Central African Republic	1970-2012	Montserrat	1970-2012
Chad	1970-2012	Namibia	1970-1990
Congo	1970-2012	Netherlands	1999-2012
Cote d'Ivoire	1970-2012	Niger	1970-2012
Cyprus	2008-2012	Panama	1970-2012
Dominica	1970-2012	Portugal	1999-2012
El Salvador	2001-2012	Saint Kitts and Nevis	1970-2012
Equatorial Guinea	1985-2012	Saint Lucia	1970-2012
Estonia	2011-2012	Saint Vincent and the Grenadines	1970-2012
Finland	1999-2012	San Marino	1999-2012
Gabon	1970-2012	Senegal	1970-2012
Greece	2001-2012	Slovak Republic	2009-2012
Grenada	1970-2012	Slovenia	2007-2012
Guinea-Bissau	1997-2012	Spain	1999-2012
Ireland	1999-2012	Togo	1970-2012
Italy	1999-2012		

13 Country Year List

Table. Currency Year List

Name	Period	Name	Period
Industrial		**Financial**	
Australia	1970-2012	Aruba	1986-2012
Austria	1970-1998	Bahamas	1970-2012
Belgium	1970-1998	Barbados	1970-2012
Canada	1970-2012	Belize	1970-2012
Denmark	1970-2012	Cyprus	1970-2007
Finland	1970-1998	Hong Kong	1970-2012
Greece	1970-2000	Lebanon	1970-2012

Iceland	1970-2012
Ireland	1970-1998
Italy	1970-1998
Japan	1970-2012
Luxembourg	1970-1998
Netherlands	1970-1998
New Zealand	1970-2012
Norway	1970-2012
Portugal	1970-1998
San Marino	1970-1998
Spain	1970-1998
Sweden	1970-2012
United Kingdom	1970-2012

Fuel

Algeria	1970-2012
Angola	1970-2012
Azerbaijan	1995-2012
Bahrain	1970-2012
Brunei	1970-2012
Equatorial Guinea	1970-1984
Iran	1970-2012
Iraq	1970-2012
Kazakhstan	1994-2012
Kuwait	1970-2012
Libya	1970-2012
Nigeria	1970-2012
Oman	1970-2012
Qatar	1970-2012
Saudi Arabia	1970-2012
Sudan	1970-2012
Trinidad and Tobago	1970-2012
Turkmenistan	1994-2001
United Arab Emirates	1970-2012
Venezuela	1970-2012
Yemen Arab Republic	1990-2012

Macao	1970-2012
Malta	1970-2007
Mauritius	1970-2012
Netherlands Antilles	1970-2010
Samoa	1970-2012
Singapore	1970-2012
Vanuatu	1970-2012

Emerging Market

Argentina	1970-2012
Brazil	1970-2012
Bulgaria	1970-1974 1990-2012
Chile	1970-2012
China	1970-2012
Colombia	1970-2012
Czech Republic	1993-2012
Egypt	1970-2012
Hungary	1970-2012
India	1970-2012
Indonesia	1970-2012
Israel	1970-2012
Malaysia	1970-2012
Mexico	1970-2012
Morocco	1970-2012
Pakistan	1970-2012
Peru	1970-2012
Philippines	1970-2012
Poland	1970-2012
Russia	1992-1993 1995-2012
South Africa	1970-2012
South Korea	1970-2012
Thailand	1970-2012
Turkey	1970-2012
Ukraine	1993-2012
Uruguay	1970-2012

Other Developing

Afghanistan	1970-1998 2002-2012	Liberia	1970-2012
Albania	1992-2012	Lithuania	1992-2012
Armenia	1992-2012	Macedonia	1994-2012
Bangladesh	1972-2012	Madagascar	1970-2012
Belarus	1992-2012	Malawi	1970-2012

Bhutan	1970-2012	Maldives	1970-2012
Bolivia	1970-2012	Mali	1970-1983
Bosnia and Herzegovina	1997-2012	Mauritania	1974-2012
Botswana	1970-2012	Moldova	1992-2012
Burundi	1970-2012	Mongolia	1990-2012
CAEMU	1970-2012	Mozambique	1970-2012
Cambodia	1970-1974 1989-2012	Myanmar	1970-2012
Cape Verde	1970-2012	Namibia	1991-2012
Comoros	1970-2012	Nepal	1970-2012
Costa Rica	1970-2012	Nicaragua	1970-2012
Croatia	1992-2012	Papua New Guinea	1970-2012
Democratic Republic of Congo	1970-2012	Paraguay	1970-2012
Djibouti	1970-2012	Romania	1970-2012
Dominican Republic	1970-2012	Rwanda	1970-2012
ECD	1970-2012	Sao Tome and Principe	1970-2012
El Salvador	1970-2000	Seychelles	1970-2012
Eritrea	1970-2012	SerbiaRep	2002-2012
Estonia	1992-2010	Sierra Leone	1970-2012
Ethiopia	1970-2012	SintMaarten	2010-2012
Fiji	1970-2012	Slovak Republic	1993-2008
Gambia	1970-2012	Slovenia	1992-2006
Georgia	1995-2012	Solomon Islands	1970-2012
Ghana	1970-2012	Somalia	1970-1990
Guatemala	1970-2012	Sri Lanka	1970-2012
Guinea	1970-2012	Suriname	1970-2012
Guinea-Bissau	1970-1996	Swaziland	1970-2012
Guyana	1970-2012	Tajikistan	1992-2012
Haiti	1970-2012	Tanzania	1970-2012
Honduras	1970-2012	Tonga	1970-2012
Jamaica	1970-2012	Tunisia	1970-2012
Jordan	1970-2012	Uganda	1970-2012
Kenya	1970-2012	Uzbekistan	1999-2000
Kyrgyz Republic	1993-2012	Vietnam	1970-2012
Laos	1970-2012	WAEMU	1970-2012
Latvia	1992-2012	Yugoslavia	1970-1992
Lesotho	1970-2012	Zambia	1970-2012

Figure 1. Overall Distribution of Regimes by Year (No Legal Tenders are excluded)

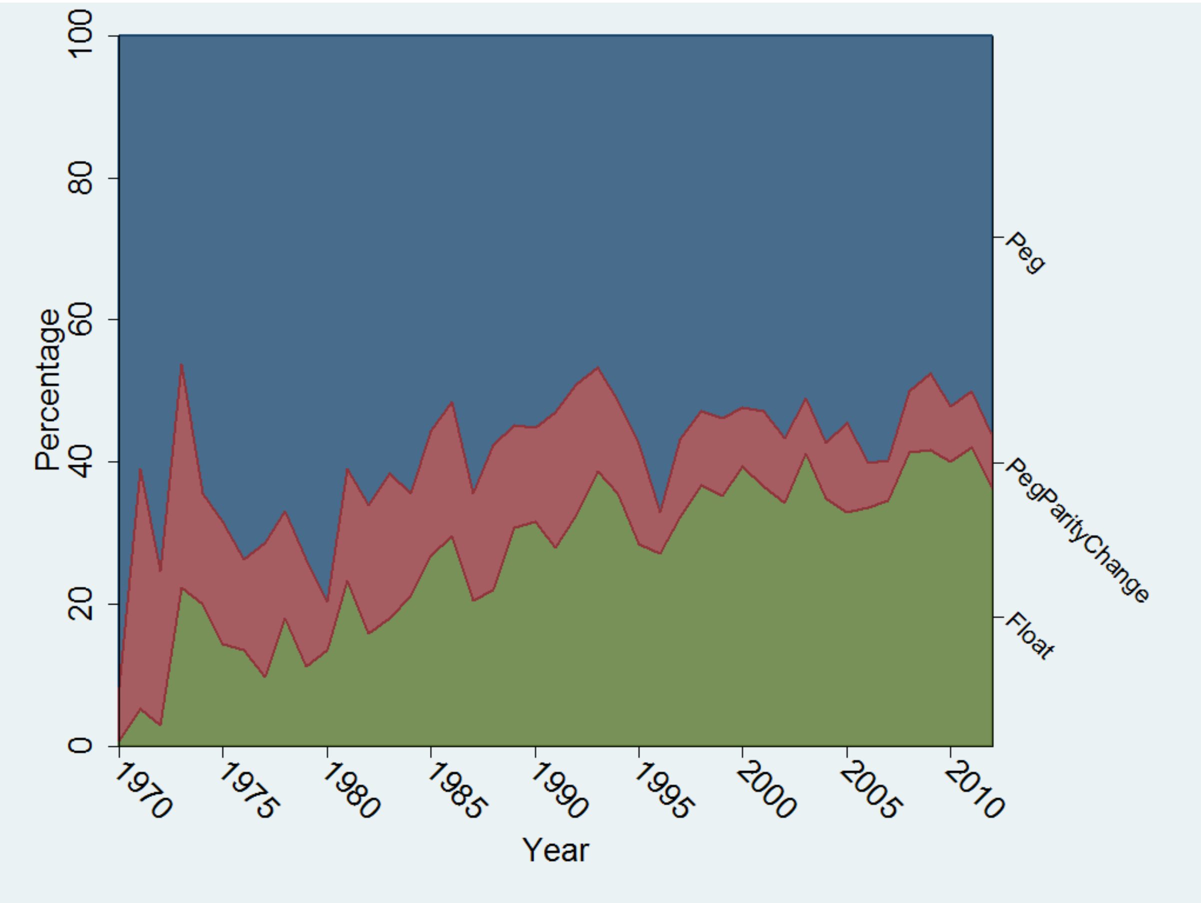

Figure 2. Offshore Financial Centres

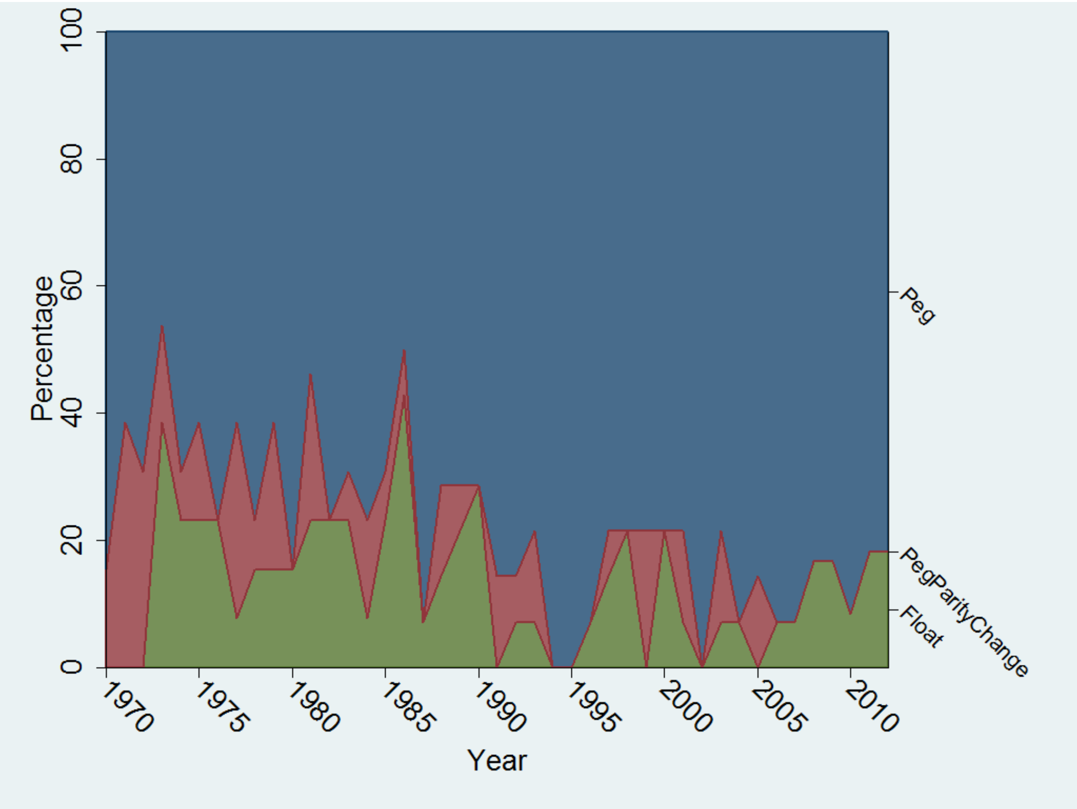

Figure 3. Oil Exporters

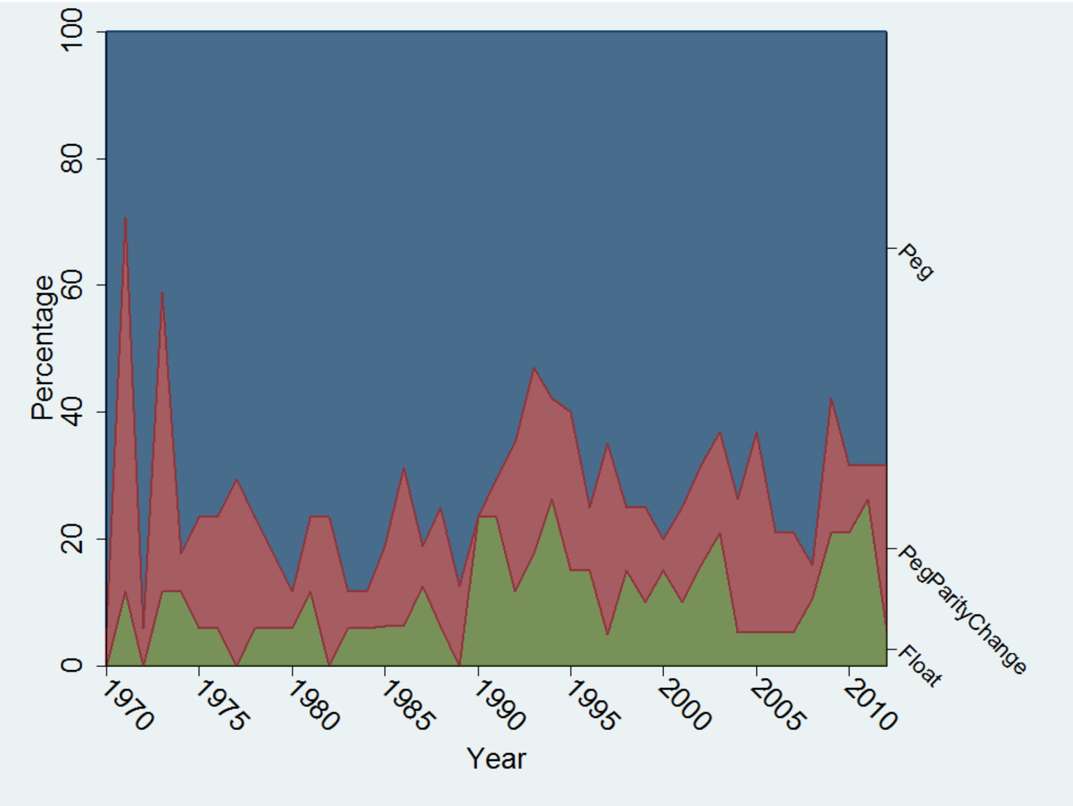

Figure 4. Emerging Markets

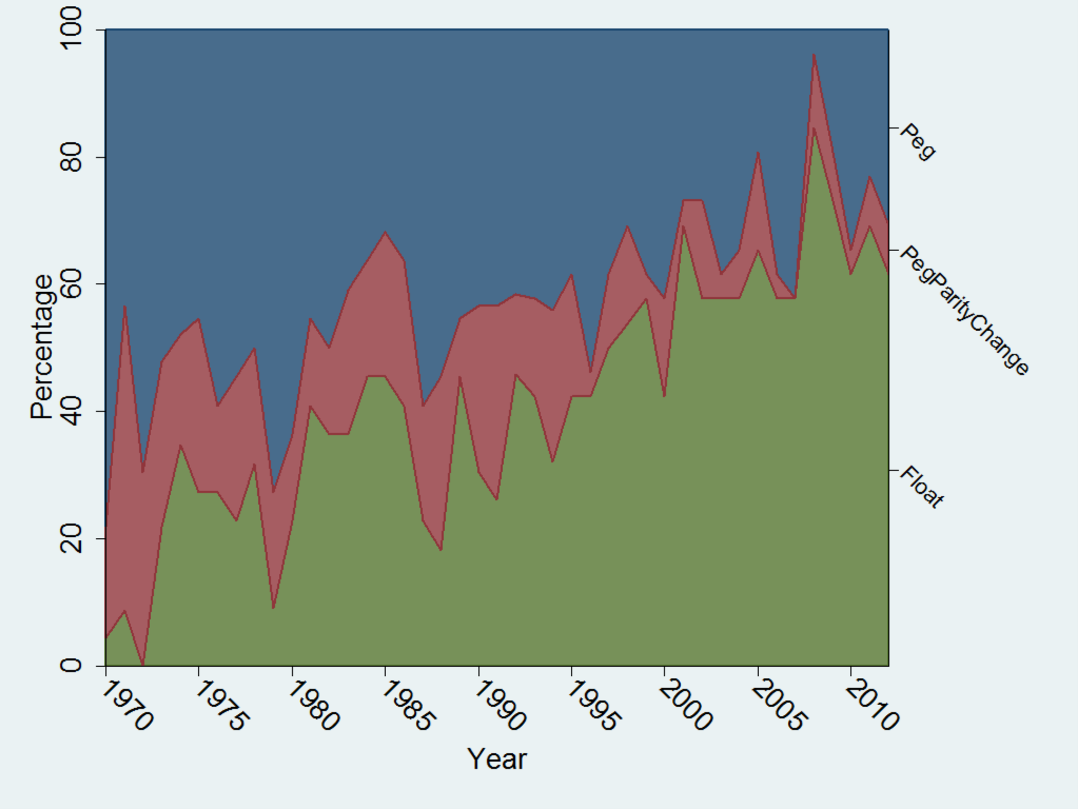

Figure 5. Other Developing Countries