Note: This is the Appendix to "The Nature of Exchange Rate Regimes" by Michael W. Klein and Jay C. Shambaugh

Appendix: Comparing Classification Schemes

A1. Different Classifications Schemes:

As mentioned in the text, we employ a classification scheme in this paper in which a peg spell is defined as a situation where, over the course of a calendar year, the month-end bilateral exchange rate with the base country stays within a 2% band. This classification scheme, which we call KS in this appendix, is similar in spirit to that used by Obstfeld and Rogoff (1995), although that paper did not provide an extensive classification of all countries as pegged or not pegged. In this appendix we compare this classification scheme to those used by Shambaugh (2004) (hereafter "JS"), Reinhart Rogoff (2004) (hereafter RR), Levy-Yeyati and Sturzenegger (2003) (hereafter LYS) and the declared or *de jure* regimes (hereafter "DJ") (Calvo and Reinhart (2004) focus on *de jure* regimes).

The KS classification scheme is most similar to the JS classification scheme, which was used to test the policy trilemma. The two principal differences between the KS and JS classification schemes are that the latter excludes one year pegs and also the latter allows a peg spell to continue if there is a one-time discrete devaluation during a year. Thus, comparisons between the KS and JS classification schemes show the effect of these two conditions since, but for the treatment of one year pegs and discrete devaluations, they are quite similar.

The RR classification scheme was developed to study the evolution of policy regimes. It focuses on the conditional probability of the exchange rate staying within a given range over a rolling five year window, and it also uses information about parallel (dual market) exchange rates in determining whether a peg continues from one year to the next. This classification scheme allows devaluations to occur within a peg spell so, consequently, it results in fewer peg spells and peg spells of longer duration than the KS classification scheme. (see also Section II and its footnotes for further discussion).[1]

LYS differs from the other classification schemes discussed here in its use of information on reserves. Cluster analysis and information on reserves/M2 volatility, exchange rate volatility, and volatility of the change in the exchange rate is used by Levy-Yeyati and Sturzenegger to sort observations into pegs, intermediate regimes, and floats. One result of this use of cluster analysis is that about half of the countries with an unvarying exchange rate, those with no reserve volatility or without reserve data, are coded as "ad hoc" pegs since the cluster analysis initially places these cases in an "inconclusive" category. Another result of the cluster analysis is that the LYS classification scheme results in far more pegs than other classifications, partly because observations with a fair amount of exchange rate volatility may, nonetheless, be classified as pegs if there is also substantial change in reserves/M2. The LYS coding does not, however, include most years with a discrete devaluation from one fixed rate to another as a peg year because the change in the exchange rate relative to the change in reserves volatility is gauged as being too large to be a peg in those cases. Thus, this classification scheme does not include as pegs many of the highest volatility outcomes that RR and JS code as pegs.

The DJ coding is the most straightforward classification scheme, simply representing the regime declared to the IMF and reported in the IMF's annual yearbook on exchange rate arrangements.

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[1] We use the Reinhart Rogoff annual data set from Carmen Reinhart's website extended to 2004 with data from Eichengreen and Razo-Garcia on Barry Eichengreen's website.

A2. Correlations of Pegging and Floating Across Classification Schemes:

Table A1 presents the percentage of observations for which binary versions of each classification scheme agree with one another.[2] The statistics in this table show that the classification schemes are broadly similar, but differ in somewhat systematic ways that generate different results on a number of areas of our analysis. See also Shambaugh (2004) or Frankel (2003) for comparisons of different *de facto* classification schemes.

Table A1: Percentage agreement of various coding methodologies for our sample

	Peg	jspeg	rrpeg	Djpeg
Peg	1			
Jspeg	93%	1		
Rrpeg	80%	82%	1	
Djpeg	81%	86%	81%	1
Lyspeg	81%	80%	73%	74%

Note: This table shows the percentage of observations where different codings yield the same result as one another. "peg" is the classification used in the paper. "jspeg" is the JS coding, "rrpeg" is the RR coding, "djpeg" is the *de jure* coding, and lyspeg is the LYS classification. All codings are collapsed to a binary peg and nonpeg coding.

A3. Spell Lengths Across Classification Schemes:

The spell length and number of spells is the category for which the results differ most across classification schemes. Table A2 presents statistics illustrating this by reproducing Table 1 in the text for the different classification schemes.

Table A2 shows that the RR classification scheme identifies far fewer spells and, accordingly, much longer duration than the others. The RR median peg length is 8 years, and the RR mean peg length is 12 years. Floats are even more durable in the RR classification scheme, with a mean and median of 20 years. This long duration is a consequence of the effort to identify overall policy regimes as opposed to specific peg spells. The RR classification scheme involves a great deal of smoothing due to the use of the conditional probability of staying within a range over a five year period.[3] Contrast this with the statistics presented in Table A2 for the JS classification scheme. The JS classification scheme, like RR, allows devaluations and drops single year pegs but it differs from RR in its focus on annual patterns and in that it does not smooth regime switches. The peg spell median in the JS classification scheme is 5 years, the mean is 9 years, the float spell median is 7 years and the mean is 11 years. A specific example also illustrates the difference between the JS and RR classification schemes: RR codes France as not pegged at all from 1973-86 and pegged throughout thereafter while JS (and KS) identify the short-lived pegs in 1979-80 and 1984-5.

[2] For RR, mgcode = 1 is considered a peg (this includes pre-announced pegs, horizontal bands that are narrower or equal to +/-2%, and *de facto* pegs. For DJ, peg is defined as pegs, limited flexibility, and cooperative agreements (the EMS).

[3] As an example of this, consider the results presented in Husain *et al.* who use the Reinhart Rogoff classification scheme. They report an average peg spell duration of 28 years. There are a number of reasons beyond coding for such a large average. They have a much longer sample and as such, very long regimes will affect the average (medians are not reported). In addition, they include very small countries (eliminated in Obstfeld and Rogoff) which have much longer spells and include some long run currency unions (such as Panama).

Table A2 Basic Statistics Across Classifications

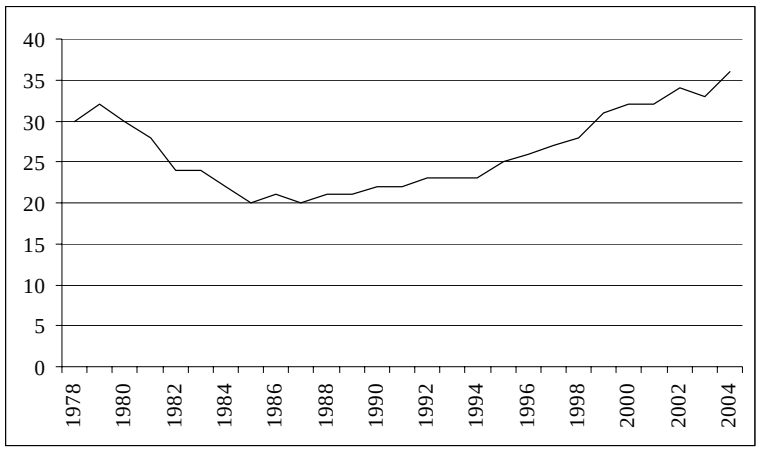
	No. of Annual Obs.	No. of C'ntry	% peg obs.	No. of peg spells	Peg Median	Peg Mean	Peg s.d.	No. of float spells	Float Median	Float Mean	Float s.d.
Full Sample	3202	104	34.01	91	8	11.82	10.9	107	20	20.31	10.05
	3924	*125*	*46.02*	*199*	*5*	*9.16*	*9.75*	*191*	*7*	*11.09*	*10.10*
	3924	**125**	**47.53**	**398**	**2**	**4.67**	**6.42**	**395**	**2**	**5.21**	**6.69**
Industrial Countries	671	21	31.74	16	10.5	13.0	10.0	20	25	24.0	6.44
	671	*21*	*35.62*	*31*	*6*	*7.55*	*8.08*	*36*	*5.5*	*12.0*	*11.79*
	671	**21**	**39.34**	**56**	**2**	**4.63**	**6.81**	**61**	**3**	**6.67**	**8.88**
Developing Countries	2531	83	34.61	75	8	11.57	11.1	87	20	19.46	10.32
	3253	*104*	*48.17*	*168*	*5*	*9.46*	*10.0*	*155*	*8*	*10.88*	*9.70*
	3253	**104**	**49.22**	**342**	**2**	**4.68**	**6.37**	**334**	**2**	**4.95**	**6.18**

Note: figures in bold reproduce statistics from table 1, plain text are for RR coding, and italics are for JS.

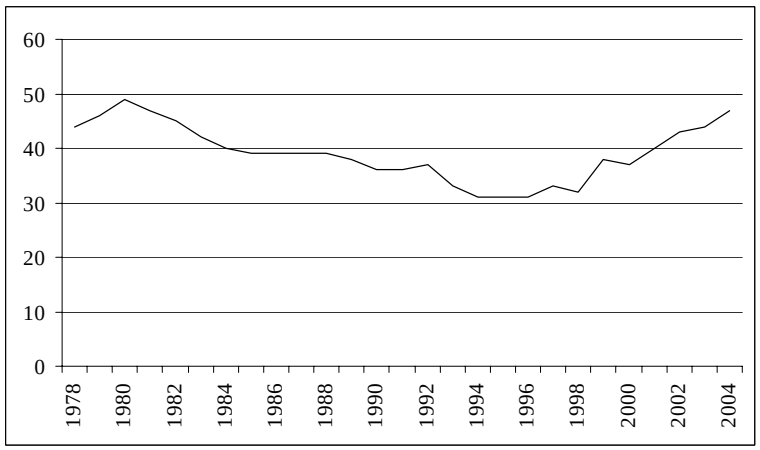
An important point made in the text is that the Obstfeld and Rogoff (1995) finding of relatively few peg spells that lasted for at least five years is partly due to the time their paper was written. We show in Figure 3 of the text that, using the KS classification scheme, the mid-1990s represents a low point of number of spells of long duration. Below, we reproduce this figure using the JS, RR, and DJ classification schemes to show the robustness of this point when using these classifications (see end of section II for discussion).

Long lasting pegs over time: For comparison to classification used in paper, see figure 3.

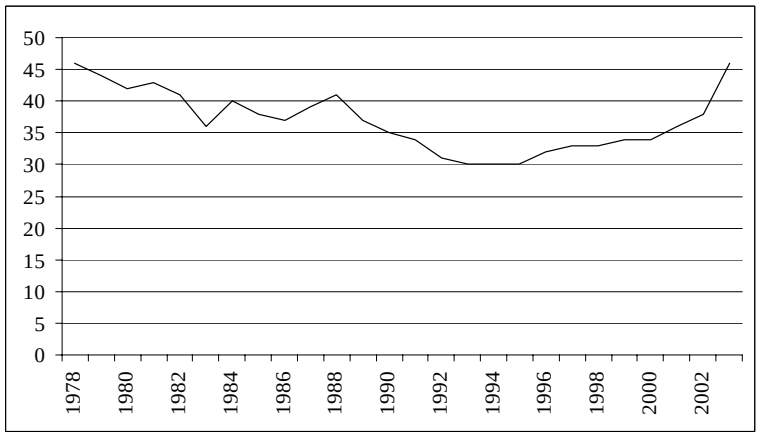
Reinhart Rogoff classification:



Shambaugh 2004 Classification



De Jure Classification



Figures show the number of countries in a peg that has lasted for more than 5 years at that moment. The panel is roughly balanced with between 98 and 104 countries in the Reinhart Rogoff sample and 122 and 125 countries in the other samples. Currency unions are eliminated from sample with the exception of spells that began as pegs and converted to currency unions (some EMU observations).

A4. Exchange Rate Outcomes Across Classifications:

The quintile analysis used to investigate the exchange rate consequences of pegging do not differ as dramatically across classification schemes as does peg duration or peg length, with Table A6 demonstrating the broad similarity of the overall pattern across schemes. A source of the difference between the KS-based results presented in the text and those obtained when the peg dummy is defined using the JS classification scheme is that the latter allows a peg to continue through a one-time devaluation and, consequently, more volatile bilateral and multilateral volatility outcomes occur during peg spells. Likewise, peg spells can last through devaluations in the RR classification scheme and, for this reason, the RR results look similar to the JS results with regards to the percentage of high volatility outcomes that are pegs. Also, the RR classification does not count all stable official rates as pegs (due to the use of secondary market rates), and thus many of the most stable outcomes are nonpegs (29%). A fifth of the DJ pegs are highly volatile since some countries declare pegs that do not hold. There are also instances of low volatility nonpegs as countries that have a *de jure* peg actually exhibit a fear of floating. The LYS classification scheme also has a large number of volatile pegs, even more on a percentage basis the DJ. These high volatility pegs are not discrete devaluations but simply moderate to high volatility outcomes.

Table A6
Percentage pegged by exchange rate volatility quintile

	Peg	**JSpeg**	**RRpeg**	**DJpeg**	**LYSpeg**
	Bilateral				
1	100%	99%	71%	89%	99%
2	87%	83%	58%	66%	93%
3	44%	31%	16%	21%	41%
4	1%	1%	7%	9%	39%
5	0%	11%	11%	20%	21%
Total	47%	45%	33%	41%	58%
	Multilateral				
1	61%	53%	51%	47%	78%
2	59%	54%	45%	46%	65%
3	53%	50%	33%	38%	58%
4	34%	32%	16%	27%	51%
5	11%	18%	12%	22%	29%
Total	44%	41%	31%	36%	56%

Like Table 6, the table shows the percentage of annual observations pegged in each quintile of exchange rate volatility. The top half shows the bilateral volatility quintiles and the bottom half shows multilateral volatility.

The most notable difference on the exchange rate effects of pegging across classification schemes is that with the DJ classification the coefficients on the *de jure* peg variable in exchange rate regressions are never significantly different from zero. This result, and others using the RR, JS and LYS classification schemes are presented in Table A8. This table includes specifications matching those in Columns 2 and 5 of Table 8 in the text to show how the effect of PEG on exchange rate volatility depends upon the classification scheme employed. The results in columns 1, 2, 5 and 6 shows that the JS and RR classification schemes, which allow peg spells to continue through one-time devaluations, result in weaker results for the coefficient on PEG than is the case with the KS classification scheme used in the paper. The results in Columns 3 and 7 show that the misidentification of regimes that occurs with DJ results in insignificant coefficients on PEG. The results in Columns 4 and 8 demonstrate that the coefficient on PEG is weaker when using LYS than what one obtains with the KS results in the text of the paper because LYS includes more volatile observations as pegs. However, the results using LYS are stronger than those with RR or JS because LYS does not classify cases with very large devaluations as continuing pegs.

Table A8. Exchange Rate Volatility in Annual Panel Data across classifications

	1	2	3	4	5	6	7	8
variable	bilateral	bilateral	bilateral	bilateral	multilateral	multilateral	multilateral	multilateral
Sample	drop 1%	drop 1%	drop 1%	drop 1%	drop 1%	drop 1%	drop 1%	drop 1%
coding	JS	RR	DJ	LYS	JS	RR	DJ	LYS
Fixed effects	CFE, YFE	CFE, YFE	CFE, YFE	CFE, YFE	CFE, YFE	CFE, YFE	CFE, YFE	CFE, YFE
Peg	-0.025	-0.013	-0.001	-.033	-0.006	-0.006	0.004	-0.013
	0.004**	0.004**	0.005	0.004**	0.002**	0.003*	0.003	0.002**
1st year float	0.027	0.017	0.035	0.034	0.011	0.017	0.023	0.015
	0.007**	0.012	0.010**	0.007**	0.004**	0.006**	0.005**	0.003**
Constant	0.020	0.025	0.013	0.031	0.019	0.019	0.017	0.025
	0.003**	0.005**	0.003**	.003*	0.002**	0.002**	0.003**	0.002**
Observations	3816	3101	3704	3088	3008	2478	2901	2560
R-squared	0.18	0.16	0.15	0.31	0.26	0.26	0.26	0.33

Note: this table reproduces columns 2 and 5 from table 8. There are country and year fixed effects included, 1% outliers are dropped, and standard errors are clustered at the country level. The change in observations across columns 1-3 and 4-6 is due to the fact that multilateral volatility is only available from 1979 on. The variation within 1-3 and 4-6 is due to different availability of the classifications.

* represents statistically significantly different from zero at the 95% confidence level, ** at the 99% level.

A5. Summary:

The lack of agreement across *de facto* exchange rate classification schemes may be viewed as an indication of an inability of these schemes to accurately code country behavior.[4] As this discussion shows, however, disagreements often stem from efforts to address different questions and hence not simply a difference in measuring pegs, but a difference in defining them.[5] The Klein-Shambaugh classification of this paper measures direct peg spells to consider the length of peg spells and float spells. Shambaugh (2004) measures annual coding of exchange rate behavior based on well established band criteria as well as allowing discrete devaluations so as to prevent artificially breaking up a consistent regime in an effort to test the monetary policy implications of pegging. Reinhart and Rogoff's classification both smoothes over time to determine regimes as opposed to spells and uses the black market rate – hence merging both exchange rate choices and capital control choices in an effort to consider the implications of policy regime choices broader than that of the choice of peg or float alone. Levy-Yeyati and Sturzenegger use reserves behavior in addition to exchange rate behavior to better identify intermediate from floats, while possibly allowing somewhat volatile but heavily managed exchange rates to be considered pegs. Thus, the classification scheme one may choose depends upon the question posed: those interested in whether a country is pegged and stable in a given year may use the JS classification scheme, those interested in absolute stability of the peg may choose the KS coding used in the paper, those interested in over-arching policy regimes smoothed over time could choose to refer to the RR coding, and those exploring intermediates versus floats or intervention behavior may refer to LYS.

[4] See for example Ghosh et al (2002).

[5] It is worth noting that even different *de jure* codings, all of which rely on the same IMF yearbooks, disagree depending on how researchers aggregate declared regimes. For example, a "cooperative system" which is how the EMS was listed could be considered a peg or intermediate. Likewise managed floats can be called intermediates or floats. Thus, using *de jure* classifications does not change the fact that an author must decide what behavior is considered a peg and what is not.