WEB APPENDIX: The Impact of Foreign Interest Rates on the Economy: The Role of the Exchange Rate Regime*

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Abstract

It is often argued that many economies are affected by conditions in foreign countries. This paper explores the connection between interest rates in major industrial countries and annual real output growth in other countries. The results show that high foreign interest rates have a contractionary effect on annual real GDP growth in the domestic economy, but that this effect is centered on countries with fixed exchange rates. The paper then examines the potential channels through which major-country interest rates affect other economies. The effect of foreign interest rates on domestic interest rates is the most likely channel when compared with other possibilities, such as a trade effect.

JEL classifications: F3; F4

Keywords: Exchange rate regime; International transmission; Interest rates

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This web appendix includes a detailed description of the propensity score methodology to trim the sample, which is detailed below in Appendix C, as well as the following additional tables:

- Tables A3-A6 provide a series of robustness checks referred to in the paper in Sections 3.2.2 and 3.2.5.
- Table A3 shows that the core results hold if the dependent variable is changed to investment growth instead of GDP growth.
- Table A4 eliminates a number of potential problems in the sample such as exchange rate regime transition years, crisis years, freely falling observations, and large home countries.
- Tables A5 and A6 examine the results across different exchange rate regime classifications. See Section 3.2.5 and note 28 for more discussion of these results and our choice to use the Shambaugh (2004) classification for the bulk of our results.

Appendix C Trimming the Sample Based on the Probability of Pegging

As noted in the paper, one concern with the results may be that pegs and nonpegs are simply different, and that one difference may be that pegs are more tied to the base economy in some way. This appendix examines attempts to trim the sample in order to control for this problem.

First, we note that most countries peg and float in the sample; thus, pegs and floats are not set in stone and always separate. There are 152 countries in the full regressions in Table 2. If we cut all full pegs (26 countries) and full floats (30 countries) we are left with 96 countries. Column 1 of Table A7 reproduces column 2 of Table 2 (our core specification) for comparison purposes. If we drop countries that always peg and float, our results are in fact stronger, with γ increasing to -0.21 and still no impact on nonpegs.

We also use a propensity score to restrict the sample. First, we estimate a probit model to predict peg status. Next, we drop observations that have almost no likelihood of pegging or floating, focusing instead on the middle of the propensity score distribution where countries might peg or float. As noted in the text, the exchange rate regime choice literature is not particularly successful at finding robust patterns in the data. Still, we can follow Juhn and Mauro (2002) and add optimal currency area variables as well as variables regarding the government role in the economy, financial depth, and capital controls. We do not add macro variables as they are quite likely outcomes not determinants. Year effects are also included to capture changes in the probability of pegging over time.

Table A8 shows both a linear probability model (estimated with OLS) and a probit, where the predicted values are capped to stay between zero and one. The R^2 is only 0.11, so the predictive power is not strong. However, coefficients are reasonable in sign: richer,

more closed, more financially developed countries are less likely to peg. Countries with large fuel exports, tied to the base country, closer to the base country, with more government intervention tend to peg more often. Many coefficients are not statistically significant when clustering the standard errors appropriately, and size of the economy (GDP) never is. One reason for the low predictive power is that the explanatory variables are relatively time invariant, but the same countries move back and forth between pegging and not pegging. It is quite easy to say that Belgium is more likely to peg to Germany than it is to Japan, but harder to say whether it will peg to Germany in 1982 vs. 1985.

Figure A1 shows the density of the probability of pegging for pegs and floats. The figure itself is informative. It shows that while the tails of the distributions for pegs and floats are different, in general, pegs and floats are not too different. In fact, the median score for pegs is 0.45 and for floats is 0.35. These are not radically different types of countries. To confirm that the tails are not driving our results, we take the 5th percentile in the distribution of pegs (0.21) to be the mark below which pegs rarely occur and the 95th percentile (0.64) for floats to be the point above which floats rarely occur. As the figure shows, within those bounds, we have a fair overlap of the distributions. Restricting the sample here drops over $\frac{1}{4}$ of the sample, but the results are close to our core regression. Column 3 shows our core regression for the sample for which we have data to estimate the probit. Results are effectively the same as column 1. Column 4 shows that after restricting the sample based on propensity scores, our results are quite similar to before. γ is slightly closer to zero, but still significant and there is still no statistically significant relationship for nonpegs. Trimming the sample less aggressively (at the lower and upper 1 percentage points of the distribution, 0.16 and 0.76, respectively) eliminates 7% of the sample, and the results are almost entirely unchanged. There is a fair bit of support in both distributions at the 1 percent mark, suggesting that is probably the appropriate place to limit the sample. Moving our cutoffs further in than the 5th percentiles begins to eliminate large parts of the sample (as can be seen from the figure).

We view these results as supportive of the contention that our core results are not being driven by a bias stemming from the choice of the exchange rate regime. Furthermore, as noted in the paper, by dropping countries that never peg or are highly unlikely to peg, we have eliminated countries for whom the designated base may be a bad match (either may be incorrectly assigned or may simply be a country to which the home country is unlikely to peg). This makes it less likely that results are driven by inappropriately selecting the base for floating countries.

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Table A3. The Effects of the Base and U.S. Interest Rates on Real Investment Growth

	(1) Full	(2) Full	(3) Full	(4) Full	(5) Non-Dollar	(6) Non-Dollar	(7) Non-Dollar
Base R	-0.188	-0.173	-0.328	-0.191	0.346	-0.056	
	(0.198)	(0.200)	(0.227)	(0.224)	(0.268)	(0.199)	
Base R×Peg	-0.589**	-0.599**	-0.567*	-0.600**	-0.612+	-0.620+	
	(0.211)	(0.220)	(0.227)	(0.221)	(0.340)	(0.342)	
Peg	0.053**	0.056**	0.048**	0.053**	0.028	0.029	-0.008
	(0.018)	(0.018)	(0.018)	(0.019)	(0.030)	(0.029)	(0.038)
Inflation		-0.029	-0.019	-0.025	0.105	0.087	0.077
		(0.039)	(0.047)	(0.040)	(0.152)	(0.135)	(0.136)
Base GDP Growth		-0.093	-0.026	-0.085	0.338	0.608*	
		(0.202)	(0.221)	(0.206)	(0.305)	(0.232)	
KA Open (Chinn-Ito)			0.008				
			(0.008)				
Base R×KA Open (Chinn-Ito)			-0.021				
			(0.074)				
KA Open				0.052**			
				(0.019)			
Base R×KA Open				-0.446+			
				(0.248)			
U.S. R							-0.086
							(0.182)
U.S. R×Peg							0.055
							(0.340)
U.S. GDP Growth							0.527*
							(0.234)
Country FE	yes	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	no	no
Observations	3089	2891	2620	2863	1212	1212	1255
R^2	0.096	0.097	0.091	0.100	0.109	0.077	0.069

Notes: The table gives OLS estimates of the effect of the base country nominal interest rate on domestic nominal interest rates. The sample period is 1973–2002. Robust standard errors are clustered at the country level. + significant at 10%; * significant at 5%; ** significant at 1%.

Table A4. Different Cuts of the Data to Exclude Outlier Periods and Observations

	(1)	(2)	(3)	(4)	(5)	(6)
		No	No	No Free	No	
	Full	Transition	Crisis	Fall	Bases	Cut 10%
Base R	-0.014	-0.029	-0.036	-0.002	-0.018	0.007
	(0.046)	(0.051)	(0.045)	(0.045)	(0.049)	(0.054)
Base R×Peg	-0.174**	-0.157**	-0.159**	-0.193**	-0.180**	-0.189**
	(0.050)	(0.058)	(0.050)	(0.051)	(0.052)	(0.053)
Peg	0.011**	0.008	0.009*	0.013**	0.012**	0.013**
	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)
Inflation	-0.029**	-0.025**	-0.025**	-0.011	-0.029**	-0.030**
	(0.007)	(0.007)	(0.008)	(0.013)	(0.007)	(0.007)
Base GDP Growth	0.113	0.093	0.115	0.136+	0.107	0.077
	(0.076)	(0.081)	(0.078)	(0.076)	(0.080)	(0.075)
Observations	3419	2938	3212	3129	3169	3020
R^2	0.204	0.202	0.212	0.209	0.200	0.199

Notes: The table gives OLS estimates of the effect of the base country nominal interest rate on domestic nominal interest rates. The sample period is 1973–2002. Country and year effects are included. "No Transition" refers to periods where a country moves from peg to float or vice versa. In this case, the year before pegging the first year of pegging, the last year of pegging and the first year after pegging are all dropped. "Crisis" is based on the definition suggested by Frankel and Rose (1996): any year where depreciation is greater than 25% and is at least 10% more than the previous year's depreciation. "Free Fall" refers to observations deemed to be freely falling (large depreciation and high inflation) by Reinhart and Rogoff. "No Bases" drops base countries from the analysis. The U.S. is automatically dropped in all regressions, but, other bases, such as France, are both a base country for some other countries and a domestic country (with Germany as the base). "Cut 10%" refers to cutting large countries, as defined as countries with GDP at least 10% of base country GDP. Robust standard errors are clustered at the country level. + significant at 10%; * significant at 5%; ** significant at 1%.

Table A5. Examination of Different Exchange Rate Regimes Classifications

	(1) R&R Sample	(2) R&R Sample	(3) R&R Sample	(4) R&R Sample	(5) Full Sample	(6) Full Sample	(7) Consensus w/R&R	(8) Consensus w/R&R
Base R	0.039	-0.054	-0.015	-0.107+	0.000	-0.060	0.038	-0.083
	(0.048)	(0.052)	(0.055)	(0.056)	(0.043)	(0.046)	(0.051)	(0.056)
Base R×Peg	-0.210**	-0.119*					-0.202*	-0.069
	(0.068)	(0.057)					(0.080)	(0.061)
Peg	0.015**	0.006					0.016*	0.009
	(0.005)	(0.005)					(0.006)	(0.007)
Base R×R&R Peg			-0.129+	-0.031				
			(0.077)	(0.060)				
R&R Peg			0.012*	0.009+				
			(0.006)	(0.005)				
Base R×De Jure Peg					-0.096	-0.098+		
					(0.063)	(0.051)		
De Jure Peg					0.004	0.006		
					(0.005)	(0.005)		
Inflation		-0.032**		-0.030**		-0.029**		-0.028**
		(0.007)		(0.007)		(0.007)		(0.008)
Base GDP Growth		0.133+		0.141+		0.111		0.163+
		(0.075)		(0.075)		(0.076)		(0.091)
Constant	0.031**	0.058**	0.034**	0.056**	0.034**	0.056**	0.031**	0.054**
	(0.004)	(0.007)	(0.004)	(0.007)	(0.003)	(0.007)	(0.004)	(0.012)
Country FE	no	yes	no	yes	no	yes	no	yes
Year FE	no	yes	no	yes	no	yes	no	yes
Observations	2940	2700	2940	2700	3830	3418	2415	2211
R^2	0.008	0.233	0.005	0.233	0.003	0.201	0.007	0.244

Notes: The table gives OLS estimates of the effect of the base country nominal interest rate on domestic nominal interest rates. The sample period is 1973–2000. R&R stands for Reinhart and Rogoff's classification scheme, De Jure refers to codes from the International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions where countries self report their exchange rate regime status, and the Consensus sample includes observations only where Shambaugh's and Reinhart and Rogoff's classifications match. Robust standard errors are clustered at the country level. + significant at 10%; * significant at 5%; ** significant at 1%.

Table A6. Examination on Reinhart and Rogoff's Five-Way Breakdown of Exchange Rate Regimes

	(1) R&R 1	(2) R&R 2	(3) R&R 3	(4) R&R 4	(5) R&R 5	(6) R&R 1	(7) R&R 2	(8) R&R 3	(9) R&R 4	(10) R&R 5
Base R	-0.144**	0.011	-0.091	0.034	0.047	-0.067	-0.144*	-0.211+	-0.018	-0.150
	(0.054)	(0.081)	(0.067)	(0.165)	(0.118)	(0.063)	(0.063)	(0.123)	(0.698)	(0.166)
Inflation						0.034	-0.010	-0.089**	0.009	-0.019*
						(0.022)	(0.035)	(0.031)	(0.084)	(0.009)
Base GDP Growth						0.184	0.244*	-0.015	0.539	0.061
						(0.122)	(0.122)	(0.173)	(0.656)	(0.169)
Constant	0.046**	0.039**	0.041**	0.030+	0.007	0.042**	0.078**	0.075**	0.009	0.033*
	(0.004)	(0.006)	(0.005)	(0.016)	(0.010)	(0.011)	(0.013)	(0.022)	(0.056)	(0.015)
Country FE	no	no	no	no	no	yes	yes	yes	yes	yes
Year FE	no	no	no	no	no	yes	yes	yes	yes	no
Observations	991	852	665	122	310	888	796	626	100	290
R^2	0.011	0.000	0.004	0.001	0.001	0.269	0.433	0.294	0.651	0.332

Notes: The table gives OLS estimates of the effect of the base country nominal interest rate on domestic nominal interest rates. The sample period is 1973–2000. R&R stands for Reinhart and Rogoff's classification scheme. 1 indicates a peg, 2 indicates a crawling peg, 3 indicates intermediate/managed float, 4 indicates float, and 5 indicates a freely falling. Column (10) has no year fixed effects because nearly all observations are countries based to the dollar making year effects and the base interest rate redundant. Robust standard errors are clustered at the country level. + significant at 10%; * significant at 5%; ** significant at 1%.

Table A7. Core Regressions on Trimmed Sample

	(1)	(2)	(3)	(4)	(5)
	Core	Drop 100% Peg and Nonpeg	Prop. Score Available	5th Pctile Trim	1st Pctile Trim
Base R	-0.014	-0.003	-0.04	-0.088	-0.063
	(0.045)	(0.053)	(0.054)	(0.060)	(0.055)
Base R×Peg	-0.174**	-0.209**	-0.172**	-0.138*	-0.155**
	(0.049)	(0.063)	(0.054)	(0.062)	(0.053)
Peg	0.011**	0.014**	0.011*	0.008+	0.009*
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
Inflation	0.113	0.112	0.11	0.139+	0.140+
	(0.074)	(0.087)	(0.073)	(0.083)	(0.076)
Base GDP Growth	-0.029**	-0.036**	-0.033**	-0.027**	-0.031**
	(0.007)	(0.009)	(0.008)	(0.009)	(0.008)
Observations	3419	2334	3017	2325	2825
R^2	0.204	0.24	0.194	0.203	0.199

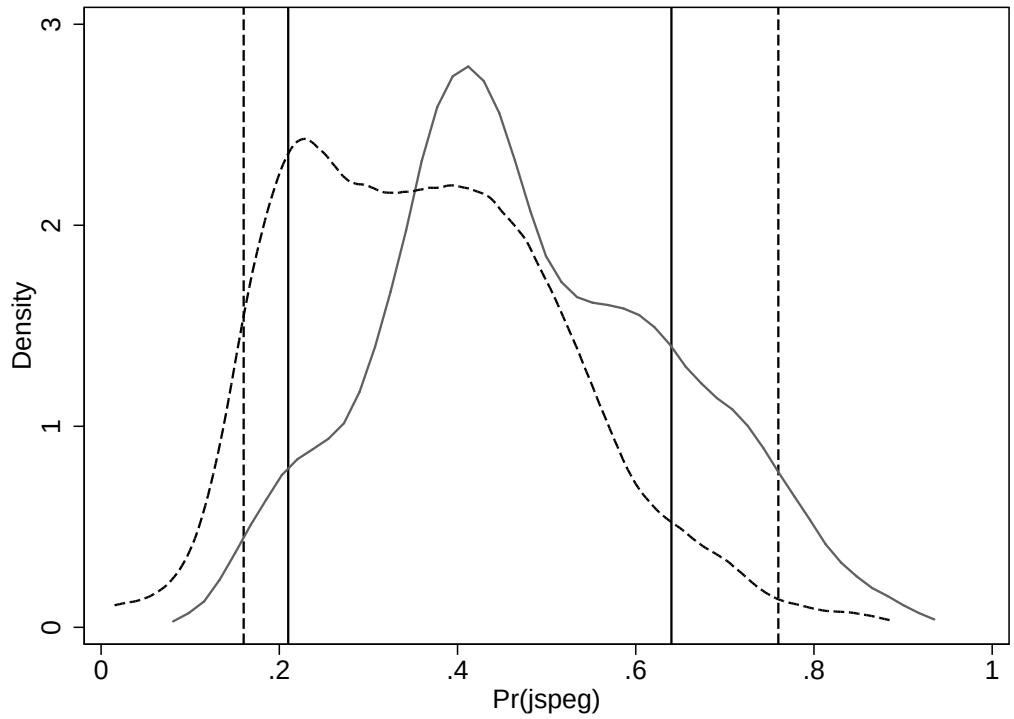
Notes: The table gives OLS estimates of the effect of the base country nominal interest rate on annual real economic growth.The sample period is 1973–2002. Country and year effects are included. Robust standard errors are clustered at the country level. + significant at 10%; * significant at 5%; ** significant at 1%.

Table A8. Probability Models to Generate Propensity scores

	(1) OLS	(2) Probit
Govt share of economy	0.004	0.010
	(0.005)	(0.013)
Bank Credit to GDP	-0.001	-0.003
	(0.001)	(0.002)
Fuel share of exports	0.003*	0.008*
	(0.001)	(0.004)
Distance to base	-0.000**	-0.000**
	(0.000)	(0.000)
GDP (in dollars)	0.000	0.000
	(0.000)	(0.000)
Real GDP per capita	-0.000+	-0.000+
	(0.000)	(0.000)
Capital controls	-0.129*	-0.373*
	(0.064)	(0.175)
Trade to GDP	0.115	0.313
	(0.099)	(0.269)
Exports to base / GDP	-0.151	-0.425
	(0.338)	(0.919)
Constant	0.775**	0.794*
	(0.118)	(0.333)
Observations	3017	3017
R^2	0.113	–

Notes: The table gives OLS and Probit estimates of the probability of a country pegging to a given base country.The sample period is 1973–2002. Year effects are included. Robust standard errors are clustered at the country level. + significant at 10%; * significant at 5%; ** significant at 1%.

Figure A1. Densities of Probability of Pegging for Pegs and Floats (Probit Exercise)



Notes: This figure plots the probability densities of either pegging or not pegging. Dashed line: density for nonpegs solid line: density for pegs dashed vertical lines represent 1% trimming points solid vertical lines represent 5% trimming points.