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Currency derivatives and the disconnection between exchange rate volatility and international trade

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Abstract

The impact of exchange rate volatility on international trade is small for industrialized countries, especially since the late 1980s. An explanation for this is Wei's (1999) "hedging hypothesis", which states that the availability of currency derivatives has changed the relation between exchange rate volatility and trade. Exchange rate risk will only have a small effect on international transactions as long as this risk is easily tradable. We find evidence indicating that the availability of currency futures can explain the relatively small impact of exchange rate volatility on trade.

Key words: international trade; exchange rate volatility; currency derivatives

JEL codes: F13, F33, F36

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1 Introduction

Exchange rate volatility is widely regarded by policy makers and the general public as detrimental to international trade. This belief contrasts sharply with the near absence of evidence on a relation between exchange rate volatility and international trade[4] - or any other real economic variable for that matter.[5] One explanation for this paradox is that the impact of exchange rate volatility crucially depends on a country's institutions.

Two types of institutions have originated in response to high exchange rate volatility. The oldest type of institution is the internationally coordinated exchange rate regime, of which the Bretton Woods gold standard (1946-1970), the European Exchange Rate Mechanisms (since 1979), and currency unions like the Euro Area are examples. The evidence that exchange rate regimes matter for the real economy is weak (Rose, 2010), although Aghion et al. (2006) found that impact of exchange rate volatility can be large in countries with an underdeveloped financial sector.

A second type of institution came into existence after the collapse of the Bretton Woods system in the form of currency derivatives. These derivatives include currency swaps, currency futures, and more sophisticated financial contracts that allow firms to hedge their risk in a Pareto efficient way: an English exporter that will be paid in dollars next month can be matched with an American exporter that will be paid in pounds next month. The advantage of currency derivatives is that they provide certainty to both contracting parties. In one of the few studies on this topic, Wei (1999) did not find a relation between currency risk hedging and international trade. This paper presents new

[4] See Frankel and Wei (1993), Rose (2000), and Wei (1999).
[5] The "exchange-rate disconnect puzzle" is one of the six puzzles in international macroeconomics identified by Obstfeld and Rogoff (2001).

evidence indicating that the availability of currency futures[6] has reduced the negative effects of exchange rate volatility on trade.

During the Bretton Woods era, fixed exchange rates between industrial countries implied little scope for currency derivatives. Immediately after major exchange rates became flexible again, the International Commercial Exchange (1970) in New York was established and became the first exchange where currency futures were traded, followed by the International Monetary Market (1972) of Chicago.

Besides the ending of the Bretton Woods system, two developments spurred the diffusion of currency derivatives in the 1980s. First, exchange rate volatility reached record levels in 1985 (Figure 1), increasing the demand for currency derivatives. Second, advances in information technology reduced the costs of administering and trading derivatives in general.[7] Coinciding with these developments, the direct (over-the-counter) trade between banks in currency derivatives started to take off (Figure 2).

[FIGURE 1]

The rise of currency derivatives is consistent with evidence indicating that the impact of exchange rate volatility on international trade has weakened over time (Clark *et al.*, 2004; Hudson and Straathof, 2010). Until the mid 1980s, the elasticity between the value of trade and exchange rate volatility was twice as large as it is nowadays (Hudson and Straathof, 2010). This decline in elasticity appears to go in parallel with the

[6] There are various types of Financial derivates. Our analysis focuses on currency futures primarily because data on these futures is collected most consistently for different periods and countries.
[7] Leo Melamed, founder of the International Monetary Market, recalled “In 1984 I recognized that the information revolution had shrunk the world and its markets. Globalization was upon us. This meant that international competition in futures markets was going to take center stage.” (Melamed, 1996)

development of markets for currency derivatives: year-end outstanding for currency swaps, for instance, increased ten-fold from $183 billion in 1987 to $1,824 billion in 1997 (Figure 2). These numbers suggest that the size of the market for currency derivatives is sufficiently large to be able to affect the relation between exchange rate volatility and international trade.[8]

[FIGURE 2]

We propose a simple test to verify whether the availability of currency derivatives in time and across countries has changed the effects of exchange rate volatility on trade. In particular, we estimate a standard gravity equation that relates bilateral trade in goods to exchange rate volatility and indicators of currency hedging activity. As we have more information on hedging activity than Wei (1999), we can introduce country-pair fixed effects in the regression. This makes the estimated coefficients less vulnerable to omitted-variable bias (Baier and Bergstrand, 2007). We find that exchange rate volatility does not strongly affect trade in recent years because its effects are largely offset by currency hedging activity.

As national governments do not systematically publish data on currency derivatives, we only have limited information on the availability of currency derivatives. When data on the availability of currency derivatives is missing, we have imputed the probability of availability as predicted by an auxiliary probit regression.

[8] Currency derivatives are not only used to hedge exchange rate risk associated with trade in goods, but also to manage currency risks associated with shares, bonds, other derivatives, etc. Unfortunately, it is not possible to disentangle the purposes for which derivatives are traded.

We control for autonomy monetary policy as autonomous monetary policy can be favorable for economic activity, including international trade if business cycles move out of sync. Failure to control for monetary autonomy could lead to underestimation of the effect of exchange rate volatility on trade. We find some evidence that autonomy in monetary policy is positively correlated with trade after taking into account differences in exchange rate volatility. This finding is closely related to research on optimal currency areas. (Beetsma and Giuliodori, 2010 provide an overview of this literature.)

A large body of literature seeks to explain the effect of exchange rate volatility—and in particular, the role of exchange rate regimes—on trade. The methodology and results of these studies vary widely. Kim and Lee (1996), Stockman (1995), and Chodwhury (1993) find the relation between exchange rate volatility and trade to be negative, while Frenkel (2008) finds conflicting outcomes. Bahmani et al. (1993) and Bailey et al. (1986) find no relation.

A related strand of literature investigates the effects currency unions, in particular the European Monetary Union (EMU). More than ten years after the EMU was established and the euro was first introduced, the exact magnitude of the euro effect regarding intra-Euro zone trade remains unclear.[9] Estimates of the effect of monetary unions on trade vary wildly, ranging from zero to three hundred[10] percent.

In a meta-study of 754 estimates of the impact of currency unions on trade, Rose and Stanley (2005) conclude that the formation of a currency union typically is associated with a trade increase of thirty to sixty percent. Part of this is caused by publication bias.

[9] Much of the variation in results is the consequence of researchers using data sets that differ in the countries and periods included.

[10] Rose’s (2000) early estimate of three hundred percent was criticised by Bun and Klaassen (2007), Santos-Silva (2010), and others.

Another overview by Baldwin and Di Nino (2006) reports that the euro's trade effect probably ranges between five and ten percent. After an extensive survey of the literature, Santos Silva and Tenreyro (2010) even conclude that "the impact of the euro on trade has been close to zero".

The remainder of the paper has four sections. In the next section, we describe the data with a focus on the measurement of hedging activity and monetary autonomy and we set out our estimation strategy. Our main results are presented in Section 3 and a robustness analysis is provided in the following section. Section 5 summarizes the main findings.

2 Data and estimation strategy

We use panel data on 50 countries and subcontinents as listed in Table A1, spanning the period from 1961 to 2006. We include mostly OECD countries in our analysis, supplemented by larger developing economies. Smaller developing countries are aggregated by subcontinent in order to reduce the number of zero trade flows in the dataset.

Data on currency futures are available from the Bank of International Settlements (BIS) for 31 countries from 1986 onwards. Before that year over-the-counter currency derivatives were hardly traded. The trade data are taken from the ITCS database compiled by the OECD and the United Nations Statistics Division (UNSD). Exchange rate volatility is based on end-of-the-month exchange rate data from the International Financial Statistics (IFS) reported by the IMF. We used the monthly exchange rate of local currency in terms of Special Drawing Rights (SDR's) to construct a monthly series of bilateral exchange rates. The monthly data are used to compute a yearly coefficient of variation[11] for each pair of countries. We use this coefficient of variation as our measure for exchange rate volatility, *ERV*.

Data on GDP and stock market capitalization originate from the World Bank's World Development Indicators. The turnover in currency futures is provided by the Bank of International Settlements for 31 of the countries in our dataset, starting from the year 1986.

In order to estimate the effect of hedging activity on international trade, Wei (1999) constructed an indicator that equals exchange rate volatility for pairs of countries multiplied by a dummy indicating whether the market for currency derivatives exists in both countries. If currency derivatives are used to avoid currency risk associated with international trade, this hedging activity variable will have a coefficient opposite in sign and nearly equal in magnitude to the coefficient for exchange rate volatility.

We use a similar hedging activity variable, *HEDGE*. First we use data available from the BIS to estimate the probability that a currency derivatives market exists in a country for which no data is available. The probit regression is specified as follows:

$$FUTURES_{it} = b_0 + b_1 FD_{it} + b_2 GDP_{it} + \varepsilon_{it} \quad (1)$$

Here, $FUTURES_{it}$ is a dummy variable indicating whether data on currency futures is available for country *i* in year *t*. *FD* is a country's financial development for which we use the stock market capitalization in that country as an approximation. *GDP* is gross domestic product and ε is an independently distributed error term. Estimation results are reported in the Appendix

[11] The coefficient of variation is defined as the standard deviation divided by the mean.

We use the estimated coefficients to obtain predictions of the probability that a market for currency futures exists, *PFUT*. If it was not possible to include a country in the regression because of missing stock market capitalization data, *PFUT* is assumed to be zero. This procedure yields two probabilities of hedging availability for every trade flow: one for the originating country and one for the destination country.

As it is not clear a priori which of the two probabilities is most likely to be relevant, we have constructed three different indicators. The first indicator selects the highest of the two probability estimates, the second selects the lowest, and the third takes the average of the two hedging activity probabilities. Following Wei (1999), we use this last indicator in our main regressions, and report the other two in the robustness analysis.

HEDGE is equal to the estimated probability of a currency futures market for the country pair in a year.

$$HEDGE_{ijt} = \frac{PFUT_{it} + PFUT_{jt}}{2} \quad (2)$$

$Prui_{tt}$ and *Putt* are the estimated probabilities of hedging activity for country *i* and *j*.

Our indicator for the autonomy of monetary policy, *AP*, is a country-pair variable defined as the sum of two country-specific dummy variables:

$$AP_{ijt} = AP_{it} + AP_{jt} \quad (3)$$

where AP_i and AP_j are equal to one if the monetary policy, in country *i* or *j* is autonomously determined, and zero otherwise. If, in a given year, a country's exchange rate volatility with its largest importer is equal to zero, then we assume this country's currency to be pegged to the importer's, hence its monetary policy is not autonomous, and its dummy is equal to zero for that year in every country pair. The same value is assigned to the country-specific dummy if the country is using the Euro in the considered year. In all other cases, monetary policy autonomy is assumed, and the dummy is set equal to one.

AP_{ijt} is equal to 2 if both countries have autonomous monetary policies, it equals one if this is true for just one of the countries, and it is zero if both countries' monetary policies depend on external authorities. The latter case occurs for fixed exchange rate regimes and currency unions where monetary policy is no longer set by a single country since it is given up to a supranational central bank. Table A2 displays summary statistics for the main variables.

We estimate a standard gravity model with fixed effects for country pairs. The main gravity equation is specified as follows:

$$T_{ijt} = a_0 + a_1 \log\left(GDP_{it} GDP_{jt}\right) + a_2 ERV_{ijt} + a_3 ERV_{ijt} HEDGE_{ijt} + a_4 AP_{ijt} + \theta_{ij} + \eta_t + \varepsilon_{ijt} \qquad (4)$$

The dependent variable *T* is the logarithm of country *i*'s export value to country *j*. ERV_{ijt} is volatility of the exchange rate between country *i* and *j* in year *t*. *GDP*, *HEDGE*, and *AP* have been defined above. The country-pair fixed effects, θ_{ij}, control for (unobserved) time-invariant country-pair characteristics like distance and common language. Fixed effects for the years, η_t, correct for shocks and trends in the data. ε_{ijt} is an independently distributed error term. Other variables that are included in the regressions are the log of GDP per capita (*GDPPC*), a dummy for intra-Euro-zone trade flows (*EURO*), and a dummy for intra-EU trade flows (*EU*). Observations with exchange rate volatility in the top percentile (values in excess of 0.5) are excluded.

Like Wei (1999), we expect that if the use of currency derivatives leads to perfect hedging of exchange rate risks, then the coefficients a_2 and a_3 will have roughly the same size and opposite sign, i.e. $a_2 = -a_3$.

3 Main results

Our baseline regression results are presented in Table 1. Column (1) shows the results for the full sample from 1962 to 2006 with the log of the GDP product and exchange rate volatility included as regressors. Both coefficients have the expected sign and are statistically significant. During the sample period exchange rate volatility appears to have a substantial negative relation with international trade.

In column (2) the indicator for autonomous monetary policy and the intra-euro dummy are added. The euro is positively related to trade even when conditioning on exchange rate volatility, which suggests an additional benefit of euro membership on top of the gains from a fixed exchange rate. Autonomous monetary policy has a modestly positive correlation with trade, reducing the euro effect.

[TABLE 1]

The negative coefficient on exchange rate volatility might be biased as large fluctuations in exchange rates might be associated with poor countries. Similarly, the impact of the euro might be overstated as it might reflect other aspects of European economic integration. In column (3) we partially correct for these sources of omitted-variable bias, by adding the log of GDP per capita and an intra-EU dummy to the regression.

If currency derivatives had an impact on the volatility-trade relation, then we would expect a less negative coefficient on exchange rate volatility in the sample restricted to the years after 1985. Column (4) shows that the magnitude of the exchange rate volatility coefficient is reduced by more than fifty percent.

We proceed with testing the hedging hypothesis. Column (5) includes *ERV*HEDGE*, our indicator of the availability of currency futures, and shows its interaction with exchange rate volatility. Consistent with Wei's hedging hypothesis, the coefficient on *ERV*HEDGE* has about the same magnitude and the opposite sign as the coefficient on exchange rate volatility. After controlling for the availability of currency derivatives, the effect of exchange rate volatility increases markedly when compared to the model in (4).

The last column repeats the regression of column (4) for the post-1985 sub-sample. Most variation over time in the *PFUT* indicator is now disregarded: after 1985 the sample of countries with currency derivatives does not vary much. Although the coefficients on *ERV* and on *ERV*HEDGE* are smaller than in the previous regression, the coefficient on *ERV*HEDGE* remains of the same size as the coefficient on exchange rate volatility.

4 Robustness analysis

We evaluate the robustness of the main regression results in two directions. First, we consider alternative indicators for the availability of currency derivatives. Second, we present results for alternative estimation strategies.

Table 2 displays robustness checks related to the way the variable for hedging activity was constructed. In Section 2, we used a probit estimation to predict the probability *PFUT* that a market for currency derivatives exists in a country. This yields two single-country probabilities for each country pair. *HEDGE* is defined here as the average of these probit estimates. We assumed that the probability of currency derivatives being available for trade between two countries is equal to the average of the probabilities of the existence of markets for currency derivatives in each single country in the pair.

Alternative assumptions on the probability of hedging can also be made. It could be that one derivatives market in a country pair is not enough to allow hedging against currency risk in that pair; it could just as well be that one country with such a market is sufficient to impact trade. In the first column of Table 2, *HEDGE* equals the minimum value of *PFUT* in the country pair. Column (2) reports results when the maximum value is used in this computation. Both regressions confirm the baseline results.

[TABLE 2]

Since data for stock market capitalization is not available for every country, we set the variable *PFUT* for the countries lacking such data to zero. Countries without information on stock market capitalization are assumed to have no possibility for hedging. Column (3) of Table 2 tests the sensitivity of results to this assumption, treating these observations as missing values instead of zeros. Again, coefficients for *ERV*HEDGE* and *ERV* have equal magnitude and opposite sign, confirming the baseline results in Table 1.

The last two columns in the table show what happens if, instead of using probit estimates as probabilities of the existence of markets for currency derivatives, we use a dummy *FUT* based directly on the original data for currency futures turnover. As data is available for 31 countries after 1985, *FUT* equals one for these countries from 1986 onwards, and zero before 1986. The remaining countries receive missing values.

In this case, for each country-pair, *HEDGE* is equal to a function of *FUT*. In column (4) of Table 2 this function is defined to be equal to one (zero) if *FUT* for both countries equals one (zero), and returns a missing value if at least one of the two dummies has a missing value. We assume that a market for currency derivatives must exist in both of the countries in a pair, in order to allow hedging activity for currency risks connected to trade among these same countries. In the last column, we assume that it is sufficient for one country in the pair to have access to derivatives for effective hedging against currency risk. The results for both alternative indicators of currency future availability are consistent with the baseline.

In the second part of the robustness analysis we check the sensitivity of the results to the estimation method and of the potential endogeneity of exchange rate volatility with trade. The results are presented in Table 3.

[TABLE 3]

Column (1) shows the coefficient estimates when a random effects model is used instead of a fixed effects model. Besides the baseline regressors, also the log of distance between the two countries, and indicators for historical and geographical factors (colonial relationship, common language, common border) are added. Some coefficients differ slightly from the baseline estimates, but the main conclusions remain unchanged. GDP per capita seems to affect trade less than in the fixed effects model; the coefficient for *ERV* is slightly smaller and the one for *ERV*HEDGE* is slightly higher than the one for *ERV*, but still they have about the same magnitude and opposite signs. Again, *EURO* is not significant, while *AP* is.

The other two columns of Table 3 show what happens when we try to get rid of the endogeneity problem: if a country's central bank tries to limit the fluctuations of exchange rate with the main trading partner of its nation, exchange rate volatility will be determined by the size of the trade flow, such that causality will run both ways.

A first test of endogeneity is presented in column (2) of Table 3. This regression is based on a subsample of the data that excludes all observations on a country's largest importer from the regression. In the last column we present a second endogeneity test. Here, we have removed the observations on trade with the smallest number of importers that can account for 50% of its total exports in each year.

In both cases, the change in the coefficient on exchange rate volatility is small, which suggests that endogeneity-related bias is not important in our baseline estimations. The results for Euro membership and monetary autonomy are confirmed as well.

5 Conclusion

The widespread adoption of currency derivatives in the second half of the 1980s has coincided with a decline in the sensitivity of international trade in goods to exchange rate volatility. This co movement is consistent with Wei's (1999) hedging hypothesis that the use of currency futures reduces the impact of exchange rate volatility on trade. We have used a gravity model of international trade to test the hedging hypothesis and we have found evidence confirming that the availability of currency futures might have stimulated international trade by making exchange rates less influential.

Currency futures allow traders to hedge against unexpected changes in exchange rates in such a way that risks are lowered for both contracting parties. An English exporter that will be paid in dollars next month can be matched on the futures market with an American exporter that will be paid in pounds next month.

While Wei (1999) did not find evidence for the hedging hypothesis, we arrive at another conclusion. Our study differs in at least two respects from Wei's analysis. First, we have more observations because 1) we know for more countries whether they have a currency futures market and 2) we use a longer time period. Second, we have estimated the probability of a futures market for countries with missing information on the presence of a currency futures market.

A second finding of this paper is that autonomy in monetary policy is positively correlated with trade after controlling for exchange rate volatility. This suggests that if business cycles move out of sync, autonomous monetary policy can be favorable for economic activity, including international trade. We do not find a significant effect of Euro membership after controlling for exchange rate volatility and EU membership.

Figures and tables

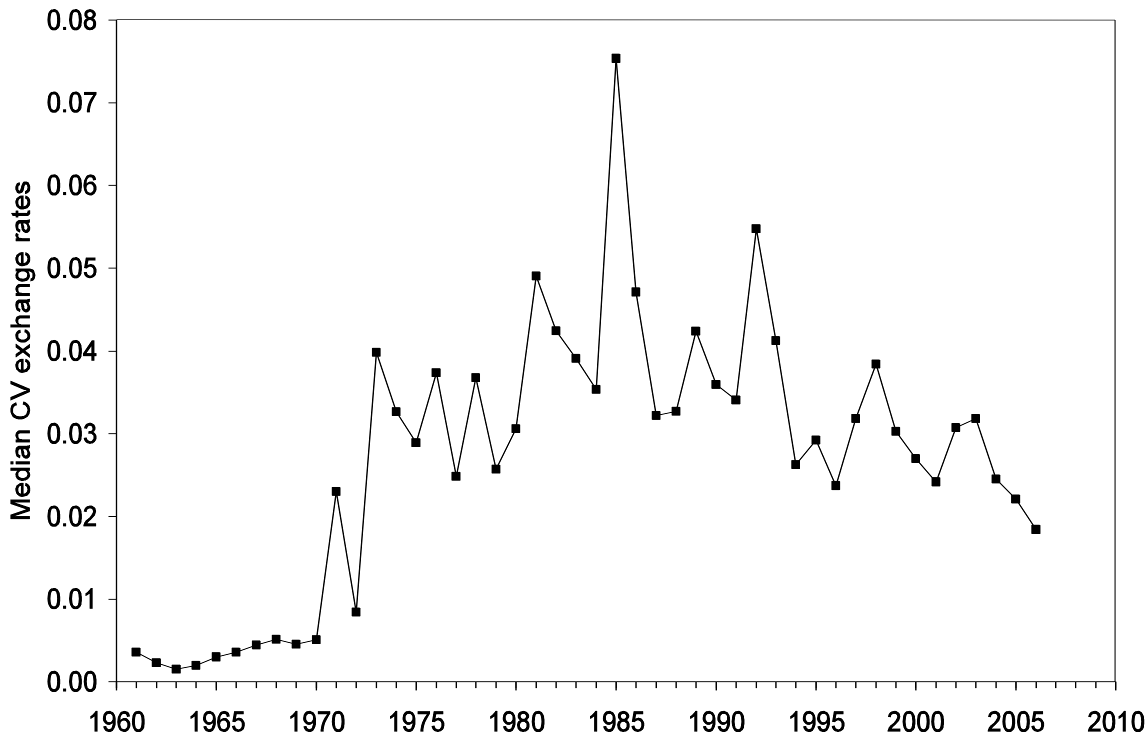

Figure 1. Volatility in bilateral exchange rates, 1961-2006

Notes: A yearly coefficient of variation is computed for the exchange rate of each country pair using monthly data from the IMF (IFS) on all countries listed in Table A1. For each year the median of the bilateral coefficients of variation is shown in the graph. Source: Hudson and Straathof (2010).

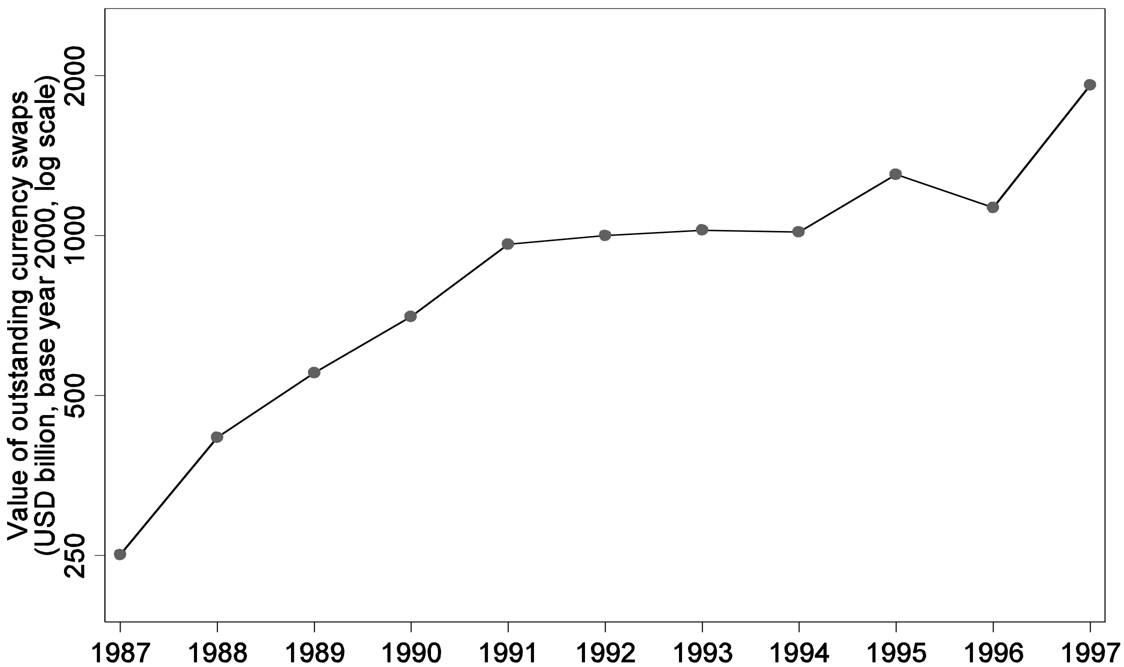

Figure 2. Total value of outstanding currency swaps

Notes: Data refer to the value of outstanding over-the-counter currency swaps as reported on the website of the International Swaps and Derivatives Association (ISDA). The series has been corrected for inflation using the GDP deflator for the United States as reported by the World Bank. After 1997, the ISDA discontinued its detailed surveying and henceforth only reports the total value of interest rate and currency swaps together. Source: Hudson and Straathof (2010).

Table 1. Main regression results

	(1)	(2)	(3)	(4)	(5)	(6)
GDP	0.886***	0.887***	0.346***	0.407***	0.345***	0.404***
	(0.035)	(0.035)	(0.048)	(0.035)	(0.047)	(0.035)
GDPPC			1.193***	0.602***	1.193***	0.611***
			(0.071)	(0.070)	(0.071)	(0.070)
ERV	-0.416***	-0.427***	-0.680***	-0.335***	-0.970***	-0.591***
	(0.085)	(0.085)	(0.086)	(0.088)	(0.119)	(0.153)
ERV*HEDGE					0.924***	0.530***
					(0.198)	(0.201)
AP		0.070**	0.104***	0.064**	0.107***	0.064**
		(0.029)	(0.028)	(0.029)	(0.028)	(0.029)
EURO		0.130**	0.053	-0.021	0.071	-0.017
		(0.063)	(0.057)	(0.050)	(0.056)	(0.050)
EU			0.183***	0.099***	0.190***	0.103***
			(0.040)	(0.034)	(0.040)	(0.034)
Sample	full period	full period	full period	>1985	full period	>1985
Obs.	68314	68314	68314	39114	68314	39114
R^2	0.734	0.734	0.755	0.407	0.755	0.407

Notes: Results for panel regression on log bilateral trade with fixed effects. Year dummies are included but not reported. Robust standard errors between parentheses; stars indicate statistical significance levels: *** 1%, ** 5%, and * 10%.

Table 2. Robustness analysis: hedging variable					
	(1)	(2)	(3)	(4)	(5)
GDP	0.344***	0.349***	0.382***	0.381***	0.374***
	(0.047)	(0.048)	(0.054)	(0.065)	(0.050)
GDPPC	1.193***	1.192***	1.213***	1.170***	1.193***
	(0.071)	(0.071)	(0.079)	(0.094)	(0.073)
ERV	-0.910***	-1.201***	-1.027***	-0.922***	-1.298***
	(0.112)	(0.150)	(0.138)	(0.135)	(0.164)
ERV*HEDGE	0.891***	0.910***	1.094***	0.657***	1.019***
	(0.212)	(0.188)	(0.221)	(0.209)	(0.201)
AP	0.108***	0.109***	0.063**	0.052*	0.100***
	(0.028)	(0.028)	(0.029)	(0.028)	(0.028)
EURO	0.070	0.070	0.034	-0.008	0.060
	(0.056)	(0.056)	(0.058)	(0.061)	(0.054)
EU	0.188***	0.194***	0.174***	0.256***	0.204***
	(0.040)	(0.040)	(0.040)	(0.042)	(0.039)
Def. HEDGE	min *PFUT*	max *PFUT*	stock market mi	max *FUT*	min *FUT*
Obs	68314	68314	55641	45154	63527
R-Sq.	0.755	0.755	0.784	0.787	0.774

Notes: Results for panel regression on log bilateral trade with fixed effects. Year dummies are included but not reported. Robust standard errors between parentheses; stars indicate statistical significance levels: *** 1%, ** 5%, and * 10%.

Table 3. Robustness analysis: estimation strategy			
	(1)	(2)	(3)
GDP	0.766***	0.347***	0.347***
	(0.025)	(0.048)	(0.049)
GDPPC	0.475***	1.193***	1.190***
	(0.037)	(0.070)	(0.071)
ERV	-0.723***	-0.975***	-0.966***
	(0.119)	(0.120)	(0.122)
ERV*HEDGE	0.876***	0.939***	0.907***
	(0.204)	(0.200)	(0.203)
AP	0.095***	0.094***	0.128***
	(0.028)	(0.028)	(0.029)
EURO	0.091	0.121	0.075
	(0.056)	(0.028)	(0.062)
EU	0.133***	0.193***	0.194***
	(0.039)	(0.040)	(0.041)
Sample	full period	full period	full period
Method	random effects	fixed effects	fixed effects
Obs.	68314	66567	63774
R^2	0.747	0.753	0.747

Notes: Results for panel regression on log bilateral trade. Year dummies are included but not reported. Robust standard errors between parentheses; stars indicate statistical significance levels: *** 1%, ** 5%, and * 10%.

Table A1. List of countries and aggregates

Argentina	France & Monaco	Poland
Australia	Germany	Portugal
Australia	Greece	Romania
Austria	Hungary	South Africa
Belgium & Luxembourg	Iceland	Spain
Brazil	India	Sri Lanka
Bulgaria	Indonesia	Suriname
Canada	Ireland	Sweden
Chile	Italy, SM, & V	Switzerland & Liechtenstein
China	Japan	Thailand
Cyprus	Korea, Rep. of	Turkey
Denmark	Malta	United Kingdom
Finland	Mexico	USA, PR, & Virgin Islands.
Fmr. Czechoslovakia	Netherlands	Venezuela
Fmr. USSR	New Zealand	Zimbabwe
Fmr. Yugoslavia	Norway	
Aggregates		
East Asia and Pacific	Middle-East and North Africa	Sub-Saharan Africa
Latin America and Caribbean	South Asia	

Table A2. Probit estimation results

Regressor	Coefficient		sd
FD	0.44***		(0.02)
GDP	3.28E-12***		(4.29E-14)
constant	-0.39***		(0.01)
Sample	> 1985	Pseudo- R2	0.287
Observations	39272	Log likelihood	-17184

Notes: Pooled probit regression on presence of currency future market. Standard errors between parentheses; stars indicate statistical significance levels: *** 1%, ** 5%, and * 10%.

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