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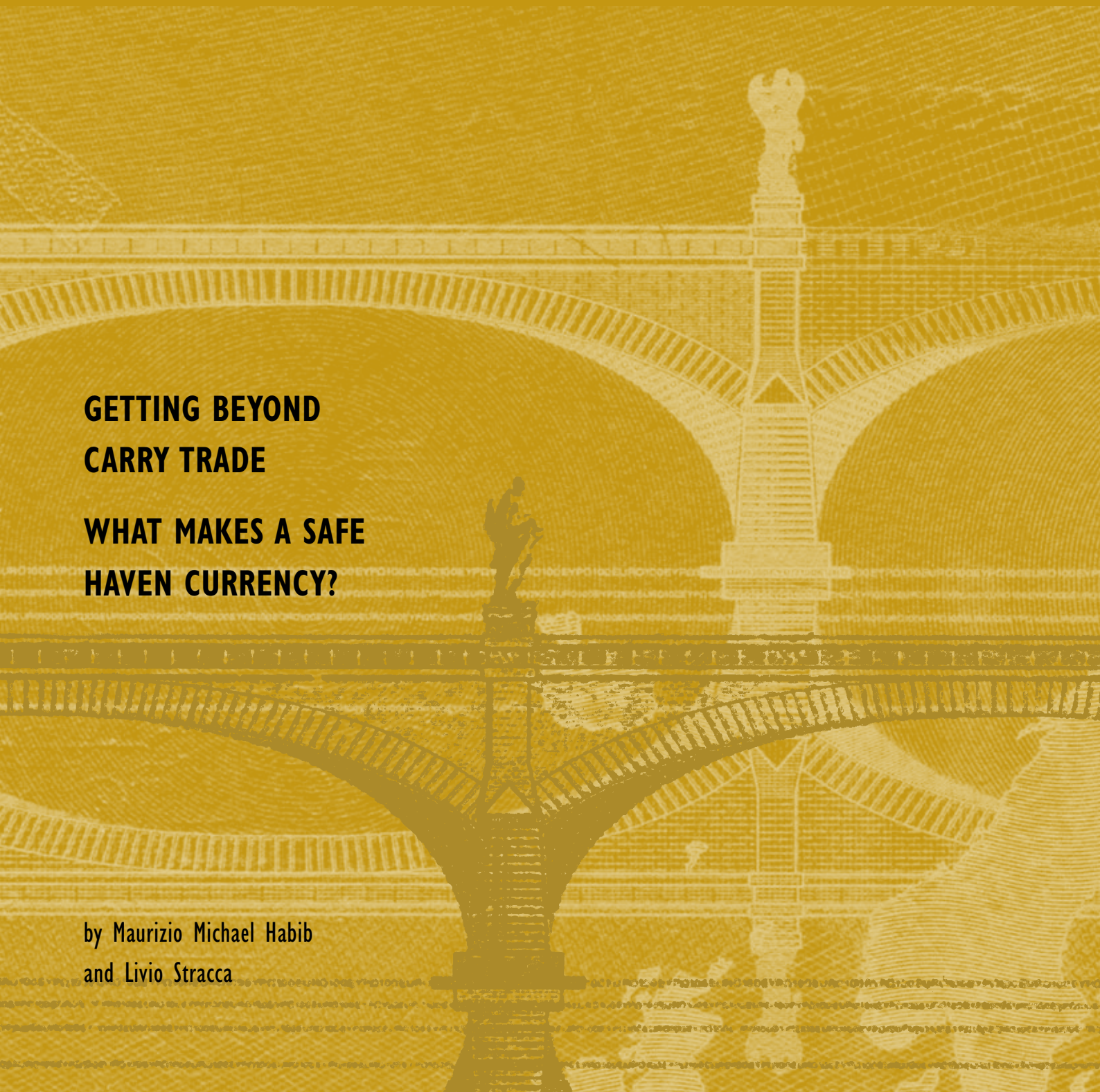

GETTING BEYOND CARRY TRADE

WHAT MAKES A SAFE HAVEN CURRENCY?

by Maurizio Michael Habib

and Livio Stracca

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by Maurizio Michael Habib and Livio Stracca[2]

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2 Both authors: European Central Bank, Kaiserstrassse 29, D-60311 Frankfurt am Main, Germany; e-mails: maurizio.habib@ecb.europa.eu and livio.stracca@ecb.europa.eu

Address
Kaiserstrasse 29
60311 Frankfurt am Main, Germany

Postal address
Postfach 16 03 19
60066 Frankfurt am Main, Germany

Telephone
+49 69 1344 0

Internet
http://www.ecb.europa.eu

Fax
+49 69 1344 6000

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Abstract

There is already a substantial literature documenting the fact that low yield currencies typically appreciate during times of global financial stress and behave as safe havens. The main objective of this paper is to find out what the fundamentals of safe haven currencies are. We analyse a large panel of 52 currencies in advanced and emerging countries over almost 25 years of data. We find that only a few factors are robustly associated to a safe haven status, most notably the net foreign asset position, an indicator of external vulnerability, and to a lesser extent the absolute size of the stock market, an indicator of market size and development. The interest rate spread against the US is significant only for advanced countries, whose currencies are subject to carry trade. More generally, we find that it is hard to predict what currencies would do when global risk aversion is high, as estimates are imprecise and often not stable or robust. This suggests caution in over-interpreting exchange rate movements during financial crises.

Keywords: VIX, global risk aversion, safe haven currencies, carry trade, globalisation.

JEL: E44, F31, G15

Non-technical summary

There is a substantial literature showing how low yield currencies typically appreciate during times of global financial stress and behave as safe havens. This leads to a systematic deviation from the Uncovered Interest Parity (UIP) whereby low-interest rate currencies systematically under-perform except in exceptional circumstances, in particular when global exchange rate volatility is high. However, this empirical regularity is not necessarily the same as safe haven status; the two concepts overlap only insofar as, and to the extent which, traders pursue carry trade strategies. In this paper, we want to go beyond this literature and try to establish what the "fundamentals" of safe haven currencies are. In short, what makes a safe haven currency?

The main objective of this paper is to find out the fundamentals of safe haven currencies, analysing a large panel of 52 currencies (51 bilateral exchange rates) in advanced and emerging countries between over the past 25 years. In particular, we put forward three possible sets of explanations of a safe haven status. First, a currency may be a safe haven if the country issuing it is itself safe and low-risk. That may be appreciated by nervous investors in times of high risk aversion. Second, we surmise that size and liquidity of a country's financial market may support a safe haven status, an argument that has been called for during the latest financial crisis. When global risk aversion is high, market liquidity may dry up and most liquid markets may get an additional bonus. Third, we test whether financial openness and more generally financial globalisation is a determinant of a safe haven status. An ideal safe haven should be a place that is insulated from the global storm when the storm strikes; a difficult feat in times of financial globalisation. An essential element of our analysis is to appraise whether and which of these possible determinants is a stable and robust predictor of safe haven behaviour.

The main contribution of the paper to the existing literature is to study thoroughly the relationship between currency movements and global risk aversion expanding (i) the sample of currencies, including up to 52 developed (23) and emerging (29) economies, (ii) the time period going as far as back 1986 and including the latest crisis and (iii) the set of potentially relevant explanatory and control variables, including policy, economic, financial and institutional factors. We also conduct an extensive analysis of stability and robustness, in particular in order to test whether, as commonly argued, the global credit crisis of 2007-09 has indeed different characteristics, in terms of safe haven currencies, compared with previous high global volatility episodes.

Our results show that are only very few variables entering consistently and robustly as determinants of safe haven status. Of course, this result is certainly not unexpected given the large literature on the exchange rate disconnect. Nonetheless, we do find a number of variables to be statistically significant and reasonably robust, more so for advanced countries and much less so for emerging countries.

First of all, focussing on carry trade, we do find that the interest rate spread is consistently associated with a safe haven status in advanced countries, but not in emerging countries, probably reflecting the low liquidity and high transaction costs that are typically associated to currencies of emerging economies. This confirms the notion that the interest rate differential is not a fundamental driver of safe haven status, and it depends on carry trade strategies being pursued.

After controlling for carry trade, in the whole sample and for emerging markets, we find that the net foreign asset position, an indicator of external vulnerability, and to a lesser extent the absolute size of the stock market, an indicator of market size and financial development, are robustly associated to a safe haven status. For advanced countries, in addition to the net financial asset position, the public debt to GDP ratio and some measures of financial development and the liquidity of the foreign exchange market (measured by the bid-ask spread) are associated to safe haven behaviour. Nonetheless, even the variables that are statistically significant tend to have a rather small quantitative impact on exchange rate behaviour. It is therefore very difficult to explain the safe haven status, and this should lead to some caution against over-interpreting exchange rate behaviour during financial stress.

Overall, our findings put the spotlight on the fact that it is not the interest rate spread, as emphasised in the carry trade literature, the most consistent and robust predictor of safe haven status, but the net foreign asset position, which is an indicator of country risk and external vulnerability. The role of the interest rate spread stems mainly, in the literature and in reality, from the fact that traders tend to follow carry trade strategies, targeting not all currencies and not always the same currencies.

1 Introduction

The global financial crisis of 2007–09 has renewed the public attention on safe haven currencies. As widely noted by observers, one paradoxical aspect of this crisis was the appreciation of the dollar as a safe haven currency exactly at the time in which the US was exporting a once-in-a-generation financial crisis to the rest of the world.

A relatively well-established literature has emphasised that returns on low-interest rate currencies tend to be negatively correlated with global risk aversion, while high-yield currencies often crash exactly when global risk aversion is high (Brunnermeier et al. 2008). This leads to a systematic deviation from the Uncovered Interest Parity (UIP) whereby low-interest rate currencies systematically under-perform except in exceptional circumstances, in particular when global exchange rate volatility is high (Menkhoff et al. 2009). However, this empirical regularity is not necessarily the same as safe haven status; the two concepts overlap only insofar as, and to the extent which, traders pursue carry trade strategies. In this paper, we want to go beyond this literature and try to establish what the "fundamentals" of safe haven currencies are. In short, what makes a safe haven currency?

In particular, we put forward three possible sets of explanations of a safe haven status. *First*, a currency may be a safe haven if the country issuing it is itself safe and low-risk. That may be appreciated by nervous investors in times of high risk aversion. *Second*, we surmise that size and liquidity of a country's financial market may support a safe haven status, an argument that has been called for during the latest financial crisis. When global risk aversion is high, market liquidity may dry up and most liquid markets may get an additional bonus. *Third*, we test whether financial openness and more generally financial globalisation is a determinant of a safe haven status.

Thus, the purpose of this paper is to answer the fundamental question of what makes a safe-haven currency. We investigate the behaviour of a large sample of 52 currencies (51 bilateral exchange rates against the US dollar) between 1986 and 2009, focusing in particular on the relationship between currency returns, economic and financial fundamentals and global volatility and risk aversion. An essential element of our analysis is to appraise whether and which of these possible determinants is a stable and robust predictor of safe haven behaviour.

Our study is related to two strands of literature. First, there is a fast-growing body of literature on the relationship between the profitability of carry-trade strategies and global risk-aversion (Brunnemeier et al. 2008, Lustig et al. 2008 and Menkhoff et al. 2009) as well as the relevance of "fundamentals" in devising carry-trade strategies (Jorda and Taylor, 2009 and Nozaki, 2010). Of particular interest for our paper is Menkhoff et al. (2009) who find that returns from carry trade strategies can be well explained by a single factor, namely global exchange rate volatility.[1] Higher yield currencies perform well when volatility is moderate or low, but can lead to potentially

[1] See also Christiansen et al. (2010).

large losses in a few episodes of high to very high volatility. Brunnermeier et al. (2008) find that carry traders are subject to crash risk, i.e. the sudden unwinding of carry trades in periods when risk appetite and funding liquidity decrease. A consequence of this literature is that low yield currencies are generally safe havens in times of financial distress. While this result is important and relevant for our work, it leaves largely unexplained the question of *why* certain currencies emerge as safe havens in the first place, which is what we attempt to address here.

Second, there are other studies which have tried to detect safe haven currencies or their features, identifying ex ante the crisis event or the safe haven currency. For instance, Ranaldo and Soderlind (2009) find that the Japanese yen and the Swiss franc, but also the euro and British pound, may be regarded as safe havens during crisis episodes preceding the latest financial crisis. The 2008 financial crisis emerged as an important case study where safe haven effects went against typical patterns (Kohler 2010) partially in contrast with the results of Ranaldo and Soderlind (2009). Indeed, specific factors may have been at play during the latest crisis. McCauley and McGuire (2009) stress the role of U.S. dollar shortages - which were generated by the funding of net long U.S. dollar exposure by European banks - and the role of "overhedged" U.S. dollar positions - resulting from write-downs of US dollar assets - in supporting the U.S. dollar exchange rate during the latest crisis. Indeed, Hui et al. (2010) confirm econometrically the impact of market-wide liquidity risk on exchange rate movements. Differently, Fratzscher (2009) develops a more traditional "fundamentals analysis", finding that countries with low foreign exchange reserves, weak current account positions and high direct financial exposure vis-à-vis the United States depreciated the most during the crisis. However, Fratzscher's paper is limited to the 2007-09 financial crisis and does not offer a longer historical perspective.

This paper has the main purpose to merge these two strands of literature in a single empirical framework. In particular, the main contribution of the paper to the existing literature is to study thoroughly the relationship between currency movements and global risk aversion expanding (i) the sample of currencies, including up to 52 developed (23) and emerging (29) economies, (ii) the time period going as far as back 1986 and including the latest crisis and (iii) the set of potentially relevant explanatory and control variables, including policy, economic, financial and institutional factors. We also conduct an extensive analysis of stability and robustness, in particular in order to test whether, as commonly argued, the global credit crisis of 2007-09 has indeed different characteristics, in terms of safe haven currencies, compared with previous high global volatility episodes.

Generally speaking, we find few variables to be consistently and robustly significant in predicting a safe haven behaviour. That is not surprising given the large literature on the exchange rate disconnect, dating back to Meese and Rogoff (1983), which is the source of a still lively debate.[2] However, we do find that the interest rate

[2] See Cheung et al. (2005) for a recent re-assessment of the empirical analysis of Meese and Rogoff (1983), basically confirming original results. See instead Engel and West (2005) for a reconciliation

spread is consistently associated with a safe haven status in *advanced* countries, but not in emerging countries. This confirms the notion that the interest rate differential is not a fundamental driver of safe haven status, and it depends on carry trade strategies being pursued (which they are not for all currencies). For advanced countries, the public debt to GDP ratio, the Net Financial Asset (NFA) position, some measures of financial development and the liquidity of the foreign exchange market (measured by the bid-ask spread) are associated to safe haven behaviour, while only the NFA position and (to a lesser extent) the size of the stock market are found to matter consistently for *emerging* countries. Nonetheless, even the variables that are statistically significant tend to have a rather small quantitative impact on exchange rate behaviour. It is therefore very difficult to explain the safe haven status, and this should lead to some caution against over-interpreting exchange rate behaviour during financial stress.

The structure of the paper is as follows. In the next section we introduce the dataset. We present the empirical model is Section 3. Section 4 presents the results of the baseline model. Section 5 reports the results of an extended model, including a set of potentially relevant economic, financial and institutional variables, and further robustness checks. Section 5 concludes.

2 Data

A large dataset of currencies, financial, economic and institutional variables has been created to study the behaviour of exchange rates during period of low and high global financial volatility. The dataset includes 51 monthly (period average) bilateral exchange rates against the US dollar from January 1986 until December 2009, which have been obtained from the IMF International Financial Statistics. *Table 1* reports the list of countries used in the paper, sub-divided into advanced and emerging countries (respectively 23 and 29 of them); note that no observations are included for euro area countries since they join the euro area, which – while unavoidable in the context of our analysis - makes our panel strongly unbalanced. On the other hand, we introduce the euro as a new currency from 1999 onwards.

[Table 1 here]

The VIX index of the Chicago Board Options Exchange (CBOE) measuring the implied volatility of S&P 500 index options is our baseline measure of global risk aversion, as has become rather common in the literature. Indeed, previous papers have found that the VIX is highly correlated to many manifestations of risk and risk aversion (Collin-Dufresne et al. 2001). However, we also use different measures of global risk aversion in order to test the robustness of our results. First, we use the

of the near-random walk behaviour of the exchange rate with fundamentals in a rational expectations present-value model.

Risk Aversion indicator developed by the bank Merill Lynch, which is a summary statistic of several measures of risk premia and volatility in stock, bond and foreign exchange markets. This index is available at a monthly frequency from 1992. We also employ a similar index, the Global Index of Financial Turbulence (GIFT) developed by ECB staff (Fidora and Lo Duca 2010), available from 1994.[3] Second, following Carr and Wu (2009), it is possible to show that the market price of options from which the VIX index is derived combines two components: the "quantity" and the "price" of risk. The latter component – called "variance premium" – should be more closely associated with (global) risk aversion, which is what arguably matters the most for answering the main question of this paper. In our study, we use a decomposition of the VIX in quantity and price of risk proposed by Bekaert et al. (2010), with the latter component proxying for global risk aversion. Finally, we test an alternative measure of global risk aversion based on the *realised*, rather than implied, volatility of the Datastream benchmark world stock market index - which includes up to forty economies - measured as the standard deviation of daily returns in each calendar month.

Since our left-hand side variable is the log change in the exchange rate vs. the US dollar, we want to employ measures of global risk aversion that single out the element of 'surprise' or 'news', correcting for the autoregressive behaviour of the various measures. We therefore run a AR(6) model on all measures and take the residual of these regressions as the global risk aversion 'news'. This is what we generically indicate as v_t throughout the paper.

Table 2 reports the correlations between the different measures of global risk aversion employed in this paper. As can be seen, they are rather strongly positively correlated, suggesting that they all tell a similar story; in particular, they are all strongly correlated with the VIX. This is reassuring in terms of the robustness of our chosen baseline measure.

[Table 2 here]

The set of control variables includes a large number of policy, economic, financial and institutional factors which may be particular relevant in time of financial stress. These control variables have been divided in four main groups: (i) baseline variables which include the interest rate spread (emphasised in the carry trade literature) and

[3] The Merrill Lynch Risk Aversion indicator is a weighted average of US high-yield spreads, the VIX, the spread between the three-month euro-dollar deposits minus the three-month T-bills, the US ten-year swap spread, emerging market bond spreads, the trade-weighted Swiss franc, emerging market equities in USD, and the US small cap stock. For each item, it takes the standard deviations from 52-week moving averages. The Global Index of Financial Turbulence captures developments in three financial market segments, namely in the fixed income, equity and foreign exchange markets. Episodes of financial stress are identified using an index based on high-frequency price variables. The index is constructed as a variance-weighted average of sub-indices associated with stress in the corresponding market sub-segment, including data for the largest 29 economies in the world. See the ECB Financial Stability Review (December 2009) for further details.

a number of control variables; (ii) country risk variables; (iii) measures of size of the economy and size and liquidity of financial markets; (iv) measures of financial openness.

Baseline variables. The first group contains the interest rate differential between one-month domestic interbank and U.S. rates, which captures the carry trade effects which have been emphasised in previous literature. We then have a set of control variables. One element that we need to take into account in our analysis is the degree of flexibility of the currencies, in particular whether currencies are pegged to the dollar, or any other currency (mainly the Deutsche Mark, DM, before 1999 and the euro after 1999). Attempts by the authorities to keep the exchange rate stable vis-a-vis fluctuations in global volatility can drive a wedge between the fundamentals and the observed exchange rate behaviour, which could distort our estimates. We need, therefore, some control for exchange rate manipulation. One variable that we will use in the empirical analysis is an estimate of whether a certain currency i is de facto pegged to the dollar (or the DM/euro) at time t. Similar to Levy-Yeyati and Sturzenegger (2005), we start from a de facto measure of exchange rate flexibility vis-à-vis the USD (or DM/euro) defined as

$$FLEX_{it} = \frac{1}{12}\sum_{j=1}^{12} Abs(\Delta e_{i,t-j}) \tag{1}$$

where $e_{i,t}$ is the log bilateral exchange rate vis-a-vis the US dollar (or DM/euro). This cumulative absolute depreciation or appreciation in the previous year should give an idea of the degree to which a given currency is floating against the US dollar (or the DM/euro).[4] Based on the $FLEX_{it}$ variable, we then construct a dummy variable PEG_{it} which takes value 1 if $FLEX_{it} < 1\%$ and zero otherwise. The threshold value of 1% is chosen based on the statistical distribution of the $FLEX$ variable across time and countries, but we have experimented with other values, with similar results.

In addition, we include variables which explicitly capture the possible government measures aiming at offsetting the impact of higher (or lower) global risk aversion on their exchange rates. These are the growth in foreign exchange reserves *in the same month*, under the presumption that reserves are used to stem an appreciation or depreciation of a given currency vs. the US dollar, and the monthly change in the 1-month interbank interest rate, again in the same month. Manipulating short-term interest rates has been a way that several countries have used in the attempt to stem currency crises (for example during the European Monetary System and Asian crises). Note that we have included the former variable, the growth rate of foreign exchange reserves, both alone and in interaction with the PEG variable, the latter interaction based on the idea that variations in official reserves signal a desire to stem the exchange rate appreciation or depreciation only in pegging countries and not in others.

[4] In this respect, we believe that a de facto measure is more reliable than a de iure one, as many emerging countries have "fear of floating".

Country risk and vulnerability. The second group consists of those variables that are monitored by analysts when assessing country risk vulnerability, such as the inflation rate, the ratio of public debt to GDP, the current account of the balance of payments over GDP and net foreign asset position to GDP, the foreign exchange reserves to import ratio, and an indicator of banking crises from Laeven and Valencia (2008). In addition, we consider indicators of overall institutional quality of the country, namely the Rule of Law indicator from the World Bank Governance Indicators (available from 1996) and the ICRG Country Risk rating.

Size and liquidity of financial markets. A third group of variables includes all the controls for the size of the economy and size and liquidity of financial markets: the GDP weight in the world economy, private credit to the country's and world GDP, stock market capitalisation to the country's and world GDP and the bid-ask spread in the foreign exchange market, an indicator of liquidity of this market. By including these variables, we are able to control whether financial investors flee towards larger and more liquid markets in the midst of crises. At the same time, it may be that currencies with small financial markets which are usually considered as a safe haven – the Swiss franc, for instance – may be subject to larger price effects since strong demand is rationed by short supply of financial instruments denominated in that currency. The expected sign of these size/liquidity variables is therefore ambiguous.

Financial openness. Finally, a fourth group of variables consists of various measures of financial and foreign exchange openness. These include measures of *de facto* financial openness (such as the ratio of external financial assets and liabilities to GDP and foreign loans to GDP) as well as some *de iure* variables, namely the capital account restrictions as estimated in Schindler (2009). The latter are however available only for a relatively short sample period (1995-2005) and will therefore only be used as a robustness check.

The data have been obtained from a number of different sources: International Monetary Fund, World Bank, Haver, Datastream/Thomson Reuters and Barclays BBI, and International Country Risk Guide. *Table 3* provides a complete and detailed description of all variables and the respective source. A number of control variables are only available at an annual frequency and have been interpolated to a monthly frequency through linear interpolation.

[Table 3 here]

Table 4 reports descriptive statistics for all the variables used in the paper, for the full sample as well as for advanced and emerging economies separately. The number of observations varies considerably depending on the variable; for example, we only have about 5,600 monthly data for capital account restrictions, but over 16,800 for foreign exchange reserves. This highlights the caveat that some of our regressions may be difficult to compare since they may refer to substantially different sample periods and country coverage. This limitation should be kept in mind in interpreting our results, in particular for the robustness analysis.

[Table 4 here]

3 Empirical model

As noted, the main purpose of the paper is to study the relationship of currency returns with global risk aversion, which is proxied, in the baseline specification, by the VIX index. The general expression for our empirical model is

$$\Delta e_{it} = \alpha v_t + \beta x_{it} v_t + \gamma x_{it} + \delta_i + \rho \Delta e_{i,t-1} + \varepsilon_t \tag{2}$$

where Δe_{it} is the bilateral monthly log-change in the value of the US dollar in terms of domestic currency i, with an increase therefore indicating an *appreciation* of the US dollar or, vice versa, a depreciation of the domestic currency, v is the 'news' element in the chosen indicator of global risk aversion, which is exogenous to the model, x is a vector with domestic variables that may affect the elasticity of returns to changes in risk aversion (most of them actually timed $t-1$ to avoid simultaneity problems) and ε is a disturbance term. The main parameters of interest in our paper are contained in β, as we want to analyse the determinants of currency returns' reaction to changes in global risk aversion. Suppose, for example, that we want to test whether currencies with high nominal short term interest rates, R_{it}, depreciate in times of high risk aversion. If the interaction term, $R_{it}v_t$, is significant, then we can conclude that the level of the nominal short term interest rate influences the behaviour of exchange rates in relation to shifts in global risk aversion. Moreover, we consider both high frequency and low frequency, structural variables in the vector x. Note also that, differently from other papers based on case studies of crises, such as Fratzscher (2009), our analysis uses the full sample information to identify the impact of greater volatility and rising risk aversion on exchange rates. Finally, note that the v measure has been standardised (to zero mean and unit standard deviation) in order to facilitate the interpretation of the estimated coefficients, which may be thought of as marginal effects.

One potential concern that may arise in the estimation of equation (2) is reverse causality. For this reason, we generally include variables dated $t-1$, with the exception of the change in the foreign exchange reserves and of the change in the short-term interest rate, which are dated t due to their different role in the equation. For all variables that have been obtained from interpolation from annual data (say, public debt to GDP) we use the $t-12$ lag, in order to rule out the risk of reverse causality if data from the same year are used. Also note that the date t variables are included as controls and we make no statement about the causal interpretation of the estimated coefficient, for which an instrumental variable estimation would be needed.[5]

[5] We carried out some estimations using instrumental variables (GMM) - not reported for brevity - and these led to similar results as the pooled OLS, but with somewhat less precision in the estimates.

We will also be looking at specifications where we include extreme values and potential asymmetries of the impact of global volatility,

$$\Delta e_{it} = \alpha' \widetilde{v}_t + \beta' x_{it} \widetilde{v}_t + \gamma x_{it} + \delta_i + \rho \Delta e_{i,t-1} + \varepsilon_t \quad (3)$$

where $\widetilde{v}$ is a truncated function of global risk aversion, e.g. "extreme" global risk aversion.

It is self-evident that the contemporaneous inclusion of all control variables would lead to an overparametrised model. For this reason, we adopted an incremental approach to the estimation of equation (2). First, in the baseline model, equation (2) is estimated in a parsimonious specification, including only the control variables in the first baseline group, as well as country fixed effects and the own lag of the exchange rate depreciation:

$$\Delta e_{it} = \alpha v_t + \beta (R_{i,t-1} - R^{US}_{i,t-1}) v_t + \beta' x_{it} v_t + \gamma (R_{i,t-1} - R^{US}_{i,t-1}) + \gamma' x_{it} + \delta_i + \rho \Delta e_{i,t-1} + \varepsilon_t \quad (4)$$

where $x_{it} = [\Delta reserves_{it}, \Delta(R_{it} - R^{US}_{it}), PEG_{it}]$ is the vector of controls, R represents the one-month rate, and $\Delta reserves_{it}$ is the growth rate of FX reserves, and PEG is a dummy variable as defined above, taken separately for the US dollar, the euro and the DM. In a variant of the model, we also add $\Delta reserves_{it} * PEG_{it}$ to the x vector.

According to the UIP, countries with a higher nominal interest rate than the US at time $t-1$ should tend to depreciate against the US dollar over time and one would expect the coefficient γ to be positive and significant. However, many studies found that this coefficient has the "wrong" negative sign, rejecting the validity of the UIP, in particular for advanced economies with floating exchange rates and over shorter horizons.[6] The global risk aversion factor drives a wedge in the UIP, which is captured by the parameter β. If β is positive and significant, countries having a higher nominal interest rate than the US not only tend to depreciate over time (depending on γ), but they also depreciate particularly strongly when v is high, i.e. in times of high global financial market volatility.

Is it sufficient to have a low nominal interest rate to be a safe haven currency? Of course, the nominal interest rate may be high or low depending on domestic macroeconomic conditions and the monetary policy regime prevailing in individual countries. For example, a country with low inflation and economic growth will tend to have a low nominal interest rate. In an open economy, however, the nominal interest rate is also an endogenous variable which responds to prevailing conditions in global financial markets. Suppose that a certain country, say Switzerland, is preferred by investors in times of global financial stress due to its intrinsic, fundamental characteristics (say, political stability). In this case, there will be an inflow of capital in the country which would tend to make its currency appreciate, even if the domestic interest rate is low. In this case, it is not the level of the interest rate in itself that attracts investors, but rather the underlying fundamental that allows the country in question to enjoy

[6] See Chinn (2006) for a recent critical review of the literature on the UIP puzzle.

a combination of exchange rate appreciation and low interest rate at times of heightened global risk aversion. In other words, the level of the nominal interest rate might be a summary indicator of a number of unobservable country characteristics, which we want to tease out explicitly in this paper.

Once we obtain a parsimonious specification of the baseline model in (4), we use this to test the statistical significance of the other groups of control variables (gradually expanding the x_{it} vector), taken one at the time. In each step, the new group of control variables is first included in the baseline model – each variable separately and then jointly, whenever they are significant individually - without variables from other groups. In the following step, the model is extended with a new group of variables, first included one by one and then jointly, including variables of other groups that are statistically significant in the previous stage. Once we have a final model possibly including a small set of variables from all groups, we tinker with the model by analysing its robustness to different samples as well as possible non-linear versions of the model.

The models in equations (2)-(4) are estimated, throughout the paper, by OLS panel fixed effects. The choice of fixed effects is a natural one in a country panel where it may be difficult to assume that the individual constant terms are randomly distributed. The Hausman test, indeed, confirms that random-effects estimates may be biased and that fixed-effects should be preferred. The time dimension of our panel is very large, up to 288 monthly observations in the best case, and would therefore be able to deal with the potential bias induced by panel estimations in a dynamic setting, which is of the order $1/T$ (see Nickell 1981).

4 Baseline results

The first step of our empirical investigation is to specify a parsimonious baseline model of the exchange rate which takes into account the impact of speculative activity during periods of high volatility – the reversal of carry trade strategies – and potential policy measures by countries which peg or fear of floating vis-à-vis the US dollar. *Table 5* shows the estimation of this baseline model allowing for a different impact across advanced or emerging economies (columns 3 and 4) and studying how the relationship could have changed in the latest crisis, from August 2007 onwards (column 5 versus 6), or after the introduction of the euro since 1999 (column 7 versus 8). It is important to consider all these possible variants in order to have an appreciation of the robustness of the main results, which is a main objective of this paper.

The autocorrelation coefficient of the exchange rate is positive and significant, but this is mainly a mechanic consequence of taking monthly average data. The model generally explains up to about 20 percent of the overall variability and of the variability within each individual country. The explanatory power of the model variability across countries is usually larger, but the between variability contributes only marginally to the overall variability of the panel which is instead dominated by

the within variability. The reported standard errors account for clustering of variance by country.

The coefficient of the interaction of the VIX index with the interest rate spread versus the US dollar is positive and significant only for advanced economies. In other words, we find some evidence of a reversal of carry trade when global volatility is high only across advanced economies and not for emerging markets. Indeed, only in the most recent years, currencies of emerging markets such as the Brazilian real or the South African rand have been included in carry trade strategies, whereas many other emerging market currencies may not have sufficient liquidity to support carry-trade speculation. Our results are also consistent with the findings of Bansal and Dalhquist (2000) who show that the often found negative correlation between the expected currency depreciation and interest rate differential is confined to developed economies.

The variables controlling for the policy measures associated with exchange rate pressure (changes in foreign exchange reserves and the interest rate spread) do not have a systematic impact in a given direction and are often insignificant, in particular the interest rate spread. In any case, we emphasise again the fact that the coefficients associated to these variables cannot be interpreted in a structural manner, due to the possibility of reverse causality.

Finally, we find that the PEG variables are negative and often statistically significant in particular for the US dollar and the DM. Unsurprisingly, the sign is negative, suggesting systematic *appreciation* of those currencies pegging to main international currency anchors compared with the floating ones. Note that these variables are mostly insignificant when included on their own, i.e. when the standardised VIX is at its sample mean of zero. Therefore, this control variable appears to be rather effective.

Overall, based on these results, the revised baseline model will, from now on, include the interest rate spread, the change in foreign exchange reserves and the PEG variables.

Before concluding this preliminary analysis, it is interesting to look at the coefficient associated with the VIX itself. In the way our empirical model is constructed, this variable essentially captures the behaviour of the dollar vis-a-vis all other currencies depending on the level of the VIX. A positive coefficient indicates a depreciation of other currencies against the dollar, and hence dollar appreciation. The coefficient is insignificant *before* the 2007-09 global financial crisis, confirming the results of other studies such as Diekmann and Meurers (2007), but positive and significant *during* the last crisis, confirming the perception that the recent behaviour of the dollar has been rather anomalous compared with previous regularities.[7] This result is robust also when conditioning to other variables, as we will see later on. Moreover, only the currencies of emerging markets tend to depreciate when the VIX rises, whereas those

[7] Note also that, when volatility is high, the currencies pegging to the US dollar tend to *depreciate* in the sub-sample until 1999.

of advanced economies are not systematically affected. We therefore conclude that, contrary to the common belief, which has been strengthened by recent events, the US dollar is not always a safe haven currency.

[Table 5 here]

5 Identifying the fundamental features of safe haven currencies

After having specified a parsimonious model of currency returns and global risk aversion, we are now in the position to test the statistical significance of a large set of economic, financial and institutional variables potentially affecting currency returns, in particular when global financial volatility changes.

5.1 Controlling for country risk and vulnerability

As mentioned in the Introduction, one key ingredient of a safe haven currency may be that the country issuing the currency and therefore the bulk of the financial instruments denominated in that currency is seen as "low risk" by nervous investors. Hence, *Table 6* presents the baseline model extended with a number of variables measuring country risk and vulnerability. These control variables are first entered separately in the regression. In the last columns of the table, we present one or more possible specifications including jointly the variables that proved to be statistically significant when entered individually. The results show that indicators of external sustainability such as the net foreign asset position or the current account are statistically significant when interacted with the VIX. As expected, the sign is negative for both variables, indicating that countries with better external positions - irrespective of whether one takes a flow or stock perspective of external sustainability - tend to have currencies that appreciated with rising global risk aversion (safe havens). Surprisingly, we find that the public debt to GDP ratio has a negative sign, implying that currencies of countries with higher public debt *appreciate* during financial crises. This result holds in the whole sample and among advanced economies, but not among emerging economies where the coefficient is statistically insignificant. Overall, this result may be interpreted as spurious and, indeed, it is not robust.[8] The inflation rate, the ratio of foreign exchange reserves to imports, the ICRG Country Risk rating, the Rule of Law indicator and the dummy variable capturing whether a country is experiencing a banking crisis are not significant. When put jointly, only the NFA position remains

[8] In addition, the debt to GDP ratio might also be considered as an indicator of the liquidity and size of a country's financial market, which might contribute positively to a safe haven status. Since the coefficient is anyway not statistically significant in a robust way, we do not investigate this issue further. This result is also very sensitive to the exclusion of an outlier, Japan.

statistically significant, with the expected sign; the current account and public debt are insignificant.

[Table 6 here]

It is important to test for advanced and emerging countries separately as the determinants of safe haven (or un-safe haven) status may be different between them. *Tables 6a-6b* report results for advanced and emerging countries respectively. The main differences between advanced and emerging countries are three. First, as noted the public debt to GDP ratio is only significant in the former group of countries; second, the interest rate spread is always significant in advanced countries and insignificant for emerging countries. Finally, the ratio of foreign exchange reserves to imports is significant for advanced countries with the expected sign, but (quite surprisingly) not in emerging countries.

[Tables 6a-6b here]

5.2 Controlling for the size of the economy and the size and liquidity of financial and foreign exchange markets

In the next step, we further extend the baseline model with an additional set of variables controlling for the size of the economy and the size of liquidity of financial and foreign exchange markets - stock market capitalisation, private sector credit, both as a share of domestic and world GDP, and the bid-ask spread in the foreign exchange market. Which of these elements contributes to the making of a safe haven currency? *Table 7* presents the results of these additional regressions. It is rather evident that size and liquidity of financial markets do not provide a lot of additional explanatory power to our regressions, at least in the full sample. One variable that is marginally significant, with the expected sign, is the country's weight in world GDP. In other words, currencies of bigger countries tend to appreciate, in relative terms, in times of high global risk aversion. The stock market capitalisation to the country's GDP has a negative sign when interacted with the VIX, while the opposite holds true for the stock market capitalisation to *world* GDP. In other words, having a large stock market in relative terms doesn't lead to safe haven status, but having a large stock market in absolute terms does. When put together, only the stock market capitalisation to world's GDP remains significant.

[Table 7 here]

Tables 7a-7b report the same analysis for advanced and emerging countries respectively. For advanced countries, the bid-ask spread is significant, but the coefficient is the opposite of what could be expected since it indicates a *negative* effect of liquidity (currencies with lower bid-ask spreads tend to depreciate when global volatility is

high). For emerging countries, the measure of economic size (weight of world GDP) is significant when interacted with the VIX and considered jointly with the other variables that are significant in the regression for all countries.

[Tables 7a-7b here]

5.3 Controlling for financial openness

Finally, the last group of variables to be added to the baseline model consists of measures of financial openness such the sum of external assets and liabilities as a share of GDP, the foreign loans and international debt to GDP ratios from the World Bank database of Financial Development and Structure and a measure of de jure restrictions on cross-border financial transactions from Schindler (2009).

[Table 8 here]

Table 8 shows that practically none of the considered variables is significant when interacted with the VIX, with the exception of the variable measuring *inflow* capital restrictions as estimated by Schindler (2009). This index is constructed in such a way that a higher score indicates a more restricted capital account. Therefore, the coefficient indicates that capital restrictions result, ceteris paribus, in a depreciation vs. the US dollar in the wake of higher global risk aversion. However, we emphasise that this indicator is available for a more limited sample period and hence that this result should be interpreted with caution.

Tables 8a-8b report results for advanced and emerging countries separately. Again, in advanced countries, the interest rate spread again remains strongly significant and with the expected sign, whereas it is not in emerging countries. The results for other variables are similar to those for the whole country group.

[Tables 8a-8b here]

Overall, it seems that the 'best' model in order to explain the determinants of safe haven status includes (i) whether countries are pegged to an international currency (the US dollar or the euro/DM), (ii) most notably, the the NFA position, an indicator of countries' external vulnerability: countries with more net external debt depreciate in times of high global volatility; (iii) the absolute size of the stock market, which probably captures the size of the financial market more generally, though with a lower degree of significance compared with the NFA position; (iv) the public debt to GDP ratio, only for advanced countries, a result that however could be spurious and is certainly difficult to interpret; (v) the short term interest rate spread vs. the US, again only for advanced countries reflecting the prevalence of carry trade strategies for currencies of (some of) these countries.

It is also useful to try and quantify the effect of these variables on exchange rates in order to understand the *economic*, rather than statistical significance of our results.

One way to appreciate the economic significance of the proposed 'fundamental' determinants of safe haven status is to compare the R squared of the baseline estimation in Table 5 (first column to the left) with that of the final model which is reported in the first column of *Table 9*. It can be seen that the R squared are of similar size, which indicates that the fundamental values explain relatively little of the overall variability of exchange rates. This is of course hardly surprising given previous results in the exchange rates literature.[9]

5.4 Robustness

In this section we test the robustness of our "final" specification by first varying the sample period and analysing the equation for advanced and emerging countries separately, and then we consider some non-linear transformations of the VIX as well as alternative measures of global risk aversion, using the measures reported in Table 2.

5.4.1 Country group and sample periods

Table 9 reports on the specification including (i) the NFA position and (ii) stock market capitalisation to world GDP. We first present the estimates for the full sample, and then move to split the country group into advanced and emerging, and then the sample before and after the August 2007 crisis and the introduction of the euro in 1999. Several interesting results emerge. First, we find again that the interest rate spread only matters for advanced countries. Second, the coefficient on the standardised value of the VIX - which, as previously noted, identifies the behaviour of the US dollar specifically - shows again some instability over time. In particular, it is negative and significant before 1999 and insignificant before the crisis (no safe haven status for the dollar as such), but it is positive and significant during the latest crisis (US dollar is a safe haven). The result on the safe haven status of the US dollar is therefore not robust. Finally, we find that the NFA position is the most consistent fundamental determinant of the safe haven status, clearly outperforming the interest rate spread in terms of robustness.

[Table 9 here]

5.4.2 Extreme values and alternative measures of global risk aversion

So far, we have estimated a linear model in which the variables of interest have been interacted with the VIX. In this sub-section, we investigate the possible role of extreme values of the VIX. *Table 10* presents estimates, again of the 'best' equation,

[9] Strictly speaking, the comparison between the fit of the equations in Table 5 and 9 is incorrect since the equation in Table 9 refers to a significantly smaller sample. Nonetheless, the similarity of the R squared also holds when estimating the two equations on exactly the same data.

when taking (i) the VIX only when it is in its highest decile (in practice, a proxy for acute global financial distress) and (ii) the VIX when above or below its average, to cater for possible asymmetry and threshold effects. The estimates are generally robust to these changes and lead to the same qualitative results. There is, overall, not much evidence to suggest strong non-linearities in the data.

In the same table, we also replace the VIX, as a measure of global risk aversion, with the alternatives presented in Table 2 (columns (5) to (9)). Again, the results are qualitatively similar, even though the statistical significance changes here and there; and again, most robust result is the one for the NFA position.

[Table 10 here]

6 Conclusions

In this paper we have tackled the question of what the fundamentals of safe haven currencies are. Previous literature has uncovered the fact that systematic deviations from the Uncovered Interest Parity (UIP) may be attributed to a "crash risk" whereby some high-interest currencies depreciate sharply in times of financial stress, while low-interest currencies typically appreciate (safe haven currencies). The first objective of this paper is to document this stylised fact on a large sample of 52 currencies (51 bilateral exchange rates), on a sample period spanning almost 25 years. Our main finding here is that there is evidence of systematic deviations from the UIP which can be associated to carry trading for advanced countries only, while for emerging countries we find no such evidence, probably reflecting the low liquidity and high transaction costs that are typically associated to currencies of emerging economies.

As the next and more innovative step in our analysis, we look at the fundamental determinants of the individual currencies' loadings on the "crash risk" factor. What makes a currency a safe haven, hence with a lower return in good times and a higher return in periods of financial stress? We put forward three possible explanations. First, the loading may be related to the *intrinsic risk profile* of the country issuing the currency. A country that is intrinsically less risky may be preferred in times of higher global risk aversion. Second, it could be that currencies are safe havens if they are supported by a large country and by large, well developed and liquid financial (including foreign exchange) markets. Again, these characteristics may be desirable to investors in times of high risk aversion and low liquidity, while they may be not in more normal times. Finally, countries that are more open to the rest of the world, in particular in the financial market, may be differently affected by global turbulence. In particular, we surmise that more financially open countries may be more exposed to financial turbulence originating at a global level, and therefore be less likely to be safe havens. An ideal safe haven should be a place that is insulated from the global storm when the storm strikes; a difficult feat in times of financial globalisation.

We look at a large set of potential explanatory variables and countries but we find very few variables entering consistently and robustly as determinants of safe haven status. Moreover, even those which enter significantly have a rather small effect on monthly currency returns. This is a result which should suggest some caution against over-interpreting exchange rate movements in times of global stress, at least at a monthly frequency as in our analysis. Of course, this result is certainly not unexpected given the large literature on the exchange rate disconnect. Nonetheless, we do find a bunch of variables to be statistically significant and reasonably robust, more so for advanced countries and much less so for emerging countries.

One main contribution of the paper to the existing literature is to put the spotlight on the fact that it is not the interest rate spread, as emphasised in the carry trade literature, the most consistent and robust predictor of safe haven status, but the NFA position, which is an indicator of country risk and external vulnerability. The role of the interest rate spread stems mainly, in the literature and in reality, from the fact that traders tend to follow carry trade strategies. A role for the NFA position requires a different type of explanation, perhaps centred on country credit risk. This should be an interesting field for future work.

The analysis conducted in this paper is in-sample. A useful extension of our work would be whether it is possible to predict safe haven behaviour out of sample. Based on information up to time $t-1$, can a trader predict which currencies will appreciate if global volatility goes up by x%? Based on the results of our paper this appears to be a very difficult thing to do, but which could be very interesting to take up in future research.

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Appendix – Tables

Table 1. List of economies

Advanced (23)	*Emerging (29)*
United States; United Kingdom; Austria; Belgium; Denmark; France; Germany; Italy; Netherlands; Norway; Sweden; Switzerland; Canada; Japan; Finland; Greece; Iceland; Ireland; Portugal; Spain; Australia; New Zealand; Euro area	Turkey; South Africa; Argentina; Brazil; Mexico; Venezuela; Israel; Hong Kong; India; Indonesia; Korea; Malaysia; Philippines; Singapore; Thailand; Bulgaria; Russia; China; Czech Republic; Slovak Republic; Hungary; Croatia; Slovenia; Poland; Romania; Taiwan; Estonia; Latvia; Lithuania

Table 2. Correlation matrix of measures of global risk aversion and VIX

	(1)	(2)	(3)	(4)	(5)	(6)
(1) VIX	1.00					
(2) Merril Lynch Risk Aversion Index	0.63	1.00				
(3) VIX˙RA (price of risk from VIX)	0.68	0.49	1.00			
(4) VIX˙UC (quantity of risk from VIX)	0.79	0.40	0.49	1.00		
(5) GIFT	0.73	0.71	0.59	0.51	1.00	
(6) Realised volatility of world stock mkt.	0.84	0.61	0.44	0.64	0.66	1.00

See Table 3 for definitions and sources

Table 3. Description of variables and sources

Variable	Description	Source	Frequency
Exchange rate	Bilateral nominal rate vs. USD. National currency per USD	IMF International Financial Statistics (IFS)	M
Risk aversion measures			
VIX	Implied volatility of S&P 500 index options (extend with VXO before 1990)	Haver/Chicago Board Options Exchange	M
GIFT	Generalised Index of Financial Turbulence (see text for further explanation)	ECB	M
Merril Lynch Global Risk Aversion indicator	Composite index of global risk aversion	Merril Lynch	M
VIX˙RA	Price of risk derived from the VIX	Bekaert et al. (2009)	M
VIX˙UC	Quantity of risk derived from the VIX	Bekaert et al. (2009)	M
Realised stock volatility	Based on the monthly standard deviation of daily returns on Datastream World Stock Market Index (covering up to 40 countries, including emerging economies)	Own calculations	M
Group 1: Speculative activity, exchange rate flexibility and policy measures			
Interest rate spread vs. USD	Spread between 1-month interbank rate (or closer substitute) and US 1-month interbank rate. Series extended using forward premium (see below)	Datastream	M
Forward premium	Difference between 1-month forward exchange rate and spot rate divided by spot rate, annualised	Datastream: Thomson Reuters and Barclays BRI	M
Growth of international reserves	Foreign exchange reserves. Log difference between time t and t-1	IMF IFS	M
Exchange rate flexibility vs. the USD	Computed as the average absolute depreciation or appreciation of a given currency vs. the USD in the preceding 12 months	Own calculations	M
Group 2: Country risk variables			
Inflation	Annual change in the consumer price index	IMF World Economic Outlook (WEO)	A
Public debt to GDP	Ratio of public debt to GDP	IMF WEO	A
Net foreign assets to GDP	Ratio of net foreign assets to GDP	IMF IFS and WEO	A
Current account to GDP	Ratio of current account to GDP	IMF WEO	A
FX Reserves to import	Ratio of foreign exchange reserves (M) to imports of goods and services (A)	IMF IFS and WEO	M/A
Country risk rating	Composite political (50%), economic (25%) and financial (25%) risk rating ranging between 0 (highest risk) and 100 (lowest risk)	International Country Risk Guide	A
Banking crisis	Dummy variable (1=crisis, 0=no crisis)	Laeven and Valencia (2008)	A
Rule of law	Includes several indicators which measure the extent to which agents have confidence in and abide by the rules of society	World Bank	A
Group 3: Size of the economy and size and liquidity of financial markets			
GDP Weight	PPP weight of world GDP	IMF WEO	A
Stock market capitalisation	From the World Bank database of Financial Development and Structure	World Bank	A
Private credit to GDP	From the World Bank database of Financial Development and Structure	World Bank	A
Stock market capital. to world GDP	From the World Bank database of Financial Development and Structure	World Bank	A
Private credit to world GDP	From the World Bank database of Financial Development and Structure	World Bank	A
Bid-ask spread	Spot exchange rate: ask-price minus bid-price divided by mid-price	Datastream: Thomson Reuters and Barclays	M
Group 4: Financial openness			
Financial openness	Ratio between the sum of external financial assets and liabilities and nominal GDP in USD	IMF IFS and WEO	A
International debt to GDP	From the World Bank database of Financial Development and Structure	World Bank	A
Foreign loans to GDP	From the World Bank database of Financial Development and Structure	World Bank	A
Capital account restrictions	See Schindler (2009)	IMF	A

Table 4. Descriptive statistics

	Full sample					Advanced economies					Emerging economies				
Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
Exch. rate depreciation vs. USD	15400	0.0068	0.0493	-0.3632	2.1546	6817	0.0029	0.0291	-0.1055	0.4877	8583	0.0099	0.0606	-0.3632	2.1546
Interest rate spread vs. US	11526	0.0385	0.0969	-0.0674	1.9941	6120	0.0143	0.0424	-0.0656	0.4820	5406	0.0658	0.1287	-0.0674	1.9941
Growth of international reserves	16809	0.0074	0.1078	-4.5126	1.1950	8029	0.0033	0.0962	-1.2876	1.1950	8780	0.0112	0.1173	-4.5126	1.1605
Change in interest rate spread vs. US	11472	-0.0003	0.0257	-0.5961	1.0263	6097	-0.0002	0.0074	-0.1791	0.1310	5375	-0.0004	0.0367	-0.5961	1.0263
Inflation	16516	0.1309	0.3256	-0.1201	3.4593	7751	0.0572	0.0934	-0.1201	0.7144	8765	0.1960	0.4278	-0.0998	3.4593
Public debt to GDP	13035	0.5262	0.3263	0.0000	2.6362	7367	0.6085	0.2937	0.0981	2.1860	5668	0.4193	0.3355	0.0000	2.6362
Net foreign assets to GDP	10686	-0.1308	0.4426	-2.6882	2.8761	6216	-0.1092	0.4158	-2.6882	1.4620	4470	-0.1610	0.4758	-1.0504	2.8761
Current account to GDP	17068	-0.0048	0.0580	-0.4061	0.2542	8027	-0.0044	0.0500	-0.4061	0.1948	9041	-0.0052	0.0643	-0.2546	0.2542
Foreign exchange reserves to imports	16362	0.2915	0.2530	0.0007	2.0632	7810	0.1918	0.1883	0.0007	1.6921	8552	0.3825	0.2697	0.0007	2.0632
Country risk rating	13754	75.342	10.684	38.500	96.000	6094	81.834	7.869	44.000	96.000	7660	70.178	9.7729	38.500	92.400
Banking crisis	17472	0.0172	0.1061	0.0000	1.0000	7728	0.0110	0.0853	0.0000	1.0000	9744	0.0222	0.1197	0.0000	1.0000
Rule of law	7540	0.8237	0.8710	-1.5900	2.1200	3335	1.5263	0.4820	-0.1300	2.1200	4205	0.2664	0.6884	-1.5900	1.7900
Bid-ask spread (basis points)	11157	12.247	20.1832	0.0000	494.31	5895	7.8499	11.421	0.0000	325.80	5262	17.174	25.918	0.0000	494.31
Weight in world GDP at PPP	17993	2.1067	4.1784	0.0156	23.695	8280	2.5663	4.6761	0.0156	23.695	9713	1.7150	3.6566	0.0284	21.258
Stock market capit. to GDP	11742	0.5496	0.6076	0.0002	5.0053	5157	0.6320	0.5146	0.0030	3.0344	6585	0.4851	0.6645	0.0002	5.0053
Private credit to GDP	14064	0.7007	0.4411	0.0643	2.6976	7470	0.8573	0.4249	0.1091	2.6976	6594	0.5233	0.3888	0.0643	1.7676
Stock market capit. to world GDP	11742	1.2766	3.8218	0.0001	38.364	5157	2.0676	5.3411	0.0012	38.364	6585	0.6572	1.6832	0.0001	16.250
Private credit to world GDP	14064	1.8823	5.2386	0.0027	41.722	7470	2.9383	6.6946	0.0043	41.722	6594	0.6861	2.2515	0.0027	18.079
Financial openness	10686	2.3065	2.8130	0.1070	25.907	6216	2.7819	2.9867	0.2864	25.907	4470	1.6454	2.4004	0.1070	23.903
International debt to GDP	11752	0.1899	0.2512	0.0000	3.2202	5267	0.3045	0.3160	0.0108	3.2202	6485	0.0968	0.1181	0.0000	0.8895
Foreign loans to GDP	6916	0.3366	0.4804	0.0176	3.3675	3059	0.4317	0.4107	0.0847	2.6064	3857	0.2613	0.5169	0.0176	3.3675
Capital account restrictions	5566	0.2785	0.3209	0.0000	1.0000	2783	0.0810	0.1245	0.0000	0.7083	2783	0.4760	0.3353	0.0000	1.0000

Note: See Table 3 for a description of the variables. The sample period goes from January 1986 to December 2009 or longest available.

Table 5. Baseline estimation

	(1) Baseline	(2) Baseline1	(3) Advanced	(4) Emerging	(5) Until Aug-2007	(6) From Aug 2007	(7) Before euro	(8) After euro
Lagged dependent variable	0.331***	0.331***	0.339***	0.320***	0.324***	0.236***	0.322***	0.313***
	(0.021)	(0.021)	(0.011)	(0.032)	(0.024)	(0.021)	(0.024)	(0.026)
Int. rate spread vs. US (lag)*VIX	0.001	0.001	0.054***	-0.005	0.001	0.097***	0.003	0.019
	(0.006)	(0.006)	(0.016)	(0.006)	(0.005)	(0.026)	(0.005)	(0.027)
Int. rate spread vs. US (lag)	0.038***	0.038***	-0.000	0.042***	0.040***	0.087**	0.016	0.051**
	(0.009)	(0.009)	(0.012)	(0.010)	(0.009)	(0.036)	(0.016)	(0.020)
Growth of FX reserves*VIX	-0.001		-0.004	0.001	0.011***	-0.008	0.010**	-0.016**
	(0.004)		(0.005)	(0.007)	(0.004)	(0.007)	(0.005)	(0.007)
Growth of FX reserves	-0.018***		-0.014**	-0.020***	-0.017***	-0.021***	-0.017***	-0.021***
	(0.004)		(0.007)	(0.004)	(0.005)	(0.003)	(0.006)	(0.004)
Growth of FX reserves*Peg to the USD*VIX		0.004						
		(0.004)						
Growth of FX reserves*Peg to the USD		-0.014**						
		(0.005)						
Δ(Int. rate spread vs. USD)$_t$*VIX	-0.037	-0.037	-0.123	-0.038	-0.029	-0.067	-0.049***	0.039
	(0.024)	(0.023)	(0.099)	(0.025)	(0.021)	(0.081)	(0.014)	(0.049)
Δ(Int. rate spread vs. USD)$_t$	0.047	0.048	-0.147**	0.056	0.049	0.114	0.061	0.006
	(0.038)	(0.039)	(0.070)	(0.042)	(0.040)	(0.138)	(0.042)	(0.066)
Pegged to the USD*VIX	-0.003**	-0.003**	-0.002*	-0.004**	0.000	-0.007***	0.003***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.002)
Pegged to the USD	-0.000	0.000	0.001	-0.001	0.000	-0.005*	-0.003	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)
Pegged to the EUR*VIX	-0.001	-0.001	0.000	-0.001	0.000	-0.002	0.000	-0.004***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Pegged to the EUR	-0.002*	-0.002*	-0.002	-0.002	-0.002*	-0.002	0.000	-0.002
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.004)	(0.000)	(0.001)
Pegged to the DM*VIX	-0.007***	-0.007***	-0.005***	-0.009***	-0.003***		-0.001	
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)		(0.001)	
Pegged to the DM	-0.001	-0.001	-0.001	0.001	-0.001		-0.000	
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)		(0.001)	
Standardized values of VIX	0.005***	0.005***	0.002	0.006***	0.001	0.007***	-0.002**	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Observations	9,710	9,710	4,451	5,259	8,604	1,106	4,556	5,154
Number of country	52	52	23	29	52	40	43	42
R2 Within	0.166	0.163	0.151	0.185	0.142	0.393	0.130	0.219
R2 Between	0.867	0.871	0.601	0.912	0.807	0.455	0.926	0.626
R2 Overall	0.179	0.176	0.152	0.200	0.157	0.391	0.155	0.225

The dependent variable is the monthly change in the bilateral exchange rate against the US dollar. The panel was estimated through OLS fixed-effects. Robust standard errors, allowing for clustering of residuals by country, are reported in parentheses. ***, **, * indicate statistical significance at the 1, 5, 10 percent level, respectively. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 6. Including measures of country risk and vulnerability

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged dependent variable	0.338***	0.338***	0.340***	0.337***	0.339***	0.338***	0.341***	0.312***	0.328***
	(0.019)	(0.015)	(0.022)	(0.020)	(0.020)	(0.022)	(0.021)	(0.023)	(0.016)
Int. rate spread vs. US (lag)*VIX	0.019	0.022	0.020	0.005	0.008	0.003	0.008	0.015	0.004
	(0.020)	(0.021)	(0.020)	(0.010)	(0.010)	(0.011)	(0.010)	(0.024)	(0.021)
Int. rate spread vs. US (lag)	0.043***	0.043**	0.051**	0.040***	0.040***	0.043***	0.040***	0.050**	0.053**
	(0.016)	(0.018)	(0.020)	(0.013)	(0.013)	(0.013)	(0.013)	(0.020)	(0.022)
Standardized values of VIX	0.005***	0.006***	0.005***	0.005***	0.005***	0.011	0.004***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.008)	(0.001)	(0.002)	(0.001)
Pegged to the USD*VIX	-0.003*	-0.003**	-0.002	-0.002	-0.003*	-0.002	-0.002	-0.005**	-0.003**
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Pegged to the USD	-0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Pegged to the EUR*VIX	-0.000	-0.001	-0.002	-0.002	-0.001	0.000	-0.000	-0.002*	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Pegged to the EUR	-0.002*	-0.002	-0.002	-0.002	-0.002*	-0.002**	-0.002**	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Pegged to the DM*VIX	-0.007***	-0.007***	-0.006***	-0.007***	-0.007***	-0.006***	-0.007***	-0.016***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Pegged to the DM	-0.000	-0.001	-0.000	-0.001	-0.001	-0.001	-0.001	0.002	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Growth of FX reserves*VIX	-0.001	-0.003	-0.006	-0.003	-0.001	-0.001	0.000	-0.010	-0.006
	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.007)	(0.005)
Growth of FX reserves	-0.019***	-0.019***	-0.018***	-0.019***	-0.019***	-0.019***	-0.020***	-0.023***	-0.018***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)
Inflation (lag12)* VIX	-0.018								
	(0.020)								
Inflation (lag12)	-0.008								
	(0.010)								
Public debt to GDP (lag12)*VIX		-0.003*							-0.004
		(0.002)							(0.002)
Public debt to GDP (lag12)		-0.000							0.002
		(0.001)							(0.002)
Net foreign assets to GDP (lag12)*VIX			-0.004***						-0.004**
			(0.001)						(0.002)
Net foreign assets to GDP (lag12)			-0.002						-0.001
			(0.001)						(0.002)
Curr. account to GDP (lag12)*VIX				-0.020***					0.000
				(0.007)					(0.011)
Curr. account to GDP (lag12)				-0.016**					-0.008
				(0.006)					(0.013)
FX reserves to imports (lag)*VIX					-0.000				
					(0.002)				
FX reserves to imports (lag)					-0.002				
					(0.002)				
Country rating (lag12)*VIX						-0.000			
						(0.000)			
Country rating (lag12)						0.000***			
						(0.000)			
Banking crisis (lag12)*VIX							-0.005		
							(0.004)		
Banking crisis (lag12)							-0.001		
							(0.006)		
Rule of law (lag12)*VIX								-0.001	
								(0.001)	
Rule of law (lag12)								0.009**	
								(0.004)	
Observations	9,681	8,689	7,436	9,693	9,680	9,029	9,286	5,704	6,976
Number of country	52	51	50	52	52	50	52	52	49
R2 Within	0.164	0.180	0.192	0.165	0.162	0.157	0.159	0.176	0.199
R2 Between	0.835	0.750	0.619	0.748	0.829	0.676	0.843	0.0157	0.472
R2 Overall	0.176	0.185	0.200	0.175	0.174	0.167	0.173	0.141	0.200

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 6a. Advanced economies. Including measures of country risk and vulnerability

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged dependent variable	0.333***	0.330***	0.338***	0.337***	0.337***	0.335***	0.337***	0.298***	0.328***
	(0.010)	(0.011)	(0.012)	(0.011)	(0.012)	(0.012)	(0.011)	(0.016)	(0.011)
Int. rate spread vs. US (lag)*VIX	0.115***	0.048***	0.036**	0.041**	0.054***	0.036**	0.062***	0.099***	0.034**
	(0.024)	(0.013)	(0.015)	(0.016)	(0.014)	(0.014)	(0.017)	(0.032)	(0.014)
Int. rate spread vs. US (lag)	0.044**	0.001	0.002	-0.000	0.007	0.003	-0.000	-0.021**	-0.011
	(0.020)	(0.013)	(0.014)	(0.012)	(0.013)	(0.014)	(0.011)	(0.010)	(0.012)
Standardized values of VIX	0.004**	0.007***	0.004**	0.003**	0.005***	0.010	0.002	-0.000	0.007***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.015)	(0.001)	(0.007)	(0.002)
Pegged to the USD*VIX	-0.002	-0.003**	-0.005***	-0.004***	-0.005***	-0.002	-0.002	-0.004**	-0.004***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Pegged to the USD	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
Pegged to the EUR*VIX	-0.001	-0.002	-0.000	0.002	-0.001	0.001	0.000	-0.003	-0.002
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
Pegged to the EUR	-0.003	-0.003	-0.002	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the DM*VIX	-0.004***	-0.006***	-0.006***	-0.005***	-0.006***	-0.005***	-0.005***	-0.014***	-0.006***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
Pegged to the DM	-0.001	-0.002	-0.001	-0.002	-0.001	-0.001	-0.001	0.001	-0.002
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)	(0.002)
Growth of FX reserves*VIX	-0.004	-0.007	-0.007	-0.004	-0.006	-0.004	-0.005	-0.016***	-0.008
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Growth of FX reserves	-0.014*	-0.013*	-0.015*	-0.014*	-0.014*	-0.013*	-0.013*	-0.004	-0.014*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.011)	(0.007)
Inflation (lag12)* VIX	-0.098***								
	(0.029)								
Inflation (lag12)	-0.066**								
	(0.025)								
Public debt to GDP (lag12)*VIX		-0.006***							-0.005***
		(0.002)							(0.001)
Public debt to GDP (lag12)		0.002							0.003
		(0.002)							(0.002)
Net foreign assets to GDP (lag12)*VIX			-0.005**						-0.005**
			(0.002)						(0.002)
Net foreign assets to GDP (lag12)			-0.006***						-0.002
			(0.001)						(0.003)
Curr. account to GDP (lag12)*VIX				-0.028					0.006
				(0.020)					(0.021)
Curr. account to GDP (lag12)				-0.027***					-0.033***
				(0.006)					(0.009)
FX reserves to imports (lag)*VIX					-0.008***				
					(0.003)				
FX reserves to imports (lag)					-0.001				
					(0.001)				
Country rating (lag12)*VIX						-0.000			
						(0.000)			
Country rating (lag12)						0.000			
						(0.000)			
Banking crisis (lag12)*VIX							-0.002		
							(0.003)		
Banking crisis (lag12)							0.012		
							(0.007)		
Rule of law (lag12)*VIX								0.003	
								(0.003)	
Rule of law (lag12)								0.014*	
								(0.008)	
Observations	4,451	4,295	3,894	4,451	4,451	4,194	4,319	1,816	3,769
Number of country	23	23	22	23	23	22	23	23	22
R2 Within	0.155	0.155	0.166	0.152	0.152	0.135	0.150	0.223	0.171
R2 Between	0.333	0.401	0.456	0.421	0.496	0.166	0.512	0.0141	0.558
R2 Overall	0.155	0.156	0.161	0.151	0.153	0.134	0.151	0.174	0.166

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 6b. Emerging economies. Including measures of country risk and vulnerability

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged dependent variable	0.334***	0.335***	0.336***	0.333***	0.335***	0.334***	0.335***	0.311***	0.313***
	(0.030)	(0.024)	(0.043)	(0.031)	(0.031)	(0.034)	(0.034)	(0.029)	(0.029)
Int. rate spread vs. US (lag)*VIX	0.012	0.005	0.012	0.000	0.003	0.002	0.003	0.003	-0.022
	(0.021)	(0.024)	(0.024)	(0.010)	(0.010)	(0.012)	(0.010)	(0.027)	(0.022)
Int. rate spread vs. US (lag)	0.046**	0.052**	0.057**	0.043***	0.043***	0.046***	0.044***	0.056**	0.068***
	(0.018)	(0.020)	(0.025)	(0.014)	(0.015)	(0.015)	(0.015)	(0.021)	(0.024)
Standardized values of VIX	0.006***	0.004***	0.006***	0.006***	0.005***	0.006	0.005***	0.008***	0.006***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.009)	(0.001)	(0.002)	(0.002)
Pegged to the USD*VIX	-0.003	-0.003*	-0.001	-0.002	-0.003	-0.002	-0.002	-0.004*	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the USD	-0.001	-0.000	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Pegged to the EUR*VIX	-0.001	-0.001	-0.003*	-0.003*	-0.001	-0.001	-0.001	-0.002	-0.004**
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Pegged to the EUR	-0.002	-0.001	-0.001	-0.002	-0.002	-0.003*	-0.003*	-0.002	-0.000
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the DM*VIX	-0.009***	-0.007**	-0.008**	-0.011***	-0.009***	-0.007**	-0.009***	-0.014***	-0.009**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Pegged to the DM	0.002	0.003	0.001	0.002	0.001	0.001	0.000	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Growth of FX reserves*VIX	0.000	-0.003	-0.001	0.001	0.001	0.001	0.004	-0.005	-0.009
	(0.007)	(0.009)	(0.011)	(0.007)	(0.006)	(0.006)	(0.006)	(0.011)	(0.012)
Growth of FX reserves	-0.021***	-0.021***	-0.020***	-0.021***	-0.021***	-0.023***	-0.025***	-0.025***	-0.020***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.006)	(0.005)
Inflation (lag12)* VIX	-0.015								
	(0.021)								
Inflation (lag12)	-0.005								
	(0.011)								
Public debt to GDP (lag12)*VIX		0.004							0.005
		(0.003)							(0.003)
Public debt to GDP (lag12)		-0.003							0.000
		(0.003)							(0.002)
Net foreign assets to GDP (lag12)*VIX			-0.003***						-0.002
			(0.001)						(0.002)
Net foreign assets to GDP (lag12)			0.000						-0.001
			(0.002)						(0.003)
Curr. account to GDP (lag12)*VIX				-0.020***					-0.021*
				(0.006)					(0.011)
Curr. account to GDP (lag12)				-0.017*					0.011
				(0.009)					(0.019)
FX reserves to imports (lag)*VIX					0.000				
					(0.002)				
FX reserves to imports (lag)					-0.002				
					(0.002)				
Country rating (lag12)*VIX						-0.000			
						(0.000)			
Country rating (lag12)						0.000***			
						(0.000)			
Banking crisis (lag12)*VIX							-0.011		
							(0.010)		
Banking crisis (lag12)							-0.010		
							(0.008)		
Rule of law (lag12)*VIX								-0.002	
								(0.002)	
Rule of law (lag12)								0.007	
								(0.005)	
Observations	5,230	4,394	3,542	5,242	5,229	4,835	4,967	3,888	3,207
Number of country	29	28	28	29	29	28	29	29	27
R2 Within	0.177	0.214	0.219	0.178	0.175	0.173	0.173	0.173	0.251
R2 Between	0.881	0.776	0.736	0.771	0.883	0.767	0.898	0.0990	0.527
R2 Overall	0.191	0.220	0.234	0.189	0.190	0.185	0.188	0.165	0.255

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 7. Including measures of size and liquidity of financial and foreign exchange markets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged dependent variable	0.325***	0.340***	0.338***	0.329***	0.337***	0.320***	0.337***
	(0.016)	(0.022)	(0.027)	(0.020)	(0.032)	(0.023)	(0.032)
Int. rate spread vs. US (lag)*VIX	0.004	0.018	0.027	0.021	0.019	0.015	0.021
	(0.016)	(0.020)	(0.021)	(0.024)	(0.022)	(0.025)	(0.022)
Int. rate spread vs. US (lag)	0.046***	0.051**	0.051**	0.065***	0.054**	0.070***	0.053**
	(0.017)	(0.020)	(0.021)	(0.018)	(0.023)	(0.018)	(0.023)
Standardized values of VIX	0.003	0.005***	0.000	0.003	0.001	0.000	-0.001
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.003)
Pegged to the USD*VIX	-0.002	-0.002	-0.001	-0.001	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Pegged to the USD	-0.000	-0.001	-0.001	-0.001	0.000	0.000	0.000
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
Pegged to the EUR*VIX	-0.001	-0.002	-0.002	-0.001	-0.000	0.000	-0.000
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Pegged to the EUR	-0.001	-0.002	-0.002*	-0.002	-0.002	-0.001	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Pegged to the DM*VIX	-0.006***	-0.007***	-0.006***	-0.006***	-0.005***	-0.002	-0.004**
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Pegged to the DM	-0.000	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Growth of FX reserves*VIX	-0.004	-0.005	-0.005	-0.003	0.012	0.010**	0.013
	(0.007)	(0.005)	(0.005)	(0.005)	(0.008)	(0.005)	(0.008)
Growth of FX reserves	-0.016***	-0.018***	-0.016**	-0.019***	-0.012*	-0.016**	-0.012*
	(0.004)	(0.004)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Net foreign assets to GDP (lag12)*VIX	-0.004**	-0.004***	-0.008***	-0.004***	-0.003***	-0.003**	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Net foreign assets to GDP (lag12)	-0.003*	-0.002	-0.001	-0.002	0.000	-0.001	0.001
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Bid-ask spread (lag)*VIX	0.000						
	(0.000)						
Bid-ask spread (lag)	0.000						
	(0.000)						
Weight in world GDP (lag12)*VIX		-0.000*					0.001
		(0.000)					(0.000)
Weight in world GDP (lag12)		-0.001					-0.001
		(0.001)					(0.001)
Stock mkt. capital. to GDP (lag12)*VIX			0.004***				0.002
			(0.001)				(0.001)
Stock mkt. capital. to GDP (lag12)			0.000				-0.001
			(0.001)				(0.001)
Private credit to GDP (lag12)*VIX				0.000			
				(0.001)			
Private credit to GDP (lag12)				0.001			
				(0.001)			
Stock mkt capital. to world GDP (lag12)*VIX					-0.000**		-0.001*
					(0.000)		(0.000)
Stock mkt capital. to world GDP (lag12)					-0.000		-0.000
					(0.000)		(0.000)
Private credit to world GDP (lag12)*VIX						-0.000	
						(0.000)	
Private credit to world GDP (lag12)						0.000	
						(0.000)	
Observations	6,871	7,436	6,123	6,837	5,694	6,375	5,694
Number of country	49	50	50	49	50	49	50
R2 Within	0.226	0.192	0.208	0.183	0.156	0.149	0.156
R2 Between	0.447	0.448	0.631	0.498	0.588	0.399	0.321
R2 Overall	0.223	0.184	0.217	0.186	0.168	0.152	0.134

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 7a. Advanced economies. Including measures of size and liquidity of financial and foreign exchange markets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged dependent variable	0.329***	0.338***	0.329***	0.334***	0.315***	0.318***	0.314***
	(0.014)	(0.012)	(0.015)	(0.013)	(0.015)	(0.014)	(0.015)
Int. rate spread vs. US (lag)*VIX	0.067***	0.034**	0.060***	0.033*	0.024***	-0.006	0.027***
	(0.015)	(0.014)	(0.007)	(0.017)	(0.008)	(0.019)	(0.008)
Int. rate spread vs. US (lag)	-0.024	0.002	0.007	-0.006	0.001	-0.013	-0.000
	(0.016)	(0.015)	(0.019)	(0.015)	(0.017)	(0.015)	(0.016)
Standardized values of VIX	0.006***	0.004***	-0.002	-0.000	-0.000	-0.000	-0.002
	(0.002)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)	(0.003)
Pegged to the USD*VIX	-0.006***	-0.003	-0.004***	-0.004**	0.001	-0.001	0.000
	(0.001)	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Pegged to the USD	0.001	0.001	0.001	0.001	0.002	0.002	0.002
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
Pegged to the EUR*VIX	-0.001	-0.000	0.001	0.001	0.001	0.001	0.001
	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)
Pegged to the EUR	-0.001	-0.002	-0.004	-0.003	-0.004**	-0.003	-0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the DM*VIX	-0.006***	-0.006***	-0.005***	-0.003**	-0.005***	-0.002	-0.004**
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Pegged to the DM	-0.000	-0.001	-0.002	-0.001	-0.002	-0.001	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Growth of FX reserves*VIX	-0.012**	-0.006	-0.004	0.002	0.015	0.013*	0.014
	(0.005)	(0.006)	(0.007)	(0.005)	(0.011)	(0.007)	(0.011)
Growth of FX reserves	-0.012	-0.015*	-0.008	-0.015*	-0.006	-0.014	-0.006
	(0.008)	(0.007)	(0.008)	(0.008)	(0.009)	(0.008)	(0.009)
Net foreign assets to GDP (lag12)*VIX	-0.004**	-0.005**	-0.008***	-0.006***	-0.007***	-0.006***	-0.008***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Net foreign assets to GDP (lag12)	-0.003	-0.006***	-0.004	-0.004	-0.001	-0.005	-0.001
	(0.002)	(0.001)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
Bid-ask spread (lag)*VIX	-0.000**						
	(0.000)						
Bid-ask spread (lag)	0.000***						
	(0.000)						
Weight in world GDP (lag12)*VIX		-0.000					0.000
		(0.000)					(0.000)
Weight in world GDP (lag12)		-0.000					-0.000
		(0.000)					(0.000)
Stock mkt. capital. to GDP (lag12)*VIX			0.003***				0.001
			(0.001)				(0.002)
Stock mkt. capital. to GDP (lag12)			-0.000				-0.002
			(0.001)				(0.001)
Private credit to GDP (lag12)*VIX				0.002			
				(0.002)			
Private credit to GDP (lag12)				0.001			
				(0.001)			
Stock mkt capital. to world GDP (lag12)*VIX					-0.000		-0.000
					(0.000)		(0.000)
Stock mkt capital. to world GDP (lag12)					-0.000		0.000
					(0.000)		(0.000)
Private credit to world GDP (lag12)*VIX						0.000	
						(0.000)	
Private credit to world GDP (lag12)						-0.000	
						(0.000)	
Observations	3,541	3,894	2,992	3,667	2,860	3,491	2,860
Number of country	22	22	22	22	22	22	22
R2 Within	0.180	0.166	0.192	0.146	0.118	0.116	0.119
R2 Between	0.382	0.427	0.344	0.446	0.496	0.396	0.543
R2 Overall	0.177	0.159	0.188	0.143	0.118	0.111	0.119

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 7b. Emerging economies. Including measures of size and liquidity of financial and foreign exchange markets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lagged dependent variable	0.312***	0.335***	0.339***	0.310***	0.348***	0.302***	0.349***
	(0.028)	(0.043)	(0.049)	(0.036)	(0.060)	(0.045)	(0.060)
Int. rate spread vs. US (lag)*VIX	-0.009	0.012	0.017	0.012	0.016	0.014	0.016
	(0.016)	(0.024)	(0.025)	(0.030)	(0.026)	(0.031)	(0.027)
Int. rate spread vs. US (lag)	0.057***	0.056**	0.056**	0.079***	0.058**	0.083***	0.057*
	(0.020)	(0.025)	(0.026)	(0.020)	(0.028)	(0.020)	(0.028)
Standardized values of VIX	0.002	0.005***	0.001	0.003	0.001	0.001	-0.000
	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)
Pegged to the USD*VIX	0.000	-0.002	0.000	0.000	0.001	0.002	0.001
	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Pegged to the USD	-0.001	-0.001	-0.001	-0.001	-0.001	-0.000	-0.001
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the EUR*VIX	-0.002	-0.003*	-0.003*	-0.003	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Pegged to the EUR	-0.001	-0.001	-0.002	-0.001	-0.001	-0.000	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the DM*VIX	-0.007**	-0.008**	-0.002	-0.007*	-0.002	-0.003	-0.001
	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
Pegged to the DM	0.003	0.001	0.005	0.002	0.005	0.003	0.005
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
Growth of FX reserves*VIX	0.004	-0.001	-0.005	0.000	0.011	0.014*	0.010
	(0.015)	(0.011)	(0.009)	(0.011)	(0.010)	(0.008)	(0.011)
Growth of FX reserves	-0.017***	-0.019***	-0.026***	-0.023**	-0.019**	-0.016*	-0.019**
	(0.006)	(0.005)	(0.008)	(0.010)	(0.008)	(0.009)	(0.008)
Net foreign assets to GDP (lag12)*VIX	-0.003**	-0.003**	-0.008***	-0.004***	-0.001	-0.001	-0.002
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.003)
Net foreign assets to GDP (lag12)	-0.003	0.000	0.000	-0.000	0.001	0.000	0.001
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Bid-ask spread (lag)*VIX	0.000						
	(0.000)						
Bid-ask spread (lag)	0.000						
	(0.000)						
Weight in world GDP (lag12)*VIX		0.000					0.002*
		(0.000)					(0.001)
Weight in world GDP (lag12)		-0.002*					-0.002
		(0.001)					(0.004)
Stock mkt. capital. to GDP (lag12)*VIX			0.004***				0.002
			(0.001)				(0.002)
Stock mkt. capital. to GDP (lag12)			0.001				0.000
			(0.001)				(0.002)
Private credit to GDP (lag12)*VIX				0.003			
				(0.002)			
Private credit to GDP (lag12)				0.001			
				(0.002)			
Stock mkt capital. to world GDP (lag12)*VIX					-0.000		-0.002*
					(0.000)		(0.001)
Stock mkt capital. to world GDP (lag12)					-0.001*		-0.001
					(0.000)		(0.001)
Private credit to world GDP (lag12)*VIX						-0.000	
						(0.000)	
Private credit to world GDP (lag12)						-0.001	
						(0.004)	
Observations	3,330	3,542	3,131	3,170	2,834	2,884	2,834
Number of country	27	28	28	27	28	27	28
R2 Within	0.277	0.219	0.229	0.225	0.186	0.189	0.188
R2 Between	0.491	0.364	0.749	0.604	0.687	0.565	0.347
R2 Overall	0.276	0.197	0.242	0.231	0.204	0.197	0.162

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 8. Including measures of financial openness

	(1)	(2)	(3)	(4)	(5)
Lagged dependent variable	0.336***	0.336***	0.294***	0.360***	0.359***
	(0.032)	(0.032)	(0.038)	(0.048)	(0.048)
Int. rate spread vs. US (lag)*VIX	0.019	0.019	0.016	0.012	0.011
	(0.022)	(0.022)	(0.024)	(0.025)	(0.024)
Int. rate spread vs. US (lag)	0.053**	0.053**	0.067***	0.054**	0.054**
	(0.023)	(0.023)	(0.021)	(0.026)	(0.026)
Standardized values of VIX	0.001	0.001	0.002	-0.000	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the USD*VIX	0.002	0.002	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the USD	0.000	0.000	-0.001	0.001	0.001
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Pegged to the EUR*VIX	-0.000	-0.000	-0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the EUR	-0.001	-0.002	-0.001	-0.003*	-0.003*
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Pegged to the DM*VIX	-0.005***	-0.005***	-0.011***	-0.009***	-0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the DM	-0.001	-0.000	-0.003	0.001	0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Growth of FX reserves*VIX	0.012	0.012	0.001	-0.003	-0.003
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Growth of FX reserves	-0.012*	-0.012*	-0.017**	-0.006	-0.006
	(0.006)	(0.006)	(0.008)	(0.009)	(0.009)
Net foreign assets to GDP (lag12)*VIX	-0.003*	-0.003***	-0.003**	-0.003**	-0.003**
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Net foreign assets to GDP (lag12)	0.001	-0.000	-0.005*	-0.004	-0.005
	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
Stock mkt capital. to world GDP (lag12)*VIX	-0.000**	-0.000**	-0.000**	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock mkt capital. to world GDP (lag12)	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Financial openness (lag12)*VIX	-0.000				
	(0.000)				
Financial openness (lag12)	-0.001**				
	(0.000)				
International debt to GDP (lag12)*VIX		0.000			
		(0.002)			
International debt to GDP (lag12)		-0.004**			
		(0.002)			
Foreign loans to GDP (lag12)*VIX			-0.001		
			(0.002)		
Foreign loans to GDP (lag12)			-0.014***		
			(0.003)		
Capital restrictions (lag12)*VIX				0.005	
				(0.004)	
Capital restrictions (lag12)				-0.002	
				(0.004)	
Inflow restrictions (lag12)*VIX					0.008**
					(0.004)
Inflow restrictions (lag12)					-0.001
					(0.004)
Observations	5,694	5,694	4,014	3,315	3,315
Number of country	50	50	50	45	45
R2 Within	0.156	0.156	0.154	0.178	0.179
R2 Between	0.504	0.549	0.157	0.408	0.393
R2 Overall	0.164	0.166	0.111	0.184	0.184

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 8a. Advanced economies. Including measures of financial openness

	(1)	(2)	(3)	(4)	(5)
Lagged dependent variable	0.313***	0.313***	0.237***	0.274***	0.275***
	(0.015)	(0.015)	(0.023)	(0.022)	(0.022)
Int. rate spread vs. US (lag)*VIX	0.024***	0.025***	0.021***	0.004	0.010
	(0.008)	(0.008)	(0.007)	(0.014)	(0.012)
Int. rate spread vs. US (lag)	-0.001	-0.000	-0.054**	-0.069***	-0.071***
	(0.016)	(0.016)	(0.026)	(0.023)	(0.023)
Standardized values of VIX	0.000	0.000	0.002	0.000	-0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the USD*VIX	0.001	0.001	-0.002	-0.001	-0.001
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
Pegged to the USD	0.002	0.002	0.002	0.005*	0.005
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Pegged to the EUR*VIX	0.001	0.001	0.001	-0.000	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Pegged to the EUR	-0.002	-0.003	-0.002	-0.006**	-0.005**
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Pegged to the DM*VIX	-0.005***	-0.005***	-0.011***	-0.011***	-0.010***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Pegged to the DM	-0.002	-0.002	-0.007*	-0.004**	-0.004*
	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)
Growth of FX reserves*VIX	0.014	0.015	-0.015*	-0.014**	-0.013**
	(0.011)	(0.011)	(0.007)	(0.005)	(0.006)
Growth of FX reserves	-0.006	-0.006	-0.006	-0.007	-0.007
	(0.009)	(0.009)	(0.014)	(0.012)	(0.012)
Net foreign assets to GDP (lag12)*VIX	-0.006***	-0.007***	-0.007***	-0.004***	-0.003***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Net foreign assets to GDP (lag12)	-0.002	-0.005	-0.014	-0.020*	-0.021*
	(0.004)	(0.004)	(0.008)	(0.011)	(0.012)
Stock mkt capital. to world GDP (lag12)*VIX	-0.000	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock mkt capital. to world GDP (lag12)	0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Financial openness (lag12)*VIX	-0.000				
	(0.000)				
Financial openness (lag12)	-0.001**				
	(0.000)				
International debt to GDP (lag12)*VIX		-0.000			
		(0.001)			
International debt to GDP (lag12)		-0.005*			
		(0.003)			
Foreign loans to GDP (lag12)*VIX			-0.003		
			(0.003)		
Foreign loans to GDP (lag12)			-0.014***		
			(0.003)		
Capital restrictions (lag12)*VIX				0.016*	
				(0.008)	
Capital restrictions (lag12)				-0.009	
				(0.006)	
Inflow restrictions (lag12)*VIX					0.019**
					(0.009)
Inflow restrictions (lag12)					0.001
					(0.011)
Observations	2,860	2,860	1,456	1,492	1,492
Number of country	22	22	22	22	22
R2 Within	0.119	0.119	0.122	0.142	0.142
R2 Between	0.289	0.219	0.0993	0.0132	0.00953
R2 Overall	0.110	0.110	0.0481	0.0626	0.0586

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 8b. Emerging economies. Including measures of financial openness

	(1)	(2)	(3)	(4)	(5)
Lagged dependent variable	0.347***	0.347***	0.309***	0.386***	0.385***
	(0.060)	(0.060)	(0.053)	(0.073)	(0.073)
Int. rate spread vs. US (lag)*VIX	0.014	0.017	0.014	0.015	0.014
	(0.027)	(0.025)	(0.027)	(0.028)	(0.028)
Int. rate spread vs. US (lag)	0.056*	0.056*	0.072***	0.057*	0.057*
	(0.029)	(0.028)	(0.023)	(0.030)	(0.030)
Standardized values of VIX	0.004	0.003	0.002	-0.003	-0.003
	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
Pegged to the USD*VIX	0.001	0.001	0.001	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Pegged to the USD	-0.001	-0.001	-0.001	0.000	0.000
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Pegged to the EUR*VIX	0.001	0.001	0.000	0.006*	0.005
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
Pegged to the EUR	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Pegged to the DM*VIX	-0.003*	-0.003	-0.003*	0.017	0.018
	(0.002)	(0.002)	(0.001)	(0.013)	(0.014)
Pegged to the DM	0.004	0.004	-0.001	0.004	0.004
	(0.003)	(0.003)	(0.002)	(0.004)	(0.004)
Growth of FX reserves*VIX	0.011	0.012	0.013	0.014	0.012
	(0.010)	(0.010)	(0.012)	(0.014)	(0.014)
Growth of FX reserves	-0.019**	-0.019**	-0.021**	-0.005	-0.006
	(0.008)	(0.008)	(0.009)	(0.015)	(0.014)
Net foreign assets to GDP (lag12)*VIX	0.003	-0.000	-0.000	0.000	0.000
	(0.004)	(0.001)	(0.001)	(0.002)	(0.002)
Net foreign assets to GDP (lag12)	0.002	0.002	-0.002	0.001	0.002
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Stock mkt capital. to world GDP (lag12)*VIX	-0.000	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock mkt capital. to world GDP (lag12)	-0.001**	-0.001*	-0.001**	-0.001	-0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Financial openness (lag12)*VIX	-0.001				
	(0.001)				
Financial openness (lag12)	-0.002				
	(0.002)				
International debt to GDP (lag12)*VIX		-0.012			
		(0.010)			
International debt to GDP (lag12)		-0.014			
		(0.014)			
Foreign loans to GDP (lag12)*VIX			-0.001		
			(0.002)		
Foreign loans to GDP (lag12)			-0.007		
			(0.007)		
Capital restrictions (lag12)*VIX				0.008*	
				(0.005)	
Capital restrictions (lag12)				-0.000	
				(0.004)	
Inflow restrictions (lag12)*VIX					0.009**
					(0.004)
Inflow restrictions (lag12)					-0.001
					(0.004)
Observations	2,834	2,834	2,558	1,823	1,823
Number of country	28	28	28	23	23
R2 Within	0.187	0.188	0.179	0.208	0.209
R2 Between	0.527	0.590	0.388	0.735	0.727
R2 Overall	0.195	0.198	0.172	0.227	0.227

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 9. Robustness of final model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Final	Advanced	Emerging	Until Aug-2007	From Aug-2007	Before euro	After euro
Lagged dependent variable	0.342***	0.334***	0.342***	0.346***	0.211***	0.405***	0.306***
	(0.027)	(0.015)	(0.049)	(0.033)	(0.023)	(0.042)	(0.032)
Int. rate spread vs. US (lag)*VIX	0.021	0.059***	0.012	0.019	0.098***	0.051**	-0.002
	(0.021)	(0.012)	(0.024)	(0.022)	(0.021)	(0.020)	(0.025)
Int. rate spread vs. US (lag)	0.051**	0.010	0.056**	0.054**	0.016	0.024	0.057**
	(0.021)	(0.020)	(0.026)	(0.023)	(0.063)	(0.045)	(0.025)
Pegged to the USD*VIX	-0.001	-0.002	-0.001	0.002	-0.002	0.007*	-0.002
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)	(0.002)
Pegged to the USD	-0.001	0.001	-0.002	0.000	-0.012***	-0.002	-0.001
	(0.001)	(0.002)	(0.002)	(0.001)	(0.003)	(0.005)	(0.001)
Pegged to the EUR*VIX	-0.002**	-0.000	-0.003*	0.001	-0.002	0.000	-0.004***
	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)	(0.000)	(0.001)
Pegged to the EUR	-0.002	-0.004*	-0.001	-0.002	-0.011**	0.000	-0.002
	(0.001)	(0.002)	(0.002)	(0.001)	(0.005)	(0.000)	(0.002)
Pegged to the DM*VIX	-0.009***	-0.008***	-0.006***	-0.005***		-0.000	
	(0.001)	(0.001)	(0.002)	(0.002)		(0.002)	
Pegged to the DM	-0.001	-0.002	0.005	0.000		0.000	
	(0.001)	(0.002)	(0.003)	(0.001)		(0.002)	
Growth of FX reserves*VIX	-0.007	-0.005	-0.008	0.014*	-0.009	0.028**	-0.016**
	(0.005)	(0.006)	(0.010)	(0.008)	(0.008)	(0.014)	(0.006)
Growth of FX reserves	-0.016**	-0.008	-0.027***	-0.012**	-0.027	-0.013	-0.021**
	(0.006)	(0.008)	(0.008)	(0.006)	(0.036)	(0.010)	(0.008)
Net foreign assets to GDP (lag12)*VIX	-0.004***	-0.006**	-0.003***	-0.003**	-0.003***	-0.004	-0.005***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Net foreign assets to GDP (lag12)	-0.002	-0.005	-0.000	0.001	-0.020	0.017	-0.004*
	(0.002)	(0.003)	(0.002)	(0.002)	(0.019)	(0.010)	(0.002)
Stock mkt capital. to world GDP (lag12)*VIX	-0.000**	-0.000	0.000	-0.000**	-0.000	-0.000	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Stock mkt capital. to world GDP (lag12)	-0.000	-0.000	-0.001*	-0.000	0.001	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Standardized values of VIX	0.005***	0.003*	0.006***	0.000	0.005***	-0.005**	0.007***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
Observations	6,123	2,992	3,131	5,489	634	2,049	4,074
Number of country	50	22	28	50	38	32	41
R2 Within	0.204	0.189	0.225	0.160	0.446	0.158	0.239
R2 Between	0.581	0.286	0.698	0.580	0.325	0.619	0.378
R2 Overall	0.210	0.181	0.235	0.171	0.354	0.164	0.234

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability.

Table 10. Nonlinearities and alternative measures of Risk Aversion (RA)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged dependent variable	0.3415***	0.3411***	0.3395***	0.3622***	0.3565***	0.3576***	0.3524***	0.3337***	0.3575***
	(0.0270)	(0.0260)	(0.0266)	(0.0251)	(0.0255)	(0.0255)	(0.0291)	(0.0274)	(0.0277)
Int. rate spread vs. US (lag)*VIX	0.0207	-0.0028	0.0148	-0.0094	-0.0004	0.0227	0.0256	0.0214	0.0170
	(0.0209)	(0.0120)	(0.0189)	(0.0121)	(0.0149)	(0.0163)	(0.0215)	(0.0199)	(0.0212)
Int. rate spread vs. US (lag)	0.0515**	0.0541**	0.0483**	0.0554**	0.0541**	0.0516**	0.0589**	0.0545**	0.0535**
	(0.0213)	(0.0232)	(0.0219)	(0.0248)	(0.0238)	(0.0218)	(0.0247)	(0.0220)	(0.0219)
Pegged to the USD*VIX	-0.0007	-0.0023	0.0015	-0.0006	-0.0005	0.0001	0.0009	-0.0010	0.0012
	(0.0017)	(0.0018)	(0.0017)	(0.0010)	(0.0009)	(0.0011)	(0.0021)	(0.0016)	(0.0013)
Pegged to the USD	-0.0009	-0.0007	-0.0010	-0.0013	-0.0013	-0.0014	-0.0012	-0.0010	-0.0017
	(0.0015)	(0.0015)	(0.0013)	(0.0014)	(0.0014)	(0.0016)	(0.0015)	(0.0015)	(0.0017)
Pegged to the EUR*VIX	-0.0025**	-0.0034***	-0.0014	0.0008	-0.0006	-0.0031***	-0.0014	-0.0017*	-0.0024**
	(0.0012)	(0.0012)	(0.0011)	(0.0009)	(0.0008)	(0.0008)	(0.0013)	(0.0010)	(0.0011)
Pegged to the EUR	-0.0023	-0.0024*	-0.0021	-0.0025	-0.0023	-0.0024	-0.0025*	-0.0023*	-0.0023
	(0.0014)	(0.0014)	(0.0015)	(0.0015)	(0.0015)	(0.0014)	(0.0014)	(0.0014)	(0.0014)
Pegged to the DM*VIX	-0.0092***	-0.0083***	-0.0060***	0.0052***	-0.0017**	-0.0021**	-0.0080***	-0.0082***	-0.0106***
	(0.0014)	(0.0013)	(0.0012)	(0.0010)	(0.0008)	(0.0009)	(0.0016)	(0.0011)	(0.0014)
Pegged to the DM	-0.0006	-0.0006	-0.0006	-0.0008	-0.0005	-0.0005	0.0021	-0.0004	0.0025*
	(0.0015)	(0.0014)	(0.0016)	(0.0014)	(0.0016)	(0.0016)	(0.0018)	(0.0016)	(0.0014)
Growth of FX reserves*VIX	-0.0075	-0.0094**	-0.0056	-0.0054	0.0067	-0.0055	-0.0170**	-0.0092*	-0.0052
	(0.0047)	(0.0046)	(0.0050)	(0.0058)	(0.0052)	(0.0059)	(0.0074)	(0.0048)	(0.0042)
Growth of FX reserves	-0.0165**	-0.0158**	-0.0190***	-0.0187***	-0.0184***	-0.0193***	-0.0226***	-0.0146**	-0.0225***
	(0.0063)	(0.0063)	(0.0065)	(0.0061)	(0.0061)	(0.0072)	(0.0081)	(0.0060)	(0.0068)
Net foreign assets to GDP (lag12)*VIX	-0.0044***	-0.0046***	-0.0041***	0.0034***	-0.0006	-0.0027**	-0.0038***	-0.0040***	-0.0034***
	(0.0013)	(0.0012)	(0.0012)	(0.0012)	(0.0004)	(0.0010)	(0.0012)	(0.0012)	(0.0012)
Net foreign assets to GDP (lag12)	-0.0016	-0.0014	-0.0027	-0.0043*	-0.0042**	-0.0035*	-0.0034*	-0.0009	-0.0030
	(0.0016)	(0.0018)	(0.0018)	(0.0022)	(0.0020)	(0.0018)	(0.0019)	(0.0017)	(0.0018)
Stock mkt capital. to world GDP (lag12)*VIX	-0.0002**	-0.0002**	-0.0001***	0.0001**	-0.0000	-0.0001	-0.0001**	-0.0001**	-0.0001**
	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0000)
Stock mkt capital. to world GDP (lag12)	-0.0001	-0.0001	-0.0001	-0.0000	-0.0000	-0.0000	0.0000	-0.0001	-0.0000
	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)
RA (VIX)	0.0049***								
	(0.0013)								
RA (High VIX, above 90p)		0.0066***							
		(0.0012)							
RA (VIX above mean)			0.0027**						
			(0.0012)						
RA (VIX below mean)				-0.0016*					
				(0.0009)					
RA (Price of risk from VIX)					0.0013				
					(0.0009)				
RA (Quantity of risk from VIX)						0.0016**			
						(0.0007)			
RA (ECB GIFT)							0.0025*		
							(0.0014)		
RA (Realised volatility)								0.0047***	
								(0.0011)	
RA (Merrill Lynch RAI)									0.0020
									(0.0013)
Observations	6,123	6,123	6,123	6,123	6,080	6,080	5,286	6,123	5,729
Number of country	50	50	50	50	50	50	50	50	50
R2 Within	0.204	0.203	0.183	0.170	0.160	0.167	0.194	0.209	0.189
R2 Between	0.581	0.532	0.591	0.524	0.486	0.515	0.531	0.574	0.544
R2 Overall	0.210	0.208	0.188	0.174	0.162	0.171	0.197	0.214	0.194

See notes to Table 5 and Table 3 for a description of the variables and the estimation method. The sample period is January 1986 to December 2009, unless otherwise stated and depending on data availability. Note that the RA measure in column (4) has a negative sign, which explains the opposite signs in the estimated coefficients.