Dollarization: The Link between Devaluation and Default Risk

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1 Introduction

Recent exchange rate crises have led many to conclude that countries should either adopt floating rates or a fixed rate with strong institutional backing (see for example Eichengreen 1994, Mussa et al 2000)[1]. The advice stemming from the Washington institutions has tended to be towards the floating end of the spectrum but the recent launch of the Euro has brought the other extreme (fixed for good) to the forefront of monetary policy discussion.[2] In this corner solution debate, strong institutional backing for the fixed end of the spectrum has been interpreted as either a currency board rule, 'dollarization' or even full monetary union.

We refer to dollarization as either the unilateral adoption of the dollar or other internationally used currency (the Euro might be a good candidate for

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[1] However, Levy-Yeyati and Sturzenegger (2000b), employing a de facto classification of exchange rate regimes, do not find a trend towards the extremes. See also Powell (2000) for related comments.

[2] See Bayoumi and Eichengreen (1994), Eichengreen (1998), Frankel (1999), Martirena Mantel (1997) and Levy-Yeyati and Sturzenegger (2000). Carrera and Sturzenegger (2000) provide a collection of papers which analyse the convenience of launching a monetary union, european style among Mercosur economies. In that volume Cohen (2000), discusses other comparable historical experiences of monetary union. During the XIX century he mentions the Latin Monetary Union undertaken by France with some of its neighbors and the Scandinavian Monetary Union between Denmark, Norway and Sweden. During the XXth he mentions the economic union between Belgium and Luxembourg, the Caribbean dollar area, the Franc zone in Africa, and the monetary union of South Africa with three of its neighbors.

several East European countries) or as the adoption of such a currency through the means of a Monetary Agreement which might fall short of full monetary union (we would advocate that full monetary union implies institutions to jointly determine monetary policy). The advantages of such a dramatic policy shift are normally couched in terms of the benefits of the elimination of currency risk and the effect that that would have on interest rates and the potential for greater integration (in terms of trade and investment) with the adopted currency country (see for example Guidotti, Powell and Escudé 2000). Greater integration, while supported by recent papers (see Frankel and Rose 2000, Rose 1999), appears as a somewhat intangible benefit. In contrast, the elimination of devaluation risk appears as extremely direct. However, less clear is the link between eliminating devaluation risk and the reduction in interest rates in the adopted currency. In our view then, eliminating devaluation risk is potentially the most important benefit from 'dollarizing' and yet the mechanism by which that feeds through to lower interest rates, higher investment and growth remains poorly understood and largely untested. This is then the focus of this paper.

The question we address is what would happen to interest rates in the economy in the event of dollarization. There are a wide set of issues relevant here including potential gains in credibility and discipline, the effects of dollarization on the budget constraint of the government, the possibility of bank runs, etc. The primary purpose of this paper is to attempt to measure how all these forces impact on local interest rates.

On the one hand, it is obviously true that local currency rates will disappear together with the local currency. However, this apparent interest rate reduction may even have a negative welfare effect, as the economy losses instruments for financial diversification.[3] However, the more relevant question is what would be the effect on interest rates at large once all debt, public and private, becomes foreign currency denominated. Because public sector spreads generally provide a lower bound for private sector financing costs, the answer to this question can be obtained by estimating what would happen to country risk in the aftermath of dollarization. We believe then that measuring how dollarization affects country risk becomes an essential (if not the most important) issue in the dollarization debate. Therefore this paper concentrates in evaluating, empirically, if there is any relation between the elimination of the local currency risk and country risk.

The relevance of this question can easily be illustrated by a simple calculation. If the capital output ratio equals 4 and the rate of return of this capital equals 10%, the impact of a 1% reduction in the interest rate is equivalent to an increase in the value of the domestic capital stock of about 10% of GDP. As long as intertemporal consumption is related to initial wealth levels, the impact on feasible consumption may be significant, and overshadows any potential welfare loss associated to seigniorage or lender of last resort considerations. It is surprising that while these wealth effect seem to overshadow whatever cost dollarization may have on other dimensions, it is usually not stressed enough in the literature.

[3] See Neumeyer (1998) for an application to the European Monetary Union.

The paper proceeds as follows. Section 2 outlines briefly the theoretical reasons why country risk could be associated to currency risk. Section 3 discuss our empirical methodology which will be based on event studies. Section 4 applies the event study methodology to European data. Here we look at events associated to the risks and/or consolidation in the process of monetary unification, and we evaluate their impact on sovereign spreads. In Section 5 we undertake a similar exercise for Latin American economies. Section 6 discusses the results.

2 The relation of currency and country risk in theory

Several issues have been identified in the literature as being relevant when assessing the impact of the elimination of the domestic currency risk on country risk. However, there is as yet no consensus as to the quantitative impact nor even the direction. Some arguments actually suggest that country risk can increase as a result of dollarization, while others suggest that it could decline. In this section we review the arguments in both directions.

2.1 Arguments for an increase in country risk

In what follows we present several arguments which could explain why there may be an increase in country risk as result of the elimination of devaluation risk.

First, a country that has both local currency and foreign currency instruments outstanding may treat foreign currency instruments as senior.[4] If, however, that country fully dollarizes outstanding debt may become more homogenous in terms of seniority diluting the pre-dollarization status of foreign currency instruments. Eliminating devaluation risk through dollarization will then tend to increase the country risk premium. This relies on a set of assumptions including the view that there are states of the world where the relevant government may opt for defaulting on the domestic currency denominated debt instruments but not on those in foreign currency. Indeed, while it might be argued that foreign versus domestic debt might correlate to some extent with seniority, currency denomination is not always the right definition of, for example, domestic versus foreign[5]. If foreign debt is senior with respect to domestic but domestic debt is as dollarized as foreign debt, then eliminating devaluation risk may have no impact on seniorities and hence no impact on currency risk.

Second, dollarization implies eliminating access to the inflation tax as a way of financing government spending. As a result, the intertemporal budget

[4] The chapter by Neumeyer and Nicolini (2000) argue the opposite, that domestic denominated debt may have a lower default risk as it can always be inflated away rather than defaulted on. They discuss the conditions under which this is a valid assumption.

[5] Powell (2000) suggests three different definitions for foreign versus domestic debt depending on the question under discussion: currency of issue (if the question is related to curency mismatches), residence of purchaser (if the question is current account sustainability) or location of issue (if the question is how debt might be restructured in default scenarios).

constraint of the government, and thus its ability to pay back its foreign denominated bonds may be weakened. This may then, all things being equal, increase default risk and increase country risk.

A third channel is the weakening of the government´s budget constraint as a result of the loss of seigniorage revenues. Once again, the reduction in government resources increases the default risk on the government´s debt instruments.

A fourth channel is that in a world with imperfect substitutability of assets, investors may want to hold a diversified portfolio of domestic and foreign currency denominated bonds. Forcing the investor to shift the entire portfolio to foreign currency liabilities may induce a higher equilibrium risk premium on those instruments. This argument, however, assumes that tilting towards domestic currency instruments a portfolio of foreign currency instruments will reduce risk which is debatable in practice.

A final channel we list here is that dollarization may imply greater rigidities (eg: wages and more controversially prices cannot adjust to a negative shock through changes in the exchange rate but must adjust through nominal reductions). This might produce greater output volatility, therefore inducing larger risk premia on that country's assets.

2.2 Arguments for a decrease in country risk

Similarly there are several arguments which suggest that a reduction in currency risk should induce a reduction in country risk.

2.2.1 The balance sheet effect

A first argument relates to balance sheets. Suppose a country exhibits a substantial currency mismatch between assets and liabilities. For example, when liabilities are denominated largely in foreign currency and assets in domestic currency, a sharp exchange rate depreciation may lead to insolvency. Under these circumstances there is then the potential for a direct link between the risk of a change in the level of the currency (currency risk) and default risk.

Table 1 exhibits a simplified computation of the balance sheet mismatch for Argentina. As can be seen the Central Government is seriously exposed to a dollar devaluation as over 90% of liabilities are in dollars. In the case of Argentina, Central Bank reserves back the monetary base due to the currency board rule so it is uncelar whether Central Bank reserves should be consolidated with the Central Government. On the other hand, on a devaluation the current level of reserves would be in excess of the value of the monetary base assuming no change in the quantities. However, even if the Central Bank's dollar assets and liabilities are consolidated with those of the Central Government there remains a significant currency mismatch in the public sector.

Table 1. Balance Sheet Effects for Argentina[6]

[6] Here we include only the Central Government although we note that Argentine provinces

(in Billion of US$, November 1999)

	Assets	Liabilities	Net Position
Central Government	2.7	111.0	-108.3
Central Bank	25.8	8.9	16.9
Non-Financial Private Sector	191.9	144.2	47.7
Financial Sector	119.1	98.9	20.2
Total	339.5	363.0	-23.5

Turning to the private sector, the table shows that the non financial private sector has a positive mismatch of about $50bn and the financial sector (excluding the Central Bank) also has a positive mismatch, albeit smaller (about $20bn). However, it is likely that within the private sector there are sectors that have very significant negative mismatches. In other words, it is likely that private sector dollar wealth is highly concentrated. This implies that a devaluation would not only harm sectors of the non-financial private sector but this would then affect the financial sector in the form of increased credit risk and higher non-performing loans. In summary, mismatches are such that a devaluation would provoke a very serious deterioration of the Government´s financial position increasing the likelihood of default and also would create severe problems for areas of the private sector. It follows therefore that an increased perceived risk of devaluation may lead to higher credit spreads. [7]

2.2.2 Other arguments

An alternative argument which explains a positive relation between country and currency risk relates to the fact that while a country maintains its own currency it may be subject to speculative attacks. The European experience during the early 90´s, and that of emerging economies since 1995, are witness to the potential for these speculative attacks. These attacks may force the Central Bank to raise interest rates in order to defend the peg, inducing a domestic recession and interest rate hikes which will most likely weaken the

and other decentralized agencies may also have dollar mismatches. Assets are reserves held in foreign currency and liabilities include all foreign currency denominated debt (issued domestically or abroad). For the case ofn the Central Bank, assets include international reservas plus Argentine US$ denominated Governemnt bonds held in the Central Bank. Liabilities include dollar liabilities with the domestic financial system - liquidity requirements held in the Central Bank. Non-Financial Private Sector assets include external assets plus dollar denominated deposits in the financial sector plus dollar denominated assets held in Argentine pension funds plus holdings of US$ cash employing an official (Ministry) estimate. Liabilities include external liabilities plus dollar denominated loans in the financial sector. Financial sector assets include dollar loans plus reserves held in dollars abroad (liquidity requirements held offshore) and liabilities include dollar denominated deposits and other foreign currency liabilities.

[7] Sturzenegger (2000) challenges this view by suggesting that the balance sheet of the Government is not properly measured when looking at current assets and liabilities. He claims that a present value appraoch is needed taking into account the true intertemporal assets of the government (expected future tax income) and liabilities (expected expenditure). Once this is done, one finds that mismatches are less severe as most government spending is on nontradables, whereas a sizable fraction of tax revenue arises from the tradable sector.

budget constraint of the government, or alternatively, increase its contingent liabilities. Eliminating the risk of currency collapses may reduce this instability which is the cause of a higher risk premium. The potential for these speculative attacks increases in a world with substantial contagion.

A third argument is that the elimination of the local currency accelerates financial integration allowing for a reduction in interest rates through increased efficiency of local financial intermediaries. This process has been an important factor during the path leading to the launch of the euro in Europe. In a similar vein, the use of a common currency has been suggested as potentially increasing significantly the amount of trade among the geographical regions using the same currency. This increased economic efficiency is likely to reduce risk across the board and thus reduce sovereign risk.[8]

Finally, dollarization may decrease interest rates through an increase in the credibility of policymakers, as it imposes a straightjacket for monetary and fiscal policy with high reversion costs. For a country like Ecuador, for example, this appears to have been an essential part of the motivation for pursuing dollarization.

3 The Event Study methodology

Figures 1 and 2 show the evolution of country risk and currency risk for Argentina and Mexico. As can easily be seen, there is a strong positive correlation between the two.

However, it is well known that such a correlation (0.82 in the case of Argentina and 0.93 in the case of Mexico) does not necessarily imply any particular causal relationship. Currency risk could cause country risk or vice versa, causality could exist in both directions or there may be no causal relationship as the correlation might be produced by a third common factor. Thus, by looking at this graph we can in no way conclude that the elimination of currency risk will entail a reduction in country risk.

This is nothing but a standard identification problem. One potential route to solve this problem is through time series analyses (eg: Vector Auto-Regressions etc). Given the nature of the measures of country risk and currency risk available, however, it is in our view problematic to use conventional time series methods to test for causality. The measures available stem from market prices and hence if markets operate efficiently both series will adjust instantaneously to news. In practice, we hypothesise that local currency asset markets are less liquid for many emerging countries than their foreign currency counterparts and this implies that country risk spreads may react more rapidly than currency risk

[8] There is an extensive literature on this issue. Panizza et. al. (2000) provide a good survey. See also Rose (2000) and Levy-Yeyati and Sturzenegger (2000c).

Figure 1: Country Risk and the Forward Discount for Argentina

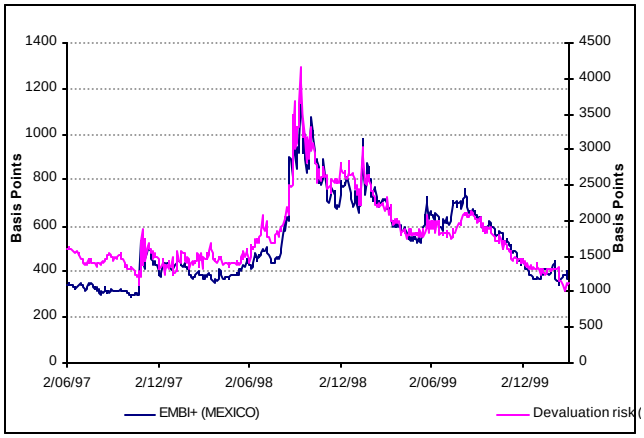

Figure 2: Country Risk and the Forward Discount for Mexico

spreads, biasing the results towards a finding that country risk causes currency risk and not vice versa using conventional time series methods.

In order to solve this identification problem, we chose to undertake an event study of the phenomena. Our methodology is to look at "events" that we can associate to changes in currency risk. We then study the evolution of sovereign risk in response to these currency events. The use of the event study ensures, on the one hand, that the currency shock is exogenous, thus allowing to solve the endogeneity problem present. On the other hand, it allows to keep all other variables constant, providing a natural experiment for the analysis and allowing to isolate the impact of currency shocks on country risk.

Following Campbell, Lo and MacKinley (1997) once the events are identified, we have to establish an estimation, event and post event window which will allow for the estimation. As with any event study the excercise consists of computing a model for the returns using the data of the estimation window and checking if there are significant deviations from this model in the post-event window. In this paper the object of study is the sovereign spread, and we test whether they change in a statistically significant way after a currency shock. We present below two models for the estimation of the normal returns: the constant mean model and the market model.

3.1 The constant mean model

In the constant mean model we assume that the expected return is a constant value, thus an abnormal return in the post-event window will correspond to deviations from the average prior to the event. The event window is chosen as the date in which the event occurs together with the three previous dates.[9] The estimation window comprises the ten days inmediately prior to the beginning of the event window, and the post event window includes the five days inmediately following the event window.[10] The setup is described graphically in Figure 3.

After the events have been identified and the time frame for the experiment determined, it is necessary to define how to compute the abnormal returns after the event. Following Campbell, Lo and MacKinlay (1997) we start with the simplest model which assumes that the normal return is constant. Call X_t the sovereign spread of any country at moment t. We assume that the model which describes this spread is

$$X_t = \mu + \epsilon_t,$$

where μ indicates the normal return and ϵ indicates the "abnormal" return. We assume that

$$\epsilon_t = N(0, \sigma^2).$$

[9] This is done in order to avoid any possible spillover of news regarding the impending event.

[10] In all cases we refer to working days. In the appendix we show the results for a ten day post event window excercise.

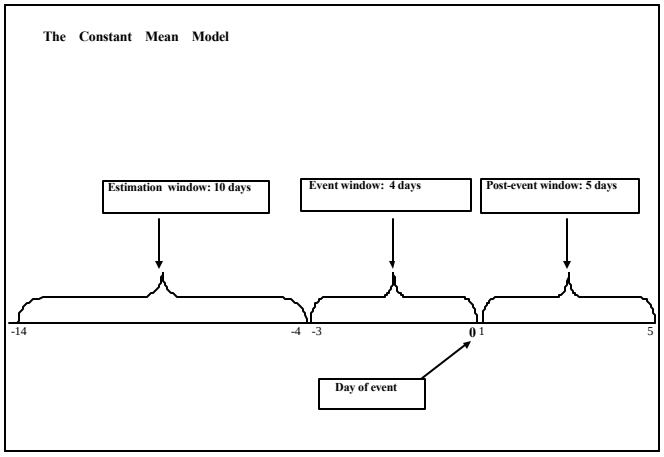

Figure 3: The Setup for the Market Model

The estimated abnormal return follows:

$$\widehat{\epsilon} = X_t - \widehat{\mu},$$

where the hat indicates an estimated value. Our estimator will be then

$$\overline{\epsilon^*} = \frac{\sum_t \widehat{\epsilon}_t^*}{N} = \frac{\sum_t (X_t^* - \widehat{\mu})}{N},$$

which defines the average estimated abnormal return in the post-event window (the * indicates belonging to the post-estimation window). Our null hypothesis is

$$H_0 : \overline{\epsilon^*} = 0.$$

If the null hypothesis holds it will indicate that there is an impact of currency risk on country risk, i.e. we would conclude that there is no evidence that currency risk affects country risk.

In order to construct the test we need to estimate the variance covariance matrix of $\overline{\epsilon}^*$. Notice that $\widehat{\epsilon}_t^*$ can be considered a forecast error of the return, and thus its covariance matrix will have two parts. The first is the variance of the disturbances, and the second is the additional variance due to sampling error in the estimation of the normal return. This sampling error, which is common for all the abnormal returns estimated in the post event window, will lead to serial correlation despite the fact that the true disturbances are independent through time. This will imply a non diagonal variance covariance matrix which has to be taken into account when estimating the variance of average estimated abnormal returns. To start we need to estimate the variance of the estimated

abnormal return in the post-event window. More precisely:

$$\begin{aligned}
V(\widehat{\epsilon}^*) &= E\left[\widehat{\epsilon}^*\widehat{\epsilon}^{*\prime}|X^*\right] = \\
&= E\left[(\epsilon^* - \iota(\widehat{\mu}-\mu))(\epsilon^* - \iota(\widehat{\mu}-\mu))'|X^*\right] = \\
&= E\left[\epsilon^*\epsilon^{*\prime} + \iota(\widehat{\mu}-\mu)(\widehat{\mu}-\mu)'\iota'|X^*\right] = \\
&= E\epsilon^*\epsilon^{*\prime}|X^*] + \iota\sigma_\epsilon^2(\iota'\iota)^{-1}\iota' = \\
&= \begin{pmatrix}
\sigma_\epsilon^2(1+\frac{1}{n}) & \frac{\sigma_\epsilon^2}{n} & \cdots & \cdots & \frac{\sigma_\epsilon^2}{n} \\
\frac{\sigma_\epsilon^2}{n} & \sigma_\epsilon^2(1+\frac{1}{n}) & & & \vdots \\
\vdots & & \ddots & & \vdots \\
\vdots & & & \ddots & \vdots \\
\frac{\sigma_\epsilon^2}{n} & \cdots & \cdots & \cdots & \sigma_\epsilon^2(1+\frac{1}{n})
\end{pmatrix}
\end{aligned}$$

where ι indicates a vector of ones. Having estimated the variance covariance matrix of each individual forecast error we compute the variance of our statistic:[11]

$$V\left(\overline{\epsilon^*}\right) = V\left(\frac{\sum_t \epsilon_t^*}{N}\right) = \frac{1}{N^2}\left[N(1+\frac{1}{N})\sigma_\epsilon^2 + N(N-1)\frac{\sigma_\epsilon^2}{N}\right] = \frac{2\sigma_\epsilon^2}{N}$$

Substituting the estimate for the variance by its unbiased sample estimate we can construct the statistic:

$$t_{N-1} = \frac{\overline{\epsilon^*}}{\sqrt{\frac{2s_\epsilon^2}{N}}},$$

which is the statistic we use to estimate if currency risk has any impact on country risk.

This test however, corresponds to a test of abnormal returns only for the case of one event. In order to gain more degrees of freedom, and assuming independence across events for each country, the tests can easily be aggregated to:

$$t_{n*(N-1)} = \frac{\sum_n \overline{\epsilon_n^*}}{\sqrt{\sum_n \frac{2s_{\epsilon_n}^2}{N}}}$$

where n indicates the number of events considered for each country. In the specification below we distinguish between positive and negative shocks which are tested separately.

[11] Our test is based on the change in the average abnormal return. It is exactly identical if we were to compute it on the cumulative abnormal return as is more standard in the literature.

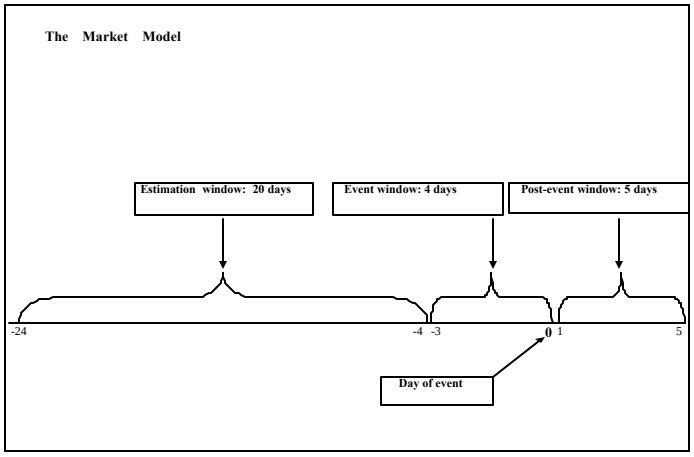

Figure 4: Response of Country Risk to good news on Currency for Argentina

3.2 The Market Model

In the market model the event window is chosen as the date in which the event occurs together with the three previous dates. The estimation window comprises the twenty days inmediately prior to the beginning of the event window, and the post event window includes the five days inmediately following the event window.[12] The setup is described graphically in Figure 4.

In the specification we assume that the sovereign spread is related to an average market return (in our empirical specification below we will compare, for example, the sovereign spread of a specific Latin American country with the overall spread for Latin American). In short

$$R_t = \alpha + \beta R_{mt} + \epsilon_t.$$

this can be expressed as a regression system

$$\mathbf{R} = \mathbf{X}\boldsymbol{\theta} + \boldsymbol{\epsilon}.$$

As in any model we will have that the estimate of the market model obtained from the data in the estimation window will be

$$\widehat{\theta} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{R},$$

with

$$\widehat{\sigma}_\epsilon^2 = \frac{1}{L-2}\widehat{\boldsymbol{\epsilon}}'\widehat{\boldsymbol{\epsilon}},$$

[12] In all cases we refer to working days. In the appendix we show the results for a ten day post event window excercise.

where L is the lenght of the estimation window. The estimation error is

$$\widehat{\epsilon} = \mathbf{R} - \mathbf{X}\widehat{\theta}.$$

As before, the estimated abnormal return in the post-event window will equal

$$\widehat{\epsilon}^* = \mathbf{R}^* - \mathbf{X}^*\widehat{\theta},$$

and its variance-covariance matrix equals

$$\begin{aligned} V(\widehat{\epsilon}^*) &= E\left[\widehat{\epsilon}^*\widehat{\epsilon}^{*\prime}|\mathbf{X}^*\right] = \\ &= E\left[\left(\epsilon^* - \mathbf{X}^*(\widehat{\theta}-\theta)\right)\left(\epsilon^* - \mathbf{X}^*(\widehat{\theta}-\theta)\right)'|X^*\right] = \\ &= E\left[\epsilon^*\epsilon^{*\prime} - \epsilon^*(\widehat{\theta}-\theta)\mathbf{X}' - \mathbf{X}^*(\widehat{\theta}-\theta)\epsilon^{*\prime} + \mathbf{X}^*(\widehat{\theta}-\theta)(\widehat{\theta}-\theta)\mathbf{X}'|\mathbf{X}^*\right] = \\ &= \mathbf{I}\sigma_\epsilon^2 + \mathbf{X}^*(\mathbf{X}\mathbf{X})^{-1}\mathbf{X}'\sigma_\epsilon^2, \end{aligned}$$

where I is $M \times M$ where M is the length of the post-event window. Again our estimate is

$$\overline{\epsilon^*} = \frac{\sum_t \widehat{\epsilon}_t^*}{N},$$

and its variance obtained from above

$$V(\overline{\epsilon^*}) = \frac{1}{N^2}\iota V(\widehat{\epsilon}^*)\iota.$$

Similar to above the aggregate test can be computed as

$$t_{n*(N-2)} = \frac{\sum_n \overline{\epsilon_n^*}}{\sqrt{\sum_n \widehat{V}(\overline{\epsilon^*})}}$$

where the estimated variance uses the unbiased sample moments.

4 The European Experience

In order to assess the relationship between country and currency risk we start by looking at the European experience during the 90´s. We believe Europe is an excellent testing ground for the relationship between these two spreads as during the decade the continent was subject to several shocks which were exclusively related to the consolidation or weakening of the process of monetary integration. Changes in the prospects for monetary unification affect directly the currency risk of the countries involved, thus allowing for an almost perfect natural experiment for testing the impact of currency risk on country risk. For example, the result of a referendum on monetary union in one country of the continent is a shock which affects directly the degree of currency risk in all other countries of the sample. These types of largely institutional shocks then provide

a set of observations of exogenous shocks to currency risk. We can then test whether they have a significant effect on country risk.

In order to apply our event study methodology to the European experience we proceed as follows. We first compute the sovereign risk for some selected European countries: Austria, Belgium, Denmark, Finland, Ireland, Spain and Sweden. The reason for choosing these countries is that they had outstanding DM denominated debt throughout most of the period, which allows, when comparing their yield with that of German bonds, to obtain an estimate of sovereign spreads. Table A.1, in the appendix, gives the characteristics of the DM bonds used for each country.

The yield of these bonds was compared to a daily estimate provided by DATASTREAM of Germany´s yield curve at the same maturity[13]. The matching of maturities, is essential as many of the bonds were approaching maturity towards the end of the sample. Figure 3 shows the evolution of the sovereign spreads for these economies during the period of analysis. Table 3 summarizes the characteristics of these spreads. As can be seen, the spreads are positive, low and with a fairly small standard deviation.

Table 3. Sovereign Spread Characteristics

	Austria	Belgium	Denmark	Finland	Ireland	Portugal	Spain	Sweden
Average (1992-2000)	14.95	19.76	19.29	27.58	24.14	19.04	20.21	13.99
Standard Deviation	8.57	9.63	11.20	12.72	9.30	11.10	6.55	9.08

Source: Datastream

Table 4, shows, the currency events identified for Europe. Our events are taken from two sources. First, the comprehensive compilation in Zettelmeyer (1996). Zettelmeyer, discusses institutional shocks, establishing their potential impact on currency risk (whether they were good news or bad news for EMU), and by checking whether they made it to the financial reports written at the time he identifies those which were important events from those that were not. Our second source is Ungerer (1997) who also provides a classification of the most important events in the process towards monetary unification. In the tables that follow shocks labelled with a Z were taken from Zettelmeyer (1996), while those labelled with a U were taken from Ungerer (1997). Those labelled with a * correspond to non-institutional events (mostly devaluations) which we believe had an impact on currency risk. It is somewhat more debatable whether these non-institutional shocks are not correlated with a general deterioration of economic conditions. If they are, then it is possible that country risk is affected directly rather than through the channel of currency risk. Although we believe that it is likely that a devaluation carries new information regarding currency risk and hence still represents a valid event for our purposes, we compute our event studies with and without these events.

Table 4. Events for Europe

[13] Germany´s yield curve was approximated by a third order polynomial.

6-4-92: Portugal joins the ERM. (U)(-)
2-6-92: Danish voters reject the Maastricht Treaty. (U/Z)(+)
18-6-92: Irish referendum on Maastricht is approved by a wide margin. (Z)(-)
21-9-92: French referendum on Maastricht on the 20th is approved by a slight margin. (U/Z)(-)
12-12-92: EC Edimburgh Summit: success for EMU. (Z)(-)
29-1-93: 10% devaluation of the irish pound on the 30th. (U*)(+)
18-5-93: Second referendum in Denmark. This time Maastricht is approved. (U/Z)(-)
23-7-93: Maastricht Treaty ratified by the Commons. (Z)(-)
2-8-93: After sustained unrest in financial markets the Monetary Committee decides the 31st. to widen the bands "temporarily" to +/-15%. (U*)(+)
12-10-93: German constitutional court rejects challenge to Maastricht. (Z)(-)
1-11-93: Maastricht Treaty comes into effect. (U)(-)
12-6-94: European elections: victory for anti-Maastricht forces. (Z)(+)
30-12-94: January 1st , Austria, Finland and Sweden become members of the UE. Norway rejects joining in a referendum and stays out. (U)(-)
9-1-95: Austria joins the ERM. (U)(-)
6-3-95: Devaluation of the Spanish peseta and the Portuguese escudo. (U*)(+)
31-5-95: European Committee releases "Green Paper" on EMU. (Z)(-)
22-6-95: First Juppé mini-budget. (Z)(-)
25-8-95: Madelin resigns over proposed spending cuts. (Z)(+)
10-10-95: First french public sector strike (24 hours). (Z)(+)
26-10-95: Chirac committs to deficit-cutting as n^{o}1 priority. (Z)(-)
7-11-95: Composition of new cabinet announced: fiscally conservative. (Z)(-)
15-11-95: Juppé unveils welfare reform package. (Z)(-)
29-11-95: Bundestag hearing on EMU: Germans tough on criteria for membership together with 3-12-95: French Unions vow to intensify strike. (Z)(+)
15-12-95: (15-16), The European Council in Madrid adopts changeover scenario, based on EMI scenario"; the common currency will be called the "euro". (U/Z)(-)
25-11-96: Italy re-joins the EMS. (U)(-)
13-12-96 The EC agrees in Dublin on the EMS II and the Pact for Stability and Growth (U)(-)

We divide the events into *Good News* (-) events and *Bad News* (+) events. *Good News* events are associated with a reduction in currency risk, whereas *Bad News* events are associated to an increase in currency risk. The devaluation of the irish pound, for example, was considered to increase the currency risk for all other countries, whereas the approval of the Maastricht treaty in France was assumed to reduce currency risk.

Tables 5 and 6 show the results for Europe, by indicating the t-statistics corresponding to the test for the null hypothesis that there are no abnormal returns after the currency events. Table 5 considers favorable shocks to EMU whereas Table 6 considers negative shocks. In the case of positive shocks we find that these decrease country risk for Austria, Belgium and Ireland with t-statistics indicating a significant effect whereas we find significant results in the opposite direction for Denmark, Sweden and Portugal. Finally, results for Finland and Spain are not significant at the 10% level[14].

[14]In the appendix we show similar results with a 10 day post-event window and also in-

Our results are therefore quite mixed with some countries appearing to have a positive relationship between currency and country risk and others going in the opposite direction. Our theoretical discussion highlighted the fact that the relationship could go either way so perhaps these results are not very surprising. On closer inspection, in the case of negative institutional shocks there is clearly less evidence of an association between currency and sovereign spreads (in this case we have fewer events to work with). However, in the case of positive institutional shocks we see there is stronger evidence and interestingly the country pattern appears roughly consistent between both positive and negative events.

One interpretation is that positive (negative) news about EMU reduced (increased) country risk in those countries that were sure to enter but actually increased (decreased) country risk in those countries where entry was far from certain. This interpretation appears consistent with our country pattern as in the case of Denmark, Sweden and Portugal we find that good news about EMU increases country risk - Denmark and Sweden did not enter and it was unclear for some time whether Portugal would meet the convergence criteria. In contrast, we find that for Austria, Belgium and Ireland, where EMU entry was more certain, good news about EMU decreased country risk[15]. In summary our results on Europe do not provide evidence for a clear one-way relationship between currency and country risk and show that while a significant relationship might exist this may go either way depending on country characteristics.

Table 5. Effect of a favorable institutional shock to EMU on sovereign spreads (5 day window)

	Austria	Belgium	Denmark	Finland	Ireland	Portugal	Spain	Sweden
t-statistic	-2.65	-4.52	3.01	-1.55	-3.01	5.39	0.62	3.08
p-value	0.00	0.00	0.00	0.12	0.00	0.00	0.53	0.00
Degrees of freedom	153	162	54	153	135	108	126	54

Table 6. Effect of a negative institutional shock to EMU on sovereign spreads (5 day window)

	Austria	Belgium	Denmark	Finland	Ireland	Portugal	Spain	Sweden
t-statistic	-0.18	1.64	-2.32	–1.18	2.01	0.79	-0.24	-1.19
p-value	0.85	0.10	0.03	0.24	0.05	0.42	0.81	0.24
Degrees of freedom	36	45	18	36	36	54	54	18

5 Emerging Economies

The experience of European economies supports our theoretical discussion that the effect of currency risk on country risk may go either way depending on individual country characteristics. In the case of emerging economies in Latin

cluding institutional shocks in the group. The results are similar under these alternative specifications to those discussed here.

[15] We are indebted to John Driffill for suggesting this interpretation of our results.

American countries (LACs hereafter), however, the results may be quite different. Unfortunately for LAC there is no set of institutional events, comparable to those considered for Europe. Thus, most of the currency shocks will carry the risk of being endogenous to a general deterioration in economic conditions or 'contagion'. Our events, rather than being general events which affect several countries, will apply largely to the countries where the event occured. In those cases (essentially Argentina) where we also include certain events which take place outside of the country we choose events which we think are primarily currency in nature. We want to emphasize that we were interested not so much in having as many events as possible but rather in having good events, i.e. events that could be clearly be identified as those in which, on impact, what changed was primarily exchange rate risk.

Thus, we have attempted to isolate events related to actual changes in exchange rate policy or (in the case of Argentina) events that led to a perception of a higher probability of exchange rate policy change. While the market usually discounts changes in exchange rate policy, it is undeniable that when the event occurs (a devaluation or a change in exchange rate bands, etc), there is new information about future exchange rate behavior, and as a result an impact on currency risk. What we test is the impact of this new information on country risk. Even if the shock is not purely exogenous, the endogeneity problem should be, to a great extent, muted by the fact that our data is very high frequency and that we test for changes between a short span of just a few days, which implies that our benchmark for comparison includes most of the information relevant until prior to the disclose of the news of the change in exchange rate policy.[16]

Tables 7 through 12 indicate the events that have been considered for Argentina, Brazil, Mexico, Ecuador, Colombia and Chile. As can be seen, most changes correspond to explicit changes of exchange rate policy or statements made by top officials or candidates on exchange rate policy. The case of Argentina is an exception. There, due to the existence of the currency board since April 1991, we consider exogenous shocks that we believe primarily affected the perception of risk to the currency board system.

Table 7. Events for Argentina

20-12-94: The Mexican peso is devalued (+)
12-1-95: Banks' deposits in the Central Bank are dollarized (-)
23-10-97: Speculative attack against the HK currency board (+)
19-5-99: Domingo Cavallo's FT interview (+)

[16]The methodology for the event selection was both from papers and by asking experts in each country. This later method has the drawback that people will remember only relevant events, thus increasing dramatically the significance of the events analyzed. We are grateful to Tim Kehoe for pointing this out to us. However this should not bias the results in either direction (positive or negative), and therefore while the t-statistics should be taken with care we believe the excersive remains correct and highly relevant.

Source: authors[17].

Table 8. Events for Brasil

30-6-94: The Real Plan is launched. (-)
6-3-95: The fixed exchange rate band is changed to a crawling peg band. (+)
15-1-99: The Real is devalued. (+)
12-11-99: The IMF freed 2 billion of Brazil's reserves at the Fund for use in stabilizing the exchange rate. (-)

Source: Ilan Goldfajn suggested these events. The exact dates were provided by Luis Sampaio Malan.

Table 9. Events for Mexico

20-12-94: Devaluation of the Mexican peso. (+)
30-11-98: "Ampliación del corto" (contractive monetary policy). (-)
18-1-00: "Ampliación del corto" (contractive monetary policy). (-)

Source: The dates for the ampliación del corto were provided by Juan Seade, Alejandro Werner also advised with respect to events and dates.

Table 10. Events for Ecuador

3-3-97: Devaluation. (+)
31-3-98: Devaluation. (+)
9-1-00: President, Jamil Mahuad, announces the dollarization of the economy. (-)
1-3-00: Congress approved the dollarization. (-)

Source: Goldman Sachs and local media newspapers.

Table 11. Events for Colombia

12-12-94: Downward movement in the exchange rate band. (-)
15-3-96: Relaxation of restrictions to capital inflows. (-)
11-10-96: Resolution limits the demand for dollars by intermediaries of the exchange market. (-)
13-1-97: Tax on foreign exchange borrowing is established. (+)
12-3-97: More restrictions on capital inflows. (+)
23-4-98: Fedesarrollo's Mauricio Cárdenas unexpectedly proposed an increase in the width of the exchange rate band. (+)
28-6-1999: Upward movement in the exchange rate band. (+)
27-9-1999: Elimination of the exchange rate band. (+)
28-4-00: Deposit for borrowing abroad is eliminated. (-)

[17]In this footnote we discuss the events for Argentina; (1) while the devaluation of the Mexican peso heralded a sharp fall in Argentine asset prices, dollar deposits in the banking system initially rose suggesting that this was first and foremost a currency event, (2) dollarizing commercial banks' deposits in the Central Bank was seen as a policy strongly reinforcing the currency board during a difficult period, (3) the attack against the HK currency board suggested that even currency boards might be subjected to attack. Argentina and Hong Kong shared virtually nothing else in common except the exchange rate system. A commonly held view in the market at the time was that if the HK currency board was changed then there was little chance the Argentine one would survive, (4) Domingo Cavallo (presidential candidate and ex economy minister) appeared to suggest in an interview in the Financial Times that Argentina could abandon the currency board - at least that was the title that the FT used even if the arguments in the article itself were more subtle in nature.

Source: Events and dates were provided by Alberto Carrasquilla and Roberto Steiner. Also from Alesina, Carrasquilla, Steiner (2000).

Table 12. Events for Chile

3-2-1998: Interest rate is increased to 8.5%. Return to active interest rate management. (-)
16-9-98: Policy interest rate is increased from 8.5% to 14%. Return to active interest rate management. Market interest rate starts reducing to a 14% level. The exchange rate band starts to widen gradually. (-)
2-9-1999: The exchange rate band is eliminated. (+)

Source: Events and dates were provided by Felipe Morandé.

Again, shocks are identified as good news (-) and bad news (+) according to whether they decrease or increase currency risk. Tables 13 and 14 present the results for the 5 day post-event window for the constant mean and market model.[18]

Table 13. The impact of currency risk on country risk: the constant mean model.

		Argentina	Brazil	Ecuador	Mexico	Colombia	Chile
Bad News	t-statistic	58.83	16.25	7.99	67.11	-2.73	-9.66
	Degrees of freedom	12	8	8	4	20	4
	p-value	0.00	0.00	0.00	0.00	0.01	0.00
Good News	t-statistic	1.13	-0.20	-6.71	1.39	9.41	0.24
	Degrees of freedom	4	8	8	8	16	4
	p-value	0.32	0.85	0.00	0.20	0.00	0.83

Table 14. The impact of currency risk on country risk : the market model.

		Argentina	Brazil	Ecuador	Mexico	Colombia	Chile
Bad News	t-statistic	3.61	1.97	4.28	14.08	-0.43	0.33
	Degrees of freedom	12	8	8	4	20	4
	p-value	0.00	0.08	0.00	0.00	0.67	0.76
Good News	t-statistic	-4.57	-2.55	-4.51	-1.30	9.68	4.31
	Degrees of freedom	4	8	8	8	16	4
	p-value	0.01	0.03	0.00	0.23	0.00	0.01

The tables show a very similar pattern with a strong impact of currency on country risk in Argentina, Brazil, Ecuador and Mexico but a different pattern for Colombia and Chile. Our preferred test is that using the market model, as here we control for other aspects affecting country risk over the event window, and hence we use Table 14 to guide the discussion. As can be seen the impact of an increase in currency risk is very significant in the first four countries, and

[18] The appendix shows the same tables for the 10 days post event window. As can be seen, the results remain unchanged.

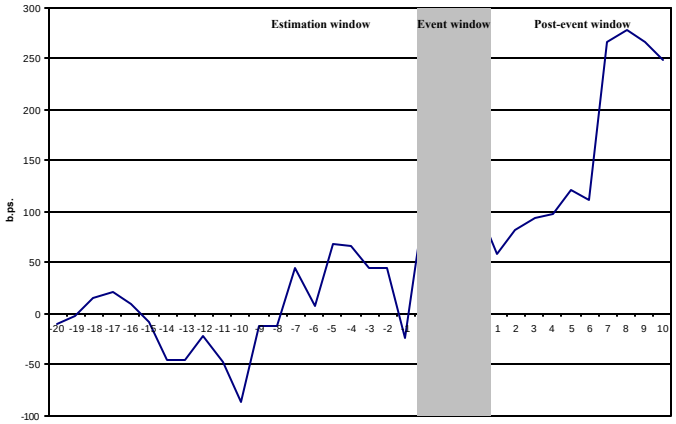

Figure 5: Response of Country Risk to good news on Currency for Chile

similarly, the reduction in country risk as a result of a reduction in currency risk is equally significant. The opposite pattern is evident for Chile and Colombia. There, an increase in currency risk seems to have no effect (it does decrease country risk significantly in the constant mean model), whereas reductions in currency risk seem to increase country risk significantly.

We conjecture that these results are roughly consistent with the extent of dollarization. Chile and Colombia are arguably the least dollarized countries in our sample and hence balance sheet effects may be less relevant. Argentina and Ecuador are probably the most dollarized countries and here we find very significant effects. Dollarization is also important in Mexico and to a lesser extent in Brazil. Our results then broadly support the view that countries with higher indices of dollarization may also have a greater impact of currency risk on country risk.

Figures 5 through 15 show the impulse responses for the significant events in Table 14.

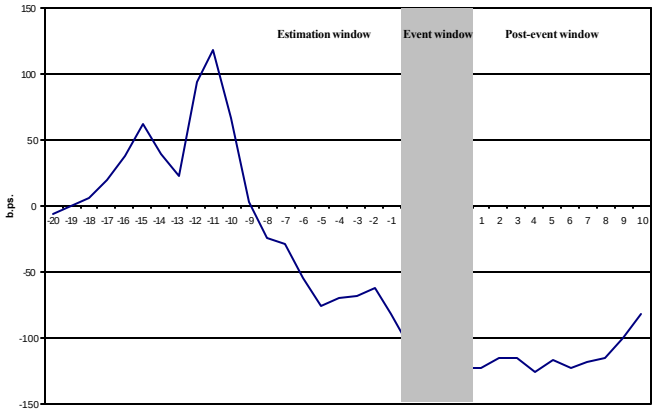

Figure 6: Response of Country Risk to good news on Currency for Argentina

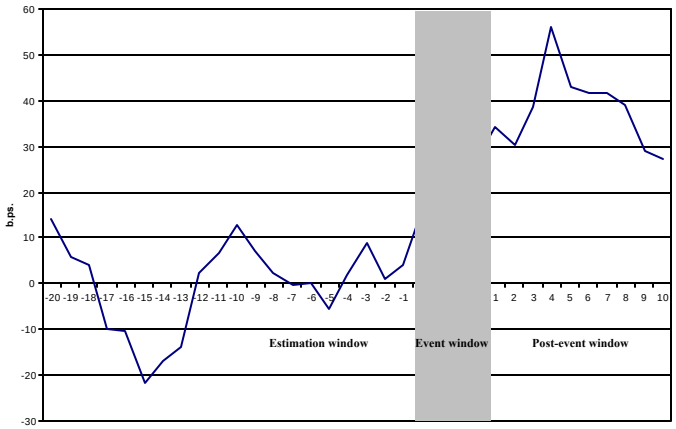

Figure 7: Response of Country Risk to good news on Currency for Colombia

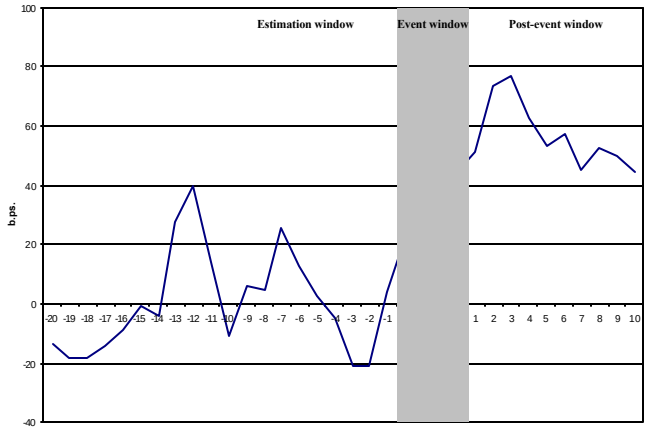

Figure 8: Response of Country Risk to bad news on Currency for Ecuador

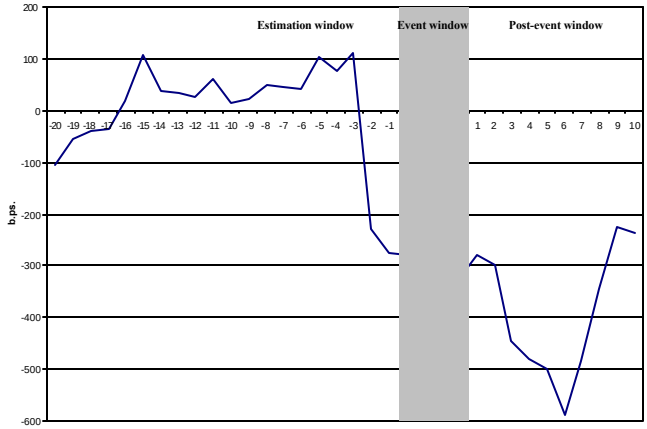

Figure 9: Response of Country Risk to good news on Currency for Ecuador

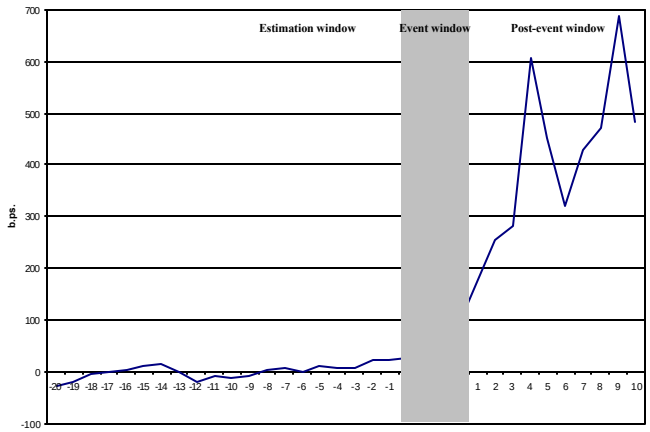

Figure 10: Response of Country Risk to bad news on Currency for Mexico

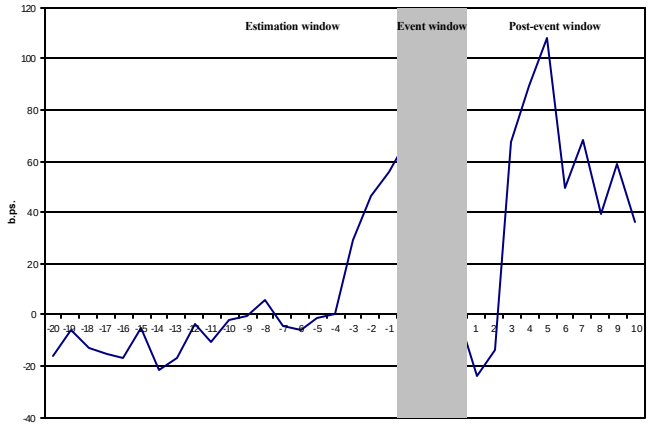

Figure 11: Response of Country Risk to bad news on Currency for Brazil

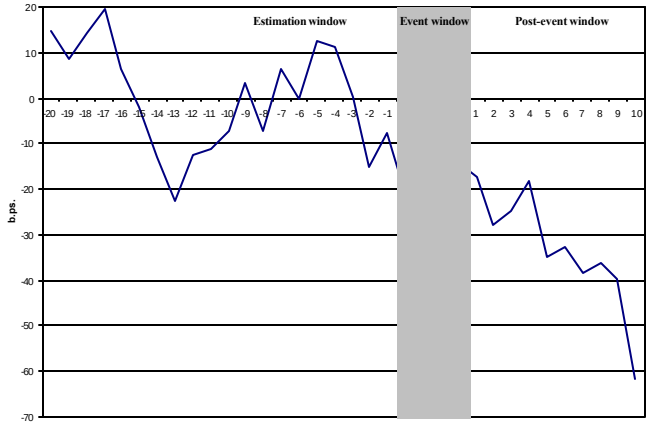

Figure 12: Response of Country Risk to good news on Currency for Brazil

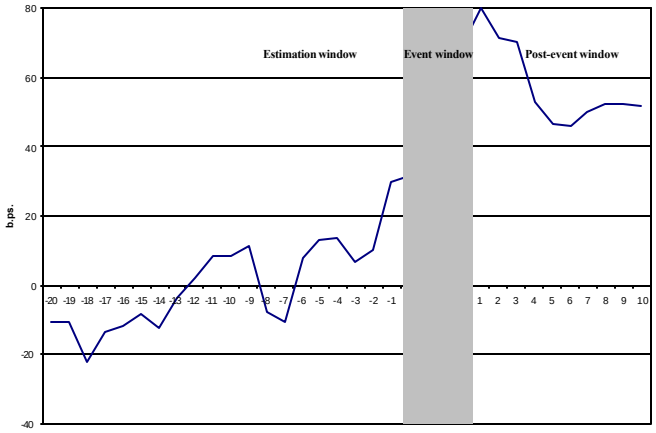

Figure 13: Response of Country Risk to bad news on Currency for Argentina

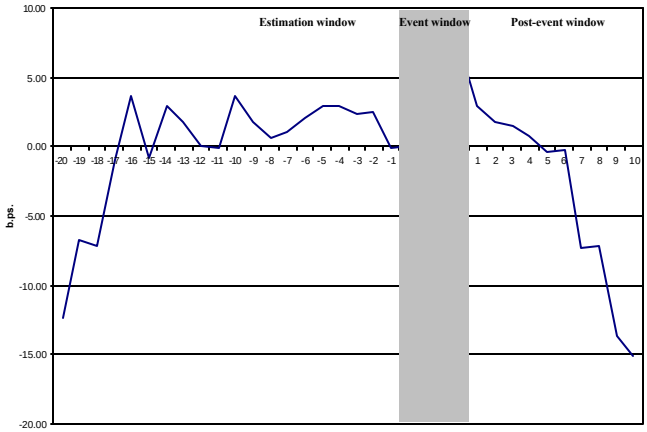

Figure 14: Response of Country Risk to bad news on Currency for Chile

Finally, in this section, we address the question of whether the events depicted in Tables 7 through 12 represent true events in which currency risk increased. In order to check this, we replicate our analysis (using the constant mean specification) in order to verify that in the events considered currency risk moved in the direction suggested. The data corresponds to forward contracts. While our database does not allow to test this hypothesis in the case of all events, the table is persuasive enough in showing that the events considered had a significant effect on currency risk, which in all but two cases moved in the expected direction.

Country	Event		t-stat/currency risk	t-stat/sovereign risk
	Date	Description		
Argentina	19-05-99	Cavallo's FTinterview	46.97 (0.00)	30.15 (0.00)
Brazil	15-01–99	Devaluation of real	406.94 (0.00)	8.35 (0.00)
	12-11-99	IMF's release	-1.73 (0.12)	-4.45 (0.00)
Mexico	30-11-98	Tighter money	4.86 (0.00)	2.06 (0.00)
	18-01-00	Tighter money	-5.70 (0.00)	1.92 (0.00)
Ecuador	09-01-00	Announcement of dollarization	6.18 (0.00)	27.01 (0.00)
Colombia	23-04-98	Proposal of widening band	0.42 (0.68)	4.70 (0.00)
	28-06-99	Band adjusted upwards	20.51 (0.00)	1.69 (0.13)
	25-09-00	Removal of the band	4.96 (0.00)	-3.72 (0.00)
Chile	03-02-98	Increase in interest rates	-2.45 (0.04)	-9.05 (0.00)
	16-09-98	Increase in interest rates	-2.35 (0.04)	2.51 (0.03)
	02-09-99	Band abandoned	13.62 (0.00)	-18.54 (0.00)

As can be seen, except in the first "ampliación del corto" in Mexico and in the announcement of the dollarization in Ecuador, the movement in the forward market indicates a change in the expected exchange rate in the direction assumed in our test. This gives us some comfort that the events that were selected were

indeed significant in altering currency risk.

6 Conclusions

In this paper we have attempted to investigate the relationship between currency risk and country risk. Casual empiricism reveals that for several emerging countries, measures of these two risks are highly correlated and several authors have hypothesised that the elimination of currency risk through dollarization may then lead to a significant reduction in country risk. However, a correlation does not imply causality in a particular direction and, as discussed in the first section of this paper, there are theoretical arguments that suggest a causal relationship in both directions. Given the nature of the measures of country risk and currency risk available, it is extremely difficult using conventional time series methods to test for causality ie: to establish exogeneity. The measures available stem from market prices and hence if markets operate efficiently both series will adjust instantaneously to news. In practice, we hypothesise that local currency asset markets are less liquid for many emerging countries than their foreign currency counterparts and this implies that country risk spreads may react more rapidly than currency risk spreads, biasing the results towards a finding that country risk causes currency risk and not vice versa using conventional time series methods.

In this paper, we therefore adopt a different approach. We develop an event study methodology where we choose particular events which we believe are primarily currency events and, within a defined event window, analyse how country risk reacts. We consider first a set of European countries and secondly a set of emerging countries in Latin America. The case of Europe is particularly interesting. Here, a set of institutional events regarding the changing likelihood of successful monetary integration provide a natural set of exogenous currency risk shocks. Our results are mixed in that in some countries we find a positive effect of currency risk on country risk and in other countries we find the opposite relationship and in a third group we find no significant relationship. These results reflect our theoretical discussion that the relationship could go either way. A fascinating interpretation of our results however divides countries into those where EMU entry was essentially guaranteed and those countries where EMU entry was very uncertain or unlikely. In the first group we found a positive relation between currency risk and country risk (ie: good news for EMU implying reduced currency risk and led to reduced country risk) whereas in the second group the opposite result held.

In the case of emerging countries in Latin America our results are quite different. Unfortunately, we do not have such a natural set of exogenous, institutional events for this analysis as we used for Europe. However we attempted to define events that represented actual changes in exchange rate policy or (in the case of Argentina), events that changed the perception of the probability of

future changes. We also attempted to limit ourselves to events that we felt comfortable as exogenous and primarily currency related. Finally, the short 'event window' employed gives comfort against the charge that the currency events employed are endogenous to, say, a general decline in economic conditions.

Given these safeguards, our results for Latin American emerging countries are strong and in broad terms support those that argue that the elimination of currency risk will have a significant impact on country risk spreads. However, there is also variation in our results for our sample of countries. We find that for Colombia and Chile there is less evidence that currency risk affects country risk and indeed even find that good news about the currency increases country risk. It is interesting to note that these are the least dollarized countries in our sample. On the other hand we find significant impacts of country risk on country risk formore highly dollarized Argentina, Brazil, Mexico and Ecuador such that good (bad) news on the currency reduces (increases) country risk. Our results then also broadly support the view that the effect of currency risk on country risk may depend on the degree of de facto dollarization.

7 Appendix 1

Table A.1. Characteristics of Bonds used for the European event study

Country	Issue date	Expiring date	Coupon	Amortization	Currency	Available since
Austria	19-05-1992	17-06-2002	Fixed: 8 %	Bullet	DM	5-6-92
Belgium	22-01-1992	25-02-2002	Fixed: 7 $\frac{3}{4}$ %	Bullet	DM	7-2-92
Denmark	13-06-1995	06-07-2000	Fixed: 6 1/8 %	Bullet	DM	18-9-95
Finland	18-05-1992	25-06-2002	Fixed: 8 $\frac{1}{4}$ %	Bullet	DM	29-5-92
Ireland	01-10-1992	22-10-2002	Fixed: 7 $\frac{3}{4}$ %	Bullet	DM	9-10-92
Portugal	03-06-1993	02-07-2003	Fixed: 7 1/8 %	Bullet	DM	18-6-93
Spain	04-02-1993	04-03-2003	Fixed: 7 $\frac{1}{4}$ %	Bullet	DM	12-2-93
Sweden	23-08-1995	12-09-2000	Fixed: 6%	Bullet	DM	12-09-95
Colombia	19-02-1994	23-02-2004	Fixed: 7 $\frac{1}{4}$ %	Bullet	US	17-11-94
Chile	22-04-1999	28-04-2009	Fixed: 6 7/8 %	Bulles	US	22-04-99

Source: Datastream.

Falta aca la tabla con todos los eventos para Latinoamerica y para Europa.

8 Appendix 2

In this appendix we include the results of the tests presented for Europe and Latin American countries for a 10 day rather than the 5 day event window as included in the body of the paper. The diligent reader will note that the pattern of the results is very similar indeed to those presented above.

10 day post-event window /Good news (Institutional shocks only)

	Austria	Belgium	Denmark	Finland	Ireland	Portugal	Spain	Sweden
t-statistic	1.22	-0.59	4.94	.39	-2.75	4.46	1.05	2.51
p-value	0.23	0.55	0.00	0.70	0.01	0.00	0.30	0.02
Degrees of freedom	126	135	45	126	108	90	99	45

10 day post-event window/Bad News (Institutional shocks only)

	Austria	Belgium	Denmark	Finland	Ireland	Portugal	Spain	Sweden
t-statistic	0.13	1.58	-2.52	-1.47	1.70	2.99	-0.44	-1.64
p-value	0.89	0.12	0.03	0.15	0.10	0.01	0.67	0.14
Degrees of freedom	27	36	9	27	27	27	27	9

Constant mean model with 10 day post-event window

		Argentina	Brazil	Ecuador	Mexico	Colombia	Chile
Bad News	t-statistic	81.98	15.54	7.05	79.24	-2.36	-18.54
	Degrees of freedom	27	18	18	9	45	9
	p-value	0.00	0.00	0.00	0.00	0.02	0.00
Good News	t-statistic	2.04	-1.62	-6.46	2.50	21.70	1.61
	Degrees of freedom	9	18	18	18	36	9
	p-value	0.07	0.12	0.00	0.02	0.00	0.14

Market model with 10 day post-event window

		Argentina	Brazil	Ecuador	Mexico	Colombia	Chile
Bad News	t-statistic	2.98	2.14	4.35	15.15	-0.60	-0.82
	Degrees of freedom	12	18	18	9	45	9
	p-value	0.01	0.05	0.00	0.00	0.55	0.44
Good News	t-statistic	-5.02	-4.04	-4.57	-2.09	9.45	10.06
	Degrees of freedom	4	18	18	18	36	9
	p-value	0.01	0.00	0.00	0.05	0.00	0.00

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