

**CONTAGION IN LATIN AMERICA:
AN ANALYSIS OF CREDIT DERIVATIVES**

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1. Introduction

The Asian currency crisis of late 1997 and Russian default of 1998 produced contagion effects in emerging markets throughout the world. Of the main emerging financial markets: Asia, Latin America and Russia, Latin America suffered the least from the ensuing international credit crunch. The crises in Asia, Russia and Brazil and their effects on economies across the world have brought attention to the phenomenon of international mobility in capital markets. One reason why Latin America experienced some insulation from speculative crises is that countries such as Mexico, Brazil, Argentina and Chile instituted fiscal and financial reforms in response to the Mexican crisis of 1994 and the Latin American debt crisis of the 1980s. The Argentine Convertibility Plan and Brazilian Real Plan are two notable examples. Latin America did suffer some real effects of the Asian and Russian crises spillovers, including currency pressures and strong reversals in private capital flows. This paper will spotlight and compare the contagion effects in Brazil and Argentina as a proxy for the Latin American market. To establish an appropriate context for comparison, this paper will draw on documentation from the International Monetary Fund to identify differences in fiscal policies of Brazil and Argentina and will explain why Brazil experienced significantly stronger speculative pressure than Argentina.

The timings of the Asian financial crisis and Russian debt crisis provide a unique window into how Latin America weathered the contagion effects. The Asian crisis and ensuing contagion caught many investors by surprise. This paper will attempt to show that Latin American corporations were unnecessarily exposed to private and sovereign default risk because they underestimated the importance of credit hedging. By the time of the Russian default in August of 1998, many of these corporations recognized the need to hedge against default risk but were already suffering from liquidity pressures and did not have the capital available to expand their portfolios to make sufficient use of credit derivatives. In the time since the Russian default, the market for credit derivatives in Latin America has expanded at an almost exponential rate. Total credit derivative contracts have grown from \$50 billion in 1996 to an estimated \$740 billion in

2000.² This is in part due to revised corporate risk models following the capital crises and because of improved regulations in the market for credit derivatives.

Although this paper will focus on the credit derivatives market in Argentina and Brazil surrounding the Asian crisis, it is necessary to acknowledge the influence of fiscal and monetary policies to contrast the corporate investing environments in the two countries. Fiscal reforms and financial innovations in response to the Mexican currency crisis of 1994 protected Argentina and Brazil from sovereign defaults in the wake of the Asian crisis. These financial reforms also made Argentina and Brazil more attractive for derivative investing. Many economic analyses explain the Brazilian crisis by persistent budget deficits. This rationale is insufficient to explain why Argentina was successful in defending its currency peg while Brazil was forced to float the real. Contrary to traditional findings, this paper will argue that macroeconomic fundamentals do not explain the Brazilian crisis following the Russian default. The Brazilian economy rebounded nearly as quickly as the Russian contagion spread; Brazil posted a budget surplus equivalent to 2.9 percent of GDP in 1999.³ Crises brought about by unsound economic fundamentals would most likely show more warning signs and prolong a full recovery. The contagion in Brazil and comparatively milder effects in Argentina may be evidence of a new form of international financial crisis, driven by corporate investing strategies. Typically, upsurges in private capital flows precede international financial crises. This is particularly the case for derivative markets, which have exploded during the past decade because of lower transactions costs and improved transparency. The continuing expansion of derivative markets is the primary innovation in Latin American (Brazilian and Argentine in particular) financial markets in recent years.

This paper will discuss the advantages of exotic derivatives for protection against credit risk. Credit risk is particularly high during an international financial crisis so the Russian spillover is an appropriate model for study. There are two apparently conflicting forces in derivative markets in the late 1990s. On one hand, increased incidence of private and sovereign defaults in Asia should have increased demand for credit derivative hedging. On the other hand, financial turmoil and liquidity crises, in addition to insufficient regulations tend to decrease demand for derivative contracts. A preliminary hypothesis would predict that the Asian crisis should have

² Deutsche Bank: *Credit Derivatives and Structured Credit: Market Survey*

³ *Latin CEO*, December, 1999; p. 16

caused a substitution of credit derivatives, which protect against default risk, for currency options since the crisis induced volatility in exchange rate markets. There is also a valid moral hazard problem concerning credit derivatives because of two reasons: first, utilizing credit derivatives may lower the risk premium and expected net return on emerging market securities; and second, corporations may view the willingness of the IMF to bail-out struggling economies as an insurance policy on sovereign credit risk.

Argentine and Brazilian companies, were improperly hedged against credit risk, and, like most of the world, did not anticipate the Asian and Russian turmoil. Their ability to weather Asian contagion is likely a result of fiscal and monetary policies in addition to derivative usage. Latin American companies were no exception in that they could not fully anticipate the need to use credit derivatives prior to the Asian crisis. It was not until the Russian default of 1998 that Latin American investors were forced to revise their derivative risk models to give more weight to credit risk. After the Russian default, Brazil suffered severe contagion effects as investors abandoned Brazilian investments to service foreign liquidity needs. Since the Russian default, credit derivatives have shifted into the spotlight via improved standardization and regulation of the contracts. It is important to note that, like all derivatives, credit derivatives are only effective when risks are not systemic. Their reliability as hedging instruments depends on probability distributions of cash flows.

To some extent credit derivatives are still a wildcard in the underdeveloped market for exotic derivatives. Some analysts caution that investors in emerging markets do not adequately understand the sophisticated instruments and therefore do not hedge properly. This is largely an unfair accusation, as many of the world's largest investment banks and financial institutions hold significant positions in emerging markets. Despite possible apprehension among investors, Argentina and Brazil have increased their use of over-the-counter derivative instruments in the past few years. This is likely a contributing factor to why they managed to survive economic spillover from the Asian crisis. After the recent capital market crises, investors and firms have reevaluated the importance of credit derivatives to protect against default risk. Following the Russian crisis, the International Swaps and Derivatives Association (ISDA) began to implement standard definitions for credit derivative products, making them more reliable hedging instruments. This paper examines a financial model of credit risk and finds that investors using

traditional risk models tend to underestimate credit risk. Furthermore, use of credit derivatives is an effective hedge against default risk during periods of international financial crises. It is possible that inadequate understanding of the relationship between market and credit risks in derivative markets is one reason for why Argentina and Brazil did not manage to avoid Asian and Russian contagion more successfully. Furthermore, increased use of credit derivatives may protect against future debt crises as well as increase corporate returns in Argentina and Brazil when used as hedges in conjunction with reference assets.

2. Macroeconomic Foundations in Argentina and Brazil and Effects of Contagion

It is necessary to examine the economic foundations in Argentina and Brazil to understand contagion effects and credit derivative usage in the two countries. The conventional model of a currency crisis involves a speculative attack on a fixed exchange rate resulting from depleted central bank reserves. This model is inadequate to explain the Asian and Russian contagion in Latin America. Spillover effects in these countries are more characteristic of an international financial crisis, in which investment flows are at least as important as economic fundamentals in prompting a currency crisis. The relative severity of contagion in Argentina and Brazil is a result both of different fiscal and monetary policies and of divergent corporate investment exposures in the two countries. Even though this paper will focus on the role of credit derivatives for insulating against international crises contagion, it would be irresponsible to ignore the role of the Argentine and Brazilian economic policies during the time period in question.

Argentina and Brazil were susceptible to Asian contagion partly because of macroeconomic conditions like current account and fiscal deficits as represented in Figure 1. Argentina posted consistent fiscal and current account deficits since 1993. Brazil's numbers were considerably worse, recording fiscal deficits equal to 7.2% of GDP in 1995 and 5.9% of GDP in 1996. In addition, low domestic savings rates created strong reliance on external financing in Argentina and Brazil. Contraction of foreign funds in response to the Asian and Russian crises strained Latin American markets. Brazil experienced especially severe contagion because of its large fiscal and trade deficits preceding the crisis and its more substantial investment linkages in international markets. Brazil's 1997 trade deficit was -4.2% of GDP. The Russian default caused

both the fiscal and trade balances to worsen in 1998 (Figure 1). The Russian default affected Brazil so severely that 1998 GDP growth turned negative. For a detailed analysis of relations between fiscal deficits and contagion, see the 1999 report of the Bank for International Settlements (which discusses movements in various derivative markets) or the 1999 IMF World Economic Outlook (which focuses on economic fundamentals).

For the purposes of this paper, it will be useful to contrast the tangible contagion effects in Brazil and Argentina. Brazil suffered more serious effects because of its larger fiscal deficits and more extensive integration in world capital markets. Prior to the 1990s Brazil attempted to control rampant inflation by freezing prices rather than reforming fiscal and credit policies. Brazil launched the Real Plan, which included an exchange rate target and tighter fiscal and credit policies in 1993 to fight inflation. Figure 2 summarizes the Real Plan. The dollar-linked exchange rate floor succeeded in reducing inflation from 45% per month in early 1994 to 3% one month after its introduction.⁴ In 1995, Brazil implemented an adjustable exchange rate band to offset expected inflation differentials with the U.S. Although the Real Plan did not completely stabilize the Brazilian economy, it did signal to investors that Brazil was able to support international capital flows.

The Real Plan succeeded in reducing inflation between 1994 and 1998 but did not alleviate Brazil's deficit problems. With the onset of the Asian crisis in October of 1997, downward pressure on the real forced the government to intervene in the exchange rate market. The Real Plan necessitated high real interest rates to spur domestic investment but also augmented debt service payments. The 1997 Brazilian trade deficit grew to \$8.5 billion, unemployment peaked at 8.5% and the stock market plunged, initiating a period of high market volatility and higher spreads on Brazilian paper in international markets.⁵ Faced with exchange rate pressures induced by the Asian crisis, Brazil tightened monetary policy, allowing interest rates to rise, while it cut fiscal spending.⁶ This temporarily preserved reserves and supported the currency. With the onset of the Russian crisis in 1998, Brazil increased interest rates to almost 43% but massive capital

⁴ Jochum and Kodres.

⁵ 1998 IMF World Economic Outlook Interim Report, p. 13.

⁶ Bank For International Settlements, 69th Annual Report, p. 46.

outflows nevertheless required an IMF bail-out package totaling \$41.5 billion.⁷ The IMF aid was conditional on substantial fiscal tightening.

While the IMF aid package should have increased confidence in Brazilian investments, Brazil was forced to float the real because of soaring domestic interest rates. Traditional analyses would interpret this failure as a credibility problem of Brazil's ability to meet IMF conditions. While this is likely a contributing factor, the financial linkages of Brazil's contagion may imply that the failure was not linked to Brazil's fundamentals, but rather resulted from unwinding of improperly hedged positions. The Russian default prompted investment banks and mutual funds to withdraw funds from Brazil to meet margin calls. In other words, the capital outflows in the fall of 1998 were largely independent of Brazilian fundamentals. In January 1999, the Brazilian government abandoned its commitment to its fixed exchange rate and attempted a controlled devaluation that actually resulted in a 40% depreciation of the real within months of the floating regime. Brazil expected to retain control over the devaluation with the IMF support package already in place but its central bank's short position in currency futures in addition to high debt interest payments made the real susceptible to the drastic devaluation. This is preliminary evidence of the importance of derivative markets in Latin America during the capital crises.

Some analysts blame this failure of the exchange rate peg on waning confidence in the Brazilian government's ability to meet IMF conditions and support the currency. However, it is possible that the collapse of the real resulted from financial contagion, and not from Brazilian fundamentals. The traditional precursors for a currency crisis do not explain why Brazil would be so vulnerable to a crisis originating in a negligible trading partner like Russia. There must be another factor that precluded Brazil from succeeding in its second exchange rate intervention. Given the IMF aid package and significant efforts by the Brazilian government to create a budget surplus, the traditional model of a currency crisis resulting from unsustainable macroeconomic policies does not explain the collapse of the real.

A more likely factor is the increased volatility of international capital flows. In such a market, investors have less incentive to investigate the fundamentals of an emerging economy and will likely follow the behavior of well-publicized investors like large investment banks. For an analysis of herding behavior and its contribution to financial contagion, see Guillermo A. Calvo,

⁷ 1999 IMF World Economic Outlook, p. 29.

1999.⁸ Since the Brazilian economy was in a state of recovery at the time of the Russian default, the collapse of the exchange rate peg is likely not a consequence of the Brazilian economy, but rather a consequence of liquidity pressures resulting from the Russian default. Investors who were caught by surprise by the Russian default sold Brazilian bonds to meet margin calls. Marc Hotimsky, the chief of global bonds for Credit Suisse First Boston left Russia on August 14, 1998 (three days before the default) thinking his Russian positions were safe.⁹ Institutional investors faced similar margin calls as Dana McGinnis, a San Antonio manager of hedge funds, who was forced to "dump" other holdings.¹⁰ Brazilian government bonds, which have a large emerging market share, were the obvious victims. Asian markets were still in recovery at the time of the Russian default. Brazilian securities presented one of the most viable options to meet liquidity needs. This massive sell-off may have been falsely interpreted as a deterioration in Brazilian credit by unsophisticated investors. Had Argentina's bond market been as integrated in world markets as Brazil's, Argentina may have suffered similar capital outflows and may not have been as successful in preserving its exchange rate peg.

Precarious derivative positions in Russian and Asian investments forced investors to sell viable Brazilian bonds to service margin calls. There are two reasons outside of Brazilian fundamentals why investors looked to sell Brazilian bonds after Russia announced its default. One reasonable explanation is that the successive crises in Asia and Russia caused investors to lose confidence in all emerging market debt and therefore wish to unload positions in Latin America. Another, and more precise rationale is that unexpected margin calls and panicked unwinding of hedged positions prompted a need for capital that selling the bonds could supply. Even after turmoil in Asia had started to subside, miscalculations in derivative hedging of the Brazilian central bank and private corporations world-wide left the Brazilian economy vulnerable to the Russian crisis. As will be discussed later, the Brazilian government bases capital requirements on the replacement cost of capital, assuming well-functioning markets. This replacement cost is likely to be understated because it does not consider the probability of corporate defaults leading to a currency devaluation, which would depress existing asset values

⁸ Calvo, Guillermo A., "contagion in Emerging Markets: when *Wall Street* is a carrier," University of Maryland, May 2, 1999.

⁹ Siconolfi, Michael; Raghavan, Anita; Pacelle, Mitchell; and Sesit, Michael R.: "Markets Under Siege Swept Away: How Russia Set off Wave That Swamped Markets World-Wide" *The Wall Street Journal*, Sept 22, 1998.

and increase replacement cost. This situation parallels the experience of private corporations in Brazil regarding credit derivatives, which will be discussed later in detail. As this paper will show, preexisting derivative risk models miscalculated credit risk. The Brazilian Central Bank did not float the real because of reserve shortages, but rather out of reluctance to sustain the extraordinarily high domestic interest rates that resulted from the uncontrollable capital outflows after the Russian default in August of 1998. Figure 1.2 shows that Brazilian reserves never fell to a critical level, and shows the volatility in overnight rates. According to the Bank for International Settlements, International Reserves were well above \$30 billion dollars at the time of Brazil's devaluation in January 1999.¹¹

Whereas Brazil attempted to defend its currency peg but was later forced to float the real, Argentina was able to maintain its fixed rate regime. It defended the peso's fixed rate by threatening dollarisation. Argentina did experience wider spreads on debt and was forced to accept high interest rates. Argentina weathered a 9% fall in peso-denominated deposits in favor of dollar-denominated deposits after the Asian crisis.¹² Although Argentina is a relatively closed economy, it had liberalized trade barriers and suffered some contagion from Brazil, its biggest trading partner. In a recent IMF speech, Michel Camdessus discussed the relative success of Latin America in the global economy.¹³ He credits much of Latin America's resilience following the Asian crisis to financial reforms imposed following the debt crisis of the 1980s and the Mexican crisis of 1994. Brazil, Argentina and Chile in particular have instituted higher capital requirements, privatized banks, permitted more foreign integration and adopted better disclosure, accounting and risk-assessment procedures.¹⁴

Unlike affected Asian economies, Chile, Brazil and Argentina have made strides toward increasing transparency between their respective governments and financial industries. For example, Argentina's 1992 central bank charter prohibits central bank financing of non-financial private firms.¹⁵ Following Argentina's Convertibility Plan in 1991, which pegged the Argentine peso to the U.S. dollar, Argentina reduced the involvement of the public sector in trade and began

¹⁰ Ibid.

¹¹ VIS, p. 56.

¹² Bank For International Settlements, 69th Annual Report, p. 46.

¹³ Camdessus speech: "Latin America in a Globalized Economy" Paris, France, March 14, 1999.

¹⁴ Camdessus, *ibid.*

¹⁵ IMF Experimental Report on Transparency Practices: Argentina, April 15, 1999.

to implement standardized accounting procedures to encourage foreign investment. Argentina's financial reforms are a main reason for its resilience compared to Brazil in the wake of the Asian and Russian crises. Argentina and Brazil had somewhat similar economic fundamentals at the onset of the Asian crisis. Both countries had fixed exchange rate regimes and substantial fiscal and current account deficits. Although not quite as serious as Brazil's situation, Argentina had a fiscal deficit of -1.9 percent of GDP and a current account deficit amounting to -3.8 percent of GDP in 1997 (see Figure 1).¹⁶ This is further evidence that contagion in Brazil cannot be explained solely on its fundamentals, because such rationale would imply that Argentina should have experienced the same capital outflows, leading to a collapse of the exchange rate. This begs the question: If both countries had significant fiscal and trade deficits and had largely similar exposure to Russia (which was minimal), how did Argentina manage to support its fixed exchange rate while Brazil could not? The answer to this question lies largely in the private banking sector. Argentina may have suffered few contagion effects and was not forced to devalue its currency because it was better mobilized in terms of credit risk-modeling for modern international capital markets.

Argentine banks have a greater appreciation of credit risk, which is evident in their complex capital requirements. To account for higher and more volatile credit risks in a less transparent market, Argentina raised its minimum ratio of capital to risk-adjusted assets to 11.5 percent.¹⁷ Argentina also imposes additional risk-weighting factors that relate loans to relevant interest rates. Specifically, the capital required for an asset is given by the Value-At-Risk (VAR) model:

$$VaR_i = V_i * k * T^{1/2} * \sigma_i$$

where V_i is the net position of asset i , k is a constant related to risk tolerance, T is the holding period, and σ_i is the daily volatility of asset i .¹⁸ With some modification, the VAR can be applied to individual portfolios and take into account short and long positions.¹⁹ The Value at

¹⁶ IMF World Economic Outlook, May 1998, p. 49.

¹⁷ IMF World Economic Outlook Interim Report: "The Asian Crisis: Capital Markets Dynamics and Spillover," December, 1998, p. 42.

¹⁸ IMF World Economic Outlook Interim Report: "The Asian Crisis: Capital Markets Dynamics and Spillover," December, 1998, p. 43.

¹⁹ $VAR_p = abs[VAR_l - VAR_s] + a * \min[VAR_l, VAR_s]$ where a takes into account possible basis risk of short and long positions not perfectly off-setting. Argentina takes a conservative position and sets $a = 1$. *Source: ibid.*

Risk model for a weighted asset portfolio of an entire bank's position projects the maximum possible loss on the collection of assets based on a normal distribution.

The VAR model was also used in the disastrous Long-Term Capital Management (LTCM) fund. The flaw in reasoning with the LTCM is that the fund managers attempted to increase their expected return by increasing the volatility but not the risk: "The reduction of the Portfolio Company's volatility through hedging could permit the leveraging up of the resulting position to the same expected level of volatility as an unhedged position, but with a larger expected return."²⁰ The notion that hedging could increase a portfolio's return without increasing risk violates the classic assumptions of the Capital Asset Pricing Model (CAPM). Yet the promise of the LTCM convinced many elite money managers from reputable banks. When LTCM started trading in 1994, the notion of firm-wide risk management did not exist.²¹ Fund managers could calculate the value at risk for various portfolios but failed to take account of the relationships between global risks. Unable to predict the exact interactions between interest exchange rate, market and credit risks to determine to what degree they were off-setting or systemic, the VAR model could and did result in serious errors.

It is necessary to distinguish between Argentina's success using VAR and the calamitous LTCM. Argentine banks use VAR to impose capital requirements on loans based on the volatility of the underlying asset to interest rate risk. The banks then separately consider credit risk before authorizing large loans. In contrast the LTCM managers almost unilaterally relied on VAR to speculate using one-sided hedging. This comparison seems to highlight a main controversy concerning over-the-counter derivatives. While the instruments can be highly effective hedges for underlying assets, they can also lead to huge losses if traded by speculators with inadequate assets. This was in an effort to leverage in hopes of increasing returns rather than hedging. This risky strategy lead fund managers to get caught on the wrong side of the Italian bond market in 1998.²² A lesson from the LTCM debacle is that VAR can support reckless speculation. However, in Argentina's case the VAR model is useful for isolating risks on existing assets.

²⁰ Dunbar, Nicholas; "Inventing Money: The story of Long-Term Capital Management and the legends behind it," John Wiley & Sons, Ltd; Chichester, 2000; p. 140.

²¹ Dunbar, p. 185.

²² Dunbar, p. 191.

Brazil has looser policies regarding credit risk, basing capital requirements to cover credit risk on the replacement cost and potential future exposure of derivative contracts. This paper will show that this traditional approach underestimates credit risk. This is because replacement cost assumes a viable currency and well-functioning capital markets. In the event of an international currency crisis, these assumptions break down and the replacement costs for affected securities can drastically change. Compounding this risky exposure, Brazil does not require any capital to insulate against market risk in derivative contracts. Compared to Argentina's policies, Brazil's underestimation of derivative exposure risks may explain why Brazil's financial markets were affected more by contagion than Argentine markets following the Asian and Russian crises.

At this point it may already be apparent that the usefulness of derivatives as hedging instruments depends critically on risk models. Employing standardized risk models that consider the interactions between various risks will increase the effectiveness of derivatives. Currently, individual banks employ different methods for weighing risk exposure. It may be reasonable to assume that the leading global investment banks have more comprehensive models than most investors. Leading a trend toward consolidation in the Argentine banking industry is a growing presence of foreign banking institutions throughout Latin America. In Argentina and Venezuela, foreign banks control approximately 50% of bank assets, while foreign control in Brazil, Chile and Mexico is almost 20%.²³ The greatest contribution of the foreign banking presence has been the introduction of more sophisticated risk models, such as the J. P. Morgan "Wrong-Way Risk" model of corporate credit risk.²⁴ Private banks and securities firms are the largest users of credit derivative instruments. Banks occupy 64% of the market share in purchasing credit derivative instruments and 54% of the market in selling such contracts. Securities firms add another 18% on the buying side and 22% on the selling side (see Figure 3).²⁵ Since these multinational banks and securities firms have a larger presence in Argentina than Brazil, Argentine investors might be expected to benefit more from using credit derivative instruments if they have access to better risk models. This disparity in private investing in credit derivatives is a credible and largely unexplored explanation for why Argentina suffered only mild contagion from the international

²³ IMF World Economic Outlook Interim Report: "The Asian Crisis: Capital Markets Dynamics and Spillover," December, 1998, p.39.

²⁴ J. P. Morgan Derivatives Research, "Wrong-Way Exposure- Are firms underestimating their credit risk?"; *please see section 2 for a detailed analysis of this model.*

financial crises. The following section will introduce credit derivative instruments and show how they can be used to hedge when default risk is high, such as during a financial crisis.

3. Credit Derivatives

The market for over-the-counter (OTC) credit derivatives has only begun to develop over the past few years. OTC instruments are more flexible, customized and face less stringent regulation than standard derivative markets. Credit derivative contracts totaled just \$50 billion world-wide in 1996 but grew to \$350 billion by the end of 1998. Deutsche Bank estimates that the market for credit derivatives will reach \$740 billion by the end of 2000 (see Figure 3).²⁶ Data on credit derivatives is not readily available, but Deutsche Bank estimates that one-third of credit derivatives cover emerging market sovereign credit, one-third cover corporations, and one-third cover private banks.²⁷ Numerous factors explain the recent popularity of credit derivative instruments. They are largely used to protect against sub-investment grade credits, so these derivatives in particular have gained popularity in emerging markets, which tend to be more volatile and have generally less credit-worthy private banks and corporations than do developed countries. One potential side-effect of derivative usage in general is that they may present a moral hazard problem as investors have fewer incentives to gather information.

Banks continue to increase their usage of credit derivatives, both buying and selling protection, in an active effort to separate and manage credit risk and market risk in their portfolios. The devaluations and corporate defaults resulting from the Asian crisis peaked interest in credit derivatives in investors who were largely focused on market risk to the exclusion of credit risk. The Asian crisis alerted investors to highly discounted investments throughout emerging markets. Credit derivatives enable investors to isolate credit risk from traditional market interest rate and currency risk, which are covered by standard derivatives. Their availability made emerging market debt and securities, which have higher default risk, more attractive. However, credit derivatives are still tools of sophisticated investors and involve substantial structuring costs. By the fall of 1997, credit derivatives were still regarded as exotic

²⁵ Deutsche Bank, *Credit Derivatives and Structured Credit*, October 15, 1999, p. 5.

²⁶ Deutsche Bank, *Credit Derivatives and Structured Credit*, October 15, 1999, p. 3.

and complex instruments. It was after the Russian default in 1998 that investors suffered from defaults on seemingly innocuous investments and were forced to reexamine credit risk models. They soon began to realize how credit derivatives could spread credit risk: buyers of protection can reduce default risk while sellers use credit derivatives to diversify their portfolios.

To illustrate why credit derivatives are integral to international investing, it will be useful to describe the types of products that currently exist in the market. The most widely used credit derivative product is the credit default swap. In these contracts, the buyer usually seeks default protection for a reference asset or entity. The reference asset can be a particular asset or part of a corporation. The buyer pays a periodic premium in exchange for a contingent payment from the seller should a credit event occur. A credit event is the event that will trigger the default payment by the contingent seller. Some examples of a possible credit event are bankruptcy, repudiation, restructuring, and failure to pay. Default swaps are not merely insurance policies that only activate in the event of a default. They are market-sensitive instruments that are priced according to credit spreads. For this reason, corporations can use them to hedge against credit spreads in addition to default risk.²⁸ The pricing of a credit-default swap should reflect the credit spread of the reference entity above the risk-free rate. Since these are OTC securities, the contract terms are typically negotiated to specific hedging needs.

It may already be apparent why a firm or investor would like to obtain credit protection by purchasing a credit default swap. Credit default swaps are also attractive to dealers wishing to sell protection. Dealers can sell the reference asset short and use the proceeds to buy a risk-free asset. If a credit event occurs, the seller must sell the risk-free asset, buy the reference entity at the market value and deliver the proceeds to the protection buyer. The default swap premium must be priced such that the premium plus the risk-free rate the seller earns will cover the borrowed security. Transactions can vary if one party is willing to accept a negative carry in exchange for a higher credit spread or riskier asset.²⁹ In the Brazilian repo market, cheap financing enabled dealers to increase the premium for protection following the Russian default. These higher premiums tend to offset the tendency for the market to become one-sided in the case of a financial crisis.

²⁷ Deutsche Bank, *Credit Derivatives and Structured Credit*, October 15, 1999, p. 5.

²⁸ Deutsche Bank, p. 10.

Credit default swaps are desirable during a currency crisis because they are protected from interest and exchange rate risk, assuming information frictions are minimal and disallowing for systemic shocks.³⁰ As increased volatility will tend to suspend traditional derivative activity, a currency crisis should promote a substitution of credit derivatives for interest and currency options. In a volatile market, credit-linked notes allow investors to take advantage of arbitrage opportunities to capture yields above those offered by cash products. In essence, a credit default swap enables investors to stake a position on a reference entity without making a cash purchase of that entity. The implication is that when a credit event occurs, the default cost can be spread in a more predictable manner. This would avoid the herding behavior that caused substantial capital outflows from Brazil in response to unanticipated margin calls following the Russian default. J. David Crammond, president of Intercapital, recognized the value of credit derivatives for avoiding financial disaster: "If this market had been around in 1994 and if people had been hedging as effectively as they are now, there would not necessarily have been such a concern over a default in Mexico."³¹ Another benefit of credit derivatives in the event of a currency crisis is the positive effects they will have on other securities markets. For example, if a credit event occurs, sellers of credit derivatives will need to sell risk-free assets to make the contingent payments. This will have a stabilizing effect in the market for U.S. T-Bills, for example, which will be in high demand by investors who lose confidence in emerging market securities. In addition, the presence of credit derivatives may support demand for emerging market debt during a currency crisis, provided the contracts can be enforced.

Other notable derivative contracts are Credit Spread Products, Total Return Swaps, and Credit-Linked Notes (see Figure 3). Credit Spread options closely resemble traditional options in that there is a set exercise price, asymmetric pay-off and maturity date. Credit-Linked Notes are flexible securities because the reference entity can be corporate loans, entire portfolios, sovereign debt instruments, or indexes like the Emerging Market Bond Index.³² The seller of protection pays the depreciation in the underlying asset value in exchange for a yield premium

²⁹ Deutsche Bank, p. 13.

³⁰ Delman, Barry, "Trading Credit," *Latin Finance*, April, 1999.

³¹ Lazaroff, Leon: "Back in Fashion. Derivatives in Latin American," *Latin Finance*, December, 1997.

³² Deutsche Bank, p. 15.

plus interest payments. CLN's can also be tailored to exchange principal. When the underlying asset is a portfolio, a credit event may be defined as the first element to default.

As with Credit-Linked Notes, Total Rate of Return Swaps may reference a debt instrument, portfolio or index. The receiver of a Total Return effectively takes a long position without owning an asset by receiving coupons payments plus the differential between any appreciation or depreciation.³³ The receiver pays the bank or issuer the LIBOR plus a credit spread and is exposed to losses in the event of a default and declining market prices. Index-based Total Return Swaps allow investors to save on transactions costs by buying or selling a portfolio without cash transactions. This provides greater tax flexibility to corporations and has significant leverage benefits for banks. Banks can reduce credit exposure from a customer without the client's knowledge or earn a higher funding rate from a lower-rated institution with which it may be reluctant to conduct transactions in the cash market.³⁴ Like the other credit derivative instruments, Total Return Swaps (TRS's) provide flexibility to banks and corporations, even in the event of a financial crisis. TRS's provide access to corporate loan markets, which have quick recoveries during times of economic turmoil. Loan investments are particularly attractive during periods of high default risk because their pricing tends to lag bond markets.³⁵ TRS's also enable equity repurchases without requiring substantial collateral.

The following sample transaction illustrates how a credit derivative instrument can benefit buyers and sellers of protection. Consider an investment grade bond. A dealer might pay 25 basis points to buy credit protection or sell protection for 40 bp. These spreads are sensitive to market movements and will differ based on the rating of the underlying asset. A protection purchaser can finance the premium by purchasing the reference asset on a swap basis, financed at the company's standard borrowing rate. This would isolate the credit risk of the underlying asset. If the asset swap yield were 6%, the break-even funding rate would be the difference in asset yield and the default premium ($6 - 25 = 5.75\%$). Some parties will achieve a positive carry value if they can obtain cheaper financing in their private borrowing. The seller of protection would want to sell the reference asset short and invest the proceeds in a risk-free asset so as to have funds available to deliver in the event of a default. The protection seller must receive a

³³ Deutsche Bank, p. 19.

³⁴ Deutsche Bank, p. 20.

premium large enough such that the premium and the risk free return are enough to buy the shorted security and pay the counterparty.

If a credit event occurs that requires payment on the credit default swap, the protection seller will have to sell the risk-free asset in order to make the swap payment. This has the external benefit of balancing the market for risk-free assets like U.S. treasury bills in the event of a currency crisis. In such events of volatility in capital markets, it is rational to expect investors to dump assets they perceive as risky in favor of more stable investments. This was the case after the Asian crisis, prompting the U.S. Federal Reserve to intervene and cut interest rates. Selling risk-free assets to service credit default swaps may stabilize that market in the event of a credit incident.

Even if the payments of a default swap do not exactly offset, at the worst, entering into the credit default swap should offset losses in the event of a corporate default. It would be unreasonable to assert that credit derivatives could eliminate all losses in the event of a major sovereign default. What they can promise is to spread risk and make cash flows more predictable, to avoid the "surprise factor" that forces unmanageable margin requirements. In the previous example, the breakeven rate would be approximately equal to the bid-side asset yield minus the premium for selling protection ($6-40 = 5.60\%$). This example would apply to a highly rated bank. The analysis can be modified for a corporation with more expensive borrowing costs, which would have to accept negative carry on the transaction or short a riskier asset which would offer a higher return. This is a simplistic example of how counterparties of varying credit status can isolate credit risk from cash-based assets and secure predictable cash flows, even in the event of a default.

Credit derivatives have been called "exotic" because they are relatively new in the world of international finance and not widely understood. In addition, they are complex contracts negotiated for sophisticated investors like banks and corporations, not for individuals. This does not mean that the common consumer can neglect the importance of credit derivative hedging by corporations. As demonstrated by the failure of the Long-Term Capital Management hedge fund and monumental losses suffered in the wake of the Russian default by reputable firms such as

³⁵ Delman, Barry, Beidl, Eugene, Tomczak; "Trading Credit," *Latin Finance*, April 1999.

Merrill Lynch & Co., Solomon Smith Barney, Credit Suisse First Boston and Bankers Trust,³⁶ corporate hedging strategies can and will impact investors across the world. Pricing credit derivative contracts is not very different from traditional derivative contracts. Typically, principal is not exchanged at the beginning of the contract. The price of the premium depends on the value of the underlying reference asset, a financing rate, a volatility measure (in this case a credit spread) and the length of the contract. It should be obvious how important corporate risk models are in setting such prices. Credit derivatives are unique in that they also factor counterparty risk and correlation between market and credit risk. Since the fundamentals of credit derivative pricing are relatively well known, the decisions of corporations to use credit derivatives depend on their own risk models.

A major reason why Latin American corporations were not properly hedged against credit risk following the Russian default is that their risk models underestimated credit risk. Specifically, the biggest challenges in credit risk modeling are isolating credit risk from market and liquidity risk, and estimating the correlation among the various types of risk. Investors mistakenly estimated the expected exposure for a future deal based on a standard distribution of options rates. This assumption is valid only as long as the solvency of the counterparty has no relation to the deal's rates. However, there is often a positive correlation between market rates and the credit worthiness of the counterparty.³⁷ When credit and market risks are related, the standard distribution will not adequately reflect both risks, leading to underestimation of exposure and potential loss.

Asymmetric derivative models likely augmented the Asian and Russian crises and may explain why contagion was unanticipated. Currency devaluations were compounded by bank defaults and corporate downgrades, amounting to losses that exceeded expectations.³⁸ Underestimating credit risk exacerbates a currency crisis because the relationship between currency and credit risks is not perfectly understood. Derivative contracts can be used to hedge against exchange rate, interest rate and default risk. What is not always taken into account is the positive correlation between market and credit risk during a currency crisis. The implication of

³⁶ Siconolfi, Michael; Raghavan, Anita; Pacelle, Mitchell; Sesit, Michael R.: "Markets Under Siege—Swept Away: How Russia Set Off Wave that Swamped Markets World-Wide...", *The Wall Street Journal*, Sept. 22, 1998, A1.

³⁷ Levin, Ronald; Levby, Arnon; "Wrong Way Exposure—Are Firms Underestimating their Credit Risk?" J.P. Morgan Derivatives Research.

this is that corporations may utilize derivative markets to guard against various forms of risk, and still incur unexpected losses in the event of a currency crisis.³⁹ Widespread miscalculations of credit risk by corporations may explain the contagion experienced by Brazil and Argentina following the Russian default. Another explanation is that corporations had suddenly exceeded their risk tolerance guidelines (dictated by VAR) in the wake of the Russian default. Banks that reached risk quotas were forced to liquidate viable positions in an attempt to reduce risk. Brazilian bonds turned out to be the convenient victims. Data on actual credit derivative usage by private corporations is unavailable. The best evidence of inadequate risk models before the Russian default are the development of new models like the J.P. Morgan "Wrong-Way Risk" model after the crisis and subsequent expansion of the market for credit derivatives."⁴⁰

J.P. Morgan is arguably the industry leader in emerging market derivatives. Derivative researchers at J.P. Morgan have revised standard credit probability models to include two incidents of default.⁴¹ The first is the default of a sovereign institution, prompting a corporate default (P[C|S]) and the second is a corporate default independent of the sovereign (P[C|/S]). J.P. Morgan first estimated the probabilities for each of these outcomes. The first scenario may represent the announcement of Russia's intention not to repay its debt obligation in August 1998. The expected value of the currency, represented by the exchange rate, given a sovereign default at time t should equal the residual factor value of the currency in the case of default multiplied by the initial forward rate at time t :

$$E[EX_t | \text{sovereign default}] = RV_t * F_t$$

For a well-functioning international currency market, the expected value of a currency is given by the forward rate. In the event of a default by a government central bank or several large private banks, a fixed rate regime may collapse or a flexible currency will depreciate. Using the previous equation, a credit default would prompt the residual factor value to fall to a fraction less than one. Again using probability analysis, Levin and Levy estimate the relationship between corporate default and liabilities to be:

$$P_c(t) = 2N^1[(L(t) - A(0)) / S_A \sqrt{t}]$$

³⁸ Levin & Levy, p. 1.

³⁹ Levin & Levy.

⁴⁰ Levin & Levy.

⁴¹ The following discussion is from the J.P. Morgan "Wrong-Way Risk" credit probability model.

where $P_c(t)$ is the probability of a corporate default at time t , N^1 is the inverse cumulative standard normal distribution, $A(t)$ is the asset value at time t , and σ_A is the annualized standard deviation of asset value.⁴² Since the probability of a corporate default is provided by the two possible probabilities, the equation can be rearranged to solve for Liabilities,

$(L(t) = A(0) + N^1(P_c(t)/2)\sigma_A\sqrt{t})$ assuming that a default occurs when an asset moves by $N^1(P_c(t)/2)\sqrt{t}$. Using probability distributions for the exchange rate and deal value, the J.P. Morgan model shows convincingly that market practice underestimates credit risk.⁴³

The phenomenon of international contagion involves not only sovereign instability but corporate default probability as well. The J.P. Morgan model can be used to examine corporate defaults under two scenarios: a corporate default precipitated by a sovereign default (private bank defaults in Brazil after the collapse of the fixed currency rate) or an isolated corporate default (Argentine corporations default while the Central Bank does not). The probability that a corporation will default increases when there are adverse market conditions. In these cases, currency pressures are likely. The J.P. Morgan model predicts this to cause some currency depreciation. To alter the model for fixed exchange rates on the Brazilian real and the Argentine peso, it will be necessary to substitute depreciation with some other measure of currency pressure, such as rising interest rates or falling reserves. Under this assumption, the collapse of the Brazilian real would be measured as an extreme case of currency depreciation.

The main problem with this model is the lack of available data. Equity defaults are rare and loan defaults are largely unreported. It is not possible to observe precisely the impact of corporate default on currency value. The J. P. Morgan model suggests two estimates: the correlation of equity share prices with currency (banks have high correlation), or the rating of a corporation. Since Argentina and Brazil had fixed currencies and high proportions of foreign equity, the second measure is more appropriate. Using corporate ratings would devote more weight to the default of a highly rated corporation. Argentina and Brazil both recorded D+ “Average Bank Financial Strength Ratings” from 1996 through May of 1998, compared to an

⁴² Ibid.

⁴³ Levin & Levy, p. 3.

average rating of C+ for U.S. banks.⁴⁴ Therefore financial contagion would likely cause banks in Brazil and Argentina to default.

Argentine banks' higher capital requirements and foreign banking derivative risk models may have compensated for some of the weakness. Argentine banks have a greater appreciation of credit risk, which is evident in their complex capital requirements. Brazil has looser policies regarding credit risk, basing capital requirements to cover credit risk on the replacement cost and potential future exposure of derivative contracts. In an address at the International Conference on Central Banking Policies, Shigmitsu Sugisaki Deputy Managing Director of the IMF, concluded that, in accordance with the J.P. Morgan model, corporate debt was a major contributor to the Brazilian crisis.⁴⁵ When exchange rates fell, Brazilian corporations defaulted on their substantial dollar-denominated debt. The counterpart in private sector insolvency problems was the deficiency in lenders' risk-assessment⁴⁶

It may seem unrealistic to assume that corporations world-wide simply did not recognize the need to use credit derivatives. Even though they are still a developing market, it is reasonable to consider that some emerging market investors chose not to buy and sell credit protection to preserve emerging market yields. For example, prior to the Asian crisis, countries with fixed exchange rates found lower interest loans in the international market. Asian firms neglected to hedge their financing properly because derivative instruments are not as prevalent in emerging markets and corporations feared that taking action to hedge would cancel the attractive interest spreads they sought.⁴⁷ Another obstacle to proper usage of credit derivative markets prior to the Asian and Russian crises was the lack of a supervisory body to enforce the contracts. A trend toward commoditization: well publicized losses from exotic derivative products had curbed demand before the Asian crisis in favor of standard contracts such as currency and interest rate swaps.⁴⁸ A plausible argument is that the Russian default and ensuing contagion served as the

⁴⁴ IMF World Economic Outlook: "The Asian Crisis: Capital Markets Dynamics and Spillover," December, 1998, p. 36.

⁴⁵ Sugisaki, Shigmitsu: "The Reform of Global Exchange and Financial Systems Since the Eruption of the Asian crisis," IMF Address at the International Conference on Central Banking Policies, May 14, 1999.

⁴⁶ Ibid.

⁴⁷ Mathieson, Donald J.; Richards, Anthony; Sharma, Sunil: "Financial Crises in Emerging Markets," *IMF Finance & Development* 1999.

⁴⁸ "International Capital Markets: Developments, Prospects and Key Policy Issues," International Monetary Fund, September, 1997.

catalyst to expand the market for credit derivatives in emerging economies. It will be useful to examine data of credit derivatives (sparse as it may be) to find support for this hypothesis.

4. Analysis of Credit Derivative Usage in Argentina and Brazil

Latin America has the largest regional credit market in the world.⁴⁹ This may be a result of the substantial foreign banking presence, which may reduce regional volatility. Yield spreads on emerging market debt are measured by the Emerging Market Bond Index (EMBI), which is dominated by Latin American credits. The EMBI had been declining since the Mexican crisis of 1994 as Latin American financial institutions (led by Argentina) undertook reforms.⁵⁰ Volatility increased in response to the Asian crisis in late 1997, but did not rise as much as in 1994 (2.8% in 1994; 2.25% in January 1998).⁵¹ The increases in spreads represent a liquidity crisis rather than only higher credit risk. This is because the widening spread is a result of lower returns on safe investments (the yields of Brazilian bonds fell as international investors sold them to meet margin requirements) instead of premiums on high-risk default issues.⁵² This increase in volatility increases the need for derivative hedging in emerging markets.

The Asian crisis created a credit crunch in Latin America, manifest in dramatic reductions in sub-investment grade issues, compounded by further corrections following the Russian default.⁵³ Banks' credit flows to emerging markets fell from \$73 billion in 1997 to -\$60 billion in 1998.⁵⁴ Both Argentina and Brazil fell victim to bank withdrawals of lending (see Figure 4). Brazil in particular experienced a remarkable reversal of credit flows between the first and second halves of 1998. High domestic interest rates induced capital inflows in the beginning of the year. The Russian crisis forced investors to unwind positions in Brazil, accounting for the large capital outflows that caused the real to collapse. Unforeseen margin calls and improperly hedged positions of international investors inside Russia caused spillover in Brazil. The financial linkages created by Brazil's integration in the world economy may have forced the capital outflows from

⁴⁹ IMF World Economic Outlook: "The Asian Crisis: Capital Markets Dynamics and Spillover."

⁵⁰ Ibid.

⁵¹ Ibid.

⁵² Bank for International Settlements 69th Annual Report, Basel, June 7, 1999, p. 94.

⁵³ Bank for International Settlements 69th Annual Report, Basel, June 7, 1999, p. 94.

⁵⁴ BIS, p. 124.

Brazil and contributed more to the collapse of the real than any domestic economic policy could. This may imply that Brazil was helpless to avoid the devaluation. This is not completely true. Had Brazilian companies made better use of OTC derivative markets, corporate risk protection may have mitigated some of the outflows.

The combination of increased volatility and fewer sub-investment grade issues in Latin America had conflicting effects on the market for credit derivatives. Reductions in issuance of typical credit reference assets may have counterbalanced the higher demand for credit protection in 1997 and 1998. The Bank for International Settlements identified private defaults as the primary impetus for the Asian crisis and ensuing contagion in Argentina and Brazil. Adjustments in derivative markets after news of the crisis, represents reassessment of credit risk by market participants.⁵⁵ Derivative markets were affected even more by the Russian default, as investors in credit derivatives were concerned primarily with the ability of a borrower to service debt obligations. Investors in Argentina and Brazil did not only worry about defaults on domestic loans, but about a domino effect triggered by the Russian default. Since it is not possible to monitor all investors to make sure they are properly hedged for default risk, the optimal strategy for a corporation in Argentina or Brazil is to invest in credit derivatives.

This assumption would predict that OTC derivative contracts should have increased in Argentina and Brazil (as they did for the world market; Figure 3) after the onset of the Asian crisis. During the months between the plunge of the Hong Kong SAR stock market in October, 1997 and the Russian default in August, 1998, new financing through international banking and securities markets showed a marked decline.⁵⁶ Presumably, at least part of this reduction may be attributable to increased activity in derivative markets. The Bank for International Settlements (BIS) did find that the use of credit derivatives increased during the same period and provided a more efficient adjustment to unforeseen exposures, but that the market was restrained by regulatory deficiencies.⁵⁷ The BIS estimates that the market for OTC credit derivatives reached

⁵⁵ BIS, p. 101.

⁵⁶ BIS, p. 122.

⁵⁷ BIS, p. 122.

\$1.18 trillion by June 1998 and that even this growth in the market for credit protection still underestimated credit risk in emerging markets.⁵⁸

5. Transparency in Credit Derivative Markets and a Look to the Future

Increased activity in derivative markets in Argentina and Brazil can be explained by higher domestic interest rates, speculation in exchange rates, and credit defaults and lending reversals following the Asian crisis. The Asian and Russian crises alerted investors to the value of credit derivatives. Concern about bank exposure to highly leveraged corporations boosted demand for derivatives that protect against default risk. It may be reasonable to argue that credit derivatives, utilized mainly by large commercial banks, insulated Argentina from Russian contagion more than Brazil because of Argentina's predominant foreign banking presence. The extent that Argentina and Brazil did experience contagion was largely not a result of weak fundamentals, but of foreign investors' liquidity needs and insufficient use of credit derivatives. The market for credit derivatives does not become one-sided in the event of an international financial crisis, as sellers can collect larger premiums on contracts. The main impediment to the global credit derivatives market is apprehension of buyers that contracts will be enforced because of imperfect transparency in derivative markets.

OTC credit derivative terms, including the reference entity, payments, and the event of a credit default are all negotiated in a contract. Exactly what constitutes a credit default is the most controversial element of the contract. For the first few years of credit derivative usage, such definitions were not standardized and poorly enforced so investors had little confidence in the enforceability of the contracts. This uncertainty; along with inadequate risk modeling, explains why credit derivative usage was too sparse in Latin America to protect sufficiently against Russian contagion. In response to these discrepancies arising from the Russian default in the summer of 1999 the International Swaps and Derivatives Association (ISDA) created a standard set of definitions for credit derivative contracts.⁵⁹ These regulated terms greatly reduce transactions costs and potential legal exposure resulting from documentation inconsistencies.

⁵⁸ BIS, p. 138. Note: the BIS figure of \$1.18 trillion credit derivative contracts outstanding is larger than the Deutsche Bank estimate.

The standardized definitions and new regulatory framework will greatly expand the demand for credit derivatives from an exotic market to an integral part of corporate hedging strategy. For a detailed listing of standard terms, such as failure to pay, restructuring and settlements, reference the Deutsche Bank Market Survey on Credit Derivatives and Structured Credit.

Aside from insecurity about contract specifications and their enforceability, the existence of the IMF as lender of last resort may explain why investors do not protect adequately against credit risk. Transparency issues and standardized definitions are the most important factors for credit derivative market growth, but it is worthwhile to mention some studies of the moral hazard argument. An IMF *Finance & Development* report recognizes the underestimation of credit risk by corporations but also speculates that the availability of international financial assistance provides a sense of security to investors to engage in risky behavior.⁶⁰ This argument may apply to the Brazilian crisis. The IMF announced Brazil's \$41.5 billion aid package in November, 1998. With this safety net in place, Brazilian corporations may have decided not to enter into credit derivative contracts to protect against default even after recognizing the potential losses unhedged credit positions could create. This may explain why continued capital outflows and subsequent corporate defaults forced Brazil to devalue the real in January 1999. For a discussion of the moral hazard arising from the lender-of-last-resort facility, see Gregory Moore, 1999.⁶¹

Traditional explanations of financial contagion in Latin America do not explain the experiences of Argentina and Brazil following the Asian and Russian crises. In 1999 Brazil refused the final US\$4.8 billion of IMF aid, following a strong economic rebound.⁶² This quick recovery supports the theory that Brazil's troubles were mainly the result of financial contagion. Although both nations carried fiscal deficits and took measures to support their currencies during the crises, the contagion may also have been the result of financial linkages, and not just economic fundamentals. The Brazilian crisis occurred in large part because of capital outflows as international investors withdrew investments in otherwise secure Brazilian bonds to service

⁵⁹ Deutsche Bank, p. 28.

⁶⁰ Mussa, Miodaniel; Swoboda, Alexander; Zettelmeyer, Jeromin, Jeanne, Olivier: "Moderating Fluctuations in Capital Flows to Emerging Market Economies," *IMF Finance & Development*, September 1999.

⁶¹ Moore, Gregory: "Solutions to the Moral Hazard Problem Arising from the Lender-of-Last-Resort Facility," *Journal of Economic Surveys*, Vol. 13 No. 4, September 1999.

⁶² *Latin Finance*, December 1999, p. 16.

Russian margin requirements in late 1998. These episodes of financial contagion deviate from traditional analyses of currency crises because they resulted from highly leveraged and poorly hedged corporate positions. The collapse of the real in January 1999 is evidence that private defaults and underestimation of corporate credit risk can destabilize a currency.

This paper demonstrated that corporations tended to underestimate credit risk prior to the Asian and Russian crises. The ensuing contagion forced investors to realize that credit derivative products should be considered a vital element of corporate hedging. As a result the market for OTC credit derivatives has increased at an impressive rate in the past few years. Since multinational banks and securities firms are the predominant users of credit derivatives, the significant presence of foreign banking in Argentina is currently leading a more sophisticated appreciation of credit risk. This, in addition to reforms of the Argentine Central Bank, explains Argentina's relative success in averting contagion compared to Brazil. As transparency and standardized definitions in credit derivatives contracts improve, the market will continue to grow. Assuming reliable risk models, credit derivatives are perhaps the best tool of emerging market corporations and investors to isolate credit risk from market risk and protect against future financial contagion.

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World Economic Outlook, May, 1998; International Monetary Fund, Washington D.C.

Figure 1

Figures are in % of GDP. Inflation is annual % change. For quarterly data inflation is the % change from 4 quarters earlier

	1990	1991	1992	1993	1994	1995	1996	1997	1998	Q1 1997	Q2 1997	Q3 1997	Q4 1997	Q1 1998	Q2 1998	Q3 1998	Q4 1998
Argentina																	
GDP growth	-1.3	10.5	10.3	6.3	8.5	-4.6	4.2	8.4	4.2	8	8.3	9.9	8.2	7.2	7.4	3.2	-0.5
Inflation	2314.7	171.1	24.9	10.6	4.2	3.4	0.2	0.8	0.9	0.7	0.7	0.6	-	0.6	1.2	1.1	0.7
Fiscal Balance	-1.7	-1.2	0.4	-0.2	-1.7	-3.4	-3.2	-1.9	-1.1	-0.7	-0.3	-1.2	-1.6	-0.5	-1.7	-1.7	-1.6
Current Account Balance	3.3	-0.2	-2.8	-3.1	-3.7	-1.5	-1.9	-3.8	-4.5	-0.7	-0.3	-1.2	-1.6	-0.5	-1.7	-1.7	-1.6
Brazil																	
GDP growth	-4.3	1	-0.5	4.9	5.9	4.2	2.8	3	0.2	3.8	4.8	2.7	2	1.1	1.6	-0.1	-1.9
Inflation	2740	414.8	991.4	2111.4	2166.2	59.7	15.5	6	3.8	9.2	8.4	6.7	7.4	6.1	4.4	3.3	1.9
Fiscal Balance	1.6	1.4	-2.2	0.2	0.6	-7.2	-5.9	-5.9	-7.5	-2.5	-1.3	-2	-2.6	-1.5	-0.5	-1.8	-2.6
Current Account Balance	-0.9	-0.4	1.6	-0.1	-0.3	-2.5	-3.3	-4.2	-4.5	-2.5	-1.3	-2	-2.6	-1.5	-0.5	-1.8	-2.6

Figures for 1990-1997 are from the 1998 IMF World Economic Outlook

Figures for 1998 are from the Bank For International Settlements, June 1999

Quarterly data for 1997 and 1998 are from the 1999 IMF World Economic Outlook. For these figures, Trade Balance is in billions of U.S. dollars

Figure 1.2

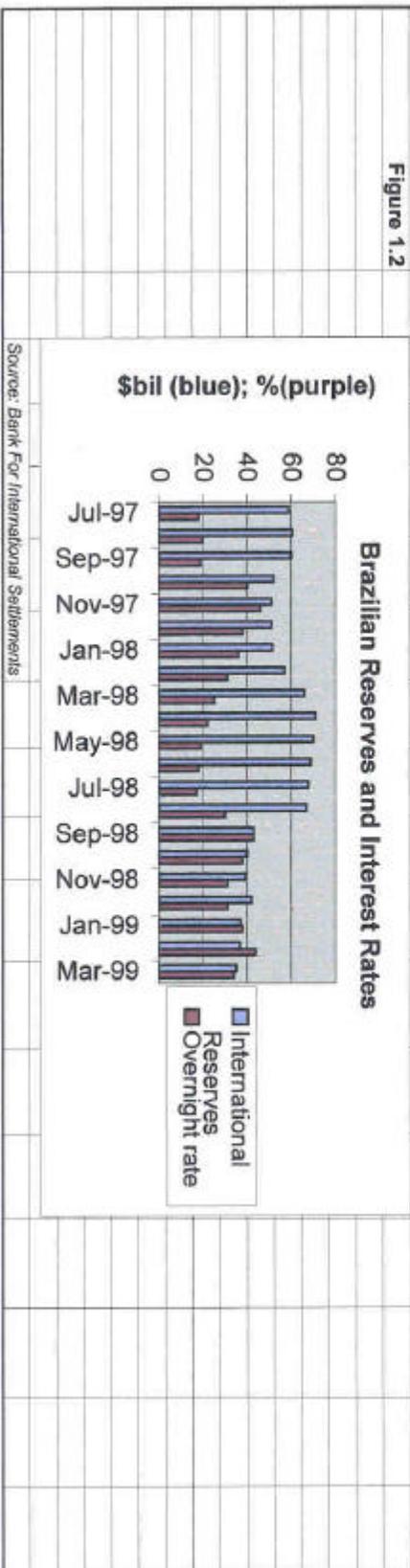


Figure 2

BRAZILIAN REAL PLAN

- PHASE 1:** 1993: Government sets and initiative to cut expenditures; target a budget surplus for 1994
- PHASE 2:** Introduced a new unit of account linked to the new exchange rate in an effort to end the practice of backward indexation
- PHASE 3:** July 1, 1994: government introduces the new currency (the real) with an exchange rate peg to the U.S. dollar with a floor of R\$1.

The plan reduced inflation from from 45% per month in early 1994 to 3% one month after its introduction. In March, 1995, the Brazilian Central Bank authorized a currency band to offset inflation differentials with the U.S.

Source - Jochum and Kodres

Actions of the Brazilian Central Bank After the Onset of the Asian Crisis

- October, 1997:** Fiscal and monetary reforms: 2.5% of GDP tax increases, spending cuts.
- Aug-Sept, 1998:** In response to capital outflows of \$12-19 billion, Brazil raised interest rates to 43% The Central Bank conducted spread auctions on spot foreign exchange instruments; Banco de Brasil took positions against market sentiment in the currency futures market; Central Bank sold dollar-denominated bonds to counter-act demand.
- November, 1998:** IMF aid package of \$41.5 billion is announced, conditional on fiscal tightening to produce a budget surplus
- January, 1999:** Brazil suffers worse capital outflows after the Russian default; authorities widen the exchange rate band; Two days later, the Central Bank let the real float while increasing interest rates. After a sharp depreciation, the currency stabilized around R\$2.

Source: 1999 Word Economic Outlook, IMF

Argentina's Currency Peg

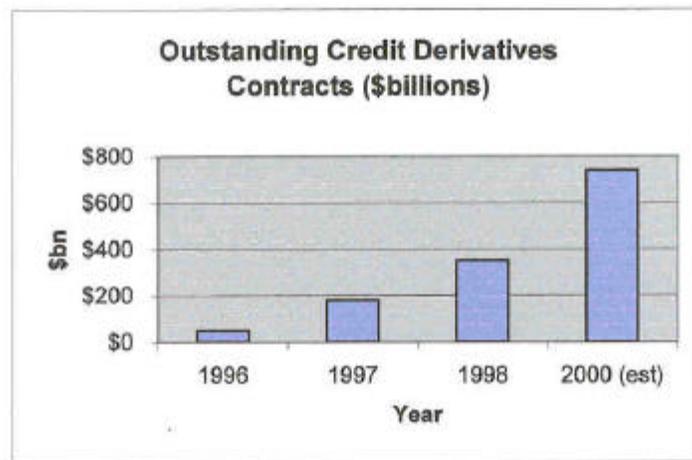
- 1991 Convertibility Plan:** Peso pegged to the U.S. dollar, stock of monetary liabilities tied to foreign reserves held by the Central Bank, established full convertibility of the peso for current and capital transactions
- 1992 Central Bank Charter:** Prohibit central bank financing of the non-financial private sector, limited the Central Bank's role as lender of last resort, reserve requirement transformed to a liquidity requirement, and tighter capital requirements.
- 1997 Currency Defense:** In addition to tolerating high domestic interest rates, auctioned resettable coupon bonds to combat credit spreads (\$500 million in spread adjustable notes (SPAN's)
- March 1998:** Offered floating rate accrual notes (FRAN's), providing interest and credit float.

Source: IMF. Experimental Report on Transparency Practices: Argentina, April 15, 1999;

Figure 3

Market Share of Credit Derivative Contracts as of Dec. 1999 (%)

	Protection	
	Buyer	Seller
Banks	64	54
Securities Firms	18	22
Corporations	7	3
Insurance Companies	5	10
Government	4	1
Mutual Funds	1	4
Pension Funds	1	2
Hedge Funds	0	4



Market Share of Credit Derivative Products (%)

	1996	1997	2000 (est)
Credit Default Swaps	35	52	38
Credit Spread Products	15	16	13
Total Return Swaps	17	14	17
Credit-Linked Notes	27	13	21
Repackaged Notes/Hybrids	6	5	11

Source: Deutsche Bank, Credit and Structured Credit: Market Survey, October 15, 1999.

Figure 4								
Banks' External Claims on Countries¹(\$billions)								
	1996	1997		1998				
	Year	Year	Year	Q1	Q2	Q3	Q4	Stocks at end-1998
Developed Countries	22.8	25.2	30.8	9.5	2.3	8.8	10.2	248.2
Latin America	28.5	34.1	0.7	12.7	2	-8	-6.1	309
Argentina	5.4	7.3	-0.3	1.5	-0.2	1.2	-2.8	46.5
Brazil	16.7	10.7	-3.9	8.1	0.6	-8	-4.5	98.2
<i>Figures are in changes in amounts outstanding excluding exchange rate valuation effects.</i>								
<i>Source: BIS 69th Annual Report</i>								