DERIVATIVES IN INTERNATIONAL
CAPITAL FLOW

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ABSTRACT

This paper will discuss the role of derivative products in international capital flows, especially in providing a means of both reducing and enhancing market risks associated with given net flows. It will emphasize how derivatives can be used to evade risk-control or prudential regulation, circumvent capital controls, drive the dynamics of currency instabilities, and obscure true risk positions and thereby undermine the usefulness of balance of payments capital account categories.

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The explosive growth of derivative products in the last fifteen years has paralleled the growth of cross-border gross capital flows. The use of derivative products has been a major factor in the growth of cross-border capital movements for several reasons. First, by allowing the separation of various risks associated with cross-border investment, it makes such investment more attractive. Portfolio diversification becomes more likely, with a consequent increase in gross international flows. Moreover, impediments to movement of capital in search of higher real yields weaken, with a consequent increase in net flows. Various dimensions of risk can be moved across borders to markets that find them less unattractive. Indeed, such potential gains in the efficiency of the international allocation of capital has redefined a major, profitable segment of the international wholesale banking market.

The problems associated with the rise of derivatives stem partly from the same source as the benefits: the increased ability to separate and market risks means that some counter parties can assume riskier positions more readily than in the past. Coupled with the existence of weak financial systems and the inherent opaqueness of derivative positions due to obsolete accounting systems, slow reporting, and unprepared supervisors, derivatives can be used to leverage financial safety nets in efforts to double up lost financial bets. Often, such activity must move offshore to evade detection and naturally generates a gross international capital flow. Moreover, derivatives can be used readily to evade onshore prudential regulation and capital or exchange control, thereby generating yet more measured capital flows.

Interpretations of the causes and dynamics of the sudden capital flow reversals associated with balance-of-payments crises generally are based on on-balance sheet information. In the presence of derivatives, however, such data can generate false inferences about the sources of a crisis

and lead to misinformed policy prescriptions. They confound the sources of the crisis: whether it stems from foreign speculators, panicked green-screen traders, or domestic insiders armed with knowledge about weak fundamentals. In addition, in the presence of large volumes of derivatives, claims that crises are generated by such inappropriate polices as an excessively short maturity of the public debt can be mirages of on-balance sheet accounting.

Even on-balance sheet data for measuring the quality of international capital flows--the capital accounts of the balance-of-payments data--are obscured by derivatives used to enhance risk or evade controls or even for benign purposes. Sub-account data, such as portfolio investment, equity investment, foreign direct investment, or long or short maturity fixed interest rate lending, are illusory in the presence of substantial volumes of derivative products.

The remainder of this essay will provide general descriptions of some of the basic derivative products, along with recent data on the extent of the market in derivatives.[1] After a discussion of the positive effects of derivatives--the ability to refine the management of risk--the paper will examine the negative aspects of these products--their role in enhancing risk-taking, in evading prudential regulations, taxes, and controls, in channeling the dynamics of currency and financial crises, and in obscuring the meaning of capital account data from the standard balance of payments accounts.

I. Some Basic Derivative Products

While the list of exotic derivatives products expands almost daily, most derivatives

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[1]The paper is an adaptation and expansion of ideas developed in Garber (1996, 1997), Garber and Lall (1996), and Folkerts-Landau and Garber (1997).

outstanding are relatively simple, consisting mainly of *forward* contracts, *swaps*, and basic

options, whose notional values are indicative of the magnitude of the market risks that are being

acquired or hedged. *Structured notes*, however, are implicitly highly leveraged products whose

notional values generally underestimate significantly the magnitude of the risks taken. Here, I

will concentrate only on a few types of swaps and structured notes.

A *generic swap of yields* is an exchange of the percentage return on one type of asset

during a given period for the percentage return on another asset, multiplied by a pre-defined

notional value to convert percentages to cash equivalents. Both returns are observable in

securities or banking markets. The swap may involve a periodic exchange of yields for a fixed

period of time, and settlement only of the net amount due. Specifically, for a given currency, an

interest rate swap is an exchange of a fixed interest return for a floating return or perhaps one

floating interest rate for another. An *equity swap* or *total return swap* generally is a periodic

exchange of the return on a given share or equity index, including dividends and capital gains,

for some interest yield, multiplied by a notional value in a given currency.

Interest and equity swaps do not involve initial and final payments of principal or

notional value, although the counter-party with the greater credit risk may have to deliver some

collateral. *Currency* and *foreign exchange swaps* do require initial and final delivery of

principal. A *foreign exchange swap*, generally a very short term deal, is a combination of a spot

sale of currency and a forward purchase--it packages in a single deal both foreign exchange

market legs of the familiar interest rate parity arbitrage operation. Foreign exchange swaps

coupled with spot exchange sales are the standard wholesale market technique for establishing

forward currency positions. A *currency swap* similarly requires an initial and final exchange of

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principal amounts of the two currencies at predetermined forward exchange rates, but it is of

longer maturity and involves periodic exchanges of interest on the principal amounts in the two

currencies. A currency swap can be interpreted as a bundle of forward exchange contracts with

sequentially lengthening maturities.

A *structured note* requires the delivery of a given amount of principal by the buyer to the

seller, as in a standard bond purchase. The payoff of either interest or principal is set as a

function of some underlying market value, such as an exchange rate or interest rate. Depending

on the nature of the formula, the payoff may deliver multiples of the initial principal; or, on the

downside, the principal may be wiped out.

II. Data on the Extent of Derivative Markets

The 1995 BIS survey of market participants in the major and many minor financial

centers indicated that the notional value of over-the-counter (OTC) derivative products

outstanding was $47.5 trillion in March 1995, and of this about 55% were cross-border

transactions.[2][3] Most of this amount consisted of simple interest rate products such as swaps,

and most cross-border transactions occurred between industrial countries.[4] For other derivative

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[2] "The global nature of the markets is underlined by the large amount of business contracts with counter parties located abroad."BIS, p.24.

[3] In a survey of its members, the International Swap Dealers Association found that outstanding swaps had increased by 37% between 1995 and 1996, although this was not as comprehensive a survey as that of the BIS. Exchange based contracts outstanding were stagnant over the year, however. See BIS (1997), p. 130, 136.

[4] Thus, the problem of inferring market risk from balance-of-payment data applies especially with regard to the positions of industrial countries. Academic investigations of the lack of cross-border portfolio diversification based on capital account data are seriously compromised by this gap in the data.

products, there are, nevertheless, large notional values outstanding in absolute terms--equity based products and structured notes and options which may be quite complex--and these are also used to an ever-expanding extent in key emerging market countries.

Of the $47.5 trillion in OTC notional values, 61 percent was in interest rate instruments, and 37 percent was in foreign exchange instruments, including outright forwards and swaps. Outstanding equity contracts amounted to 1.25 percent and commodity-related instruments were 3/4 percent of the overall notional value or about $590 billion and $350 billion, respectively. Exchange-traded contracts outstanding amounted to $8 trillion, almost all of which were interest rate contracts. Gross market values or replacement costs were $2.2 trillion for OTC contracts, about 4.6 percent of the notional value.[5]

Of the interest rate products, 50 percent was cross-border; while 56 percent of foreign exchange products was cross-border, for an overall total of about $26 trillion.[6] For equity products, cross-border position data are not reported by the BIS. For comparison, the total stock of domestic and international securities in the OECD countries was $26.3 trillion, and

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[5]Most derivative products are priced on initiation of the contract so that they have zero market value. As underlying market prices move through the life of a contract, the contract--which is a bet on the movement of the underlying prices--acquire positive absolute values. These values are called replacement costs.

[6]See BIS, p. 23, Table D3.

international banking assets excluding securities holdings were $8.3 trillion in March 1995.[7]

Thus, if applied one-to-one to outstanding securities, the stock of both OTC and exchange traded derivatives were sufficient to have repackaged the risk characteristics of all domestic and international securities and all international banking assets. Of the outstanding volume of OTC products, however, about 57 percent of the local and cross-border deals was between dealers to balance positions.

III. Why Derivatives Can Increase Cross-Border Movement of Capital

It is worthwhile at this point to consider a brief set of examples of derivative products. These examples will be used throughout the remainder of the paper to show how derivatives might aid in the diversification of portfolios, reduce or to enhance risk, evade prudential regulations, and avoid capital controls and taxes. In these activities, they can create gross international capital flows that otherwise might not have materialized, but they also can confound the nature of the cross-border flows that do occur. Some of the derivative types in the following examples were important in the Mexican exchange rate crisis of 1994-1995, so they will be developed in the Mexican context, which is used as a backdrop for many of the succeeding conclusions; but they are generic products and are used world-wide for the same reasons they were used in Mexico.

Some Specific Examples of Derivative Products and Associated Gross Capital Flows

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[7]Notional amounts do not reflect the payments obligations. They do reflect the price exposure in the underlying markets and they are useful for comparison with the underlying for the amounts outstanding. See BIS, p. 24.

Currency Swap

The initial example is a plain vanilla currency swap in its most common context. Suppose that IBM sells DM bonds in Germany to shave some basis points from its finance costs--German fund managers find IBM securities desirable for diversification purposes but insist on DM settlement. IBM wants dollar liabilities, however, because of the nature of its earning stream. It enters a currency swap with a US bank, equivalent to a stack of forward exchange contracts in which IBM pays dollars at pre-determined exchange rates and receives the DM needed to cover its bond obligations. In its net position, IBM is then a dollar debtor; and the bank has acquired the currency risk. Similarly, Daimler-Benz also can save basis points by placing its bonds with a US pension fund, which also seeks diversification of credit risk, but it must denominate the bonds in dollars. Another, opposite currency swap is born, perhaps with the original US bank as the natural, ultimate counter party. The US bank makes the market and takes a spread, but has no net currency position. [8]

There is no *net* international movement of capital, but the two bond issues appear on-balance sheet as *gross* capital flows to be captured by the periodic snapshots of the balance-of-payments data. In the absence of the swaps, neither borrower may have found it beneficial to go to an offshore market and may have confined their borrowing to domestic lenders, leaving no tracks in the data on gross international capital movements. As off-balance sheet items, the swaps are not reported and are not captured in balance of payments data, except to the extent that collateral is demanded by the market making bank from one or both final counter parties:

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[8] See Feldstein (1994), pp. 13-14 for further analysis of net versus gross movement of capital

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Single Currency Interest Rate Swaps

It is natural that gross capital flows should arise from currency swaps, because a cross-border flow is at the heart of the swap deal. With interest rate swaps in a single currency, which account about 60% of the outstanding OTC notional value, the natural international aspect disappears. Nevertheless, such swaps are frequently associated with capital flows. Suppose that a highly rated US company borrows fixed interest dollars in London and enters a swap as a floating rate payer with a bank--it will pay three-month dollar LIBOR multiplied by the notional value of the swap at the same maturity as its bond. On net, the US company has converted its required service payments into floating rates, which it prefers. The bank's balancing customer might be a lesser-rated Italian company that sells floating rate dollar denominated securities in London but wants to pay fixed interest. In the absence of the swap, the US company might have preferred to borrow at floating rates directly in the US, but it is encouraged to borrow in London because the swap allows it to shave basis points from the deal, and similarly for the Italian company. The funds for the principal of the two loans have to come from somewhere. Whoever would have bought the US company's potential US bond issue—say a US resident--will now buy its more attractive Eurobond issue, and similarly for the Italian company. Again, there are no net cross-border flows but positive gross flows. Before the advent of interest rate swaps, this gain from trade between the two companies would not have been possible, and the deals would have been directly financed from national sources.

Tesobono Swaps and Repos

The interest rate swaps described above involved exchanging fixed for floating rate yields in the presence of derivatives.

in a single currency or fixed rate for fixed rate yields in two different currencies for relatively long maturities. Similar deals are made in large volumes for shorter maturities. Here, the tesobono swap will serve as a useful example of such deals.

Tesobono swaps were offshore derivative operations used by Mexican banks as a means of leveraging tesobono holdings, the notorious treasury bills of the Mexican government indexed to the peso-dollar exchange rate. In a tesobono swap, a Mexican bank received the yield earned on tesobonos and delivered dollar LIBOR plus some additional basis points, multiplied by a notional amount of dollars.

The leverage involved in tesobono swaps can be most readily examined by analyzing first the nearly equivalent tesobono repurchase agreement. As an example, consider a New York investment firm that is willing to lend dollars for one year against tesobono collateral through a repo. The firm engages in a repurchase agreement with a Mexican bank to buy tesobonos at some agreed price and to resell them in a year at the original price

Table 1. Tesobono Repurchase Agreement
1. Tesobono yield = 8%   LIBOR yield = 5%   Maturity--1 year
2. Mexican bank sells $1 billion of tesobonos to New York firm for $800 million with agreement to repurchase in 1 year for $800 million x (1+LIBOR+1%)
3. NY firm funds 80% of Mexican bank's position--has $200 million of margin (20%)
4. NY firm is a foreign address holding $1 billion of tesobonos
4. Mexican bank gets tesobono return @ 8% on $1 bn., finances 80% @ LIBOR+1%--2% spread
5. NY firm borrows $800 million @ LIBOR, lends @ LIBOR +1%

plus a dollar interest rate.[9] In the example in Table 1, a Mexican bank sells $1 billion of tesobonos to a New York firm for $800 million with an agreement to repurchase the tesobonos in one year for the original price plus the LIBOR plus 1 percent interest. The yield on tesobonos is 8 percent while dollar LIBOR is 5 percent. Effectively, the Mexican bank has financed a $1 billion tesobono position by borrowing $800 million, although official data on tesobono holding will indicate that a foreign address holds the tesobonos. The gain to the Mexican bank is that it pays LIBOR plus 100 to finance tesobonos that may pay the equivalent of LIBOR plus 300. The gain to the U.S. lender is that it gets to place dollar funds at LIBOR plus 100 against good collateral while it borrows at LIBOR.

A tesobono swap places both parties in the same risk position as a repurchase agreement. Table 2 indicates the positions taken if the financing of the Mexican bank's tesobono position takes the form of a tesobono swap. Suppose the New York firm swaps tesobono yield in return for LIBOR plus 100 basis points against a US$1 billion notional principal. It requires US$200 million as collateral from its Mexican counter party, i.e. a margin deposit of 20 percent to guarantee compliance with the contract. The payoffs to the two

Table 2. Tesobono Swap
1. New York firm delivers tesobono yield for LIBOR+1% with Mexican bank on $1 billion notional principal
2. NY firm requires deposit of 20% margin--$200 million
3. To hedge, NY firm buys $1 billion. of tesobonos, financed by $200 million margin from Mexican bank, $800 million borrowed at LIBOR
4. Foreign address holds tesobonos
5. Mexican bank puts up $200 million of own funds to get $1 billion of tesobono yield

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[9] In the swap form of the deal, of course, only net amounts were due in each settlement period.

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counter parties are identical to those of the repurchase agreement. To hedge, the New York firm will purchase US$1 billion in tesobonos directly from the market, paid from the $200 million margin and $800 million borrowed at LIBOR. As before, the tesobonos will be held by a foreign addresses, although Mexican domestic residents will bear the tesobono risk.

In either form, these operations serve to channel a net flow of capital of $800 million into Mexico, which ultimately finances the government. Gross flow data picked up in the normal balance of payments operation will measure an inflow of $1 billion worth of tesobono purchases and an outflow in the form of bank deposits for the collateral of $200 million. The swap, however, disguises the nature of the flow. Superficially, it appears that foreign lenders are buying Mexican government debt in the form of tesobonos--i.e. they are satisfied to hold the indexed T-bills at the maturities offered by the managers of the Mexican public debt. In fact, they are making short term dollar loans, while Mexican residents are holding the tesobono risk. On the national balance sheet--consolidating the government and domestic banking sector--Mexico is a short term borrower of dollars.

Equity Swaps

Table 3 presents an example to show that an equity swap establishes a leveraged position in shares, with funding coming from an offshore source. Again, a Mexico-based example will be used with an eye on later exposition, but such cross-border deals are commonplace.

Suppose that a Mexican bank agrees to swap the total return over one year on Telmex for dollar LIBOR plus 300 basis points on a notional amount of US$1 billion. Its offshore counter party, a New York securities house, requires US$200 million in collateral. To hedge its short equity position, the New York firm then directly buys US$1 billion worth of Telmex shares, thereby appearing as a foreign investor in Mexican shares. The New York firm is taking a long position in short-term dollar loans while the Mexican bank has a long position in Telmex shares and a short position in short-term dollar loans. The Mexican bank has acquired $1 billion of Telmex risk by putting up $200 million of collateral in New York.

Table 3. Equity Swap
1. New York firm delivers Total Return on Telmex for LIBOR+3% with Mexican bank on $1 billion notional principal
2. NY firm requires deposit of 20% margin--$200 mil.
3. To hedge, NY firm buys $1 billion of Telmex ADRs, financed by $200 million collateral from Mexican bank, $800 million borrowed at LIBOR
4. Foreign address holds Mexican shares.
5. Mexican bank puts up $200 million of own funds to get $1 billion of stock market risk

Again, balance of payments accounts will report a gross inflow of $1 billion worth of

equity purchases for portfolio investment or perhaps foreign direct investment and an outflow of

$200 million in bank

deposits. The Mexican

bank--and therefore the

national balance sheet--

holds the equity risk, while

the foreign address is only

a short term dollar lender.

Structured Notes

Structured notes

exist in many forms, but

the example studied here

will determine the payoff

on what might be

described as a "Bullish

Obligation on the Peso," as

Table 4. Bullish Obligation on the Peso
1. i_{cetes} = .85 annual
2. $i_{\$}$ = .05 annual
3. Maturity of contract--29 days
4. Overall Payoff of the Note = Coupon + Principal = $1.95*7.0/P_m * 29/360 + \quad 1+3 \ [(7.0 - P_m)/P_m]$
5. Some arithmetic to determine implied dollar and Npeso positions.
$\text{Payoff} = (-2 + 3.157 * 7.0/P_m) \times \$10 \text{ mil.}$
$= -\$20 \text{ million} + \$31.57 \text{ million} * 7.0/P_m$
$= -\$20 \text{ million} + \text{Npesos } 221 \text{ million}/P_m$
Present Values:
Current $ position   -$19.92 million
Current Npeso   209.95 million = $29.99 million

presented in Table 4.[10] For example, a Mexican bank or its foreign subsidiary might buy a note

with a 29 day maturity from a New York investment house for $10 million. The coupon on the

note and the principal on the note are payable in dollars. Suppose that the coupon offered in the

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[10]The description of this note was taken from an indicative term sheet issued by Donaldson, Lufkin and Jenrette on March 22, 1995.

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note is 195 percent annually multiplied by the ratio of the current spot value of the peso to the

peso-dollar exchange rate at maturity. Interest rates on peso paper such as cetes--peso

denominated treasury bills are 85 percent per annum and 5 percent on dollar paper. The principal

repayment also depends negatively on the peso value of the dollar at maturity--suppose it will be

$[1+3x(7.0-P_m)/P_m] \times \$10$ million, where 7.0 is the initial peso value of the dollar and P_m is the

value at maturity. In an extreme case, if the peso has depreciated by 50 percent at maturity, from

say 7.07 to 14.0 pesos per dollar, the principal repayment will be -$5 million. The overall

payoff is then -$3.25 million.[11] Conversely, if the peso appreciates significantly, the payoff can

be a multiple of the initial investment. Table 4 shows that this is the payoff structure of a

position that is currently short about $19.92 million at a market dollar interest rate of 5 percent

per year and long 209.95 million pesos at a market peso interest rate of 85% percent per year.

Effectively, the initial $10 million investment has been leveraged three-fold and invested in peso

paper.

Overall, through the payoff formula, the New York investment house would have a

position equivalent to being short 209.95 million worth of peso paper and long $19.92 million

worth of dollar loans. In addition, it has the initial $10 million from the sale of the note. To

hedge, it may wish to buy the peso by investing in one-month cetes while simultaneously selling

the dollars in the position. It would then appear in the on-balance sheet accounts as a foreign

buyer of a peso-denominated asset rather than as a dollar-denominated lender, which is its true

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[11]As a safety feature for the buyer, such structured notes cap the potential losses. For
example, in the actual "Bullish Obligation", in no case would the principal redemption plus
coupon payment be less than zero. This adds a put option feature to the note.

position.[12]

If the seller of the note hedges the position, the balance of payments accounts will report

a net inflow of about $20 million. This will result from a gross inflow of about $30 million in

the form of portfolio purchases of short-term, peso denominated government paper and outflow

of $10 million in the form of a Mexican bank's purchase of a short maturity, dollar denominated

note.

IV. Circumventing Prudential Regulations and Capital Controls

In addition to their normal uses in portfolio diversification or risk reduction, derivatives

can be used to increase risk--one side of the deal may be speculating. In weakly regulated,

undercapitalized financial systems, derivatives provide a perfect opportunity for financial

intermediaries to acquire risky positions in attempts to recover capital. This section will show

how derivatives such as those in the examples developed earlier can be used to escape prudential

regulation and capital controls.

Evading Prudential Regulation

Prudential regulations of varying stringency are well-accepted across different financial

systems, but they are especially important in the presence of large capital inflows. Such inflows,

in particular, increase the potential to have systemic failures in the financial sector because of

the rapid expansion of bank balance sheets into unfamiliar business. If capital suddenly flows

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[12]As an additional feature, such notes contain clauses that state that the notes will pay zero
if there is a "default event" on cetes or and "exchange control event." This is sort of a poison pill
that automatically wipes out part of domestic bank capital in a country that imposes such policies.

into a country in quantity, there will be a general expansion of the financial system and investment projects; and it is not clear that a large fraction of the investments will be placed in "good" projects. There is a belief among regulators and academics that the inflows are often the results of various investment fads--ultimately, investor disappointment over the payoffs from these investments will lead to an attempt to withdraw them. Therefore, regulations are imposed-- such as reserve requirements, limits on lending to individuals, firms, or sectors, liquidity requirements against domestic or foreign exchange liabilities, net foreign currency exposure limits, capital requirements, etc.--which aim at channeling inflows away from banks and risky projects. Similarly, a ban on holding securities on margin or on short sales will mean that equities holders will not be forced to join the general scramble for cash in a liquidity crisis and thereby reduce the potential magnitude of the demand for cash. Nevertheless, bans on margin buying tends to push such activity offshore, through over-the-counter derivative markets.

Banks can readily avoid regulations either in a straightforward manner or by going offshore or engaging in off-balance sheet activities, which violate the intent, if not the letter, of regulations. We will examine how structured notes and equity swaps can be used to avoid such regulation.

Structured Notes

As shown earlier, structured notes are investment vehicles with coupon payments and principal repayments driven by formulas that can leverage the initial capital invested. Nevertheless, in value accounting systems they can be booked as normal investments and in the currency denominated in the prospectus. More than simply magnifying the usual market risks associated with investment positions, structured notes provide an easy method for circumventing

prudential regulations on currency positions or interest rate mismatches.

In the context of the last section's example, booked as claims of Mexican institutions with dollar principal and dollar payoffs, these notes in fact were currency bets that created a short dollar and long peso currency position to take advantage of positive interest rate spreads between peso and dollar money markets.[13] The notes were reported by Mexican banks as dollar assets, allowing them to offset short dollar positions in meeting regulatory limits on net foreign currency positions. In addition, some banks could count it to satisfy their liquidity coefficient required for foreign currency denominated liabilities because its short maturity allowed it to be classified as a liquid deposit. In the event of a depreciation of the currency, banks might have a much larger net short dollar position and greater losses than regulators had realized.

Held in this way, the structured note of the example is a financial engineering device to circumvent prudential regulation. Only the principal was booked, in accordance with value accounting principles. The structured note payoff formula component was not booked--it is an off balance sheet item. That is the accounting trick--one can alter the nature of the booking through a complicated payoff formula. The use of the trick, however, requires an outflow of capital in the form of principal. Thus, a net inflow of $20 million takes the form of a gross outflow of $10 million and a gross inflow of $30 million.

Equity Swaps

As a means of taking a position in stocks, the market in equity swaps can be used to avoid

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[13]In Malaysia, these instruments, known as "principal adjusted coupon notes", serve the same purpose of providing leverage in providing domestic currency positions to foreigners through foreign exchange financing. Regulation precluded foreign addresses from directly holding short-term ringgit claims onshore.

financial market regulations against such positions. Such regulations may ban buying securities

on margin or short selling or limit the share positions of foreign addresses.[14] The benefits to

market participants of the existence of this market are obvious. Speculators can leverage and

gain larger positions, and hedgers of long positions held either directly or implicitly in the form

of options could short stock to cover their positions. Again, net short-term dollar foreign

borrowing for domestic stock purchases takes the form of a gross outflow in the form of dollar

denominated margin and a larger gross inflow in the form of a stock purchase by a foreign

address.

Avoiding Capital Import Taxes or Controls

Taxes or outright bans on the acquisition by foreign addresses of domestic securities have

emerged in recent years as a means of stemming capital inflows. They sometimes have been

imposed differentially by maturity of asset and by type of asset. Often, such taxes have been

successful in that they have placed a wedge between domestic and foreign yields on similar

assets. They can be breached by the usual invoicing subterfuges, but market participants have

also used financial engineering to circumvent the taxes. Specifically, suppose that an enforceable

tax is placed uniformly on all forms of gross inflows. Then, any positive net inflow will incur

the tax, but gross transactions will move offshore. As an example, instead of acquiring an equity

position directly, a foreign investor will buy an offshore equity swap from a domestic resident

who can hedge without a tax. If the domestic resident has a lower credit rating, an export of

capital in the form of margin will be recorded. There will be no taxable inflow, but foreigners

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[14]Offshore equity swap markets also exist for Malaysia, Korea, and Thailand, among
others, also in order to avoid curbs on short selling and leveraging.

can take risk positions in domestic assets.[15]

If the tax is differential across types of assets acquired from abroad, the net inflow will tend to take the form that incurs the lowest tax. Similarly, if differential controls are imposed allowing equity investment but limiting short term, fixed interest inflows, the flows will enter through the least restrictive door. The risk and maturity characteristics of the inflow can then be resculpted through offshore derivatives to a more desirable form. For instance, if equity investment is given a better treatment than short term fixed interest securities or bank deposits, the inflow will take the form of a stock acquisition together with an equity swap that converts it on net into a floating interest loan of foreign currency. Even the maturity of the loan can be adjusted with an attachment by the lender of a stringent margining provision that permits the offshore creditor to realize cash on call.

V. The Role of Derivatives in Crisis-Driven Capital Outflows

Where such markets exist, forward contracts are the speculator's instrument of choice in implementing an attack on a currency, the beginning of a sudden outflow of capital. Positions in forward contracts can arise suddenly or be built up gradually in the expectation of an impending devaluation. Such derivatives serve merely to effect a crisis that is emerging from other causes. Other derivative products, already outstanding in large volumes, may reflect an environment in

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[15] In the case of Chilean equity, market sources report that offshore equity swaps are used regularly to permit trading in Chilean equity. They also report serious, though as yet unsuccessful, financial engineering research efforts to crack directly the Chilean tax on capital imports in the form of a uncompensated deposit requirement.

which such speculation may be successful and may even determine the dynamics of the currency and financial crisis that ensues.

This section will show how forward contracts transmit an impending attack on a central bank's reserves through foreign exchange swap and spot exchange markets.[16] Next, using the examples developed earlier from the Mexican case, it will show how the existence of these products operated to determine the dynamics of exchange markets leading into the currency crisis of December 1994, to determine the magnitude of the final attack, and to drive the foreign exchange market turbulence in the months after the attack.

The Mechanics of Speculative Attack

This section covers the mechanics of exchange market operations in speculative attacks. It shows how transactions in forward exchange work their way through the banking system and how they are financed. It discusses in particular the effect of reducing credit to speculators, either through interest rate increases or, more directly, through controls.

Speculators generally attack a weak currency by selling the currency through forward contracts to a bank at relatively long maturities, e.g. thirty days.[17] Whether a customer speculates through a short sale or hedges a long position, the international banking system handles a forward sale of a currency in the same way. As standard practice to balance the long position in

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[16]This section has been adapted the exposition on the mechanics of speculative attacks from Goldstein et al. (1993) and notes written for Folkerts-Landau et al. (1997).

[17]Forward sales may also be launched by hedging programs implemented by fund managers, nonfinancial corporations, and market makers. Speculators may also attack a currency by buying put options on the currency. From the perspective of the counter party bank, this creates a long forward position in the weak currency in an amount indicated by the option pricing formula used by the bank. The bank's hedging program will respond in the same way as if the bank had entered directly into a forward contract with its counter party. See Garber and Spencer (1995) on the effects

the weak currency that this transaction initiates, the counter party bank will immediately sell the

weak currency spot for the conventional two day settlement. Although its currency position is

then balanced, the bank still has a maturity mismatch in both currencies: it can borrow the weak

currency overnight to cover settlement of the spot sale, but it will receive the currency in thirty

days through the forward contract. It faces the opposite maturity mismatch with its strong

currency position. To close this maturity mismatch, a bank typically will transact a foreign

exchange swap. These are customary wholesale operations executed by banks writing forward

contracts to customers, in both normal periods and speculative episodes.

Table 5 presents a concrete example of such a forward transaction. In this example, the

weak currency is the baht and the strong currency is the dollar. Suppose that the forward and

spot exchange rates between the dollar and the baht are 25 baht per US dollar. In the first step, a

customer sells 2500 baht forward for $100 to a bank. This is an off-balance sheet item for the

bank, but it has payments implications like any on-balance-sheet transaction. The payments and

receipt implications for the bank are displayed in the first panel. The bank will receive 2500 baht

and pay $100 in one month. These are the same movements of funds that the bank would face if

it were long a baht Bank of Thailand bill and short a US Treasury bill. To eliminate the

currency mismatch, the bank immediately sells 2500 baht for dollar spot exchange, the payments

implications of which are combined with those of the forward contract in panel 2. The currency

positions are now balanced, but there remains a maturity mismatch in each currency--one-month

baht are funded with rollover baht and rollover dollars are funded with one-month dollars. To

eliminate the maturity mismatch, the bank immediately undertakes a one-month foreign

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of such hedging in a crisis.

exchange swap, exchanging $100 for 2500 baht spot and 2500 baht for $100 thirty days forward.

The complete payments implications for the bank are displayed in panel 3: the bank has eliminated market exchange and interest rate risk through these transactions.

This example indicates that a baht-dollar forward contract is equivalent to a foreign exchange swap combined with a spot exchange transaction. Also, on its origination, a forward sale of baht by the customer immediately generates a spot sale of baht by the bank.

Who is the ultimate counter party in these transactions? In time of crisis, there are few spot market buyers of the weak currency, so a central bank defending an exchange rate level must appear as the counter party through its

Table 5. Receipts and Payments to the Counter party Bank Arising from Forward Contract Operations		
Step 1. Forward Contract = Currency Mismatch		
	Receipt	Payment
baht in one month	2500	100 US dollars ($) in one month
Step 2. Forward Contract + Spot Sale = Maturity Mismatch		
	Receipt	Payment
baht in one month (forward)	2500	2500 baht in two days (spot)
$ in two days (spot)	100	· 100 $ in one month (forward)
Step 3. Forward + Spot + Swap = Balanced Position		
	Receipt	Payment
baht in one month (forward)	2500	2500 baht in one month (swap)
baht in two days (swap)	2500	2500 baht in two days (spot)
$ in one month (swap)	100	100 $ in one month (forward)
$ in two days (spot)	100	100 $ in two days (swap)

exchange market intervention.

A customer in the forward market may be a central bank, which can intervene in the foreign exchange market to defend parity by buying its currency forward rather than spot. If the central bank's forward purchase of its currency matches a forward sale of some other customer of the banking system, all the swap and spot transactions of the banking system will balance; specifically, spot exchange sales will be matched with purchases at the parity exchange rate. Thus, the central bank's forward intervention will absorb the spot sales of its currency without the central bank's having to intervene directly in the spot market. By entering a forward contract, the central bank implicitly supplies domestic currency credit directly to the short seller of its currency. The short seller in this example is obligated to deliver the weak currency to the central bank on the value date of the forward contract, effectively a loan from the central bank.

In a currency crisis, with the potential for a one-sided bet, few private parties would be willing net suppliers of weak currency credit. Nevertheless, to fuel a speculative attack, the world banking system must in aggregate provide credit in the weak currency to the short sellers. This is evident in the first panel of Figure 1, where the bank's baht receipts from the forward contract embody a one-month baht loan to the short seller. If the central bank does not supply the credit directly through forward intervention, the credit must come either through its money market operations or its standing facilities. In any crisis, the baht provided by the banking system are a pass-through of credit from the Bank of Thailand, which must be the ultimate counter party in both legs of the position-balancing transactions of the banking system. The bank in the example must find a counter party bank to engage in the swap. By entering into a one-month baht foreign exchange swap, the counter party bank effectively lends baht spot to be

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repaid in one-month. When the baht are sold on the spot market, they are bought by the Bank of Thailand--and the other regional central banks that support it--in the campaign to defend the exchange rate. In lending spot baht through the swap, the counter party bank acquires the baht needed for spot delivery either by discounting paper through the standing facilities of the Bank of Thailand or through outright sale or sale with repurchase through the Bank of Thailand's market operations.

Derivatives and the Dynamics of Capital Flow Reversals

Even in countries where currency forward contracts did not play a role in a sudden reversal in capital flows, other derivative products may be present in sufficient quantities to affect the dynamics of a crisis. The Mexican peso crisis of 1994 is such a case. Speculators did not use the forward market suddenly to short sell the peso. Rather, outstanding products of the sort outlined earlier drove the near-in movements of capital going into and coming out of the devaluation of the peso.

The derivative positions that drove the crisis were established by a weak banking system hungry for current income. The Mexican groups that had purchased the banks on privatization in 1991-1992 had financed the aggregate $12 billion price through substantial amounts of borrowing. Interest due had to be paid through current bank income, and this led the banks into taking increased credit risk through on-balance sheet expansions and increased market risk through off-balance sheet growth.

Tesobono Swaps

Industry sources in Mexico report that there was a stock of about US$16 billion of

tesobono swaps at the time of the devaluation.[18] Of the US$29 billion of tesobonos outstanding on December 19, 1994, about US$16.1 billion were held by foreign addresses. Thus, sufficient tesobono swaps existed to repackage the entire foreign holding of tesobono risk: foreigners held tesobonos primarily to hedge tesobono swaps and Mexican banks held the tesobono risk.

When the crisis arrived, tesobono market values in dollars suddenly fell. From December, 1994 to January, 1995, tesobono yields jumped from 8 percent to 24 percent, and several of the interim offerings had failed. The fall in market value reduced the value of the collateral and triggered margin calls to deliver dollars or close out the positions.

If the typical tesobono fell by 15 percent in dollar value, the value of the collateral in the tesobono swap of the earlier example would have fallen significantly; and a margin call would immediately have been sent to the Mexican bank. Alternatively, anticipating margin calls, the Mexican bank would immediately have sought dollar liquidity in preparation. To restore margin, the $16 billion in swaps would instantly generate $16 x .15 = $2.4 billion of demand for dollars by the Mexican banks.

Equity Swaps

Market participants have characterized the market in offshore Mexican equity swaps as very large, but they were not as explicit about orders of magnitude as in the case of tesobonos, though several have claimed up to $3 billion notional value of such contracts existed at the time of the crisis.

With the collapse of the peso, the stock market fell immediately by about 50 percent in

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[18]Such numbers are guesswork because no one aggregates such data. Nevertheless, similar estimates were given to me by market managers at the top two banks in Mexico, which did a large

dollars and by 66 percent within two months. With the margin in the equity swaps more than

wiped out, margin calls or anticipations of margin calls again forced the Mexican banks to rush

for dollar liquidity. Taking $3 billion as the notional value of outstanding equity swaps, this

would have required the banks to find and additional $1.5 billion at the time of the December 19,

1994 devaluation. Mexican institutions and individuals engaged in these swaps had to sell pesos

to get margin or close out their position, adding to the turmoil of the exchange and stock markets.

The total of margin calls from tesobono and equity swaps alone was about $4 billion.

Coincidentally, this was approximately that amount that the Banco de Mexico's reserves fell in

the final attack just before the peso was allowed to float on December 21, 1994.[19]

Structured Notes

During 1994, Mexican financial institutions took large positions in structured notes with

investment houses in New York.[20] Because the notes were reported by the banks as dollar

assets, however, the accounting rules in Mexico allowed them to be booked as a dollar position,

so that they were not counted against the regulatory net currency position limit of a maximum of

15 percent of capital.

The first group of these structures were known as ajustabono structures and were first

noticed when consolidated regulation was implemented in September, 1994. The second group

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fraction of the business.

[19]In addition, there were other Mexico-oriented derivative products such as cetes swaps and Brady bond swaps, which also would have drawn margin calls at the same moment.

[20]Most major New York financial engineering firms sold such products--e.g. Bankers Trust,

were similar to the structured note discussed earlier and came to the attention of authorities just after the December, 1994 devaluation.

Ajustabonos are inflation-indexed Mexican government securities that had long been held by Mexican banks. In addition, to paying a relatively fixed real interest return, ajustabonos could be counted as foreign exchange assets in determining regulatory foreign exchange positions, so Mexican banks funded their ajustabono positions with dollar borrowings. When real interest rates rose in 1992, Mexican banks found that their ajustabono positions were frozen because they did not want to realize the capital losses on their investment portfolios. The solution was to contract structures with New York banks and investment houses through which the ajustabonos could be used as collateral.

For example, a US and a Mexican securities firm associated with a bank would jointly organize a company in the Caymans or in Bermuda which would agree to purchase ajustabonos at face value, with the funding provided from the sale of two series of securities, one senior and one junior, both denominated in dollars. Suppose that the deal involved a Mexican bank's selling $120 million par value worth of ajustabonos to the company. The Mexican partner might put up $20 million and receive $20 million par value of the junior securities, which it would sell to the Mexican bank. Denominated in dollars, the junior notes could be counted as a foreign exchange asset in determining regulatory positions. The US firm would invest $100 million and receive $100 million par value of the senior securities. The senior securities would be designed to pay a relatively secure dollar yield, which could be paid if the exchange rate did not depreciate excessively, and would be sold for LIBOR plus. The payoff on the junior securities

Merrill Lynch, Bear-Stearns, Donaldson, Lufkin, and Morgan Stanley.

was like that of a structured note--if the exchange rate did not depreciate, it would pay a high yield and make good the losses on the ajustabonos. If the exchange rate depreciated, the yield or principal of the junior note would decline according to a predetermined formula.

When the banking authorities became aware that the return on the junior notes was correlated with the peso, they required that 100% of the notes be covered with foreign exchange. Market sources estimate that $2 billion of the junior notes were outstanding in 1994. The banks began to cover their positions in September, 1994 and throughout the autumn, which contributed significantly to the drain on official reserves in the several months just prior to the devaluation.

The Banco de Mexico found out after the devaluation that the more general structured notes like that of the "Bullish Obligation" example existed in large amounts. Charged with enforcing the regulation on net foreign exchange positions of the banks, the Banco de Mexico immediately ordered the banks to cover their short dollar positions. This forced a scramble for several billion dollars of foreign exchange during the post-collapse floating period, leading to the highly volatile and illiquid foreign exchange market that dominated the first quarter of 1995.

Thus, taken in sequence, the ajustabono structures, swaps, and structured notes account for most of the currency market dynamics in the months surrounding the collapse of the peso. The Mexican peso crisis is an example of a systemic crisis whose dynamics were driven by a structure of outstanding derivatives. The timing and magnitude of the near-in reserve drain, the final attack on foreign exchange reserves, and the post-collapse market turbulence are explainable by the automatic credit and market risk-covering programs attached to the contracts by counter parties and regulators themselves.

What Does "Proper Public Debt Management" Mean in the Presence of Derivatives?

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Because Mexico had issued large amounts of short term tesobonos that could not be rolled over in the aftermath of the devaluation, subsequent analyses have pinpointed improper public debt management as a major cause of the crisis.[21] The consequent policy prescription has been to restructure the public debt to longer maturities in a modern version of the nineteenth century British prescription for virtuous public debt management--"all consols-no bills."

The example of the tesobono swaps, however, indicates that such a prescription can easily be circumvented. Even in the case of the relatively short term tesobonos, the yield apparently was not sufficient to encourage foreign lenders to hold Mexico risk. Only the income-hungry Mexican banks wanted to hold the risk and were willing to accept the yields on tesobonos that were unacceptable to foreign lenders. Thus, vis-a-vis the rest of the world, the Mexican national balance sheet was a borrower of call dollars through the tesobono-tesobono swap operation. The tesobonos canceled out, and the sudden calls on the Mexican banking system to deliver dollars to restore margin were equivalent to calls to deliver official reserves.

Suppose that instead of tesobono issues, the Mexican government had structured its debt by issuing ten-year peso or even dollar denominated bonds. Foreign buyers, even more reluctant to absorb these issues than to absorb tesobonos, would have required very high yields. Mexican banks, however, proved that they would have been willing to take the risk at lower yields. Again, they would have entered into swaps that converted these long term claims against the Mexican government into short term, perhaps callable dollar claims against the national balance sheet.

If the foreign lenders view of the risks is that they warrant only short term lending, a

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[21] See for example, Calvo (1996), Calvo and Mendoza (1996), and Cole and Kehoe (1996).

prescription to lengthen the debt is an irrelevancy. Even if it is undertaken on-balance sheet, it will be undone off-balance sheet.

Of course, if the government is strongly committed not to bail out the banking system, the construction of a national balance sheet is irrelevant; tesobono risk or the risk of government securities with any particular features would then be priced properly by the domestic banks, and their dollar margin requirements would not be met by the central bank. The public debt could then be truly lengthened, if that is desirable.

VI. Effects of Derivatives on Interpretation of BOP Accounting

Among the rationales of balance of payments accounting is to ascertain the stability of capital flows of on-balance sheet movements of assets. Typically, balance of payments accounting data are used to measure how long capital will remain in a country--to distinguish "good" money from hot money.[22] Various categories of the capital accounts have been interpreted as indicative of the nature of capital inflows or outflows. Foreign direct investment, for example, has been considered a more stable form of investment than portfolio investment or the foreign acquisition of bank claims. Foreign acquisition of short term fixed interest products is generally regarded as a speculative flow. Balance of payments accounts are also used to measure the foreign exchange position of a country's consolidated balance and, in times of crisis, to determine the potential outflow of foreign exchange through speculation or covering

[22]Although the balance of payments capital accounts are set up to measure cross-border changes in legal ownership of claims to assets and liabilities, the classification system for financial items is designed to bring out the motivation of creditors and debtors. See Balance of Payments Yearbook, Part I, 1994, p. xxii.

operations by holders of domestic liquid assets.

The revolution in global finance and notably the explosion in the use of derivative products have rendered the use of balance of payments capital account data even more problematic than it has been in the past.[23] Balance of payments accounting data use on-balance sheet categorizations, and they are based on value accounting principles to book and categorize asset values. They ignore almost completely the existence of derivatives and their role in reallocating who bears market risk. This would not be a problem of a magnitude greater than the normal caveats on balance of payments accounting data except that there has been a massive explosion in the use of derivative products and especially in the use of cross-border products.

For example, the acquisition of a large block of equity is classified as foreign direct investment, but a foreign buyer may be acquiring the block simply to hedge a short position in equity established through a derivative position. In the case of the equity swap described above, the foreign investment firm that sells the swap must acquire the shares to form a hedge. If the swap is large enough, the hedging operation may be booked as foreign direct investment because the offshore swap position is not included in the capital accounts, although the investment house in fact is making a short term floating rate loan in foreign currency.

Declines in equity values or exchange rate will then generate instantaneous exchange

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[23]The usual problems concern omissions or mis-categorizations of transactions. That these have been magnified in the presence of widespread use of derivatives has been duly recognized by authorities responsible for technical standards, as exemplified by the April 1996 meeting at the IMF of the Informal Group on Financial Derivatives. Nevertheless, technical discussions even now center on how to fit derivative-generated payments into standard categories such as interest vs. capital gains, the treatment of margin flows, and how to book repurchase agreements. The undermining of the meaning of the various asset categories of the capital accounts in the presence of unrecorded derivative products is not an issue under discussion.

market pressure as margin calls are made or positions are closed. This is contrary to the general view among central banks that stock market investment will not likely generate exchange market pressure in a crisis because the losses will already have been absorbed in a resultant crash. Stock market money is therefore regarded as less "hot." If the buyer of the swap is a domestic resident, the capital import effectively takes the form of short term, foreign currency denominated borrowing, but the leveraged equity risk, and even the long term control, remains in the hands of the domestic resident. Thus, the "direct investment" turns into the hottest of money. In a similar manner, direct investment in the form of reinvestment of profits can be converted into short term funding through an equity swap.

Alternatively, a foreign program trader may acquire the domestic stock index in the cash market while selling forward in the offshore OTC index market. On net, he has a zero position in equities but in the balance of payments accounts appears as a portfolio investor in domestic equities. If the opposite positions are taken by a domestic residents--a sale of equities in the cash market and a forward purchase in the derivatives market, the net equity risk position for domestic residents is unchanged, though domestic residents are now in effect short term foreign currency borrowers.

To the extent that they start with zero replacement values as in the case of swaps and forwards, derivative products do not affect measured net capital inflows or outflows but they blur the information in sub-categories of the capital accounts.[24] Specifically, they make a mockery of the use of capital account categories to attempt to measure the aggregate short foreign currency

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[24]An exception arises if a deposit of margin is required by a foreign counter party; the margin will be counted as a capital export.

position of an economy.

VII. Conclusion

From the explosion in the use of derivative products has emerged a blind spot in both

national and international surveillance of capital markets. Through derivatives both individual

institutions and financial systems can be put at risk in magnitudes and from directions

completely unknown to regulators. This problem arises because derivatives are ideal means of

avoiding prudential regulations, given the universally slow adjustment of accounting principles

to the advent of these products. On a more parochial level, the accounting principles on which

the balance of payments data gathering exercise is based have are being made increasingly

obsolete. For each country, the extent of the problem is unknown because comprehensive data

on derivatives are gathered only at long intervals, and even the triennial BIS data are not broken

down into those relevant for emerging market countries.

The optical illusion created by viewing the flow of capital only through the on-balance

sheet lens creates a dangerous potential for misinterpreting the implications of major events in

capital markets. The information conveyed by the balance of payments accounts on the riskiness

of the national balance sheet is confounded, so the susceptibility of an economy to capital flow

reversals cannot be known. When capital flows suddenly reverse, it is difficult to know which

players are driving the flows and therefore to determine the appropriate short and long term

policy response.

This paper has provided several examples to illustrate how readily the existence of

derivative products can change the meaning of capital flow data, how the derivatives may

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automatically generate liquidity demands in response to triggering events in financial markets,

and how easy it is to attribute such responses to structural flaws elsewhere in the financial

system.

References

BIS, "Central Bank Survey of Foreign Exchange and Derivatives Market Activity, 1995", Basle, May 1996.

BIS, 67th Annual Report, Basle, June 9, 1997.

Calvo, Guillermo, "Capital Flows and Macroeconomic Management Tequila Lessons," University of Maryland, Working Paper No. 23, March, 1996.

Calvo, Guillermo and Enrique Mendoza, "Mexico's Balance-of-Payments Crisis: A Chronicle of a Death Foretold," University of Maryland, Working Paper No. 20, March, 1996.

Cole, Harold and Timothy Kehoe, "Self-Fulfilling Debt Crises," Federal Reserve Bank of Minneapolis, Staff Report 211, December, 1996.

Feldstein, Martin, "Tax Policy and International Capital Flows," Kiel: Institut fur Weltwirtscaft an der Universitat Kiel, 1994.

Folkerts-Landau, David and Peter Garber, "Derivative Markets and Financial System Soundness," in Charles Enoch and John N. Green, eds., Banking Soundness and Monetary Policy, Washington: IMF, 1997.

Garber, Peter, "Managing Risks to Financial Markets from Volatile Capital Flows: the Role of Prudential Regulation", International Journal of Economics, Vol. 1, July, 1996.

Garber, Peter M. and Subir Lall, "Derivative Products in Exchange Rate Crises," Prepared for Federal Reserve Bank of San Francisco's Conference on "Managing Capital Flows and Exchange Rates: Lesson from the Pacific Basin", September 26-27, 1996.

Garber, Peter and Michael Spencer, "Foreign Exchange Hedging with Synthetic Options and the Interest Rate Defense of a Fixed Exchange Rate System", IMF Staff Papers, Vol. 42, No. 3, September 1995.

Goldstein, Morris, David Folkerts-Landau, Liliana Rojas-Suarez, and Michael Spencer, International Capital Markets. Part I. Exchange Rate Management and International Capital Flows, IMF, April, 1993.

IMF, Balance of Payments Annual, 1994, Part I.

Lall, Subir, "Speculative Attacks, Forward Market Intervention and the Classic Bear Squeeze", IMF Working Paper, June 1997.