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FX Short Positions, Balance Sheets and Financial Turbulence: An Interpretation of the Asian Financial Crisis

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This paper discusses a framework that explains the dynamics of financial crises such as the one that occurred in Asia in 1998. In the framework that we develop below, market participants start taking risky positions due to an initial mispricing. The positions weaken the balance sheet of the financial sector. This fragility then imposes constraints on the Central Bank's policies and makes sure that the mispricing is perceived as "long-term", which in turn leads to an increase of the risky positions.

I. INTRODUCTION

One obvious aspect of financial crises is the violence of movements observed in prices and valuations.

This is best seen in the record exchange rate movements observed during the years 1997-1998, where within one day the dollar-yen exchange rate exhibited a movement of 8%, in the absence of any major event. Another example is the ratings of sovereign credits.[1] For example, during the month of October 1997, South Korea was rated as AA- by S&P. Certainly a solid *investment grade* rating. After barely 6 months, South Korea's Rating had fallen 9 steps to B+. Such a steep, mass downgrading in such a short period of time was unprecedented, and completely unpredictable just a few months earlier.

This paper discusses a framework that may make the explanation of such dynamics easier. In the framework that we develop below, market participants start taking risky positions due to an initial mispricing. The positions weaken the balance sheet of the financial sector. This fragility then imposes constraints on the Central Bank's policies and makes sure that the mispricing is perceived as "long-term", which in turn leads to an increase of the risky positions.

In a sense, we argue that many precarious-looking market conditions may turn into some sort of equilibrium that may last for years, making the balance sheet of the financial sector progressively worse and worse. Yet, given the right "circumstances", these worsening balance sheets may be interpreted by market participants as a short-term guarantee that the mispricing that is at the root cause of such risky positions continue unchanged.

The discussion below will be conducted in terms of the Asian crisis of 1997. The mispricing under consideration will be exchange rate pegging. The risky positions will be represented by open FX positions of the banking sector. Yet, the discussion is general enough and any type of mispricing can potentially lead to the similar "equilibria" given the right circumstances.

Hence the paper will first develop the parameters and the conditions that are needed in order for such a dynamics to start taking place. In doing this we will use the environment of the Asian financial crisis, and base the examples on East Asian data. Second, the paper will describe various stages of this process in more detail.

There is some recent research that deals with some of the issues that we discuss below in more formal models. Cavalleri and Corsetti (1997) and Corsenti, Pesenti and Roubini (1998) are two very good examples. A good background reading for the Asian crisis is Claessens and Glaessner (1997).

The paper is organized as follows. In the next section we briefly summarize various approaches to financial crises. Next, we develop the institutional parameters of the framework that we have in mind. In the following section we discuss the necessary conditions for such dynamics to take place. Section III will describe the process itself. Section IV concludes.

II. SOME APPROACHES TO FINANCIAL CRISES

There are several explanations for financial crises. For a recent review, see Flood and Marion (1998). Briefly, these can be grouped as follows:

Speculative attack interpretation

Expansion of domestic credit eventually leads to a breakdown of a pegged exchange rate system. In heuristic terms, excessive money supply leads to an attack by speculators, who "bet" that the currency will collapse. This joint action leads to a steep devaluation; a crisis follows.

Credibility issues and the risks of pegged exchange rate models

The experiences of failed Latin American stabilization programs have complemented the speculative attack models with notions of policy credibility. One example is as follows.

At the time of their introduction, stabilization packages have to *peg* the exchange rate in order to lower inflationary expectations.

In a nutshell, the argument goes like this. In the midst of an inflationary period, the currency depreciates. Policy makers think that pegging the currency will convey the message that the government is now committed to lowering the inflation rate.

If the "reforms" and other stabilization measures are credible, players in financial markets will adjust their inflationary expectations downward. Yet, if the measures are not perceived as credible, or if the government is not sufficiently determined, inflation will not decrease very much, the peg becomes doubtful and leads to an overvalued currency. Agents react, leading to a collapse. Again, financial crisis follows.

Bank run literature

These interpretations deal with the 19th and early 20th century western banking crises. It is not clear at the outset if these are directly related to episodes such as the Asian Financial Crisis, yet careless or even negligent credit expansion was one of the main factors behind the bank runs. Also, during the bank runs one witnessed the existence of lax regulatory rules and overly optimistic assessment of economic conditions, parameters certainly not very foreign to the Asian markets of 1995-97.

It should also be emphasized that the late 19th and the early 20th centuries had also seen international capital flows that were in excess of the present case. Bank runs literature had emphasized the role of such factors as well.

In all these models, the existence of some "fixed or managed price" and "factors leading to the fragility of the banking system" play a prominent role. The *excessive* expansion of credit or of some other (capital) flow is also critical.

Most of these effects will be present in our discussion as well. However, we discuss these issues within the context of the Asian financial crisis.

Clearly, there are significant structural and financial differences among various economies in Asia, and this played a significant role in the dynamics of the crisis. Yet, the similarities in terms of some "fixed price" and the presence of heavy short-term capital flows are well known.

In the case of the Asian financial crisis, the fixed prices in question were the exchange rates of Asian countries, all pegged one way or another to the US Dollar. The excessive valuation in question, was real estate prices or was the factors that led to heavy real investment. Careless lending practices and to some extent careless use of financial derivatives also played a role. Non-transparent data reporting processes complicated things further.

The essential idea of this paper is that these conditions created, what at the beginning was short term above normal profit opportunities for a banking sector that was operating in a badly-regulated environment. This led to balance sheet fragility. Once the system became fragile, it was too late to change the exchange rate pegging, since this would lead to the insolvency of the banking system.

A key argument of this paper is that the way these positions develop, and the way they make the concerned institutions "too big to fail" played an important role in episodes such as the Asian financial crisis. Financial derivatives, although essential for sound risk management and financial engineering, can nevertheless facilitate this process if used solely for the purposes of leverage.

Hence, in many ways the Asian financial crisis has aspects similar to those emphasized in the speculative attack literature and the models of bank runs. But there are some differences as well.

Below we first describe an environment where the discussion can proceed further.

III. THE ENVIRONMENT

The health of an institution should be visible from its balance sheet. Yet, in effect there is not one, but (at least) *two* balance sheets. The first is the visible one displaying the *on*-balance sheet items. The second is the one that incorporates the effect of the *off*-balance sheet items. We call this the "true" balance sheet.[2]

Asian countries had, and still have, financial systems where the environment is ripe for these two balance sheets to diverge significantly. And what is more important, this divergence is *non-transparent*.

What are some of the major characteristics of such environments, which are believed to have played an important role in the Asian financial crisis? We begin by describing the plausible parameters of such an environment.

A. Environmental Parameters

A brief summary of the environmental parameters is as follows:

1. Imperfect *flow of information, non-transparent* books, non-transparent final exposures (in contrast to exposures on balance sheets).

Even in closely regulated, mature financial markets the accounting standards for off-balance sheet items are newly developing. In Asian countries such standards were nonexistent.[3]

What were the true liabilities of Asian banks? What was the level of Asian countries' short-run debt? What were the maturities involved? To what extent was the banking system supported by government credit?

And more importantly, were banks involved in previously unsuspected derivatives deals?

The non-transparency of the balance sheets in Asia was at such a level that these questions were not asked.[4]

2. Undercapitalized banks and the *concentration of ownership* in relatively few hands.

In many Asian economies individuals or families dominated in making policy decisions in the banking sector. Thailand and Indonesia were the primary examples. The same phenomenon was true in the Philippines and to some extent in Malaysia. South Korea banks were reasonably managed, yet they were under the influence of the Ministry of Finance and were not able to follow market criteria fully in making loans.

Besides making decisions based on their personal experience, owners of banks in economies such as in Thailand or Indonesia are able to form *informal groups*, where decisions can be coordinated and "weak" members can be "supported" during periods of need.[5] Such collusive attitude leads to sustain weak members much longer than, say a western banking system would permit. In the short run this behavior can be regarded as strength. It may even "work" for many years and sustain precarious equilibria. Yet, in the long run, such equilibria are likely to collapse much more suddenly than a banking system that is subject to market competition on a regular basis.

3. Limited experience with *past* banking crises.

Latin America has had financial crises since the 19th century. Yet, apart from similar problems experienced by China before and during the Maoist revolution, severe financial crises are to a large extent new to Asian societies.[6] Given today's communication and electronic trading technologies, financial crises could spread much more rapidly than the past. Markets that have very limited experience with such episodes are much more prone to panic selling (buying). The response of the public is likely to be quite severe.

4. Finally, we should mention the vague notion of *corrupt public institutions* as a factor with some significance. It is interesting to note that Singapore and Taiwan who are known to have less corrupt institutions, were affected less by the Asian financial crisis. At the other extreme, there was Indonesia and then Thailand, where the corruption was endemic.[7]

This environment provides a very fertile ground for financial crises. Yet, the weaknesses it introduces in the financial system are not in general *sufficient* for a crisis of the magnitude we observed. After all, this environment also creates its own forces to protect the system against failures of its weaker members.[8]

We need further conditions.

B. Some Necessary Conditions

In order for a financial crisis similar to the one in Asia to develop, one needs some further conditions. First, some sort of *exchange rate pegging* is needed. Second, it appears that some significant non-transparency of risk exposures has to be assumed.

We discuss these briefly before dealing with the dynamics that leads to a crisis.

C. Pegged Exchange Rate

The basic argument that we are trying to develop starts with an initial mispricing and continues with ways in which the balance sheet of the financial sector progressively worsens as a result of this.

The initial mispricing can be in any asset's price. But in order to maintain that the mispricing persists a sufficiently long period of time, it needs to be related to some price set by policy. Say, either an interest rate or an exchange rate. Since 1970's interest rates are "assumed" to be market determined, while there is a significant Central Bank pegging of exchange rates, especially within emerging market economies.

Hence, we work with exchange rate pegging. This could either be a constant peg to Dollar, or a version of crawling peg. For our purposes, the essential role played by the peg is that it will make the short-term behavior of the nominal exchange rate *easy to forecast.*

The ability to accurately forecast the behavior of the nominal exchange rate in the very short-term is in fact a key element of our discussion. As long as financial players can forecast, or rather, as long as they *think* they can accurately forecast the immediate future of the exchange rate behavior, the "peg" will, given enough time, lead to a crisis in an environment such as the one described above. But, with (approximately) floating exchange rate regimes the arguments below are difficult to justify.

D. Non-transparency of Exposures

The second important condition has to do with the issue of non-transparency. Given that the reader may be less familiar with some of the practices here, we prefer to spend a little bit more time on this point.

First we note that there are (at least) two ways of acquiring a credit; namely, on-balance sheet, and off-balance sheet. For example, in South Korea, short-term off-balance sheet loans secured by banks were around 20 billion dollars. This number is to be compared with total short-term liabilities of South Korea that in November 1997 was estimated to be 80 billion dollars.

Off-balance sheet credit exposures may lead to significant non-transparency effects in a environment described earlier in the paper. We would like to discuss two examples.

1. The Role of SPV's

How can a bank borrow off-balance sheet?

We illustrate the idea using the mechanism of Special Purpose Vehicle's (SPV). The use of an SPV is a relatively new practice in financial markets.

A South Korean bank that wants to borrow in international credit markets indirectly forms an SPV, an entity established offshore and fully owned by the bank. Next, the parent company can "give" some of its stock to the SPV, which in turn issues short term paper, or borrows, using these stocks as collateral. These funds can then be used to take any position desired by the parent bank.

In a deeper sense, it is the bank that borrowed. Yet, if we look at the bank's balance sheet, these liabilities will not be visible.

In Asia, the use of SPV's in order to borrow *off*-balance sheet was facilitated by the existence of controls on the proportion of stocks foreigners could buy. For example, in South Korea foreigners are prevented to own more than 20 percent of the market. Using SPV's established by South Korean banks, international banks can obtain exposure to South Korean risk indirectly. Circumventing these controls.

2. Role of Derivatives

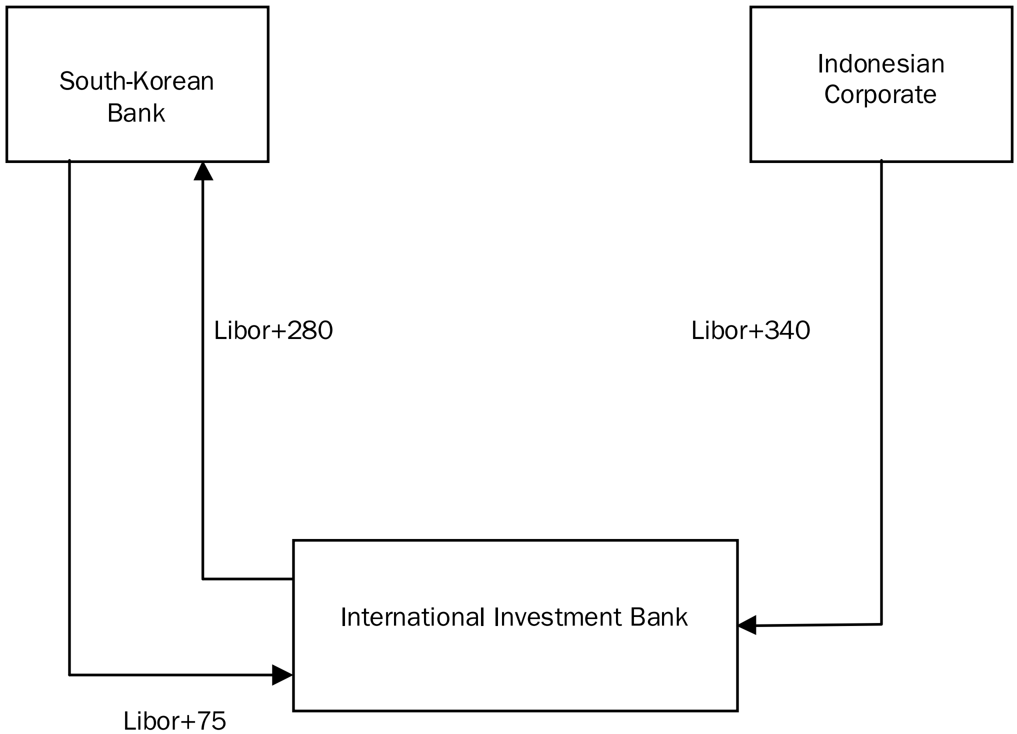
A second mechanism by which the liabilities of a bank can be taken off the balance sheet is through financial derivatives. There are many derivatives that can accomplish this. A recent and, during 1995-1997, very popular one in Asia was the Total Return Swaps (TRS). These swaps seem to have played some role in the contagion of the Asian financial crisis.

Total return swaps are a significant innovation that is likely to play a very important role in pricing credit correctly in the future. These instruments will certainly be essential in hedging and trading credit risk. But, as is the case with any asset, when they are mispriced, they can cause problems.

Major investment banks used Total Return Swaps in Asia, in order to facilitate the issuance of Indonesian paper during the years 1995-97. As a result of this process South Korean banks were heavily exposed to Indonesian credit. A nutshell description follows.

During the 1995-97 period a significant portion of Indonesian credit was swapped out to Korean banks, who were in search of higher yields due to the high funding cost that they started to pay on their existing loans beginning 1996.[9] But, given the difficult situation and the

Exhibit 1. Annual Cash Flow Exchanges With no Capital Gains or Losses



long-term nature of the loans to Chaebol, these higher funding costs could not be passed on. As a result, many South Korean banks saw their profit margins shrink or even, turn negative. They started to look for a way out of this situation.[10]

At the other end, Indonesian companies were in need of new funding, given the high growth of the economy. But the credit standing of Indonesia was not the same as South Korea or Singapore. It appears that there was not adequate demand for low quality Indonesian corporate paper *if issued according to standard market practices*. But, by using the TRS such demand could be created.

Total Return Swap is described in the Exhibits 1 and 2. We see that the derivative consists of the exchange of two types of cash flows. An international bank swaps a LIBOR+280bp return involving Indonesian corporate risk against a LIBOR+75 return involving South Korean bank risk. This exchange of cash flows are regular, made every 6 months or every year.[11]

The second exchange involves any capital gains or losses that the paper generates during the year. In particular, in the event of bankruptcy of the Indonesian corporate, the South Korean Bank would compensate the international bank for the loss. This is shown in Exhibit 2.

According to Exhibit 2, in return for a higher predictable annual return, South Korean bank is selling default-protection to the international bank. The default in question being that of an Indonesian corporate.

The spread of 60 basis points that the international bank obtains from the CD return of LIBOR+340 is a compensation for various risks involved in the deal. The major component of this is of course, the default-risk of the South Korean banks involved in the TRS.[12]

But, note that at the end of this process, Korean banks are being exposed to Indonesian credit. This however was not visible on their balance sheets. This situation not only created the possibility for contagion but also made the contagion unpredictable and severe.

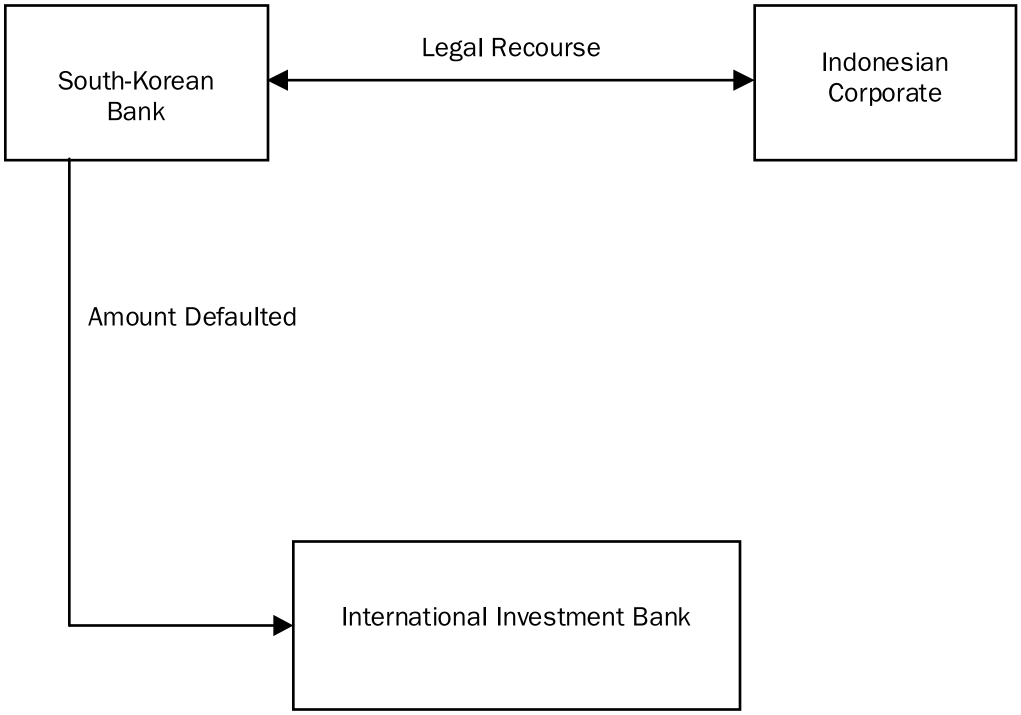
E. Contagion Effects: An Example

The discussion above also provides an example of contagion. This is not directly related to our main point, so we note it only in passing.

As a result of such TRS (mostly) European investment banks that swapped the Indonesian credit to Korean banks faced the following situation:

• Korean banks that took over Indonesian default risk could be insolvent during a potential financial crisis in Indonesia. A South Korean Bank in this situation could not be expected to generate a payment of 100 million dollars to pay the international investment bank. Especially during a period where liquidity would dry up in international credit markets.

Exhibit 2. Cash Flow Exchanges In the Event of an Indonesian Default



• This means that credit risk of Indonesia is eventually born by the large international banks, which originally thought they eliminated this exposure by buying protection from South Korea.[13]

• Because Korean banks may default on their commitments to international banks, they are more likely to default on their loans obtained from Japanese banks.

• Thus, a financial crisis in Indonesia would be transmitted to South Korea first, and then through South Korea, would be transmitted, in terms of higher spreads, to Japan second. It would become "contagious".

Another way of putting the same problem is to say that throughout this process, Indonesian risk was not properly priced. Also the risk was not diversified and allocated to a broad investor base. It was concentrated in relatively few hands. Instead of a broad body of investors who would have purchased the Indonesian CD's, a small number of Korean, European and Japanese banks are hurt.

IV. DYNAMICS OF SUSTAINED MISPRICINGS

These elements are now used in a somewhat more formal framework in order to bring an interpretation to the dynamics of crises such as the one observed in Asia.

We consider a small economy. Let e denote the percentage change in the exchange rate of domestic currency per one USD, during an infinitesimal interval dt. Let r be the return received from some investment in some domestic currency asset during the same infinitesimal interval. Let r^f be the cost of funds in USD, secured from a foreign bank and finally let μ be the risk premium associated with the domestic currency assets.

Then, arbitrage arguments will require:

$$r - r^f - e = \mu \tag{1}$$

with μ being the "normal" risk premium. According to this, local investment would pay a known (predictable) return equaling the cost of foreign funds, plus depreciation of the local currency, plus a risk premium. The risk premium should be sufficiently high, but not higher than what is required by the risk associated with the investment.

The fair value of μ is difficult to estimate. Hence the analysis will treat μ as a residual:

$$r - r^f - e = \mu \tag{2}$$

The main point of this section is the following. We intend to show that in an environment similar to the one described above, the value assumed by μ can remain *very high* during periods as long as 3 or 4 even 5 years. We then argue that this *process* will eventually make the *true* balance sheet of a banking system insolvent, given the environmental parameters discussed earlier. Being unsustainable, the "equilibrium" is bound to collapse.

Below, we discuss the case of Thailand. But similar cal-

Exhibit 3

Year	1994	1995	1996	1997(July)
Thai commercial bill rate	14.4	16.3	15.3	14.9
Thai Baht per USD	25.1	26.3	25.9	26.0
U.S. short rates	4.2	5.5	5.1	5.6
Japan short rates	1.9	1.0	0.3	0.5
Japanese Yen/USD	102.2	94.1	108.8	117.0

Exhibit 4. Annual Net Return

Year	1994	1995	1996	1997
Position A return in Yen	2.5%	17.3%	25%	12.5%
Position B return in USD	11.2%	10.7%	10.2%	8.2%

culations can be made for other Asian economies as well. The so-called *domestic asset*, utilized in the case of Thailand, may be different for other countries. For example, in Thailand and Malaysia it could be the property sector or Dollar-Yen short positions in Japan. In South Korea it could be the Total Asset Swaps.

But, regardless of the vehicle by which the positions are taken, the logic is similar.

The process begins by a few institutions taking a very risky position, due to, say, the pegged exchange rate regime. The resulting higher than normal returns make the position spread to other institutions. This fuels some type of property price rise, which in turn helps sustain the risky positions further. After a while, the system as a whole has moved to the risky position and has become "too big to fail." The initial mispricing becomes very difficult to change, since the risk is now systemic. The process continues further.

Such effects reduce the overall risk of these positions, which in fact were very risky at the micro level. This equilibria lasts until some shock hits the economy.

A. The Case of Thailand

Consider the data below related to the banking system positions for Thailand during the period 1994-1997.[14]

We now use the data shown in Exhibit 2. Suppose a player takes either one of the following two positions:

- Position A: Beginning of 1994 borrow 100 million USD worth of Yen. Invest in Thai commercial Bills until July 1997. Unwind the position at .225 Baht per yen.
- Position B: Beginning of 1994 borrow 100 million USD in international markets. Invest in Thai commercial Bills until July 1997.

Unwind the position at the devalued rate 28.5 Baht per USD.

What would be the yearly return of these positions during the period 1994-1997?

We perform this calculation in Exhibit 4. Exhibit 4 gives net returns in USD and in Yen of the two positions. If one subtracts from these numbers a "normal" return for Thailand, one in fact obtains the excess returns component of the variable F that we introduced above.

Looking at Exhibit 4, we see that the returns in Dollars are systematically high during the entire period 1994-1997. Returns in Yen on the other hand are even *better*. For example, 100 million dollars' worth of yen borrowed in 1994 from international capital markets,

would have generated a net income of 69 million dollars. The same investment started by using funds in USD provides a net income of 47 million dollars in 3.5 years.

Note the following points.

To secure such an investment all one needs is a banking or financial company license, a phone and a secretary. Hence these numbers mentioned above may in extreme cases indeed be viewed as *net* earnings.

But, of course there are risks. The main risk of these positions is the currency exposure. The borrowing and the lending are done in different currencies. If the Baht is devalued and the currency collapses, losses would be severe and insolvency might result.[15]

One may also have a maturity mismatch of the loans.

The borrowings would usually be with floating one year or six month terms. The lending could be with somewhat longer term fixed interest rates.

Yet, within the context described in this paper these risks may not appear as "big" to the local players. It turns out that the currency peg is the main building block of these strategies. As long as the players see the peg holding for a reasonable period of time, they may even find these short positions "riskless". For example, the players may think that there are enough reserves available to allow them to unwind their positions, albeit at somewhat unfavorable rates. But since the whole position is unusually profitable, these last minute "costs" would be regarded as tolerable. They may even be factored in the strategy, ex ante.

In fact, the expectation of a typical player may be as follows:

"The peg will hold at least for the next few weeks. We borrow Yen, lend Baht, secure 20% annual net return. In case currency starts to collapse, we unwind the position, or simply hedge ourselves in the forward market.[16]

One must also factor in, the well-known high growth of Asian economies. In an economy experiencing high growth for years, the risk of entering in a severe financial crisis may indeed seem very remote. This also reinforces the *one-way bet* view of the situation.

B. Moral Hazard Aspects

There is more to the above explanation. In fact, there are significant moral hazard aspects of the above positions, aspects that *reduce* the risk of collapsing currencies. These moral hazard aspects play a crucial role in the building of the risky positions because they essentially make the positions A or B *one way* bets, for a rather lengthy period of time.

It turns out that once most players start following the same strategy and the balance sheet of the system moves into positions such as A and or B, then the authorities cannot afford to change the peg, anyway. Instead, they will try to resist any speculative attacks until the end. Most players would then have ample time to unwind their positions.[17]

In the event of a significant and sudden collapse, which leaves the players unable to cover their positions, this aspect of the problem will make the government step in, and bailout the biggest players. In the extreme case that this does not happen, the government will eventually assume the liabilities to foreign banks or to domestic depositors and the domestic players will just walk away from their obligations. Assuming that the mispricing continues a reasonable amount of time, and given that no significant initial capital was invested in the "bank", the players may make money even under such severe conditions. So, regarded from this angle, the positions are not much risky. Or, more correctly, ex ante they may not appear very risky to each player.

There are some minor points that we would like to emphasize. First of all, the analysis above gives the net incomes after the initial float (devaluation) of Thai Baht during July 1997. The returns *before* the devaluation are 10% higher for the year 1997.[18]

Second, it should be noted that the returns shown for Thailand are systematic. In spite of the Mexican crisis, and the ensuing Tequila effect, players who took these positions were *gainers* consistently. Due the exchange rate regime, the spreads remained "excessive" throughout the 3.5-year period.

Third, if these funds in Yen were invested in Thai property directly, the returns during the period 1994-1997 would be significantly higher. Thai property prices at some point were increasing at rates of 20 to 30%. However, such investment is at the outset significantly more illiquid and risky than the positions A and B outlined above. Of course, to the extent the eventual borrowers from the banks were real estate speculators, the short-term nature of the bank lending was meaningless. Because during a period of stress the real estate speculator could default on its loan regardless of the maturity of his or her commitment.[19]

Finally, there is an additional cost that we need to add to the figures in Exhibit 3. The so-called Thailand premium that banks may have to pay during this period was between 95 basis points and 50 basis points during the interval under consideration.

C. The Dynamics

We can now summarize the dynamics of the financial markets under the conditions described in this paper and in the event the players start taking positions A and B.

Phase I

One or two big local banks start taking the relevant positions on or off-the balance sheet. These institutions do this hesitatingly, because they know it carries high risks. They are the only ones to do so. Initially, other institutions look at their decision skeptically.

But, when regarded from the point of view of the whole banking system, in the aggregate, the position is small. Also, there is the factor of corrupt administrations. Hence, the position remains unnoticed by local or international regulators. In fact, the position from the point of view of the whole system does not carry much risk. It certainly does not necessitate a change in the exchange rate regime.

Phase II

Initially the high risk was born by a few pioneering institutions. But there was no crisis and the institutions end up realizing high returns. In fact their profits are significantly higher than the local competition. But, this is an environment where the banks are owned by individuals or by families and these individuals have close relations. Hence, other banks and investors notice quickly this difference in profits and compare these returns with their own. The number of institutions taking the same position starts to increase.

After 2 or 3 years, the "true" balance sheet of the banking system has moved towards the risky positions in the *aggregate*. In general, the system is short in some foreign currency and long in some high-yielding local (Indonesian, Thai) asset.

Phase III

Eventually the *whole system* could move in these short positions. Under these conditions, even if they have the intentions, the administrators will be incapable to act due to a systemic risk. Namely, any major policy decision that goes against the position may cause a sudden collapse of currency (or, for example, in property) prices. So, they will try to defend the *peg* as long as possible. They will use reserves or other rationing mechanisms available to prevent the collapse of the currency.

This will give enough time to shrewd speculators to unwind their positions.

Obviously the dynamics is unstable and will eventually collapse. The crisis is a matter of time, but as always, it is impossible to forecast when this collapse will occur. Yet, this fragile state of affairs may continue much longer than outside observer might think.

D. An Example

In this section, we discuss a numerical example that illustrates the dynamics of ever enlarging exposures to FX risk in the balance sheet of the financial sector. We intend to provide a rationale for two hypotheses:

1. That the large devaluation risk premium built in domestic currency assets such as bonds, O/N or repo's can persist for many years even in the presence of significant capital inflows.

2. That these risk premia will lead to increased FX exposure and to the eventual collapse of the exchange rate regime. Yet, the increased likelihood of the collapse may provide, paradoxically, some sort of insurance against an early collapse for a surprisingly *long* period.

In providing the rationale behind these assertions we will emphasize three necessary conditions. First, we need some sort of a pegged exchange rate regime. Second, we need a current account deficit. A third possible necessary condition is the existence of some kind of deposit insurance. Yet, the presence of unwritten rules such as "too big to fail" will also lead to the same conclusion.

The example below uses overly simplified balance sheets to illustrate the main points. We assume that there are three balance sheets in the economy. That of households (HH), that of the Central Bank (CB) and the balance sheet of the financial sector (FS).

In the following, all numbers are expressed in USD. The symbol e is the local currency price of the USD.

1. Initial Phase

The Household sector will not play an important role in the example. It is assumed to have the balance sheet as shown in Exhibit 5, that will not change during the process[20].

Exhibit 5. Household Sector

Assets	Liabilities
Real Assets (USD) 100	Equity 100

The financial system has the balance sheet of Exhibit 6.

Exhibit 6. Financial System

Assets	Liabilities
Domestic Currency Assets 0	Loans 0

The Central Bank has the initial balance sheet shown in Exhibit 7.

Exhibit 7. Central Bank

Assets	Liabilities
Reserves 0	Notes 0

Clearly, these balance sheets can be complicated in many ways. But, for the arguments below we don't need to do that.

2. Second Phase

In the second phase, some players in the financial sector decide to open their FX positions and take an FX exposure. In particular, they increase their USD borrowing in international markets, sell the dollars to the central bank, get domestic currency and lend these at high real rates either to the government, to realtors or to the business sector.

The high *real rates* obtained from these loans would be around, say, 10 to 15% per year because they incorporate the domestic currency risk premium.

Yet, although these exposures are risky, the CB has the USD's and is ready to defend the exchange rate policy by selling the dollars back to the market. Hence, looked at closer, the "high risk" FX exposures are in fact not risky at all. Local and international players know this. In addition, there is no reason, at this point, for the CB to change the exchange rate policy and devalue the currency. The economy grows, the current account deficit is manageable and the exposures are not excessive.

Hence, the banks that opened their FX positions will realize high profits, while others will perform poorly. The treasurers of the latter, will be "penalized" for their conservative policy.[21] This will lead to further financial institutions joining the policy of open FX positions. After 1 or 2 years the system's balance sheet will start to change. The new balance sheet will be as follows (Exhibits 8-10).

Households are assumed to have the same balance sheet since they don't join in opening FX positions, although this assumption can easily be modified.

Exhibit 8. Households

Assets		Liabilities	
Real Assets	100	Equity	100

The financial system has borrowed USD and has lent domestic currency.

Exhibit 9. Financial System

Assets		Liabilities	
Domestic Currency Loans	*e* 100	Loans	100

The Central Bank has purchased the USD sold by the financial institutions.

Exhibit 10. Central Bank

Assets		Liabilities	
Reserves	100	Notes	*e* 100

Note that the money supply must have increased. Shouldn't this lower the domestic interest rates, lower the returns in USD terms and eventually stop the process of opening positions? Not necessarily. In fact, the financial system is now carrying significant FX exposure and the devaluation risk premium may increase somewhat. As result, the effects of looser money supply may be compensated by a higher risk premium.

But the situation does not have to lead to a crisis at this point, because central bank can always sell the reserves back to the financial sector and the FX positions can easily be closed.

3. Third Phase

In this phase we need some sort of effect that will lower the central bank reserves. This can happen in many ways. But one way or another the existence of a current account deficit is required. Whether financed by foreign borrowing or by CB reserves, the effect of this deficit will not be very different. So we assume that Central Bank spends 25% of the reserves to finance the current account deficit.

The new balance sheets will look like this (Exhibits 11-13). Again the household balance sheet has not changed.

Exhibit 11. Households

Assets		Liabilities	
Real Assets (USD)	100	Equity	100

The financial system has borrowed even more USD and has increased domestic currency lending, because given the weaker balance sheet of the CB, a devaluation will now lead to a financial crisis. Hence, paradoxically, the exchange rate policy will in the short run be even *less* likely to change. Also, given the increased risks, risk premium must have increased and the real returns would go up to ranges such as 15 to 25%. This could very well lead to new players entering the game.

Exhibit 12. Financial System

Assets		Liabilities	
Domestic Currency Loans	*e* 200	Loans	200

The Central Bank has purchased and sold some USD in order to finance the current account deficit. At the end the balance sheet may look as represented in Exhibit 13.

Exhibit 13. Central Bank

Assets		Liabilities	
Reserves	150	Notes	*e* 150

Note that any demand by the financial sector to reverse the FX positions will immediately lead to an insolvency of the financial sector and hence to a financial crisis. This is because, the USD liabilities of the system is now greater than the available reserves of foreign currency. Hence the CB, now is *obligated to maintain* the exchange rate regime as long as it can. Other market players, who may join the process, will see this as some sort of short-term insurance.

Clearly, the devaluation risk premium must also increase. It is more profitable to open positions as long as there is no imminent danger of a devaluation.

V. CONCLUSION

The example above can be complicated in many ways. In fact, one interesting complication is to differentiate between two types of open positions. Those that finance domestic currency O/N investment, and others that finance longer-term maturities.

It can be shown that as long as the Central Bank has enough reserves to meet the reversals of O/N positions, there will be no real danger of an imminent financial crisis. On the other hand, given that O/N positions are earning high returns, there is no need to reverse them either, since they can be reversed at any time. Finally, given that O/N positions are not reversed, the longer maturity domestic currency positions will never be reversed either.

Thus, the amount of Central Bank reserves necessary to maintain the temporary "equilibrium" may in fact be much smaller than the foreign exchange liabilities of the banking system. A stock of reserves that exceeds O/N, or weekly repos may be sufficient to keep the players away from unwinding any positions.

The "equilibrium" will continue as long as it can. And this may be for many years.

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END NOTES

[1] Using the criteria of S&P, these ratings are grouped under symbols such as AAA, AA, A, BBB, BB, B, and C. Agencies also distinguish between borrowers by attaching "+" or "-" signs to these letter grades. The ratings below BBB- are considered to be *speculative* grade, in contrast to being *investment* grade.

[2] A brief definition of on and off-balance sheet items will be appropriate. Any asset acquired by paying "hard cash", or any liability that has generated "hard cash" is an on-balance sheet item. But there are many other transactions that have neither generated cash nor were the result of cash payments. Many contracts are just contingencies at the time they are entered into and may result in cash receipts or payments only if certain contingencies are realized. They are legally enforceable promises, yet until the time they generate cash or lead to cash payments, they will be off the balance sheet. An example may help. When a household buys a new car this will be included among the households assets - regardless of how the car is purchased, by cash or by bank loans. Hence the car will be *on* the balance sheet of the household. Yet, the purchase of a collision insurance on this car does not add another car to the household balance sheet. At least, not until some accident occurs. Yet, by writing an insurance policy the insurer has committed himself in some very precise way and must take the necessary measures.

[3] Poor regulation is not a very critical factor in explaining the Asian financial crisis. If somebody wants to cut corners, regardless of the level of supervision/regulation, with modern instruments, they can. The key is the desire to obey rules. As an example, note that Asia had better supervision than Latin America.

[4] An example to the non-transparency of balance sheets is Table I given in the Appendix. In Table I we list the total foreign debt of various Asian countries as given *before* the Asian crisis. According to this Table short-run debt of South Korea is shown to be only 70.2 billion dollars. Yet, after the turbulence in South Korean markets the true short-term debt of South Korea was determined to be close to 100 billion USD. Similarly, in Table I Indonesia is shown before the crisis, with a total debt of 55 billion dollars. After the turbulence the same number turned out to be over 80 billions.

[5] This is in fact the case of the so-called *convoy* system used in Japan.

[6] Of course, here the issue is one of severity. For example, during 1980 the Thai banking system did go through a financial crisis. So did the Philippines on several occasions. During the Mexico crisis in 1994 Thailand was affected. Yet, these were not full-blown crises and had limited effect.

[7] South Korea was on the positive road in terms of establishing a corruption-free public administration. So, in this respect one might think that it forms a counter-example to the importance of corruption factor. Yet, as will be discussed below, South Korean banks had carelessly exposed themselves to Indonesian risk during the previous period.

[8] The reader should notice the absence of any comments about the real economy. In fact, the real side of economies that possess such environments is not very important. Such economies may in fact experience very high growth and very fast transformation towards a modern society. This will not prevent the onset of a crisis. It may however delay it. On the other hand, if the real side has problems of its own, then this would make the crises occur earlier.

[9] The funding costs of South Korean banks were increasing during 1996-1997. South Korean banks had floating rate liabilities that they used to finance capital investments of the Chaebol. These investments were long term and their expected rates of return were declining during this period. At the same time, various scandals and the ensuing democratization process had exposed the questionable accounting standards of these industrial conglomerates and had increased the South Korean risk. Korean banks saw their funding cost to increase. Another factor was the Japan premium that Japanese banks had started paying on the dollar loans that they secured. Some Japanese banks passed the higher funding costs to Korean banks.

[10] Note that given the special relationship between Banks-Chaebol and the policies followed by the South Korean ministry of finance, the loans to Chaebol could not be sold in the secondary market. If this was possible, the banks would have taken a one time hit and then continued their operations in a more efficient manner. But the special relationship forced them to carry these long-term loans on their balance sheet.

[11] One percent is 100 basis points. In other words, 280 basis points can also be expressed as 2.8%. The LIBOR on the other hand is the rate of interest quoted by an average of 5 London banks in "selling" dollar loans. It is a benchmark interest rate used in floating rate loans.

[12] Competition among international banks for a share of the Asian market later drew this spread to almost zero. There is in fact, another mispricing here, but it is not essential for our purposes.

[13] Foreign banks lending in Indonesia is as follows. Japanese banks $23 billions, German banks $5.6 billions, French Banks $4.8 billions, US banks $4.6 billions.

[14] After devaluation, in July 1997 Thai Baht exchange rate went from 26 to 28.5 Baht/USD.

[15] Thai government's exchange rate policy was as follows. Baht was pegged to a basket of currencies dominated by Dollar. The basket was composed of 80-85% USD, 8-10% Yen, 4-10% DEM and 0-2% Sterling. Hence, the currency was essentially pegged to Dollar. But still there was some flexibility in the adjustment process. After the devaluation Baht was let to float.

[16] In Thailand, for example, such forward markets did exist and were utilized for about 22 billion dollars.

[17] Needless to say, some players would still be non-liquid at the time of the collapse given the maturity of the loans that they made. For example, in Thailand the stress period before the devaluation lasted about 8-10 months. If a player had issued a one-year loan in September or October 1996, he or she would still not be liquid enough to unwind the position by July 1997, when the currency was allowed to float. Also, often such loans were callable.

[18] Several weeks before the devaluation the players had the opportunity to unwind their positions. Thai central bank was on the other side of the deal and sold about 20 billion dollars of foreign reserves and FX forwards.

[19] Some numbers. In Thailand after the crisis, 56 finance companies, two thirds of the sector, was closed by the government. These companies had assets totaling $20 billion, of which a third is real estate loans gone bad. Because this property has not been liquidated, the Thai property market has not really collapsed yet.

[20] This can certainly be modified. The household sector can start by taking speculative positions as well. For simplicity, we assume these away.

[21] Note that if the banking system is immature, or if modern risk management is not very well understood, it may be extremely difficult to explain to the owners of these banks, returns such as 7-8% while their competitors have been displaying performances of 10-15%, two or three years in a row.