Macroeconomic Behavior During Periods of Speculative Pressure or Realignment: Evidence from Pacific Basin Economies

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This paper uses nonparametric tests to provide a description of the "stylized facts" associated with episodes of speculative pressure in foreign exchange markets in Pacific Basin Economies and to see whether these "stylized facts" appear to be broadly consistent with the alternative explanations for such episodes suggested in the theoretical literature.

The empirical results are mixed, but some are nonetheless suggestive. Larger budget deficits and growth in central bank domestic credit appear to be associated with episodes of depreciation rather than episodes of appreciation or periods of tranquility, indicating that unusually expansionary or contractionary policies may contribute to speculative pressures in foreign exchange markets. There also is some evidence that episodes of speculative pressure may arise when economic conditions make it costly for the government to maintain a stable exchange rate.

In recent years, there has been renewed interest in the causes and characteristics of episodes in which speculators put strong upward or downward pressure on a currency. General interest has been motivated by the attack on the exchange rate mechanism of the European Monetary System in September 1992 and more recently by the devaluation and float of the Mexican peso in December 1994. In Asian economies, interest in speculative pressures is largely motivated by their experiences with surges in capital inflows (see Glick and Moreno, 1994).

It is not easy to explain why an exchange rate may be subject to speculative pressure. One view is that macroeconomic policies that are inconsistent with a government's exchange rate target trigger speculative pressures. Another explanation is that the speculators' beliefs affect government policy and, specifically, the willingness of a government to defend a peg, triggering episodes of speculative pressure that may force adjustment in the exchange rate. For example, expectations of inflation may raise domestic interest rates, making it costly for the government to preserve a peg that it otherwise would have maintained, leading to devaluation and higher inflation. Under these conditions, market expectations take on the characteristics of self-fulfilling prophecies.

The underlying source of speculative pressure in foreign exchange markets has important implications for policy. If such pressures reflect the adoption of inconsistent macroeconomic policies, they can be avoided by pursuing policies that are consistent with the exchange rate peg. However, if speculative pressures largely reflect more or less arbitrary changes in expectations, sound macroeconomic management may not suffice to ensure the maintenance of a peg. In response, countries may adopt policies seeking to enhance the credibility of the peg (for example, by adopting a currency board), choose to allow the exchange rate to float, or occasionally adopt capital controls, at the cost of efficiency and the development of their financial sectors.

In spite of the possible usefulness of distinguishing between the causes of realignment, there is little evidence on which type of model is more relevant empirically. The reason is that, with the exception of a study by Eichengreen,

Rose, and Wyplosz (ERW, 1995),[1] most empirical studies of speculative attacks generally assume that pressures to realign reflect macroeconomic policies that are inconsistent with the exchange rate peg.[2]

ERW suggest that comparing the behavior of macroeconomic variables during periods of speculative pressure with their behavior during periods of tranquility may provide insights into the plausibility of alternative explanations of episodes in which there is pressure to realign. They argue that a finding that the behavior of macroeconomic variables is different in the two periods supports the view that episodes of speculative pressure are triggered by inconsistent macroeconomic policies. If no difference is found, then episodes of speculative pressure may be the result of arbitrary shifts in expectations.

Using monthly data for 1967–1992 covering 22 countries (mostly OECD members) and applying nonparametric tests, ERW find that, among the European economies, the behavior of macroeconomic variables during periods of speculative pressure does not differ significantly from the behavior of these same variables during tranquil periods. However, their behavior does differ across periods among the non-European economies in their sample.

This paper applies methods similar to those suggested by ERW to a sample of economies in the Asia-Pacific Basin over the period 1980–1994. The experience of these economies is of interest because it was not considered in ERW's study. Also, in contrast to developing economies in Latin America and Africa, they have by and large adopted stable macroeconomic policies that have resulted in moderate rates of inflation. Nevertheless, these economies have also experienced episodes of speculative pressure in which their currencies tended to depreciate or to appreciate.

The paper has two relatively modest objectives. The first is to provide a description of the "stylized facts" associated with episodes of speculative pressure in foreign exchange markets. The second is to see whether these "stylized facts" appear to be broadly consistent with the alternative explanations for such episodes suggested in the theoretical literature.

The paper is organized as follows. Section I discusses models of speculative pressure in some detail and their implications for macroeconomic behavior during episodes of speculative pressure and tranquility. Section II implements

the comparisons of episodes of speculative pressure and tranquility and Section III offers some conclusions.

I. Models of Speculative Pressure

Pre-attack Macroeconomic Policies

To illustrate how macroeconomic policies may lead to speculative attacks, as in Krugman's (1979) model, consider the case of a fictitious country, Latinia. The Latinian currency is the peso, and its exchange rate against the dollar is governed by the relative supply of and demand for pesos. Suppose that the peso exchange rate is pegged by the government. The enforcement of the peg depends on the ability of the government to control the monetary base, which is the sum of central bank domestic credit and net foreign assets. The central bank is prepared to defend the peso peg so long as it has a minimum level of net foreign assets.

Suppose now that the Latinian central bank increases domestic credit to finance government deficits. The resulting incipient increase in the money supply will tend to depreciate the peso. In order to prevent the peso from depreciating, the Latinian government must prevent the money supply from increasing. As reducing the stock of domestic credit is ruled out by deficit financing, Latinian authorities must stand ready to sell any dollars demanded by the market at its target exchange rate. The sale of dollars has a contractionary influence on the Latinian money supply (simultaneously reducing the net foreign assets and the monetary liabilities of the central bank) that fully offsets the increase in domestic credit and preserves the peso peg.

Although (unsterilized) intervention preserves the peso peg in the short run, such a peg may be unsustainable in the long run if domestic credit is used to finance a persistent fiscal deficit. Under these conditions, domestic credit increases in each period, and Latinia's central bank must keep on selling foreign assets to prevent the peso from depreciating. At some point, the central bank will reach its minimum acceptable level of foreign exchange reserves and will be forced to abandon the exchange rate peg. Anticipating this, speculators will attack the peg prior to this point, reducing the central bank's reserves to zero and forcing the abandonment of the peg.

Blanco and Garber (1986) provide an intuitive way of identifying the precise point in time at which the exchange rate peg will collapse. They define the shadow exchange rate as the floating rate that would clear the foreign exchange market given the stock of domestic credit, after all foreign exchange reserves have been sold to the private sector. They show that the exchange rate will be attacked at

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1. Another study that does not assume that attacks are caused by pre-attack macroeconomic policies that are inconsistent with a peg is by Drazen and Masson (1994). This study draws on a model developed by Obstfeld (1991, 1994) which is discussed later.

2. Blanco and Garber (1986), Cumby and van Wijnbergen (1989), and Goldberg (1994).

precisely the time (say t^*) when the shadow exchange rate equals the fixed exchange rate.

Before t^*, if foreign exchange reserves were all sold off by the central bank, the money supply would be smaller than at t^* (the date when the floating rate equals the fixed), so that the exchange rate would *appreciate* from the pegged level. As speculators are aware that they would experience capital gains if the peg were abandoned, they will hold on to their pesos, and no attack will occur before t^*. After t^*, the money supply will be greater than at t^*, even if all foreign exchange reserves are sold off. The exchange rate therefore would *depreciate* if the peg were abandoned, exposing holders of pesos to capital losses. To avoid such losses, speculators would attack the peso at t^*, at which point the central bank's foreign exchange reserves would fall to zero and the currency would float. After t^*, the shadow exchange rate equals the actual floating rate.

As there is no uncertainty in Krugman's original model, the exchange rate cannot jump when the peg is abandoned (otherwise agents could experience fully anticipated capital gains and losses, which would not be consistent with rationality). By introducing uncertainty into the process of domestic credit creation, Blanco and Garber obtain two plausible results. First, the spread between domestic and foreign interest rates rises over time, as the probability of a devaluation increases. Second, the timing of a devaluation is no longer fully anticipated (it depends on the size of the shock to domestic credit at a given point in time), so the exchange rate can jump when the peg is abandoned.

Self-Fulfilling Expectations

A number of observers have noted that Krugman's model does not seem to describe the situation of some European countries that experienced attacks on their exchange rates in 1992–1993. In contrast to Krugman's model, European countries at the time were not constrained by the availability of foreign exchange reserves. Speculative attacks, which tended to put downward pressure on the exchange rates of a number of European countries against the deutsche mark, were at times directed at countries whose economic policies were not obviously inconsistent with a deutsche mark peg—such as France. In some of the European countries, the decision to abandon a currency peg appeared to be related to the perceived cost of defending a peg by raising interest rates. Similarly, speculative pressures on some Asian currencies such as the Hong Kong dollar, and the Thai bhat, following Mexico's financial crisis in December 1994, did not appear to reflect the perception that those countries' monetary authorities lacked foreign exchange reserves.

These differences have prompted some authors to consider models in which the beliefs of speculators may affect the government's incentive to defend or abandon a currency peg, leading to self-fulfilling crises. As noted by Obstfeld (1994), a circular dynamic arises because expectations depend on conjectured government responses, which in turn depend on how changes that themselves result from expectations affect the government's desired response. This "implies a potential for crises that need not have occurred, but that do occur because market participants expect them to" (p.3).

To illustrate how self-fulfilling crises and multiple equilibria may arise in a regime with fixed but adjustable parities, consider Obstfeld's (1991, 1994) open-economy extension of Barro and Gordon's (1983) model. In this model, labor market rigidities introduce a role for output fluctuations and stabilization policy in the presence of demand shocks. For example, if the demand shock is deflationary, the real wage set beforehand will be too high, and output will contract. The government can offset the shock by devaluing the exchange rate, at the cost of higher inflation. Precisely how the government will respond to the shock depends on its objective function.

The government is assumed to minimize a quadratic loss function that penalizes deviations from zero inflation and a target level of output. It is also assumed that because of distortions (say, in the labor market) that lead to production that is not fully efficient, the target (log) level of output is positive (compared to the rational equilibrium output level of zero when the demand shock is at its mean value of zero).

If the government cannot pre-commit to a fixed exchange rate, the government reaction function can be derived to show that the government ex post will (i) use the exchange rate partially to offset shocks to output; (ii) attempt a "surprise" depreciation whenever wage inflation risks eroding competitiveness; (iii) attempt to drive output above the "natural" level (of zero) by devaluing to offset the assumed distortion in the economy. Under these conditions, a fixed exchange rate will be optimal only if the penalty for inflation is infinitely large.[3]

As is to be expected in this type of model, the economy is characterized by a systematic inflation bias proportional to the deadweight output loss. This inflation bias reflects the government's attempts to exploit the potential short-run Phillips trade-off created by predetermined nominal wages. While a precommitment to a fixed exchange rate would eliminate the inflation bias, it also would prevent the government from responding to unpredictable output shocks. In choosing whether to maintain a peg or to adjust

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3. Appendix 1 provides a derivation of these results.

the exchange rate the government will select the alternative that minimizes its loss.

To describe the nature of the choice facing the government, Obstfeld assumes that the government cannot credibly commit to fix the exchange rate in all circumstances, and that instead it faces a fixed realignment cost, c. The loss function of the government can then be described by:

(1) $l_t = (\theta/2)(e_t - e_{t-1})^2 + (1/2)[\alpha(e_t - w_t) - u_t - y^*]^2 + cZ_t$
($Z = 1$ if $c \neq 0$, $Z = 0$ otherwise).

In equation (1), e_t is the nominal exchange rate, w_t is the wage, u_t is a demand shock and y^* is the target level of output. The first right-hand term reflects the cost of deviations from zero inflation, the second the cost of deviations from the target level of output y^* associated with changes in the real exchange rate $(e_t - w_t)$ or demand shocks, and the third the fixed cost of realignment.

A realignment will then occur whenever the cost of pegging the exchange rate exceeds the cost of keeping the exchange rate fixed, or when the following condition is satisfied:[4]

(2) $\qquad (1/2)\lambda[\alpha\pi_t + u_t + y^*]^2 > c$.

If equation (2) is binding, we obtain two roots which represent the upper and lower bounds for the demand shock $(u_H > u_L)$. The government devalues whenever $u > u_H$ and revalues whenever $u > u_L$. Intuitively, when the demand shock is very large, the cost of unemployment is so high that the benefits of a stimulus offset the costs of inflation associated with a devaluation. When the demand shock is small enough, then the benefits of reducing overemployment outweigh the costs of deflation.

The preceding fixed exchange rate mechanism, which allows for realignment for sufficiently large demand shocks, opens the door for successful speculative attacks. The reason is that the threshold points u_H and u_L which determine whether the government will revalue or devalue depend on prior expectations of depreciation π_t. These expectations in turn depend on market perceptions of where the points u_H and u_L lie. A shift in these market perceptions, or in the cost of realignment, can lead to a change in the threshold points and to an exchange rate crisis and devaluation, whereas none might have occurred in the absence of this shift. The shift in perceptions may have nothing to do with the soundness of domestic economic policy or other market fundamentals.

The importance of market perceptions in determining the timing and success of speculative attacks suggests that

a reputation for "toughness" may help policymakers deter an attack and preserve a peg. (This appears to be the rationale for proposals such as the adoption of currency boards, which can make it less likely that money will be issued in a manner inconsistent with a peg, and also make it more difficult to adjust a peg.) Drazen and Masson (1994) investigate this question and point out that there is still a trade-off. Speculators may infer that a government resisting a speculative attack is indeed "tough," thus deterring them from future attacks, or they may instead infer that the defense against the first speculative attack was so costly that the government could not possibly resist a future attack. Drazen and Masson's model seems to fit the experience of Sweden. Obstfeld (1994) observes that in September 1992, Swedish authorities successfully resisted an attack on the krona by raising the domestic interbank rate up to 500 percent (annualized). However, they responded to a second attack in November 1992 by floating the currency. The cost of defending the peg, given high unemployment, was simply too high.

Two-Sided Attacks

Most discussions of pressures to realign focus on episodes in which devaluations may occur either because a country has pursued policies that deplete foreign exchange reserves (as in Krugman's model) or because the government cannot resist the temptation to inflate when inflationary expectations make the economy less competitive or output growth is sluggish (as in Obstfeld's model). However, speculative pressures involve revaluations as well as devaluations. In Pacific Basin economies, which are the focus of this paper, episodes of speculation that a currency will appreciate against the U.S. dollar are not uncommon. For example, the methods used in this paper identify 54 episodes of appreciation pressures on the exchange rate compared to 72 episodes of depreciation pressure in the period 1980–1994 (see the last row of Table 1).

As is apparent from the preceding discussion, a model where realignments reflect the government's desire to offset shocks to competitiveness and employment allows for appreciation or depreciation pressures. In such a model, surprise revaluations reduce excess demand by reducing the competitiveness of the export sector. Appreciation pressures can be interpreted as resulting from a real exchange rate that is "misaligned," in the sense that it produces a macroeconomic outcome that is not consistent with the government's ultimate policy objectives.

In contrast to the models with multiple equilibria, the literature based on Krugman's (1979) paper typically focuses on episodes of depreciation. This may reflect the fact

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4. See Appendix 1, equations (A4) and (A6).

TABLE 1

SOURCES OF SPECULATIVE PRESSURE
(Percentage of episodes in which the change in variable led to identi-
fication of a speculative episode. Episodes are identified using indi-
vidual country data.)

	ALL SPECULATIVE	DEPRECIATION	APPRECIATION
EXCHANGE RATE	49	51	46
RELATIVE NET FOREIGN ASSET	34	36	31
RELATIVE SHORT TERM RATE	17	13	22
NUMBER OF EPISODES	126	72	54

that it is not easy to explain why exchange rate apprecia-
tion might matter in this type of model. Grilli (1986) does
examine the implications of appreciation pressures by ex-
tending Blanco and Garber's (1986) model to allow for
both a lower and an upper limit on reserves at which the
exchange rate will be allowed to float.

Grilli does not explicitly discuss why a country would
want to limit the level of reserves. It might be argued that
policymakers worry about the expansionary impact such
foreign exchange reserves may have on the stock of money.
However, this cannot be the case in this type of model, be-
cause episodes of appreciation pressure necessarily reflect
monetary contraction (in spite of foreign exchange accu-
mulation). Another plausible explanation is that policy-
makers do not want to hold too high a level of foreign
reserves because the return on foreign assets is lower than
on domestic assets, imposing a quasi-fiscal cost on the
government. This type of explanation is not ruled out by
this class of models, but neither is it explicitly taken into
account.

Another point worth noting is that it is not entirely clear
what process would lead to the persistent foreign exchange
reserve accumulation described in Grilli's model. The
counterpart to Krugman's original scenario of reserve
drainage would be a situation where a country experiences
budget surpluses that the government uses to increase its
deposits with the central bank. The resulting monetary
contraction then attracts capital inflows and leads to in-
creases in reserves. One limitation of this type of scenario
is that it may not explain most appreciation episodes in
Pacific Basin economies. While most of these economies
adopt relatively conservative fiscal policies, it does not ap-

pear that government budget surpluses systematically drain
liquidity in most of the economies in the region (with the
exception of Singapore).[5]

II. EMPIRICAL ANALYSIS

In this section we examine some "stylized facts" about
speculative episodes. The preceding discussion of alterna-
tive models of speculative pressure may provide a broad
framework for attempting to interpret the results of this
analysis.

Two broad sets of questions are addressed. First, how
does foreign exchange market adjustment occur during
episodes of speculative pressure? Are most such episodes
associated with sudden adjustment in the exchange rate,
with sharp changes in net foreign asset growth, or with
changes in relative interest rates? Are there differences in
adjustment during periods of appreciation and deprecia-
tion? These questions may be addressed by evaluating the
behavior of indicators of speculative pressure (changes in
the nominal exchange rate, relative net foreign asset growth,
and changes in interest rate differentials) and seeing how
the behavior of these variables differs during periods of
speculative pressure and tranquility.

Second, are there significant differences in macroeco-
nomic behavior during periods of speculative pressure and
periods of tranquility? Such differences were not found by
ERW for a sample of European countries, but were found
for a set of non-European economies. Are there also dif-
ferences in macroeconomic behavior during episodes of
appreciation and depreciation? As argued by Eichengreen,
Rose, and Wyplosz, if speculative episodes are caused by
more or less arbitrary changes in expectations, there may
be no differences in the behavior of macroeconomic vari-
ables during periods of speculative pressure and tranquility.
However, if some differences in the behavior of macro-
economic variables are observed, the nature of these dif-
ferences may shed light on whether speculative pressures
appear to reflect inconsistent macroeconomic policies or
policymakers' response to adverse economic conditions.

In particular, the policy environment, which can be rep-
resented by comparing monetary and fiscal policy indica-
tors during periods of speculative pressure and tranquility,
may shed light on whether expansionary monetary and fis-
cal policies trigger speculative attacks, as in Krugman
(1979). It may be argued that such policies can be the
source of speculative pressures if it is found that monetary

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5. For a discussion of Singapore's monetary regime, see Moreno (1988).
The monetary regimes of Singapore and other economies are discussed
in Talib (1993).

and fiscal policy variables differ during periods of speculative pressures and periods of tranquility.[6]

Indicators of internal or external balance may shed light on whether the cost of maintaining a stable exchange rate is too high for the government, leading to shifts in expectations associated with speculative pressures. For example, if output is unusually sluggish, domestic inflation is relatively high, or the current account is unbalanced, the government may find it too costly to defend the exchange rate, as suggested by some models used by Obstfeld (1991, 1994) and Drazen and Masson (1994).[7]

The Data

In order to analyze episodes of speculative pressure, a number of data series were constructed. The percentage change in the bilateral exchange rate against the U.S. dollar, changes in relative net foreign asset growth, and the differential between the first difference of the logs of the domestic and U.S. interest rate, were used as indicators of speculative pressure. The differential between the relative growth (domestic compared to U.S.) in an estimated measure of central bank domestic credit, narrow and broad money were used to indicate the monetary policy environment. The ratio of the budget deficit to government spending (relative to the U.S.) was used to represent the fiscal policy environment. The differential (domestic less U.S.) in inflation and deviations of output growth from the mean rate of growth for each country were used to represent the internal balance, while the ratio of exports to imports was used to represent the external balance.

The data are taken from the IMF *International Financial Statistics.* All the series are monthly, except real output growth and the government budget balance, which are quarterly. Speculative pressure episodes were identified over the period 1980–1994. However, the indicators of the policy environment or the internal and external balance did not always span the full period or in some cases were miss-

ing values. For some series data from certain countries are excluded because of lack of availability. The countries covered are Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, and Thailand.[8]

Analyzing Episodes of Speculative Pressure

The models discussed previously assume that the exchange rate is fixed. However, as is apparent in Appendix 3, the countries in our sample have adopted a variety of exchange rate regimes in various time periods, including *de facto* pegs to the U.S. dollar (Thailand up to 1984), basket pegs or managed floats (most of the countries in the 1980s) and relatively free floats with occasional massive intervention (Japan). Nevertheless, a review of these exchange rate regimes suggests that policymakers as a rule seek to dampen large fluctuations in the exchange rate.[9] For this reason, it can be argued that while the exchange rate is not strictly fixed in many cases, episodes of very large exchange rate movements may be interpreted as episodes of speculative pressure that will be viewed with concern by authorities and may trigger a policy response, even in regimes where the exchange rate is supposed to float freely. Also, large changes in net foreign assets of the central bank or in short-term interest rates may be interpreted as reflecting episodes of pressure in foreign currency markets where authorities may have resisted an adjustment in the exchange rate.

The models discussed previously also tend to assume that speculative attacks on the exchange rate always succeed because rational agents correctly anticipate that they will be worse off by delaying an attack. In practice, however, episodes of speculative pressure do not always result in large adjustments in the exchange rate.

In line with this, episodes of speculative pressure in foreign exchange markets were identified by focusing on large adjustments in the exchange rate and on episodes in which there were large changes in net foreign assets or in relative short-term interest differentials. Using data for each country, an arbitrary band was constructed around each indicator of speculative pressure by taking the mean of the indicator plus or minus 1.5σ, where σ is the standard deviation of the indicator. To identify episodes of "speculative pressure," episodes where changes in the exchange rate were outside the 1.5σ band were selected first. From the remaining (nonselected) observations, episodes where changes in relative net foreign assets were outside the 1.5σ

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6. It may be noted that in one of the models described by Obstfeld (1994), a weak fiscal position may lead to self-fulfilling attacks on the exchange rate, so it is not entirely possible to rule out this type of explanation when looking at the budget deficit.

7. Although the general approach adopted here is inspired by Eichengreen, Rose and Wyplosz (1995), the interpretation differs from theirs. Eichengreen, Rose and Wyplosz do not explicitly distinguish between policy and internal and external balance indicators, but instead interpret these indicators as broadly representing the behavior of "fundamentals." They argue that if the tests reveal that the distribution of fundamentals differs during periods of speculative pressure and tranquility, then this suggests that episodes of speculative pressure are best explained by models in which a peg becomes unsustainable because of inconsistent macroeconomic policies, as in Krugman's (1979) study.

8. Appendix 2 provides more information on the data.

9. For recent reviews of exchange rate policies in Pacific Basin economies see Glick and Moreno (1995), Glick and Hutchison (1994), and Moreno (1994).

band for that series were selected next. The list of speculative pressure episodes was completed by adding episodes where changes in short-term interest differentials were outside the 1.5σ bands. The remaining observations (inside the band defined for each of the three indicators) were treated as periods of "tranquility." In order to prevent the continuation of a speculative episode from being identified as a new episode, windows were created by dropping five observations around previously identified episodes.[10]

Eichengreen, Rose, and Wyplosz (1995) use similar indicators but adopt a different approach for identifying speculative episodes. They construct a weighted average index of the three indicators, and identify speculative attack episodes by taking those observations that fall outside the 1.5σ band around the index. Their weights are constructed to compensate for the volatility of each variable, in effect rescaling, so that each variable has the same influence in the index.[11] It may be noted that for some Pacific Basin countries, data for interest rates (Indonesia) or net foreign assets (Philippines) are missing over certain periods. If a weighted-average index were used, those periods would have to be treated as missing, or as periods of tranquility. In either case, the weighted-average index would not fully utilize information from the indicators of speculative pressure that are observed during periods when data from one of the series is missing. The selection procedure used in this paper avoids this difficulty and, as a result, identifies a larger set of speculative pressure episodes than would a weighted-average index.

A number of plausible episodes of speculative pressure are identified by the sequential method used in this paper. In the case of Japan, the present method picks up the pressure on the yen to appreciate in September 1985, around the time of the Plaza meetings. However, speculation on the yen in March 1987, after the Louvre meetings, was excluded because it fell within the window that followed a speculative episode in October 1986. Other plausible episodes that have been identified include the 1980 devaluation of the Korean won, the December 1993 speculation on the Malaysian ringgit,[12] the Thai baht devaluation of 1984, the depreciation pressure on the Philippine peso during the political-cum-debt crisis of 1983, and the appreciation pressure in Indonesia in recent years after the country's depreciation pressures in 1983 and 1986.

Eichengreen, Rose, and Wyplosz use their index to test for differences in the statistical properties of macroeconomic variables during periods when the index value is inside the band and when it is outside. In this paper, their approach is taken a step further by also distinguishing between episodes of appreciation and depreciation for those points outside the band. A *depreciation episode* is said to occur if the percentage change in the exchange rate is outside the 1.5σ band for the exchange rate and is greater than zero, or if the exchange rate is inside its band but the change in relative net foreign assets is outside its corresponding band and is negative, or if neither the exchange rate nor the change in relative net foreign assets are outside their respective bands but the change in short-term interest rates is outside the band and positive. *Appreciation episodes* are constructed in a similar manner, but the changes are negative for the exchange rate, positive for net foreign assets and negative for short-term interest rates.

To describe the characteristics of episodes of speculative pressure more fully, we estimated the proportion of times that a change in either the exchange rate, relative net foreign assets or relative short term rates was the criterion used in selecting a speculative pressure episode. The results, reported in Table 1, indicate that unusual behavior in the exchange rate accounted for about 50 percent of the speculative pressure episodes identified (whether we consider all episodes combined, depreciation episodes or appreciation episodes), relative net foreign assets for over 30 percent, and relative short-term interest rates for 13–22

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10. More precisely changes in the exchange rate, net foreign assets or short-term interest rates outside the corresponding 1.5σ band were not treated as speculative pressure episodes if they fell within the five-month window following an episode already identified by a large movement in the exchange rate. In addition, episodes identified by relative net foreign asset growth or short-term interest differentials were dropped if the five months that followed included an episode previously identified by the exchange rate. Episodes identified by short-term interest differentials were dropped if the five months that followed included an episode previously identified by the relative net foreign assets. The effect of this procedure is to give first priority to the exchange rate and second priority to net foreign assets when an observation falls within a five-month window. A similar priority is given to these variables in classifying episodes of depreciation and appreciation. Macroeconomic behavior is analyzed in the month or quarter corresponding to the date of the speculative episode.

11. Eichengreen, Rose and Wyplosz's speculative pressure index is defined as

$$(s_t - s_{t-1})/s_{t-1} + \alpha*(\Delta\log i_t - \Delta\log i^{US}_t) - \beta*(\Delta NFA_t - \Delta NFA^{US}_t)$$

where s is the nominal exchange rate (domestic over foreign), i is the short-term interest rate, and NFA is net foreign assets of the central bank. The weights α and β are based on conditional volatilities scaled so as to dampen the impact of the more volatile components on the index.

12. However, December 1993 would be classified as a depreciation episode by the method used here, because the exchange rate depreciated and this takes precedence over the large accumulation of foreign exchange reserves. Since the main concern of policymakers at the time was capital inflows, it would seem more reasonable to classify it as an appreciation episode. Such difficulties in interpreting particular episodes are likely to arise in any procedure adopted for classifying episodes.

percent. The fact that half of speculative pressure episodes are identified by unusual movements in relative net foreign assets and relative short-term interest rates (episodes in which the exchange rate itself does not make a large adjustment) suggests that monetary authorities in the Asia-Pacific Basin intervene actively in foreign exchange markets, and succeed in preventing large movements in the exchange rate quite often.

Table 2 seeks to shed further light on the characteristics of speculative pressure episodes by reporting the median values of changes in the exchange rate, relative net foreign assets and relative short-term rates during speculative pressure episodes and periods of tranquility. The differences between the median values for the combined speculative episodes and tranquil periods appear to be relatively small. In contrast, median values for all the variables are much larger (in absolute value) during episodes of depreciation than during periods of tranquility. Adjustments in the exchange rate, net foreign assets and short-term rates also tend to be larger during episodes of depreciation than during episodes of appreciation.

To assess more formally whether periods of speculative pressure differ from periods of tranquility, two nonparametric tests were implemented, both suggested by Eichengreen, Rose, and Wyplosz (1995). The first test is the Kruskal Wallis (KW) test, and the second is the Kolmogorov-Smirnov (KS) test. In both cases, the null hypothesis that the distribution of selected variables during periods of speculative pressure does not differ from the distribution of these same variables during periods of tranquility was tested.

Consider the distribution of relative inflation rates during periods of speculative pressure and of tranquility. The KW statistic can be used to test the null hypothesis that the populations from which the two inflation samples are drawn (speculative pressure and tranquil populations) are identical, against the alternative that one of the populations yields a larger observed value (higher inflation) than the other population. The KW test statistic depends not only on central location but also on the ranks of the observations in the combined sample. It therefore uses more information than does the median test statistic, which relies only on determining whether observations are below or above the median (Conover, 1971).[13]

One limitation of the KW test is that it assumes that any difference in distribution reflects only a difference in central location (if the distribution $F(x) \neq G(x)$, then $F(x) = G(x + c)$, where c is a constant).[14] The test may not detect differences of other types, such as differences in variance. For this reason, the KS test statistic, which computes differences in the empirical distribution function of two samples (speculative pressure versus tranquility) is also used.

The Behavior of Macroeconomic Variables

Table 3 reports the results of the comparison of indicators of the policy environment and of internal and external balance during periods of speculative pressure and tranquility. The qualitative features of differences in the behavior of the various series are presented in Table 4, which reports the median values during episodes of all types of speculative pressure, depreciation, appreciation, and tranquility.

In line with Krugman's (1979) model, we would expect an expansion in monetary aggregates to be associated with episodes of depreciation pressure, and monetary contraction with episodes of appreciation. Also, we would expect budget deficits to be larger during episodes of depreciation pressure than during periods of tranquility. The data in Tables 3 and 4 provide mixed support for this type of story.

The results in Table 3 indicate that the distribution of broad money differs during periods of depreciation pressure and tranquility (significant at 5 percent) and provide mixed evidence of differences in central bank domestic credit during periods of appreciation and tranquility (p value of 8 percent for the KW test). The median values for central bank domestic credit are broadly consistent with the view that depreciation episodes may result from faster money growth and appreciation episodes from monetary contraction. However, these results should be interpreted with caution, as the central bank domestic credit contraction during appreciation episodes may reflect sterilization efforts to offset net foreign asset accumulation. Thus such contraction could be *caused by* appreciation pressures rather than

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13. The KW test combines both samples (speculative pressure and tranquil) into a single, ordered sample. Ranks are then assigned to the combined sample values from smallest to largest. The test statistic is the sum of the ranks assigned to the values from one of the populations. If the sum is very small, or very large, the values from that population may be taken to be smaller, or larger, than the values from the other population. The null hypothesis of no difference between the samples is rejected if the ranks associated with one sample are sufficiently large compared to the ranks associated with the other sample. Ranks are preferred in

this case because the distribution functions may not be normal, in which case the probability theory underlying the actual data may not be known. The probability theory of statistics based on ranks is simpler and may not depend on the distribution of the actual data. Note that difficulties arise in implementing the KW test if there are too many ties in the rankings. However, this is likely to be a problem only when the test is applied to the exchange rate if there are periods when the exchange rate is fixed.

14. Another limitation is that the KW level of significance is likely to differ from the true level of significance if there are many tied values. However, this is not likely to be the case for the series being analyzed.

TABLE 2

SPECULATIVE PRESSURE AND TRANQUIL PERIODS
MEDIAN VALUES

CHANGES IN:	ALL SPECULATIVE	DEPRECIATION	APPRECIATION	TRANQUIL
Dollar Exchange Rate	0.25	2.01	−0.73	0.09
Net Foreign Assets	0.73	−2.89	4.6	1.37
Short Term Interest Differentials	−0.53	0.34	−1.52	−0.11

TABLE 3

ALL SPECULATIVE PRESSURE AND TRANQUIL PERIODS
TESTS OF SIMILARITY AND DISTRIBUTIONS

	ALL SPECULATIVE		DEPRECIATION		APPRECIATION	
	KW	KS	KW	KS	KW	KS
Indicators of policy environment						
DOMESTIC CREDIT	0.17	0.76	0.91	0.74	3.17*	1.18
	(0.68)	(0.61)	(0.34)	(0.64)	(0.08)	(0.13)
NARROW MONEY	1.46	0.93	1.33	1.08	0.35	0.67
	(0.23)	(0.36)	(0.25)	(0.19)	(0.56)	(0.76)
BROAD MONEY	2.97*	1.16	5.88**	1.47**	0.01	0.64
	(0.08)	(0.13)	(0.02)	(0.03)	(0.94)	(0.80)
BUDGET DEFICIT	0.44	0.92	2.86*	1.14	0.81	0.77
	(0.50)	(0.36)	(0.10)	(0.15)	(0.37)	(0.59)
Indicators of internal and external balance						
CPI INFLATION	1.13	1.19	0.99	1.22*	0.29	0.60
	(0.29)	(0.12)	(0.32)	(0.10)	(0.59)	(0.86)
REAL OUTPUT	0.16	0.95	2.03	1.22*	1.09	0.85
	(0.69)	(0.33)	(0.15)	(0.10)	(0.30)	(0.47)
EXPORTS/IMPORTS	0.27	0.97	0.93	1.08	0.09	0.59
	(0.61)	(0.31)	(0.33)	(0.19)	(0.77)	(0.88)

NOTE: The test in each case compares the distribution of the data during periods of tranquility with the distribution of the data during all speculative, depreciation, and appreciation episodes respectively. Test statistics are reported, followed by p values in parentheses.
** Reject null at 5%
*   Reject null at 10%

be the cause of appreciation pressures as is implicitly assumed in our approach here. Further research is needed to sort out the causality.

It may also be noted that the median values for narrow and broad money do not appear to be consistent with the view that excessive money growth contributes to depreciation episodes. As can be seen in Table 4, money growth rates appear to be larger during periods of tranquility, and broad money growth seems to be greater during periods of appreciation than during periods of depreciation. Given that central bank domestic credit behaves in the opposite fashion, the behavior of broader money growth appears to reflect changes in monetary conditions during episodes of speculative pressure that need to be explored further.

The data provide some evidence that large budget deficits may be associated with speculative pressures. Table 3 indicates that the distribution of budget deficits differs during periods of depreciation pressure and tranquility (*p* value of 9 percent for the KW test).[15] Budget deficits also

appear to be larger during episodes of depreciation (or tranquility) than during episodes of appreciation (Table 4).

Further insights may be gained on the characteristics and possible causes of episodes of speculative pressure by examining indicators of internal and external balance. As noted previously, if output is unusually sluggish, domestic inflation is relatively high, or the current account is unbalanced, the government may find it costly to defend the exchange rate, and this perception of government weakness may trigger speculative pressures. Such results would lend support to explanations that do not attribute speculative pressures to prevailing monetary or fiscal policies (e.g., Obstfeld, 1994 or Drazen and Masson, 1994).

Table 3 provides mixed evidence that the distribution of CPI inflation and output growth differs during periods of depreciation pressure and tranquility (*p* values of around 10 percent). In addition, the data in Table 4 suggest that inflation is higher and relative output growth is slower (in fact negative) during episodes of depreciation than during episodes of appreciation or tranquility. This is consistent with explanations that suggest that economic conditions (rather than macroeconomic policies) may contribute to episodes of speculative pressure. However, it may be noted that the behavior of the indicator of external balance, the ratio of exports to imports, does not appear to differ during the various periods, and the median values are close.

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15. The significant result for the budget deficit should be interpreted with caution because these are quarterly observations and some of the countries had to be dropped due to lack of data. See data Appendix 1.

TABLE 4

ALL SPECULATIVE PRESSURE AND TRANQUIL PERIODS
MEDIAN VALUES
(Monthly percentage changes or percentage ratios)

	ALL SPECULATIVE	DEPRECIATION	APPRECIATION	TRANQUIL
	Indicators of policy environment			
DOMESTIC CREDIT	–0.14	0.06	–0.38	–0.09
NARROW MONEY	–0.01	–0.07	0.21	0.41
BROAD MONEY	0.64	0.43	0.88	0.90
BUDGET DEFICIT	0.57	0.92	0.28	0.67
	Indicators of internal and external balance			
CPI INFLATION	0.04	0.09	0.01	0.02
REAL OUTPUT	–0.04	–0.20	0.21	–0.05
EXPORTS/IMPORTS	0.98	0.99	0.97	1.00

Alternative Assumptions

To see whether the preceding results are sensitive to alternative assumptions, the tests were first rerun excluding Japan from the sample, as it may be argued that its foreign exchange market differs from those of other economies in the region (deeper market with a wider array of domestic instruments, and a freer float). For the sake of brevity, the main findings will be summarized but the actual values will not be listed. With Japan excluded, the behavior of the budget deficit ratio no longer differs between periods of tranquility and of depreciation or appreciation. However, as in the full sample, the behavior of broad money differs during depreciation episodes (with *p* values of 5 percent for the KW test and 9 percent for the KS test), and the evidence that central bank domestic credit differs during episodes of appreciation is now stronger (*p* values of 3 percent and 7 percent for the KW and KS tests, respectively). The median values still convey the impression that during episodes of depreciation budget deficits are larger and that during episodes of appreciation central bank domestic credit is smaller, and broad money growth is greater.

For the indicators of internal and external balance, as for the full sample, there is mixed evidence that the distribution of the CPI differs during episodes of depreciation. However, no significant differences in output behavior are now found. The median values are qualitatively similar to those found previously, as they indicate that inflation tends to be higher and relative output growth contracts during episodes of depreciation in comparison to other periods (appreciation or tranquility).

One potential difficulty with the preceding results is that the crisis episodes and the macroeconomic variables are contemporaneous, making the direction of causality uncertain. For example, while some of the models described earlier might suggest that a rise in domestic inflation may lead to speculative pressures, it is possible that speculative pressures lead to inflationary pressures instead. To see whether this possibility affected the results, the tests were performed by comparing the behavior of monthly variables in the month *before* the date of a speculative episode to their behavior during periods of tranquility (once more including Japan in the data set).[16] Using this data set, the evidence that domestic credit of the central bank differs during episodes of appreciation was once more mixed (significant at 10 percent for the KS test but not the KW). There was also mixed evidence that the relative CPI differed in the month before a depreciation episode (KW test rejects the null at 10 percent), and that broad money growth differs in the month before an appreciation episode (both KW and KS tests significant at 5 percent). The other test results were not significant. As for the median values, those for central bank domestic credit are very similar to those reported in Table 4. CPI inflation is much smaller during episodes of appreciation, and is in fact negative in this case, which is consistent with the previous findings. Broad money growth once again is larger during episodes of appreciation.

III. CONCLUSIONS

This study applied a procedure to identify episodes of speculative pressures in foreign exchange markets for selected economies in the Asia-Pacific Basin and compared the behavior of macroeconomic variables during periods of speculative pressure and periods of tranquility. The empirical results are mixed, but some of the results are nonetheless suggestive. Episodes of depreciation appear to be associated with larger budget deficits and growth in central bank domestic credit than are episodes of appreciation or periods of tranquility, indicating that expansionary policies may contribute to speculative pressures in foreign exchange markets. There is also some evidence that episodes of speculative pressure may arise when economic conditions make it difficult for the government to maintain a stable exchange rate.

Further research using different methods may give additional insights on the sources of speculative pressures in foreign exchange markets and shed further light on the properties of speculative episodes. In addition, alternative statistical techniques may permit estimation of the relative importance of alternative sources of speculative pressure on the exchange rate.

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16. The test was not performed for quarterly data because it is likely that the indicators of speculative pressure did not cause differences in budget deficits or relative output growth. For the monthly data, it may be noted that if the observation preceding a speculative episode falls in the six-month window of a previous speculative episode, it is not included in the set.

Appendix 1

Summary of Obstfeld's Open Economy Model of Speculative Attacks

The model assumes PPP, capital mobility and perfect asset substitution. The log of output in period t depends on the contemporaneous log real exchange rate and a mean zero, serially independent shock that reflects the impact of foreign interests rates, private and government shifts in demand and so on. Before the demand shock is observed, labor markets set wages so as to maintain a constant expected real wage. Consider the government's flow loss for period t, which can be expressed as:

$$(A1) \quad l_t = (\theta/2)(e_t - e_{t-1})^2 + (1/2)[\alpha(e_t - w_t) - u_t - y^*]^2$$

where the first right-hand term reflects the cost of deviations from zero inflation, the second, the cost of deviations from the target level of output y^*. The government chooses the home currency's exchange rate e_t each period to minimize l_t given the nominal wages set at $t-1$. Minimizing the preceding expression over e_t yields first order conditions that imply the following reaction function

$$(A2) \quad e_t - e_{t-1} = \lambda(u_t/\alpha) + \lambda(w_t - e_{t-1}) + \lambda(y^*/\alpha).$$

In the term $\lambda = \alpha^2/(\theta + \alpha)^2$, α reflects the responsiveness of output to changes in competitiveness (the real exchange rate) and θ reflects the weight assigned to inflation in the government's loss function.

Workers and firms know the government's reaction function and will set wages to take the government's expected exchange rate adjustment into account. Under these conditions, it can be shown that the equilibrium depreciation rate in the economy is:

$$(A3) \quad e_t - e_{t-1} = \lambda u_t + (\lambda/1 - \lambda)(y^*/\alpha)$$

where all variables are in logs, e_t is the nominal exchange rate in domestic currency units per foreign currency unit, u_t is the demand shock, $y^* > 0$ is the government's target level of output, and λ is a measure of the extent to which the government accommodates shocks. This last expression is higher the greater is the adverse impact of changes in the real exchange rate on output, and smaller the greater is the weight given to inflation in the government's loss function. It may be noted that under a discretionary policy, a fixed exchange rate would result here only if inflation is infinitely costly, in which case the term λ goes to zero.

The Case with Fixed Cost of Realignment

Since the government faces a preset nominal wage w_t when deciding the exchange rate for period t, the predetermined expected rate of price inflation is given by the expected change in the exchange rate. More explicitly,

$$(A4) \quad \pi_t = w_t - e_{t-1} = E_{t-1}(e_t) - e_{t-1}.$$

In (A1) it is assumed that workers negotiate wage changes to match the expected rate of inflation. Now under a fixed exchange rate, $e_t - e_{t-1} = 0$, so the loss according to equation (1) in the text is

$$(A5) \quad l_t^F = (1/2)[\alpha\pi_t + u_t + y^*]^2$$

If the government instead realigns according to the reaction function described earlier, it incurs a fixed cost c, and it can be shown that the loss is:

$$(A6) \quad l_t^R = (1/2)(1 - \lambda)[\alpha\pi_t + u_t + y^*]^2 + c.$$

Appendix 2

Data Description and Sources

The following variables are from the IFS CD-ROM: end of period exchange rate (line ae), short-term interest rate (line 60b, except for Philippines line 60c), foreign assets (line 11), foreign liabilities (line 16c) where possible, reserve money (line 14), narrow money (line 34), quasi-money (line 35), CPI inflation (line 64), exports (line 70), imports (line 71), budget deficit (line 80), and government expenditure (line 82). Japan's government expenditure is from IFS line 91F.C. while the deficit is taken from OECD quarterly National Accounts. The U.S. budget deficit and government expenditure are from Citibase with mnemonics GGFNET and GGFEX, respectively. To represent output, real GDP (typically line 99b.p) was used for all countries except Japan and Taiwan, where real GNP (line 99a.r) is used. United States money is from Citibase (fm1, fm2).

When IFS data were not available, central bank publications were used. Taiwan data are from *Financial Statistics,* Taiwan District, The Republic of China. Quasi-money data for 1980:1–1981:2 are taken from Taiwan's *Supplement to Financial Statistics Monthly.* Part of Indonesia's interest rate, reserve money and money are from *Indonesia's Financial Statistics.* Philippine money data for January 1984 to November 1986 (except the December numbers in this period) were obtained from *Philippines Financial Statistics.* Thailand's 1994 exports and imports are from the Bank of Thailand's *Quarterly Bulletin.* Malaysia's 1994 reserve money series is constructed using data from Bank Negara Malaysia's *Monthly Statistical Bulletin.*

The frequency of all the data is monthly except for output and the budget deficit which are quarterly. Net foreign assets is defined as foreign assets (11) less foreign liabilities. Missing values for foreign liabilities are set to zero if

these are small as a proportion of foreign assets. Because of missing values, Philippines liabilities for August 1983, December 1983 and December 1984 are calculated using changes over the same period 12 months earlier. Also, the Thai interest rate for December 1993 was computed using the 12-month change. A number of macroeconomic series did not span the entire period or contained missing values. Estimates were then performed using the available data for each country. Because of lack of quarterly data, Indonesia, Thailand and Malaysia were excluded in the output comparisons and Taiwan was excluded in the budget deficit comparisons.

Many of the variables are transformed by taking the differential between domestic and United States first differences of natural logarithms or percentage changes. Central bank domestic credit growth is the difference between the percentage growth in reserve money less the change in net foreign assets scaled by reserve money in the last period. Net foreign assets is the first difference of net foreign assets divided by the previous month's reserve money. The nominal dollar exchange rate is expressed as the percentage change over the previous month. Output is the deviation from the mean growth of real GDP or real GNP. The budget deficit is taken as a ratio of government expenditure (to maximize data use, as quarterly output data are often unavailable), and then divided by the corresponding budget ratio for the U.S. Budget ratios, narrow and broad money (the sum of narrow money and quasi-money), exports, and imports are seasonally adjusted using X11.

APPENDIX 3

EXCHANGE RATE REGIMES IN PACIFIC BASIN ECONOMIES

Indonesia. Indonesia has had a managed float in place since January 16, 1978, when the link with the U.S. dollar was discontinued. Bank Indonesia (BI) has set the middle rate of the rupiah in terms of the U.S. dollar, the intervention currency, by taking into account the behavior of a basket of currencies of Indonesia's main trading partners. In September 1989, the foreign exchange system was modified substantially so that the BI-announced exchange rate applies only to certain transactions undertaken at certain times of the day. For all other transactions, banks are free to set their own rates.

Japan. Exchange rates are determined on the basis of underlying demand and supply conditions in the exchange markets. However, the authorities intervene when necessary in order to counter disorderly conditions in the markets. The principal intervention currency is the U.S. dollar.

Korea. From January 1980 to March 1990, the won was linked to a multicurrency basket (consisting of trade-weighted basket and SDR basket), but other factors were also taken into account in setting the exchange rate. The Bank of Korea (BOK) set a daily exchange rate of the won (BOK base rate) in terms of the U.S. dollar, which is the intervention currency. A market average rate (MAR) system introduced on March 2, 1990 sets the won–U.S. dollar rate on the basis of the weighted average of interbank rates for won-U.S. dollar spot transactions of the previous day. During each business day, the Korean won–U.S. dollar exchange rate in the interbank market is allowed to fluctuate within fixed margins (plus or minus 1 percent in 1994) against the MAR of the previous day. The won exchange rate against other currencies is determined by the level at which these currencies trade against the U.S. dollar in the international market. Buying and selling rates offered to customers are set freely by foreign exchange banks.

Malaysia. The value of the ringgit is determined by supply and demand conditions in the foreign exchange market. Bank Negara Malaysia (the central bank) intervenes to maintain orderly market conditions and to avoid excessive fluctuations in the value of the ringgit against a basket of currencies weighted in terms of Malaysia's major trading partners and the currencies of settlement.

Philippines. Up to 1984, authorities intervened when necessary to maintain certain margins around a "guiding rate" that was established daily by the Bankers' Association. Commercial banks were required by the association to observe certain margins for transactions of less than US$100,000. The minimum and maximum spot buying (selling) rates were 0.5 percent (0.75 percent) and 1 percent (1.25 percent), respectively below (above) the guiding rate. For transactions above US$100,000, margins were determined competitively. Since October 1984, the value of the peso has been determined freely in the foreign exchange market. However, the central bank is a major participant in this market and intervenes when necessary to maintain orderly conditions in the exchange market and in light of medium-term policy objectives.

Singapore. The Singapore dollar is permitted to float, and its exchange rate in terms of the U.S. dollar and all other currencies is freely determined in the foreign exchange market. However, the Monetary Authority of Singapore monitors the external value of the Singapore dollar against a trade-weighted basket of currencies. Historically, Singaporean authorities have targeted the exchange rate (through intervention) to achieve a domestic inflation goal. Rates for other currencies are available throughout the working day

and are based on the currencies' exchange rates against the U.S. dollar in international markets. Banks are free to deal in all currencies, with no restrictions on amount, maturity, or type of transaction.

Taiwan. A managed float was adopted in 1979, involving a daily exchange rate ceiling set by the central bank. The ceiling was abandoned in March 1980, and reestablished in September 1982. Until 1989, the spot central rate of the U.S. dollar against the NT dollar was set daily on the basis of the weighted average of interbank transaction rates on the previous business day. Daily adjustment of the spot rate was not to exceed 2.25 percent of the central rate on the previous business day. In April 1989, the limits on daily fluctuations of the interbank rate were rescinded, and a new system of foreign exchange trading was established, based on bid-ask quotations.

Thailand. The Thai baht was *de facto* pegged to the U.S. dollar from 1981 until 1984, when it was devalued. The baht was subsequently pegged to a weighted basket of currencies of Thailand's major trading partners, but the exchange rate can also be influenced by other considerations. The Exchange Equalization Fund announces daily the buying and selling rates of the U.S. dollar for transactions between itself and commercial banks. It also announces daily minimum buying and maximum selling rates that commercial banks must observe when dealing with the public in various currencies. The EEF intervenes to keep the relationship of the baht to the basket of currencies within a margin and to maintain orderly conditions in the exchange market.

SOURCES: IMF. Exchange Arrangements and Exchange Restrictions. Moreno (1994), Working Paper version.

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Sterilization of Capital Inflows through the Banking Sector: Evidence from Asia

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This paper develops an open-economy version of the Bernanke-Blinder model which indicates that sterilization efforts through increases in reserve requirements will have limited impact if viable financial alternatives to the commercial banking sector exist. I then examine the capital inflow surge experiences of seven developing Asian nations. Our analysis yields three stylized conclusions: First, the timing of capital inflow surges indicates a causal role for both domestic and foreign factors. Second, there is little general rule as to the most effective sterilization instrument. Finally, the experiences of the developing nations during their capital inflow surge period largely coincide with the predictions of the model. Korea, the country with the largest nonbank financial sector, had the least success in stemming the impact of capital inflow surges despite intervention through both open market operations and increased reserve requirements.

The magnitude of recent capital inflows into developing countries in the Pacific Basin has been staggering. During the period from 1990 to 1993, Asian developing nations received a net capital inflow of $151 billion. These flows were large relative to the countries as a whole. Capital inflows reached 13 percent of GDP in Thailand and Malaysia, 10 percent of GDP in Singapore, 6 percent in the Philippines, and 5 percent in Indonesia (Glick and Moreno 1994). The source of these surges in capital inflows is controversial. Calvo, Leiderman, and Reinhart (1993) present evidence that external factors played a dominant role in the pattern of capital inflows in Latin America. However, Schadler (1994) stresses that external developments did not always coincide with surges in inflows, and that domestic factors must have played a role as well. Among these, she stresses structural changes that improved potential productivity, improved fiscal policies, and a tightening of domestic credit policies. Chuhan, Claessens, and Mamingi (1993) also find that while the foreign environment matters, domestic factors were the primary determinants of the magnitude of Asian capital inflows in their study.

A large literature has emerged analyzing the implications of these capital inflows, and in particular, investigating the contention that the extremely large magnitudes of the inflows can be disruptive to a nation's economy, resulting in the desire to mitigate their influence. It has been suggested that while capital inflows may be desirable because the marginal product of capital is larger in developing countries, rapid reversals of these flows can lead to domestic liquidity problems. Bercuson and Koenig (1993) question whether large increases in financial flows can be handled efficiently by the financial system, suggesting that flows of sufficient magnitude may jeopardize the safety of the banking system. In addition, the real exchange rate appreciations that often accompany these capital inflows can lead to undesirable resource reallocation, particularly if the reallocation of resources motivated by the capital inflow surge is likely to be temporary.

Asian developing country governments in particular have responded to these capital inflows with aggressive attempts at sterilization. In 1993, one-third of the $100 billion in net capital inflows into Asia Pacific Economic

Cooperation Forum (APEC) nations was absorbed by central banks as foreign currency reserves. By the end of 1993, the stock of reserves of the Asian region equalled $261 billion, far exceeding the combined total of all the developing nations and nations in transition in the rest of the world.

While sterilized intervention through open market operations appears to be the most common response to capital inflows, its use appears to diminish over the course of an extended capital inflow episode. In Asia, for example, the share of capital inflows which became increases in reserves has declined over time (Khan and Reinhart 1994). This may reflect the problems associated with prolonged sterilized intervention noted by Calvo, Leiderman and Reinhart (1993). First, sterilization requires governments to purchase low-yielding foreign securities despite the fact that they are often paying high interest rates on external debt. This process obviously places a burden on the recipient country government. These "quasi-fiscal costs" have been estimated to amount to up to one-half percent of GDP in Latin America (Kiguel and Leiderman 1993). Second, by preventing a decrease in the interest rate differential between domestic and foreign assets, sterilized intervention fails to eradicate the conditions which led to the capital inflow.

As nations become dissatisfied with the costs or the effectiveness of sterilized intervention through open market operations, they turn towards other, less standard sterilization instruments. In this paper, we examine an alternative policy response to capital inflows which has been particularly popular in Southeast Asia, increases in commercial bank reserve requirements.[1] This policy attempts to limit the impact of foreign capital inflows by reducing the magnitude of capital which flows into the banking sector. Banking institutions retain a significant role as financial intermediaries in developing countries in Asia. Consequently, a significant portion of the capital which flows into these countries either enters directly into, or finds its way into, the developing country banking system.

Most of the portfolio inflows into APEC developing countries in recent years have been bonds issued by APEC borrowers in foreign currencies (Folkerts-Landau, et al., 1994). However, the potential for an increase in bank lending resulting from this form of inflow is similar. If the local bond issuer deposits his capital in a domestic bank, it is the same as if the domestic bank had issued a foreign li-

ability itself. Consequently, regardless of the form of the capital inflow, the impact is likely to be an expansion of the domestic financial system.[2]

Policymakers may also have particular interest in limiting the activities of their banking sector during capital inflow surges. Large and volatile capital flows can contribute to bank problems by causing large swings in bank liquidity. Calvo, Leiderman, and Reinhart (1993) discuss the possibility of capital inflows leading to "improper intermediation." These could result from a variety of sources, including improperly priced government deposit insurance, either explicit or implicit. The problem with addressing the improper intermediation through a mandatory deposit insurance scheme, according to Calvo, Leiderman, and Reinhart, is that such a scheme would need to be highly sophisticated, incorporating the loss associated with a reversal in the flow of capital. The authors argue that "…in the short run, it may be more practical simply to preclude banks from intermediating much of the new capital inflow by increasing required reserve ratios" (p. 144). They argue that by limiting the investments of banks in markets prone to speculative bubbles, such as real estate and equity markets, the country's banking system will be less exposed when the bubble bursts.

However, placing the burden of sterilizing the capital inflow surge on the commercial banking sector is not a costless policy. Folkerts-Landau, et al. (1994) identify two primary disadvantages of sterilization through increases in bank reserve requirements. First, since reserves do not earn market rates of return, an increase in reserve requirements distorts the share of intermediation handled by the banking sector. Second, raising reserve requirements may not be effective at addressing capital inflows which are intermediated outside the banking system. These include bond and equity markets which have been growing rapidly in these countries over the previous decade and the informal lending or "curb markets" prevalent in many Asian developing countries. Raising reserve requirements will put banks at a competitive disadvantage relative to these non-bank institutions and lead to disintermediation.

Below, we develop a simple model which can analyze the implications of enhanced capital inflows on the domestic credit markets of the capital recipient countries. Our model is an open-economy Mundell-Fleming version of the Bernanke-Blinder (1987) model. The Bernanke-Blinder model introduces an explicit banking sector into a standard IS-LM macro model. Our "open economy" extension is essentially the introduction of a balance of payments equation. This extension allows us to trace out the

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1. While the Pacific Basin countries have been particularly active in using reserve requirements as the instrument for limiting capital inflows, they have not been alone. In 1992, for example, Chile levied a 30 percent reserve requirement on foreign credits, while Mexico imposed a 10 percent limit on the share of foreign currency liabilities (Folkerts-Landau, et al., 1994).

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2. The exception would be if the capital immediately flowed back out of the nation to support a current account deficit.

implications of a surge in capital inflows and a reserve requirement increase policy response.[3]

We then examine the empirical experiences of seven Asian developing countries over this period. These nations experienced a variety of capital inflow episodes and responded to them with an assortment of government policies, including a variety of policies designed to curtail the activities of the banking sector.

Both our theoretical analysis and our empirical evidence demonstrates that the effectiveness of sterilization policies, including those specifically targeted at the banking sector, depends on the ability of the nonbank sector to play a substitute role for intermediation. The greater is the degree to which foreign investors can substitute nonbank for banking sector investments, and the greater is the degree to which these nonbank investments influence the level of aggregate demand, the lesser is the ability of the recipient country's government to mitigate the impact of capital inflows through the use of reserve requirements.

The remainder of this paper is organized into four sections. Section 1 introduces an open-economy version of the Bernanke-Blinder model. Section 2 conducts comparative static exercises concerning the implications of a decrease in the foreign rate of interest for this model and the impact of policy responses through either an increase in reserve requirements or a decrease in the stock of high-powered money. Section 3 examines the experiences of seven Asian countries during the period of relatively large capital inflows. Finally, Section 4 concludes.

I. A SIMPLE MODEL OF THE MACROECONOMIC IMPACTS OF CAPITAL INFLOWS

Assumptions

There are three domestic assets, as in the Bernanke-Blinder (1987) augmented IS-LM framework: money, bonds, and bank loans. Domestic bank loans pay interest rate r, as do bank deposits, while domestic bonds pay interest rate i. The real side of the economy is assumed to be similar to a standard Mundell-Fleming model. Domestic aggregate demand follows a standard IS-LM pattern:

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3. Chinn and Dooley (1995) use a similar model to explain inconsistencies found in the literature concerning the degree of capital mobility in Pacific Rim economies. Their argument is that studies based on money market rates ignore that "bank credit is special." Their empirical finding that capital inflows positively affect bank lending for a group of Pacific Rim countries is also consistent with the predictions of the open-economy Bernanke-Blinder model.

$$(1) \qquad A = A(i,r)$$

where $A_i < 0$ and $A_r < 0$. Income is equal to domestic aggregate demand plus the net trade surplus:

$$(2) \qquad Y = A + T$$

where T represents the trade balance. We assume throughout that prices are fixed and that the monetary authority maintains a pegged exchange rate regime. For the purposes of this paper, we also implicitly hold foreign income levels constant and express T solely as a function of Y:

$$(3) \qquad T = T(Y)$$

where $T_Y < 0$.

We make the simplifying assumption that all foreign capital inflows come directly into the domestic banking sector in the form of foreign deposits, which we term D^*. The supply of foreign capital to the domestic banking sector is assumed to be increasing in the spread between domestic bank interest rates and the risk-free foreign rate of interest, r^*:

$$(4) \qquad D^* = D^*(r - r^*)$$

where $D^*_{r-r^*} > 0$. We assume that domestic agents only hold domestic assets for simplicity, and thus rule out the possibility of capital flight.

We assume that when foreign source deposits enter the commercial banking system, the central bank, in order to maintain the exchange rate peg, issues enough reserves to match these assets one for one in domestic currency. Define τ as the bank reserve requirement, $0 < \tau < 1$. Assuming that banks hold no excess reserves and letting R^* represent the reserves issued to monetize foreign capital inflows, the central bank issues reserves such that

$$(5) \qquad D^*(r - r^*) = R^*/\tau .$$

Note that this component of high-powered money is not discretionary to the monetary authority. Under free capital mobility, this change in the stock of high-powered money is required to defend the nominal exchange rate peg. We examine the implications of monetary policy below by examining changes in the discretionary component of the monetary base, R, the high-powered money issued to underlie domestic credit.

We next turn to the market for bank loans. Banks hold reserves equal to $\tau(D + D^*)$ and divide up their remaining assets between bank loans and bank holdings of bonds. Define $\lambda(r,i)$, $\lambda_r > 0$, $\lambda_i < 0$, as the share of free assets banks hold as loans. The bank loan supply curve then satisfies $L^S = \lambda(r,i)(D + D^*)(1 - \tau)$. We specify a standard loan demand curve, $L^D = L(r,i,Y)$, $L_r < 0$, $L_i > 0$, $L_Y > 0$. Equilibrium in the market for bank loans then satisfies:

(6) $L(r,i,Y) = \lambda(r,i)(D + D^*)(1 - \tau)$.

Finally, we derive the equilibrium condition in the money market.[4] Since banks do not hold excess reserves, the supply of deposits is equal to the stock of high-powered money divided by reserve requirements, $(R+R^*)/\tau$. Following Bernanke and Blinder, we specify the demand for money as a function of the bond rate and income $D = D(i,Y)$, $D_i < 0$, $D_Y > 0$. The equilibrium condition in the money market then takes on the characteristics of a standard LM curve:[5]

(7) $D^*(r - r^*) + D(i,Y) = (R + R^*)/\tau$.

By (5), equation (7) simplifies to

(7′) $D(i,Y) = R/\tau$.

Using equation (7′) to substitute for D in equation (6) yields the equilibrium condition in the bank loan market as

(8) $L(r,i,Y) = \lambda(r,i)[R/\tau + D^*(r - r^*)](1 - \tau)$.

Equation (8) suggests that we can express the bank loan rate r as a function of the world interest rate, r^*, the required reserve ratio, τ, the size of the monetary base underlying domestic deposits, R, the bond market interest rate, i, and the level of income, Y:

(9) $r = \phi(r^*,\tau,R,i,Y)$

where $\phi_{r^*} > 0$, $\phi_\tau > 0$, $\phi_R < 0$, $\phi_i > 0$, and $\phi_Y > 0$. We demonstrate these comparative static relationships in the appendix.

In addition, we obtain the result that $dr/d\tau$ is decreasing in the absolute value of both L_r and λ_r. Intuitively, these relationships reflect the fact that the degree to which an increase in reserve requirements results in an increase in the bank loan rate depends on the elasticity of bank loan demand and supply. In particular, the ability of banks to pass their additional cost of funds on to its borrowers will depend on the elasticity of demand for bank loans, which presumably depends on the ability of bank loan customers to obtain funds elsewhere. Similarly, the willingness of substitute bonds for bank loans in their portfolio depends on the quality of alternative investment instruments available. Consequently, the relatively poorer are the alternative potential sources of funds, the greater is the bank loan rate response to an increase in bank reserve requirements.

Substituting (9) into equation (2) yields:

(10) $Y = A[i,\phi(r^*,\tau,R,i,Y)] + T(Y)$.

We can refer to equation (10) as the "CX curve." The curve should be thought of as a variant of the standard IS curve, along which domestic and external goods markets are in equilibrium, which also defines equilibrium in the bank loan market. Like a standard IS curve, the CX curve is negatively sloped. However, the introduction of a bank loan market allows the CX curve to shift due to credit market shocks, such as policy changes in R or τ, as in the Bernanke-Blinder model. In addition, the external sector can provide a source of foreign shocks, proxied simply here by changes in r^*.

Our CX curve reduces to a standard Mundell-Fleming "XX curve," where aggregate supply is equal to domestic absorption plus the net trade balance, if loans and bonds are perfect substitutes to either lender or borrowers.[6] Similarly, the CX curve becomes flat if foreign and domestic assets are perfect substitutes under our maintained small-country assumption. Of course, as in the standard IS-LM model, the LM curve becomes flat if money and bonds are perfect substitutes.

While the CX curve measures equilibrium in the goods market, it does not imply a balance of payments equilibrium. The balance of payments is equal to the sum of net exports and capital inflows. As in the standard Mundell-Fleming model, we define the "BP curve" as the locus of points where the balance of payments is equal to zero. The BP curve therefore satisfies

(11) $T(Y) = -D^*(r - r^*)$.

We then have our model as shown in Figure 1. Note that the BP curve is upward-sloping reflecting our assumption that foreigners consider their deposits imperfect substitutes for their domestic deposits. The intersection of all three curves implies that the goods market, the money market, and the balance of payments are all in equilibrium.

II. Comparative Statics

Implications of a Decrease in r*

Many authors, such as Calvo, Leiderman, and Reinhart (1993), attribute the surge of capital inflows into Latin America to a change in the relative demand for these assets due to a fall in developed nation interest rates. We can express the system in balance of payments equilibrium by substituting for T in equation (10) by using equation (11),

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4. Satisfaction of equilibrium in the goods, bank loans, and money markets implies satisfaction of equilibrium in the bond market by Walras' law.

5. The demand for money should also be a function of total wealth. As in Bernanke and Blinder, we assume that this is constant and suppress it.

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6. This is analogous to the fact that the Bernanke-Blinder CC curve reverts to a normal IS curve under the same conditions. Closing the economy to foreign capital inflows would obviously result in the CX curve reverting to the standard Bernanke-Blinder CC curve.

FIGURE 1

OPEN ECONOMY BERNANKE-BLINDER MODEL

FIGURE 2

IMPACT OF A DECREASE IN r^*
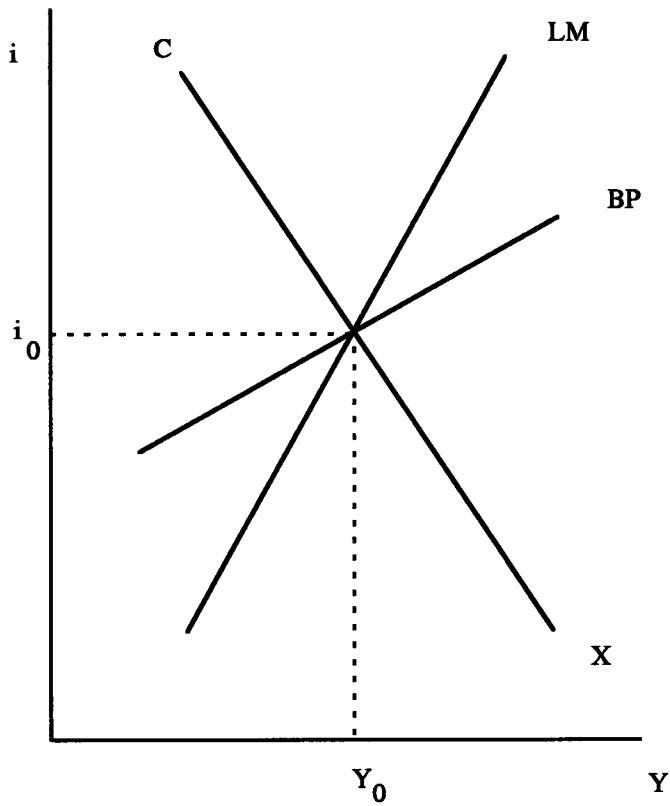
which yields

$$(10') \qquad Y = A[i, \phi(r^*, \tau, R, i, Y)] - D^*(r - r^*) .$$

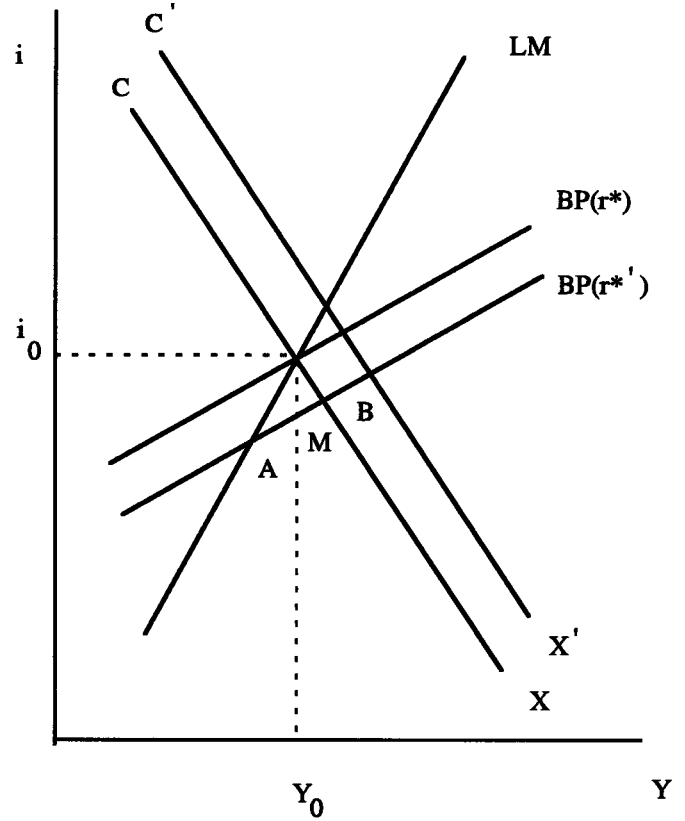Equations $(7')$ and $(10')$ form our basic system under balance of payments equilibrium of two equations in two endogenous variables, i and Y.

Graphically, we can see the effect of a decrease in r^* in Figure 2. The decrease in r^* leads to a downward shift in the BP curve. At a point like E_0, there will be positive foreign capital inflows. To maintain the exchange rate peg, these foreign currency inflows must be monetized through the issue of R^* in reserves. This leads to an outward shift in the LM curve until a new equilibrium is reached. In a standard Mundell-Fleming model (where the CX curve fails to shift), the required intervention needed to maintain the nominal exchange rate peg leads us to point M, so labelled by Frankel (1994) due to its correspondence with the monetary approach to the balance of payments.

In our model, however, the impact of a decrease in foreign interest rates will also fall directly on the domestic goods market. By equation $(10')$, a decrease in r^* has an expansionary impact on aggregate demand by reducing

domestic interest rates. This implies an additional channel for the transmission of a decrease in the foreign interest rate through the positive impact the reduction in foreign interest rates has on bank loan interest rates. This leads us to point B (as in Bernanke and Blinder). This additional channel also implies that a larger degree of monetization is necessary to accommodate the now-larger magnitude of capital inflows. As in Bernanke and Blinder, the final impact on the level of interest in the nonbank financial sector is unclear because of the rise in the transactions demand for money associated with the increase in output.[7] However, the level of r, the bank loan rate, must decrease.

In an international setting, equation $(10')$ reminds us that there are forces at work which serve to dampen this effect. In particular, the reduction in foreign interest rates, by

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7. Previous studies that have not included a "credit channel" have treated the widespread failure of interest rates to drop noticeably during the period of high capital inflows as an anomaly. For example, see Frankel and Okongwu (1995), who ascribe the failure of interest rates to fall in capital recipient countries during the 1989–1994 period to increased expectations of precipitous exchange rate devaluations.

generating capital inflows, must correspond to a reduction in net exports under balance of payments equilibrium. Differentiating the right-hand side of equation (10′) with respect to $r*$ yields

$$(12) \qquad\qquad A_\phi \phi_{r*} - D^*_{r*}.$$

The first term of (12) is negative, implying that a decrease in $r*$ shifts out the CX curve due to the expansionary effect on the banking market. However, the second term is positive reflecting the fact that a decrease in $r*$ results in increased capital inflows and a deterioration in the trade balance, which would shift in the CX curve. This can be seen in Figure 2. If the capital inflow were not monetized so that the LM curve was shifted outward, the final equilibrium would have to be at a point like *A,* implying that backward shifts in the CX curve, in response to deterioration of the trade balance, would have to do the work of bringing the balance of payments back into balance. We proceed under the assumption that (12) is negative, implying that the CX curve indeed shifts out in response to a reduction in $r*$.

Given this assumption, we show in the appendix that the comparative statics of the model with respect to $r*$ satisfy

$$(13a) \qquad di/dr* = -D_Y(A_{r*} - D^*_{r*})/\Lambda > 0$$

$$(13b) \qquad dY/dr* = D_i(A_{r*} - D^*_{r*})/\Lambda < 0$$

where Λ represents the determinant of the system, shown to be negative in the appendix. As suggested, a decrease in the foreign interest rate is expansionary, leading to an increase in Y and a decrease in i (as well as a decrease in r by equation (9)).

Central Bank Policy Responses

We next turn towards the impact of policy responses to the capital inflows. As we discussed above, the balance of payments equilibrium in this model subsequent to a drop in $r*$ corresponds to point *B.* Any effort to deviate from this equilibrium through monetary policy will eventually be thwarted by capital inflows or outflows which require adjustments in reserves. In other words, monetary policy cannot take us indefinitely off the BP curve. Nevertheless, countries sometimes do attempt to sterilize their intervention through offsetting reductions in domestic credit. In our model, this corresponds to shifting back both the LM curve and the CX curve towards a point above the BP curve. At this point, since the domestic interest rate still lies above the world rate of interest, the position must be defended by an accommodating change in the reserve position of the central bank, and further pressure will be experienced in the future. Nevertheless, we can examine

the "short run" implication of a sterilization effort by examining the comparative statics in equations (7′) and (10) (instead of (10′) above, which also indicates balance of payments equilibrium).

Increase in the Required Reserve Ratio. We first consider an increase in the level of the required reserve ratio, τ. The standard channel for the transmission mechanism of an increase in the required reserve ratio can be found in equation (7′). An increase in τ reduces the magnitude of domestic deposits, shifting the LM curve back.[8]

However, equation (10) demonstrates that there will also be a shift in the CX curve. An increase in τ, by increasing the rate of interest on bank loans, will reduce investment and shift the CX curve back. Moreover, consider the explicit sensitivity of the bank interest rate with respect to a change in τ derived in the appendix:

$$(14) \quad \frac{dr}{d\tau} = -\frac{\lambda[R(1-\tau)/\tau^2 + R/\tau + D^*]}{L_r - [\lambda_r(R/\tau + D^*) + \lambda D^*_r](1-\tau)} > 0.$$

Among other factors, it can be seen that the magnitude of $dr/d\tau$ is decreasing in the absolute value of both L_r, the interest rate sensitivity of the demand for bank loans, and λ_r, the interest rate sensitivity of the supply of bank loans. Holding all else equal, the greater is the ability of borrowers to turn to the nonbank financial sector to substitute for the intermediation provided by the banking sector, the smaller will be the decrease in aggregate demand resulting from a given increase in τ. The ability of a nation to use a given reserve requirement increase to stem the impact of capital inflows will therefore be less the greater is the ability of the nonbank financial sector to substitute as the channel of intermediation.

To see the overall impact of an increase in bank reserve requirements more clearly, consider the complete comparative static solutions for an increase in τ derived in the appendix:

$$(15a) \qquad di/d\tau = -[R(1-A_Y-T_Y)/\tau^2 + A_\tau D_Y]/\Lambda$$

$$(15b) \qquad dY/d\tau = [D_iA_\tau - A_iR/\tau^2]/\Lambda < 0.$$

See Figure 3. Beginning at point *B,* an increase in the required reserve ratio results in a backward shift of both the LM and the CX curves to a point like *B′.* The LM curve is shifted back through the standard channel, so that an increase in reserve requirements reduces the money multiplier and the resulting money supply. The CX curve also is shifted back through the credit channel. The increase in

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8. Such an expansion in the amount of foreign deposits does not occur by equation (6), since $R*$ will now be increased to offset the reduction in τ.

FIGURE 3

IMPACT OF AN INCREASE IN τ OR A DECREASE IN R

to more capital inflows and further exchange rate appreciation pressure. Unless the foreign interest rate change is temporary, this alternative attempt at achieving independent monetary policy in a fixed exchange rate regime with an open capital market will be as susceptible to pressure from international capital markets as standard sterilization efforts.

Impact of an Decrease in the Stock of High-Powered Money. We next consider such a "standard" effort at sterilization, through a decrease in R, the stock of high-powered money underlying domestic assets. As in the case of an increase in τ, a decrease in R will also work through two channels in this model. A decrease in R shifts back the LM curve, through its impact on the stock of money underlying domestic deposits, and also shifts back the CX curve, through its impact on the bank loan rate and its subsequent impact on credit markets. Consequently, the qualitative picture corresponds to Figure 3. The comparative static results for a decrease in R derived in the appendix also look quite analogous to those above:

$$(16a) \qquad di/dR = [(1 - A_Y - T_Y)/\tau - A_R D_Y]\Lambda$$

$$(16b) \qquad dY/dR = [D_i A_R - A_i/\tau]/\Lambda > 0.$$

However, the graphical analysis masks some differences in the transmission mechanism underlying the two policies. To see this, consider the determinants of ϕ_R derived in the appendix:

$$(17) \quad \frac{dr}{dR} = \frac{\lambda(1 - \tau)/\tau}{L_r - [\lambda_r(R/\tau + D^*) + \lambda D^*_r](1 - \tau)} < 0.$$

As in the case of an increase in reserve requirements, the impact of a given decrease in the stock of high-powered money will be greater the less desirable are alternative sources of intermediation, i.e., the greater is the absolute value of both L_r and λ_r. In other words, the lower is the elasticity of demand and supply of bank loans, the more effective are standard sterilization techniques as well. However, the absolute value of the numerator of (17) is smaller than that of (14). This is because a change in reserve requirements works through two channels not relevant to a change in the stock of high-powered money. While both policy instruments influence the money supply, increases in reserve requirements also reduce the level of intermediation by banks, both of domestic and foreign deposits. Define the elasticity of r with respect to τ as $\varepsilon_{r,\tau} = (dr/r)/(d\tau/\tau)$, and define the elasticity of r with respect to R similarly. By (14) and (17):

$$(18a)\, \varepsilon_{r,\tau} = -\frac{\lambda[R/\tau + \tau D^*]}{r[L_r - [\lambda_r(R/\tau + D^*) + \lambda D^*_r](1 - \tau)} > 0.$$

bank reserve requirements reduces the amount of bank transactions, reducing output, as shown in equation (15b), and hence the transactions demand for money.

It can be seen that in this model (15a), unlike the standard IS-LM model, the immediate impact on interest rates in the nonbank sector of such a policy is ambiguous. However, by equation (9), interest rates in the banking sector must rise. The additional shift in the CX curve implies that for a given level of income and interest rates subsequent to a capital inflow surge, the magnitude of reserve requirement increase necessary to restore pre-inflow income levels is smaller. However, such a conclusion is somewhat misleading, because the inflow itself leads to an outward shift in the CX curve and hence a larger level of income. Consequently, the addition of a credit channel does not imply that for a given capital surge caused by, for example, a reduction in the foreign rate of interest, the magnitude of increase in τ required to restore initial income levels is smaller.

Finally, we reiterate that our BP curve demonstrates that this sterilization effort is not consistent with long-run equilibrium because the high domestic interest rate will lead

(18b)
$$\varepsilon_{r,R} = \frac{\lambda R(1-\tau)/\tau}{r[L_r - [\lambda_r(R/\tau + D^*) + \lambda D^*_r](1-\tau)} < 0.$$

Comparing (18a) and (18b), it can be seen that $\varepsilon_{r,\tau}$ is greater than $\varepsilon_{r,R}$ in absolute value. In addition to the larger first term in the numerator, the additional numerator term in (18a) represents the reduction in the rate of intermediation of foreign deposits which find their way into the banking system as a result of the increase in reserve requirements. It is this channel on which policymakers have concentrated in advocating reserve requirement increases as a mechanism for mitigating the impact of surges in capital inflows.

III. INDIVIDUAL COUNTRY EXPERIENCES

In this section, I summarize the experiences of seven Asian developing nations who experienced capital inflow surges between 1986 and 1993. As an informal "test" of the predictions of the model above, we pay particular attention to the nations who attempted sterilization through the banking sector.

Indonesia

As in a number of Asian developing nations, changes in domestic Indonesian policy also contributed to its capital inflow surges. Indonesia initially pursued a policy of reforms designed to encourage capital inflows. Between 1979 and 1991, the central bank conducted foreign currency swaps with banks on demand at forward premia which were below expected depreciation rates (Folkerts-Landau, et al., 1993). In addition, it pursued an aggressive policy of financial liberalization from 1988 to 1993. Prior to this liberalization period, Indonesian banks faced numerous ceilings on foreign borrowing. These were eased during the period of liberalization, as were restrictions on entry for domestic banks.

This liberalization was followed by a surge in capital inflows. Foreign-owned assets as a percent of GDP increased from 45 percent in 1988 to 74 percent in 1993. In addition, many of these found their way to the commercial banking sector. Commercial bank foreign liabilities as a percentage of GDP increased from 2 percent in 1988 to 7 percent in 1993. Looking at Table 1, we see that the Indonesian capital account balance plus net errors and omissions reached 3.8 percent of GDP during 1986 and 1987, fell somewhat during 1988 and 1989, and then topped 5 percent in both 1990 and 1991, and 4 percent in 1992. This surge then decreased to 2 percent of GDP in 1993.

Indonesia maintained a strong fiscal balance over the capital inflow period. Consequently, the 1990-1993 capital inflow period coincided with a much more moderate real exchange rate appreciation, indicating success at sterilization. The surge in capital inflows also resulted in a rapid buildup of foreign liabilities of domestic banks, as well as a rapid expansion of the banking sector. Indonesia's asset ratio, the share of assets in the banking sector, increased from 60.87 percent in 1986 to 85.43 percent in 1992. Similarly, the "credit ratio," the ratio of commercial bank assets to domestic credit, increased from 84.26 percent to 93.27 percent.

Indonesia's rapid surge in foreign capital inflows coincided with a deterioration in the stability of the nation's financial sector. Nonperforming loans reached 16 percent of outstanding loans in the 1990s. Two major banks failed, bank Duta in 1990 and Bank Summa in 1992. These were followed by increased restrictions on the banking industry to reduce the growth of credit. It has been argued that these capital restrictions in 1991 became the primary instrument of monetary policy (Cole 1994). In addition, the two large bank failures were covered completely from assets obtained in the private sector. This strong stance towards owner liability also contributed to a slowdown in lending.

Indonesia also pursued sterilization activities. During the reform period, Indonesia sterilized capital inflows by requiring its public enterprises to convert commercial bank deposits to Bank Indonesia certificates, known as SBIs. From 1988 to 1993, the stock of SBIs increased from 8 to 34 percent of total liabilities. This policy placed the burden of limiting the expansion of liquidity on the public enterprises.

While Indonesian authorities did not increase reserve requirements as a form of sterilization, their tightening of financial policies in 1991 did reduce the pace of intermediation of these inflows. Folkerts-Landau, et al. (1994) suggest that Indonesia's initial unwillingness to sterilize through reserve requirements led to increased interest volatility. Given the initial interest rate reductions associated with the financial liberalization, when sterilization finally did take place, interest rates rose and asset quality declined. Nonperforming loans at large state-owned banks rose from 6 percent at the end of 1990 to 21 percent by October 1993. Indonesia responded by easing capital adequacy and loan deposit ratios in May of 1993.

Korea

Korea experienced a capital inflow surge in 1991 and 1992 (Table 2). The Korean capital account balance plus net errors and omissions topped 2.5 percent in both years. However, this capital inflow was largely offset by a current account deficit, so that the overall balance was actually negative in 1991 and only 1.2 percent of GDP in 1992. In

TABLE 1

INDONESIA (1986–1993)

	1986	1987	1988	1989	1990	1991	1992	1993
MACROECONOMIC INDICATORS								
Growth of Real GDP	5.88	4.93	5.78	7.46	7.24	6.95	6.46	6.50
Inflation	5.83	9.28	8.04	6.42	7.81	9.41	7.53	9.23
Fiscal Balance	–3.53	–0.83	–3.09	–2.01	0.41	0.43	–0.42	0.67
Change in Real Eff. Exchange Rate	28.66	30.57	2.91	–0.90	2.64	–0.64	1.29	–1.96
Reserves (Bil of US$)	4.05	5.59	5.05	5.45	7.46	9.26	10.45	11.26
Reserves to Imports	2.80	4.17	3.51	3.01	3.07	3.55	3.75	4.25
BALANCE OF PAYMENTS								
Balances of Goods, Services, and Private Transfers	–4.10 (–5.1)	–2.27 (–3.0)	–1.55 (–1.8)	–1.28 (–1.4)	–3.24 (–3.1)	–4.39 (–3.8)	–3.12 (–2.4)	–2.30 (–1.6)
Balance on Capital Account Plus Net Errors and Omissions	3.10 (3.9)	2.90 (3.8)	1.44 (1.7)	1.77 (1.9)	5.49 (5.2)	5.92 (5.1)	5.19 (4.1)	2.89 (2.0)
FINANCIAL SECTOR								
Foreign Liabilities (Bil of US$)	0.33	0.46	0.67	1.78	6.65	5.99	7.86	NA
Deposit Bank Assets	16.77	20.62	26.77	37.47	55.43	63.12	66.69	NA
Asset Ratio (%)	60.87	62.09	62.73	74.58	78.02	84.47	85.43	NA
Credit Ratio (%)	84.26	84.57	86.62	89.72	92.37	93.84	93.27	NA

NOTE: Balance of payments data are in billions of U.S. dollars. Numbers in parentheses indicate component as a percentage of GDP. Variables are defined in the appendix.

contrast, in 1988 Korea's large current account surplus yielded a large surplus in the balance of payments. Korea responded to its capital inflows through a number of policies. Korea used "money stabilization bonds" to sterilize foreign capital inflows through open market operations. The quantity of these bonds outstanding increased from 9.6 percent of M2 in 1986 to 21 percent of M2 in 1992 (Folkerts-Landau, et al., 1994).

In addition, Korea raised reserve requirements and the degree of regulation on the banking sector. Reserve requirements for commercial banks were raised to 11.5 percent on demand and time deposits. Because of Korea's extensive nonbank financial sector, this policy shifted assets out of commercial banks. The share of deposits held by banks, which had been 70 percent in the 1970s, fell to 36 percent in 1992 (Folkerts-Landau, et al., 1994).

Korea grew very rapidly over the period, averaging about 10 percent growth over the period. Its sterilization effort also resulted in a large buildup of government reserves. The reserve to import ratio tripled from 0.77 to 2.42 between 1985 and 1994. Korea also experienced large real exchange rate appreciations in 1988 and 1989.

Korea had a unique financial sector experience. Foreign liabilities of the banking sector remained relatively unchanged from 1986 through 1993. However, deposit bank assets did triple over the period. Most interestingly, the relative share of the commercial banking sector fell by both the asset ratio and credit ratio measures. This demonstrates the existence of disintermediation in Korea over the period, in part presumably due to Korea's sterilization efforts through increases in reserve requirements.

Malaysia

Malaysia's capital inflows surged from 1991 to 1993. Looking at Table 3, we can see that the balance on its capital account plus net errors and omissions as a percentage of GDP reached unprecedented magnitudes even for a developing Asian nation. However, Malaysia is notable as a country which pursued an aggressive policy of sterilization, both through increased reserve requirements and through other instruments. Malaysia sold central bank securities to stem the impact of capital inflows. From 1989 to 1993, the value of government deposits increased by 72

TABLE 2

KOREA (1986–1993)

	1986	1987	1988	1989	1990	1991	1992	1993
MACROECONOMIC INDICATORS								
Growth of Real GDP	11.55	11.52	11.27	6.38	9.51	9.13	5.06	5.53
Inflation	2.75	3.05	7.15	5.70	8.58	9.30	6.24	4.80
Fiscal Balance	−0.09	0.43	1.51	0.19	−0.67	−1.62	−0.84	NA
Change in Real Eff. Exchange Rate	17.62	1.10	−8.21	−10.68	7.73	2.67	10.40	2.95
Reserves (Bil of US$)	3.32	3.58	12.35	15.21	14.79	13.70	17.12	20.23
Reserves to Imports	1.01	0.83	2.53	2.71	2.29	2.01	2.49	2.71
BALANCE OF PAYMENTS								
Balances of Goods, Services, and Private Transfers	4.61 (4.2)	9.84 (7.2)	14.12 (7.8)	5.01 (2.3)	−2.18 (−0.9)	−8.55 (−2.9)	−4.50 (−1.5)	0.53 (0.2)
Balance on Capital Account Plus Net Errors and Omissions	−4.53 (−4.2)	−7.73 (−5.7)	−4.80 (−2.6)	−1.89 (−0.8)	0.97 (0.4)	7.45 (2.5)	8.23 (2.7)	2.48 (0.8)
FINANCIAL SECTOR								
Foreign Liabilities (Bil of US$)	14.54	11.59	10.25	9.78	10.18	13.79	14.65	14.80
Deposit Bank Assets	58.13	72.50	94.79	117.78	139.86	158.21	171.20	188.2
Asset Ratio (%)	54.77	51.59	48.79	48.13	48.76	49.01	45.81	42.80
Credit Ratio (%)	62.00	57.81	53.37	51.36	51.96	51.88	48.98	45.57

NOTE: Balance of payments data are in billions of U.S. dollars. Numbers in parentheses indicate component as a percentage of GDP. Variables are defined in the appendix.

percent. In addition, Malaysia used the assets of its pension fund, the Employee Provident Fund, to sterilize capital inflows. The assets of the Employee Provident Fund and the government deposits were transferred to the central bank. The value of Federal and local deposits at the central bank increased from 3 to 19 percent of total deposits from 1989 to 1992 (Folkerts-Landau 1994).

Reserve requirements were raised three times. First, they were increased from 6.5 percent in 1991 to 7.5 percent. They were then raised again to 8.5 percent in 1993. Finally, they were further increased to 11.5 percent in 1994. Much of the impact of reserve requirement increases was passed on to depositors. The margin between borrowing and lending rates increased from 3.8 percent to 4.7 percent. The cost of maintaining reserves was estimated to have increased 23.5 percent over the period, while the margin increased almost as much, 22.7 percent (Folkerts-Landau, et al., 1994).

The financial industry also became subject to more extensive regulation. In 1993, Bank Negara Malaysia placed limits on banks' foreign liabilities. In the securities markets, residents were forbidden from selling short-term securities to nonresidents for a few months in 1994. Foreign financial accounts in Malaysia had to be deposited in "vostro" accounts with the central bank. These did not pay interest and were subject to reserve requirements, effectively placing a tax on nonresident deposits. The reserve requirement on these accounts was lifted in May and the ban on the issue of short-term securities was lifted in August.

Malaysia's aggressive response to capital inflows was felt both in the financial sector and in the real side of the economy. Malaysia's banking sector experienced relatively subdued growth over the period. Nevertheless, the asset and credit ratio measures both indicate that the relative share of the commercial banking sector increased over this period. In addition, Malaysia had a relatively moderate real exchange rate appreciation during the 1990–1993 period.

Philippines

The Philippines' surge in capital inflows was also preceded by a period of liberalization. From 1986 to 1993, the Philippines undertook major trade, financial, and foreign ex-

TABLE 3

MALAYSIA (1986–1993)

	1986	1987	1988	1989	1990	1991	1992	1993
MACROECONOMIC INDICATORS								
Growth of Real GDP	1.05	5.39	8.94	9.21	9.73	8.66	7.81	8.46
Inflation	0.74	0.29	2.56	2.81	2.62	4.36	4.77	3.54
Fiscal Balance	–10.48	–7.73	–4.28	–5.13	–4.76	–4.35	–4.22	–5.21
Change in Real Eff. Exchange Rate	22.23	6.55	12.05	2.45	2.93	1.04	–6.93	–2.82
Reserves (Bil of US$)	6.03	7.44	6.53	7.78	9.75	10.89	17.23	27.25
Reserves to Imports	6.16	6.10	4.22	3.82	3.49	3.58	4.98	6.61
BALANCE OF PAYMENTS								
Balances of Goods, Services, and Private Transfers	–0.18 (–0.6)	2.47 (7.8)	1.73 (5.0)	0.16 (0.4)	–0.97 (–2.3)	–4.24 (–9.0)	–1.93 (–3.3)	–2.54 (–3.9)
Balance on Capital Account Plus Net Errors and Omissions	1.63 (5.9)	–1.35 (–4.3)	–2.16 (–6.2)	1.07 (2.8)	2.92 (6.8)	5.48 (11.6)	8.56 (14.8)	13.88 (21.5)
FINANCIAL SECTOR								
Foreign Liabilities (Bil of US$)	2.37	2.00	1.87	2.34	3.01	4.32	7.15	11.66
Deposit Bank Assets	24.22	26.51	25.85	30.88	36.30	43.06	49.77	52.49
Asset Ratio (%)	55.02	53.47	51.51	93.46	97.34	98.65	71.23	64.85
Credit Ratio (%)	69.36	66.16	63.90	96.15	97.34	98.65	95.67	95.58

NOTE: Balance of payments data are in billions of U.S. dollars. Numbers in parentheses indicate component as a percentage of GDP. Variables are defined in the appendix.

change liberalizations (Lamberte 1994). In addition, the Philippines liberalized the rules for foreign investment in the 1991 Foreign Investment Act. As in other countries where liberalizations preceded the capital inflow surge, it is difficult to assess the share of capital inflows attributable to domestic and foreign factors.

Looking at Table 4, we can see that the Philippines' capital account plus net errors and omissions has been large and growing since 1988. The Philippines case is unique, however, because in addition to standard capital account inflows, their surge in capital inflows also came from the nonmerchandise portion of the current account. Most notably, this includes remittances of overseas workers and withdrawals of foreign currency deposits. 1993 remittances equaled $2.3 billion or 4 percent of GDP. The foreign currency deposit withdrawals may be considered capital flight repatriation.

The Philippines responded to its capital inflow surge with a myriad of instruments, including high reserve requirements. Reserve requirements have been very high, averaging 22 percent between 1987 and 1992. In addition, the Philip-

pines responded by reducing its request to the Paris Club for loan rescheduling, and lifting the restrictions on repatriation of foreign investments. It also allowed outward investment to increase from $1 million to $6 million per year. Finally, the Philippines also used sterilized intervention to increase the demand for foreign exchange. From 1991 to 1994, the Central Bank purchased $6.6 billion U.S. dollars.

The Philippines did not experience large capital inflows relative to the magnitude of its current account deficit until 1992. As a consequence, there was little impact on domestic credit. Lamberte (1994) has shown that, during this latter period, "standard" sterilization policy in the Philippines through open market operations was relatively ineffective. Consequently, if sterilization efforts did play an important role in mitigating the impact of capital inflows on domestic credit levels, they must have stemmed from more "nonstandard" efforts, such as increases in reserve requirements, which directly affected the domestic banking sector.

This can be seen most clearly in Table 4 from the experience of the Philippines' real exchange rate. From 1988–

TABLE 4

PHILIPPINES (1986–1993)

	1986	1987	1988	1989	1990	1991	1992	1993
MACROECONOMIC INDICATORS								
Growth of Real GDP	3.42	4.31	6.75	6.21	3.04	–0.58	0.34	2.14
Inflation	0.75	3.79	8.76	12.21	14.14	18.71	8.92	7.59
Fiscal Balance	–5.03	–2.45	–2.91	–2.11	–3.45	–2.11	–1.18	–1.48
Change in Real Eff. Exchange Rate	26.76	3.59	–2.09	–5.68	6.07	3.15	–8.14	8.52
Reserves (Bil of US$)	1.73	0.97	1.00	1.42	0.92	3.25	4.40	4.68
Reserves to Imports	3.91	1.45	1.47	1.54	0.84	3.06	3.13	2.79
BALANCE OF PAYMENTS								
Balances of Goods, Services, and Private Transfers	0.75 (2.5)	–0.64 (–1.9)	–0.67 (–1.8)	–1.81 (–4.3)	–3.05 (–6.9)	–1.39 (–3.1)	–1.34 (–2.5)	–3.59 (–6.6)
Balance on Capital Account Plus Net Errors and Omissions	0.39 (1.3)	0.58 (1.8)	1.34 (3.5)	2.11 (5.0)	3.01 (6.8)	3.14 (6.9)	3.03 (5.7)	3.88 (7.1)
FINANCIAL SECTOR								
Foreign Liabilities (Bil of US$)	1.83	1.94	2.10	2.02	2.38	2.06	3.00	2.91
Deposit Bank Assets	6.26	7.23	8.65	10.38	10.40	11.67	15.65	18.88
Asset Ratio (%)	72.90	82.40	84.53	86.46	87.41	88.11	93.95	97.12
Credit Ratio (%)	63.20	70.17	75.63	79.94	82.76	85.24	79.65	62.55

NOTE: Balance of payments data are in billions of U.S. dollars. Numbers in parentheses indicate component as a percentage of GDP. Variables are defined in the appendix.

1993, the Philippines actually experienced a small net real exchange rate depreciation. The reserve to import ratio also tripled from 1985 to 1986, from 1.21 to 3.91 percent. However, this ratio subsequently decreased to 0.84 percent by 1990, only to triple again during the subsequent capital inflow surge period.

Despite its increases in reserve requirements, the share of the commercial banking sector in the Philippines grew dramatically over the studied period, as measured by our asset and credit ratios. In addition, foreign liabilities of Philippine commercial banks and the asset size of deposit banks also grew demonstratively.

As the surge in capital inflows cooled down, the Philippines weakened its policy to allow for the maintenance of a sustainable level of capital inflows. By August of 1994, reserve requirements had been reduced to 17 percent from a high of 24 percent in January 1993 (Lamberte 1994).

Singapore

Singapore has had a relatively volatile capital inflow expeience over the period. Looking at Table 5, we can see that

the capital account balance plus net errors and omissions surged in 1985, 1987, 1990, and 1992–1993. These periods were separated by periods of relatively minor capital account balance surpluses. Despite this volatility, Singapore maintained a high and relatively stable rate of GDP growth and moderate inflation. In addition, Singapore's real exchange rate appreciation from 1989 through 1993 was moderate relative to other Asian developing countries.

Singapore took a relatively nonstandard approach to sterilize its capital inflow surge. First, it resisted any increase in bank reserve requirements. Second, because it lacked the government bonds to use in more standard sterilization efforts, it sterilized capital inflows through the assets in its large mandatory government pension fund, the Central Provident Fund. While its stock of reserves more than quadrupled over the period, its outward orientation and its high rate of GDP growth implied that the reserve to import ratio stayed relatively constant.

Singapore's policy response to its capital inflow surge had a relatively neutral impact on the share of the commercial banking sector, which stayed relatively constant at around 85 percent, according to the asset ratio and the

TABLE 5

SINGAPORE (1986–1993)

	1986	1987	1988	1989	1990	1991	1992	1993
MACROECONOMIC INDICATORS								
Growth of Real GDP	1.84	9.41	11.14	9.24	8.76	6.65	6.04	9.94
Inflation	–1.37	0.47	1.53	2.38	3.44	3.42	2.27	2.42
Fiscal Balance	1.45	–2.73	6.97	10.25	10.87	8.84	NA	NA
Change in Real Eff. Exchange Rate	18.60	8.29	0.75	–5.65	–4.52	–2.38	–2.48	–0.85
Reserves (Bil of US$)	12.94	15.23	17.07	20.35	27.75	34.13	39.89	48.36
Reserves to Imports	5.71	4.61	4.02	4.70	4.81	6.19	5.55	6.16
BALANCE OF PAYMENTS								
Balances of Goods, Services, and Private Transfers	0.33 (1.9)	–0.09 (–0.5)	0.98 (3.9)	2.91 (9.9)	2.26 (6.2)	4.16 (9.8)	3.94 (8.1)	2.25 (4.1)
Balance on Capital Account Plus Net Errors and Omissions	0.21 (1.2)	1.19 (5.9)	0.68 (2.7)	–0.17 (–0.6)	3.17 (8.7)	0.05 (0.1)	2.16 (4.5)	5.32 (9.7)
FINANCIAL SECTOR								
Foreign Liabilities (Bil of US$)	13.44	15.37	17.36	23.95	24.94	24.57	29.45	32.08
Deposit Bank Assets	17.68	21.01	23.74	29.34	36.53	44.46	48.90	57.24
Asset Ratio (%)	85.48	85.35	84.45	84.26	84.60	84.82	84.72	84.02
Credit Ratio (%)	85.46	85.33	84.44	84.25	84.60	84.81	84.71	84.01

NOTE: Balance of payments data are in billions of U.S. dollars. Numbers in parentheses indicate component as a percentage of GDP. Variables are defined in the appendix.

credit ratio. There was, however, some moderate growth in foreign commercial bank liabilities and the deposit bank assets grew at a robust pace. Of course, this was necessary over the period to keep pace with the rest of the economy.

Taiwan

Taiwan experienced a large episode of capital inflows in 1986 and 1987. In both years, the capital account balance plus net errors and omissions exceeded 9 percent of GDP. Nevertheless, this was followed by a seven-year period of capital outflows, from 1989 to 1994, as measured by this proxy. The net impact on domestic credit from this capital inflow surge was therefore relatively minimal.

Taiwan did engage in efforts subsequent to the initial capital inflow surge to limit the expansion of domestic credit. However, instead of raising reserve requirements, it required commercial banks to directly purchase treasury bills and central bank certificates of deposit. The government also shifted the assets of the postal system from the commercial banking sector to the central bank. As in the

case of Indonesia described above, therefore, the burden of sterilization that did take place was partly financed by the public sector.

Looking at Table 6, it can be seen that the period was one of rapid increase in GNP growth.[9] In addition, we see that while Taiwan's real exchange rate did appreciate over the period 1987–1989, a prolonged spell of moderate depreciation from 1990–1993 mitigated the net real exchange rate movement. Taiwan also rapidly accumulated reserves over the period, particularly in 1986 and 1987. However, the country grew so rapidly that the reserve to import ratio was lower in 1994 than in 1985, despite a large initial increase.

Thailand

Unlike most capital-recipient countries, Thailand did not experience an increase in domestic rates prior to its capital inflow surge. This evidence has been used by proponents

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9. GNP figures were used for Taiwan because GDP figures were not available.

TABLE 6

TAIWAN (1986–1993)

	1986	1987	1988	1989	1990	1991	1992	1993
MACROECONOMIC INDICATORS								
Growth of Real GDP	11.65	11.86	7.33	7.98	5.54	7.55	6.23	6.02
Inflation	0.70	0.50	1.28	4.46	4.06	3.60	4.54	2.86
Fiscal Balance	–0.77	0.13	0.76	0.92	1.64	–0.93	–2.45	–1.27
Change in Real Eff. Exchange Rate	9.79	–5.33	–3.54	–6.12	6.99	2.82	1.27	3.34
Reserves (Bil of US$)	46.31	76.75	73.90	73.22	72.44	82.41	82.31	83.57
Reserves to Imports	19.95	20.17	18.87	17.59	14.84	15.57	13.96	12.90
BALANCE OF PAYMENTS								
Balances of Goods, Services, and Private Transfers	16.27 (21.6)	17.99 (17.7)	10.18 (8.3)	11.39 (7.6)	10.77 (6.7)	12.04 (6.7)	8.19 (4.1)	6.74 (2.9)
Balance on Capital Account Plus Net Errors and Omissions	7.05 (9.4)	10.10 (10.0)	1.60 (1.3)	–12.16 (–8.2)	–14.69 (–9.2)	–2.36 (–1.3)	–6.79 (–3.4)	–5.17 (–2.2)
FINANCIAL SECTOR								
Foreign Liabilities (Bil of US$)	7.98	15.06	12.86	12.14	11.12	15.05	15.18	16.75
Deposit Bank Assets	58.99	85.37	119.72	167.66	186.13	239.03	310.18	352.3
Asset Ratio (%)	90.89	90.29	92.85	90.26	88.33	87.81	90.08	89.89
Credit Ratio (%)	91.76	91.46	92.43	91.91	90.98	90.61	92.07	91.84

NOTE: Balance of payments data are in billions of U.S. dollars. Numbers in parentheses indicate component as a percentage of GDP. Variables are defined in the appendix.

of external factors as the dominant cause of capital inflow surges over the period, such as Schadler, et al. (1993). In addition, it has been argued that Thailand's history of low inflation and outward-oriented policies may have enhanced its ability to weather its surge in capital inflows (Schadler, et al., 1993). Its capital inflows were extremely high: The capital account balance plus net errors and omissions averaged about 10 percent of GDP from 1988 through 1992 (see Table 7).

While it failed to engage in extensive sterilization, Thailand did pursue a variety of measures designed to mitigate the magnitude of capital inflows. These included encouraging capital outflows through early service of external debt and easing the restrictions on foreign capital outflows. In 1991, Thailand allowed individuals to open foreign exchange accounts up to $500,000 and corporations to open accounts up to $2 million. In addition, they eliminated the requirement for Bank of Thailand approval for repatriation of investment funds.

Thailand's macroeconomic indicators suggest that it weathered the capital inflow surge period well. It achieved

a high rate of GDP growth with minimal inflation and an increasing share of investment in GDP. Thailand experienced a very moderate real exchange rate appreciation from 1988–1993. Thailand's reserves also more than tripled from 1989 to 1994. However, its reserve to import ratio less than doubled over the period, due to its growth in GDP and outward orientation.

Thailand's capital inflows resulted in a rapid expansion of its domestic banking sector. This expansion included a large expansion in foreign liabilities. Foreign liabilities of the banking sector grew to twelve times their 1986 level by 1993, primarily due to borrowing from foreign financial institutions. Deposit bank assets also quadrupled over the same period. In addition, the share of the commercial banking sector grew according to both the asset ratio and credit ratio measures.

Summary

The experiences of the seven developing Asian nations in this study are summarized in Table 8. A number of pat-

TABLE 7

THAILAND (1986–1993)

	1986	1987	1988	1989	1990	1991	1992	1993
MACROECONOMIC INDICATORS								
Growth of Real GDP	5.53	9.52	13.29	12.29	11.57	7.88	NA	NA
Inflation	1.84	2.47	3.86	5.36	5.93	5.70	4.14	3.57
Fiscal Balance	–4.23	–2.23	6.80	2.95	4.53	4.73	2.94	NA
Change in Real Eff. Exchange Rate	17.64	6.47	–0.55	–2.93	0.28	–2.20	3.86	–1.35
Reserves (Bil of US$)	2.80	4.01	6.10	9.52	13.31	17.52	20.36	24.47
Reserves to Imports	3.55	3.10	3.30	4.16	4.59	6.43	5.95	6.01
BALANCE OF PAYMENTS								
Balances of Goods, Services, and Private Transfers	0.86 (0.2)	–0.49 (–1.0)	–1.84 (–3.0)	–2.70 (–3.7)	–7.47 (–8.7)	–7.67 (–7.8)	–6.49 (–5.8)	–6.96 (NA)
Balance on Capital Account Plus Net Errors and Omissions	0.63 (1.5)	1.43 (2.8)	4.44 (7.2)	7.73 (10.7)	10.74 (12.5)	12.29 (12.5)	9.33 (8.5)	14.13 (NA)
FINANCIAL SECTOR								
Foreign Liabilities (Bil of US$)	1.22	1.48	2.44	3.32	4.34	4.90	6.57	13.79
Deposit Bank Assets	25.15	31.79	39.13	48.46	63.53	75.89	89.38	109.1
Asset Ratio (%)	63.43	65.75	68.98	70.81	70.81	71.13	69.69	71.51
Credit Ratio (%)	76.56	78.93	84.64	87.61	89.19	91.19	92.95	94.35

NOTE: Balance of payments data are in billions of U.S. dollars. Numbers in parenthesis indicate component as a percentage of GDP. Variables are defined in the appendix.

terns are notable. First, not all of the Asian nations experienced capital inflow surges at the same time, although all except Taiwan experienced some capital inflow surge between 1991 and 1992. This indicates, as suggested by other authors (e.g., Schadler 1993), that internal factors also played a role in determining capital inflow surges. Nevertheless, the importance of external factors is demonstrated by the simultaneous capital inflow surge in the early 1990s.

Second, note that the policy response to the capital inflow surge varied widely across countries. The instruments used in "nonbank" sterilization ranged from standard open market operations by Korea to the use of pension funds by Malaysia and Singapore, to the use of increased external debt service by the Philippines and Thailand. Instruments used to sterilize the impact of the inflows in the banking sector were also diverse. While Korea, Malaysia, and the Philippines used increases in reserve requirements, Indonesia and Taiwan used a variety of measures designed to lower the assets of the commercial banking sector. All of these instruments had cases of successes and failures

which appear to be more closely related to the initial conditions in the country than the instrument of sterilization they chose.

The pattern of greatest relevance to the model concerns the relationship between the relative share of a country's intermediation conducted ex-ante by the banking sector, which provides a coarse proxy for the elasticity of supply and demand for bank loans and its sterilization experience. Our model above suggests that the more developed is the nonbank financial sector, the less effective will be either standard sterilization policy through open market operations or through distorting the banking sector.

If this were the case, our model would predict that of the three countries which raised reserve requirements, the increase would lead to more disintermediation in Korea than in Malaysia or the Philippines. Because of the availability of other forms of financial intermediation, this would imply that the backwards shift in the CX curve would be smaller, as would the backward shift in the LM curve, due to the reduction in the money multiplier. This second effect from the existence of nonbank financial markets has

TABLE 8

SUMMARY OF CAPITAL INFLOW EXPERIENCES

Country	Capital Inflow Surges	Nonbank Sterilization	Bank Sector Sterilization	Real Exchange Rate Impact	1986 Ratio of Banking Assets (%)	Avg. Ratio (%) for 1986–1993		1986–1993 Avg. Annual Change in Banking Assets Ratio (%)
						Asset	Credit	
Indonesia	1986–1987; 1990–1991	——	Increased regulatory restrictions; Decreased public sector assets in commercial banks	Moderate real exchange rate appreciation	60.87	72.60*	98.24*	5.99*
Korea	1991;1992	Used "Money Stabilization Bonds" in open market operations	Increased reserve requirements	Large real exchange rate appreciation	54.77	48.71	52.87	–3.41
Malaysia	1991–1993	Used government and pension fund securities in open market operations	Increased reserve requirements; Increased regulatory restrictions	Moderate real exchange rate appreciation	55.02	73.19	85.35	6.24
Philippines	1988–1993	Increased foreign debt service	Increased reserve requirements	Moderate real exchange rate depreciation	72.90	86.61	74.89	4.26
Singapore	1987, 1990, 1992–1993	Used pension funds in open market operations	——	Moderate real exchange rate appreciation	85.48	84.71	74.70	–0.24
Taiwan	1986–1987	——	Required commercial banks to directly purchase treasury bills and central bank certificates of deposit; Decreased public sector assets in commercial banks	Moderate real exchange rate appreciation	90.89	90.05	91.63	–0.14
Thailand	1988–1992	Increased foreign debt service; Eased restrictions on capital outflows	——	Moderate real exchange rate depreciation	63.43	69.01	86.93	1.75

*Average Banking Assets Ratio for Indonesia from 1986–1992.

been noted by Van Wijnbergen (1983). Holding all else equal, reserve requirements should then be less effective as an instrument for lessening the impact of capital inflow surges on the real side of the economy in Korea because of substitute avenues of intermediation.

The crude evidence appears to bear out this prediction. While Korea experienced a large real exchange rate appreciation over the period 1986–1993, the real exchange rate showed only moderate appreciation in Malaysia and actually showed moderate depreciation in the Philippines.

Consequently, the evidence suggests that reserve requirement increases are more effective at sterilization the more limited are a country's financial alternatives.

The model predicts a similar relationship for nations which used open market operations as the mechanism for sterilization. Table 8 demonstrates that the evidence is largely consistent with the model. Of the nations that used open market operations or enhanced foreign debt service as mechanisms of sterilization, Korea, the nation with the largest nonbank financial sector, experienced the greatest degree of real exchange rate appreciation. This occurred despite the fact that it engaged in both open market operations and increases in reserve requirements. Nations with large shares of assets in the commercial banking sector, such as the Philippines and Singapore, had no or moderate real exchange rate appreciation. In addition, Thailand, a nation with a relatively small share of assets in the commercial banking sector, also experienced very moderate real exchange rate appreciation.

IV. CONCLUSION

This paper develops an open-economy version of the Bernanke-Blinder model which demonstrates how foreign interest rate shocks can lead to an expansion through capital inflows. In addition, the model sheds light on the determinants of the impact of instruments commonly used for sterilization. In particular, the model claims that the ability to mitigate the impact of capital inflows by either sterilizing through open market operations or raising reserve requirements will be limited if viable financial alternatives to the commercial banking sector exist.

We then examine these predictions in the context of the capital inflow surge experiences of seven developing Asian nations. Our analysis yields three conclusions: First, the timing of capital inflow surges exhibited both similarities and differences, arguing for a role for both domestic and foreign factors in causing capital inflow surges. Second, there is little evidence of dominant sterilization instruments. Third, we demonstrated that in comparing the nations which used either increases in reserve requirements or open market operations over the period, the predictions of the model were borne out.

Of the nations which increased reserve requirements, Korea, the country with the largest nonbank financial sector, had the least success stemming the impact of capital inflow surges. A similar pattern was found in comparing the set of nations which pursued sterilization through open market operations. Of course, we held much constant when making these predictions. Nevertheless, the fact that Korea is both the country which experienced the greatest degree of disintermediation and the greatest real exchange rate appreciation fits the model rather well.

APPENDIX I

I. DERIVATION OF EQUATION (9)

Totally differentiating (8) with respect to r and τ, M, i, Y, and r^* yields

$$\frac{dr}{dr^*} = \frac{\lambda D^*_{r^*}}{I} L_r / (1 - \tau) - [\lambda_r (R/\tau + D^*) + \lambda D^*_r] > 0.$$

$$\frac{dr}{d\tau} = -\frac{\lambda [R(1-\tau)/\tau^2 + D^*]}{L_r - \lambda_r [(R/\tau + D^*) + \lambda D^*_r](1-\tau)} > 0.$$

$$\frac{dr}{dR} = \frac{\lambda/\tau}{L_r/(1-\tau) - [\lambda_r (R/\tau + D^*) + \lambda D^*_r]} < 0.$$

$$\frac{dr}{di} = -\frac{L_i - \lambda_i (R/\tau + D^*)(1-\tau)}{L_r - [\lambda_r (R/\tau + D^*) + \lambda D^*_r](1-\tau)} > 0.$$

$$\frac{dr}{dY} = -\frac{L_Y}{L_r - [\lambda_r (R/\tau + D^*) + \lambda D^*_r](1-\tau)} > 0.$$

II. COMPARATIVE STATICS

Equations (7′) and (10′) yield the system of equations:

$$\begin{bmatrix} D_i & D_Y \\ -A_i D^*_i & 1 - A_Y + D^*_Y \end{bmatrix} \begin{bmatrix} di \\ dY \end{bmatrix} =$$

$$\begin{bmatrix} 0 & -R/\tau^2 & 1/\tau \\ A_{r*} - D^*_{r*} & A_\tau - D^*_\tau & A_R - D^*_R \end{bmatrix} \begin{bmatrix} dr^* \\ d\tau \\ dR \end{bmatrix}.$$

The determinant of the system satisfies:

$$\Lambda = D_i (1 - A_Y - D^*_Y) + D_Y (A_i - D^*_i) < 0.$$

The comparative statics of the model satisfy:

$$di/dr^* = -D_Y (A_{r*} - D^*_{r*})/\Lambda > 0$$

and $$dY/dr^* = D_i (A_{r*} - D^*_{r*})/\Lambda < 0.$$

Equations (7) and (10) yield the system of equations

$$\begin{bmatrix} D_i & D_Y \\ -A_i & 1 - A_Y - T_Y \end{bmatrix} \begin{bmatrix} di \\ dY \end{bmatrix} =$$

$$\begin{bmatrix} 0 & -R/\tau^2 & 1/\tau \\ A_{r*} & A_\tau & A_R \end{bmatrix} \begin{bmatrix} dr^* \\ d\tau \\ dR \end{bmatrix}.$$

The determinant of the system satisfies

$$\Lambda = D_i (1 - A_Y - T_Y) + D_Y A_i < 0.$$

The comparative statics of the model for policy changes satisfy

$$di/d\tau = - [R(1 - A_Y - T_Y)/\tau^2 + A_\tau D_Y]/\Lambda ,$$

$$dY/d\tau = [D_i A_\tau - A_i R/\tau^2]/\Lambda < 0 ,$$

$$di/dR = [(1 - A_Y - T_Y)/\tau - A_R D_Y]\Lambda ,$$

and

$$dY/dR = [D_i A_R + A_i/\tau]/\Lambda > 0.$$

APPENDIX 2

The data are from International Monetary Fund's *International Financial Statistics* and from *Financial Statistics,* Taiwan district, The Republic of China. The source of real effective exchange rate (1990 = 100) is JP Morgan.

Macroeconomic Indicators

Growth of real GDP (99b.p), inflation (64), and real effective exchange rate are calculated using changes over the previous year. Taiwan uses real GNP (99a). The fiscal balance (80) is expressed as percentage of nominal GDP (99b). Reserves (.1L.D) are in billions of U.S. dollars. The ratio of reserves to imports (71 for all countries except Indonesia which uses (71..d) are end-of-year ratios. Imports were converted to dollars using the exchange rate (rf).

Balance of Payments

The balance of goods, services, and private transfers is current account (77a.d) less unofficial unrequited transfers (77agd). The balance on capital account plus net errors and omissions is the sum of unofficial unrequited transfers (77agd), direct investment (77bad), portfolio investment (77bbd), other capital (77g.d), and net errors and omissions (77e.d).

Financial Sector

Foreign liabilities (26c) are in billions of U.S. dollars. Deposit bank assets is the sum of lines 22a-f of IFS. The asset ratio is the bank deposit assets divided by the sum of bank deposit assets, central bank assets (12a-f) and lines (42a-f). The credit ratio is the ratio of bank deposit assets to domestic credit, sum of lines (32a-f), where (32a) is approximated by the sum of (12a), (22a), and (42a).

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Implementing the Single Banking Market in Europe

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Financial integration of the European Community requires actions by both the EC and its member states to create a common EC-wide competitive and regulatory environment. This paper focuses on the EC's creation of the single market for retail banking services. It tracks the EC legislative process and the adoption of EC directives designed to create the single market. The study also examines some of the costs and benefits associated with the single banking market. This paper evaluates the EC's success in creating the single market by examining the rate of implementation by the member states of the EC single banking market directives. It concludes with an assessment of the European Community's progress toward its goal of a single banking market.

Following a turbulent year for European unity the European Community (EC) created the framework for a single European market for retail banking services on January 1, 1993. This action is expected to increase competition in the financial services industry in Europe as national markets are integrated into an EC-wide market. This paper attempts to evaluate the progress of the EC member states in implementing the framework for the single banking market based on their actions taken to adopt the key single banking market standards.

After adding three new members on January 1, 1995, the EC now encompasses fifteen European nations that cover most of western Europe.[1] As a single market with nearly 368 million people, the EC is a major economic and financial power that accounts for up to 20 percent of world trade.[2]

Financial integration of the EC requires actions by both the EC and the member states to create a common EC-wide competitive and regulatory environment. Member states must eliminate competitive barriers that may protect their domestic financial service industries. While some national industries and some firms may suffer as a result of the transition to a more competitive environment, the single market is expected to generate significant overall benefits for the EC and the member states.

The EC integration process is complex. The single European market initiatives for banking institutions were only one part of a wide array of "single market" initiatives for financial services. Creation of a single market for insurance services, both life and nonlife, was instituted on December 31, 1993, and on July 1, 1995, a single market for securities investment services was implemented. (See Commission of the European Communities 1994c, pp. 31–53 and pp. 54–66.)

Moreover, the single market for financial services is just a small part of the EC efforts to create a huge integrated

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1. On January 1, 1995 the EC added Austria, Finland and Sweden to the dozen member states: Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom. Norway, which also had been accepted for entry, voted in November 1994 not to join the European Community.

2. Harrison (1988) p. 13, reports 40 percent.

single EC market by eliminating impediments, such as tariffs, quotas, nontariff barriers and differing national standards, that can reduce the trade of real goods and services within the EC.

The single banking market is primarily designed to increase competition for retail banking services across the large EC market. Traditionally retail banking services primarily have been provided to customers in the member state where the bank is headquartered. These are primarily offered to businesses and individuals and include payments services, consumer credit, credit cards, mortgage products, foreign exchange and travelers checks, as well as commercial loans and letters of credit.

In addition to offering retail banking services, many banks also are active in providing wholesale banking services. These services are typically designed to provide financial and money market products to large corporations and financial institutions. However, these services often are supplied to large and multinational firms in competitive financial markets that are already integrated on a regional or global scale.

The focus of this article is on the EC's creation of the framework for a single banking market for retail banking services and the adoption and implementation of the EC's single banking-market standards by the twelve nations that were EC members in 1993. The paper is organized as follows: Section I describes both the history and the legislative process for the EC banking reform legislation and reviews the major EC Banking Directives that set the framework for the single market. Section II examines some of the costs and benefits of the EC's move toward a single banking market. Section III evaluates the success of member states in the implementation of the EC directives designed to create a single banking market. Section IV provides an assessment of the progress toward creation of the single market.

I. Legislation and Banking Directives

The Treaty of Rome (1957) created the basis for establishing an internal "market" for goods and services, including financial services, within the European Community. The Community's goal is the elimination of barriers to the movement of goods, services and capital (Commission of the European Communities (1988c) p. 8).

Slow progress in financial services reform led to the EC's 1985 White Paper that called for renewed efforts to establish a single financial market by 1992. As a result of this action, the EC passed the Single European Act of 1986. The act redefined the EC market as "an area without internal frontiers in which the free movement of goods, serv-

ices, persons and capital is ensured." It also targeted 1992 for the achievement of a unified European market.

Integration

A key to the success of the EC integration process is that the expected gains from increased efficiency of the single market are expected to benefit all member states. The EC also tries to offset adverse impacts by allowing for transfer payments to help mitigate transitions that hurt certain industries, regions or nations, as they adjust to the imposition of market forces. There are tradeoffs however; not all member states will benefit from all aspects of the single market.

This latter point is worth returning to when we examine the pace of the adoption of the single market for specific goods or services, like the banking industry. Integration may provide some member states with an incentive to allow their adoption of some single market activities to lag behind the EC deadlines, especially if they expect an unusually large negative impact. Still, in the long run, given the wide array of markets involved and the overall expected benefits, it seems likely that member states will accept some hardships in selected industries as the price to pay for the overall benefits of EC membership.

Legislative Process

The integration of the EC has taken place using a legislative process that starts with the European Commission, which acts as the executive and administrative body of the EC. The Commission proposes EC legislation, which is then reviewed and potentially modified by the European Parliament, before going on to the European Council for adoption. The Commission also is responsible for negotiating trade agreements for the EC and for ensuring that EC rules and regulations are enforced.

The EC legislative processes include the use of both regulations and directives. *Regulations* are binding laws that take precedence over national laws. *Regulations* may take effect as soon as 20 days after they have been published and they become effective throughout the entire EC. Member states need not pass implementing legislation (see Price Waterhouse (1994) pp. 1–7 and Commission of the European Communities (1994a) pp. 1–11).

Directives are legislation that also are legally binding. However, directives generally require action on the part of the member states to be implemented. EC directives set a result or objective that must be achieved by each member state while leaving the means of compliance to the member states. Typically the member states pass legislation that

conforms their national laws and regulations with EC standards. This process creates similar statutes across member states while still allowing for some variation between member states.

Once legislation is adopted, the member states "notify" the EC of their actions and then the European Commission reviews them to determine whether the national legislation meets the EC requirements. Member states commonly have about two years from the date of publication of the directive to take action to revise their laws and regulations to conform with the EC directive, although in some cases they have had four years or more.

The Infringement Process

In cases where the European Commission is not satisfied that a member state has implemented the required directive, or has not done so in a timely manner, the EC automatically begins infringement proceedings against the member state. These legal actions are designed to force the member state to take action on implementation before infringements are referred to the Court of Justice. However, the EC also allows member states to miss implementation deadlines.[3]

Banking Directives

From this multi-step legislative process two key banking directives have emerged. The First Banking Directive (1977) and the Second Banking Directive (1988) set the framework for the integration of the EC banking market in 1993. Through 1993 these two directives were followed by eight additional banking directives. The First Directive was designed to "...establish the rules for banks to establish branches in other Member States." Essentially, this directive set the rules for expansion across national boundaries within the EC by adopting the concept of "host country rule." Under host country rule, expansion is possible. However, a foreign bank or branch is required to

gain permission from the supervisory authorities in the *host* country before they are allowed to operate in the host nation. Thus before 1993, banks and branches were typically regulated by each host country's regulatory agency. Under this regulatory regime, banks involved in cross-border expansions were required to operate under multiple regulatory and capital standards, i.e., one for their home country and another for each host country where they operated.

While host country rule opened the way for cross-border expansion of retail banking services in the EC, it did little to eliminate the differences in banking powers and regulatory regimes that existed across member states. Furthermore, as long as those differences continued to exist, they were likely to act as barriers to cross-border competition in retail banking services. As a result, there was relatively little movement by banks in cross-border mergers, acquisitions or alliances in the retail banking area until after passage of the Second Banking Directive.

The Second Banking Directive (1988), adopted in 1989 for implementation on January 1, 1993, went well beyond the reforms of the First Banking Directive. It included several major changes that are expected to lead to a more efficient financial sector, and one that is more competitive in the global financial markets. Among the key changes leading to the creation of a single market or "single passport" for banking services are: (1) The "harmonization" across EC nations of essential standards for prudential supervision of financial institutions; (2) "Mutual recognition" by the supervisory authorities of financial institutions in each member state of the way in which they apply those standards; and (3) "Home country control and supervision" by the member state in which the financial institution is based.[4]

These changes have brought about major alterations in the framework for banking in the EC. The first principle, harmonization, lead to the creation of directives designed to create uniform safety and soundness standards and a comparable competitive environment across the EC member states. Under this principle, banks operating in more than one EC member state face only a set of uniform EC standards and capital requirements, not a dozen different regulatory systems and capital standards.

The mutual recognition of a single banking "license" or "passport" eliminates the need for EC banks to get a local banking charter from the host country for branches and/or bank products that are permitted by their home country

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3. Commission of the European Communities (March 29, 1994) p. 5. Infringement proceedings are the first step if a member state fails to comply. More serious failures may be referred to the Court of Justice for a decision, although this is not very common. Both infringement proceedings and referrals to the Court of Justice typically are resolved in a settlement between the EC and the member state. Failure to implement EC directives into national law, even after a Court of Justice judgement against a member state, would lead the Commission to start a new infringement action against the member state. This process allows a member state to lag in the adoption of a directive that it finds particularly onerous.

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4. Commission of the European Communities (February 1988) and American Bankers Association (1990) p. 18 or Fitchew (1990) p. 9.

bank regulations.[5] Moreover, the directive defined a list of banking services that may be provided throughout the EC, provided that they also are authorized by a bank's home country. This list thus sets the standard for banking services across the EC.

Home country rule requires the regulators to give up the primary regulatory responsibility for foreign-owned banking institutions operating within their borders and turn it over to the institution's *home* country regulators. Thus, since January 1, 1993, the primary regulatory responsibilities for the entire banking firm have been shifted to its *home* country regulators, even when a bank operates or enters the retail banking business in another member state.

As an example, these reforms mean that a Dutch-owned bank or banking subsidiary operating in Belgium would be regulated by its "home" or Dutch regulatory authorities, rather than by the "host" or Belgium regulators. Its list of authorized EC banking activities would be determined by its Dutch or "home" country powers, not by the list of banking activities for "host" Belgium.

Between 1986 and 1992 eight additional banking directives were passed by the EC. They are described in Box 1. They deal with an array of safety and soundness issues, accounting standards, solvency and exposure issues, and have the net effect of increasing the EC's regulation of banks in those areas. The directives require that banks be examined annually for risk management and risk exposure and that the review take place at the fully consolidated banking institution level. Other directives set minimum capital and solvency standards, both for on- and off-balance sheet assets. Others limit an institution's exposure to borrowers and set standards for reporting financial and accounting data. It is critical for the successful integration of the single banking market that these directives, along with the key First and Second Banking Directives, be adopted by the member states.

Defining Banking Services

As noted earlier, the Second Banking Directive also sets forth a broadly defined list of appropriate banking activities or powers for EC banks. Individual member states may have their own definitions of banking activity that may be more or less restrictive than the EC. Individual EC member states typically have permitted banks to offer a much wider array of financial products than are permitted for U.S. banks, especially in the securities and insurance powers.

The EC list of appropriate services includes both traditional banking activities as well as some new ones (e.g., trading in securities). The list of permitted "banking activities" within the EC was included in the Annex to the Second Directive and is presented in Box 2 below. Most of these activities may be conducted within the bank, or through bank subsidiaries, rather than through a bank holding company as is typical in the U.S. banking industry (Table A1). Finally, the EC also allows banks to hold partial ownership interests in industrial firms and for industrial firms to own banks, as is shown in Table A2.

Integration Incentive

Because the Second Banking Directive embraced the principle of home country regulation for member states that already allowed universal banking, it effectively created an incentive to open up the regulatory process in member states with restrictive banking legislation. The liberal EC standards—compared to the U.S.—combined with the single banking license and home country regulation, give member states with more restrictive banking laws an incentive to loosen those restrictions. Otherwise their domestic banks would face a more restricted set of activities, even in their home country, than would a foreign bank operating there (*Financial Times,* 1991). This incentive also appears to be compatible with the deregulatory forces created by technology and innovation in the financial system.

Banking integration also is made more complicated because the EC banking industry varies widely across member states and within member states as well. As is shown in Table 1, the industry varies widely in terms of the number of banks, branches and the relative size of the industry across countries. When the single market was created at the beginning of 1993, the EC had far fewer banks than the U.S., under 2,500 compared to over 11,700. The United Kingdom, with 511 banks had the largest banking industry as measured by assets, while Greece with only 40 banks, had the smallest volume of assets. Average bank size ranged from a high of $3.4 billion in the Netherlands to a low of $863 million in Denmark, which is still well above the $300 million average for U.S. banks.

Bank structure also varies considerably across member states, although two to five key banks tend to dominate the industry in most countries (*Financial Times,* 1991). The mix of industry orientation between retail and wholesale also varies, complicating cross-border comparisons of size, productivity and profitability (Hawawini and Rajendra (1989) pp. 10–28).

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5. Although it has since been superceded by the Uruguay Round Agreement on Financial Services, the EC had adopted a "national reciprocal treatment" standard that allowed non-EC banks to operate throughout the EC as long as the EC banks in the foreign market were treated the same as domestic banks. This was less stringent than "mirror treatment," that would have required EC banks to have had the same powers in a foreign market that a foreign bank would have had in the EC.

Box 1

ADDITIONAL BANKING DIRECTIVES

- **Directive on Supervision of Credit Institutions on a Consolidated Basis** (1992)
  Requires that supervision of a credit institution, including the review of financial statements, risk exposure and management, take place annually on a consolidated basis.

- **Own Funds of Credit Institutions Directives** (1989 and 1991)
  Define common rules on core capital and supplementary capital for all credit institutions in the EC. Require those rules to be compatible with capital standards set by the Basle Committee and the Group of Ten.

- **Solvency Ratio Directive** (1989)
  Designed to harmonize prudential supervision and to strengthen solvency standards among Community credit institutions. It sets risk weights on various types of on- and off-balance sheet assets that are used in estimating solvency ratios.

- **Directive on Money Laundering** (1991)
  Designed to safeguard the EC financial markets by eliminating activities associated with illegal money laundering.

- **Directive on the Monitoring and Controlling of Large Exposures of Credit Institutions** (1992)
  Sets limitations on credit institution exposure by category of borrowers.

- **Directive on the Publication of Annual Accounting Documents** (1989)
  No longer requires branches to publish separate annual reports as long as the parent organization publishes these annual documents.

- **Directive on the Annual Accounts and Consolidated Accounts of Banks and Other Financial Institutions** (1986)
  Sets the requirements for banks and other financial institutions reporting balance sheet and profit and loss statements, special provisions, and valuation rules. It also sets consolidation and publication requirements.

Box 2

BANKING ACTIVITIES PERMITTED WITHIN THE EC

- Deposit taking and other forms of borrowing

- Lending (including consumer credit, mortgage lending, factoring, invoice discounting, and trade finance)

- Financial leasing

- Money transmission services

- Payments services (including credit cards, electronic funds transfer, point of sale, travelers checks and bank drafts)

- Providing guarantees and commitments

- Trading on their own account or for customers in money market instruments, foreign exchange, financial futures and options, exchange and interest rate instruments and securities

- Participating in share issues and the provision of services related to such issues (for shares, bonds and other securities) including corporate advice, and arranging mergers and acquisitions

- Money brokering

- Portfolio management and advice

- Safekeeping of securities

- Offering credit reference services

- Safe custody services

FROM: Commission of the European Communities, "Second Council Directive," Brussels, 16 Feb 1988, see Annex.

TABLE 1

Comparison of EC Commercial Banks
(Ranked by commercial bank assets, Dec. 31, 1992)

EC Member States	Number of Banks	Branch Offices	Staff	Assets (US$,Bil)	Population (Mil)
United Kingdom	511	13,100	397,400	1,454	57.8
France	419	10,366	200,400	930	57.4
Italy	319	18,635	327,192	683	56.9
Germany	334	7,542	221,700	632	80.6
Netherlands	109	4,734	115,563	372	15.2
Spain	159	17,288	152,025	317	39.1
Luxembourg	213	310	17,592	297	0.4
Belgium	93	3,515	49,574	270	10.4
Denmark	119	2,467	47,560	103	5.2
Portugal	35	2,852	60,772	80	9.9
Ireland	43	918	20,731	46	3.5
Greece	40	1,233	40,188	40	10.3
Total, EC–12	2,394	82,960	1,650,697	5,224	346.2
Sweden	15	2,564	40,381	141	8.7
Austria	57	723	18,411	84	7.9
Finland	14	902	24,021	68	5.0
Total, EC–15	2,480	87,149	1,733,447	5,516	367.8

U.S. Banking Industry Compared to the EC

U.S. Banks	11,719	53,858	1,477,619	3,506	255.5
US as % of EC	472.5%	61.8%	85.2%	63.6%	69.5%

Sources: Banking Federation of the European Community (1993) pp. 88–89; *OECD* (1994) pp.6–7; .FDIC (1992), p.5; Board of Governors, *Annual Statistical Digest,* (1992), pp.150–151; and Council of Economic Advisors (1995), p. 307.

II. Benefits and Costs of a Single Market

Proponents of unified EC markets long have maintained that the pre-EC 1992 banking system was less than ideal. In most national markets the industry was highly concentrated and regulated, and in some cases those regulations tended to create barriers that limited competition (Price Waterhouse, 1994). Hence, analysts like Vives (1991) contended that, "the main effect of integration will be to change the

focus from collusion and regulatory capture to competition" (p.10). Eliminating regulatory barriers associated with cross-border expansion into retail banking markets was a special concern of single market proponents.

Barriers

Barriers to trade in the financial services area may take many forms. Exchange controls have been a traditional favorite for limiting international capital flows and were still in effect in Greece and Portugal during the 1980s. Spain, Greece, and Portugal have phased out restrictions on foreign direct investment that could prohibit acquisitions of foreign banks. Regulations prohibiting cross-border solicitation of deposits or securities activities also limit cross-border competition and create barriers to entry, as did restrictions on banking powers, deposit and loan interest rate ceilings, restrictive product standards and different tax structures. The EC hoped to remove these types of barriers, along with "red tape" and nation-by-nation capital requirements and regulatory structures.

As the traditional barriers are removed, the EC also has to monitor the use of "technical standards," standards that also may insulate national banking markets from foreign bank competition. These include such areas as consumer protection laws, ATM network standards and access polices, company policies and merger and acquisition policies.

Price Differentials

The existence of barriers is consistent with discrepancies in cross-border banking service prices prior to the single banking market. The EC tried to verify and measure the potential price differential for financial services in a March 1988 study for the Commission of the European Communities. The study, reported in *European Economy,* indicated that the barriers were responsible for sizeable price differentials for similar banking services across EC countries.[6]

The Price Waterhouse Study, as it is known, estimated the country-by-country price differentials based on the percentage differences in prices of standard financial service

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6. There may be a number of explanations for the pre-1993 price differentials. They may have been made possible by barriers to entry like different national requirements for a banking license, different regulatory standards, limited banking powers and varied product standards, or the differences may have at least partially arisen from different cost structures. Clearly, to the extent that barriers existed, they would have increased the cost of entry across national boundaries within the EC. With potential competition limited by these barriers, banking firms in some national markets would be shielded from vigorous competition for retail banking services.

products for each country compared with the average price for the four lowest-priced countries. Use of the average price for the four lowest-priced countries as a competitive benchmark may eliminate some distortions if "standard" services vary somewhat across borders.[7]

The Price Waterhouse benchmark may be a less-than-ideal measure of competitive prices since it is not measuring strictly comparable services. Moreover, as was shown by Neuberger and Zimmerman (1990), even when comparing similar deposit services across states in the U.S., holding service differences and cost factors constant, it is still not possible to explain a large share of the price differentials for some services.[8]

Despite these shortcomings, the study has become the benchmark for estimating potential price changes and benefits arising from the integration of the EC's banking markets. In the following paragraphs, the Price Waterhouse study provides the basis for estimating price differentials across countries, for projecting changes in interest rates and for measuring any macroeconomic impacts arising from the integration of the EC banking market.

Cecchini, et al. (1988) and Klausner and Schwartz (1989) relied on the study to illustrate the large pre-single market differences in cross-border prices for a single banking product. Both highlighted a country-by-country comparison of consumer credit prices showing that France, Germany and the UK reported prices for the same services that were more than double the average price for the four countries with the lowest prices.

Price Waterhouse estimated the price differentials for seven retail banking services: consumer credit, credit cards, mortgages, letters of credit, foreign exchange drafts, travelers checks and commercial loans. These single product prices were then used to generate the service-by-service and country-by-country price reductions for the basket of banking services (Klausner and Schwartz (1989) p. 5). The potential price changes for the basket of banking services, as well as for securities and insurance services, are shown in Table 2.

Of course, these large price differentials are symptomatic of what Vives (1991) has described as markets having, "...a lack of vigorous competition" (p. 10). Elimination of cross-border barriers through creation of the single banking market was expected to reduce those differentials.

Lower Prices

The Price Waterhouse study estimated an EC-wide reduction of 21 percent in banking prices following adoption of the single market.[9] However, like the banking industries across the member states, the estimated price reductions for banking services varied dramatically across countries. The Netherlands, where the study estimated a theoretical reduction of 10 percent in the price level of the basket of banking services after implementation, and Spain, where a 34 percent reduction was calculated, represent the extremes of the changes shown in Table 2. The study projected that countries like Spain and Germany could experience price reductions of 33 percent or more for banking services as a result of the integration of the EC's banking market.

The significance of such large price reductions for the "basket of banking services" also could be expected to have a sizeable impact on bank profitability in the EC and perhaps on the speed of member state adoption of the banking directives. A 1993 survey by Gemini Consulting for the European Financial Management and Marketing Association (EFMA) suggests that European bankers are expecting deregulation and the single market to have a significant impact on their profitability as measured by return on equity (ROE) over the next decade. This survey of bankers suggests that ROE will average 10 percent in 2005, far below the 12 to 25 percent reported (1989–1991) for the top ten banks in five EC member states. The lower expected profitability is a result that is consistent with the large reductions in banking service prices estimated by Price Waterhouse (EFMA (1993) pp. 6–7).

Lower Rates for Borrowers

The study also was used to generate estimates of the impact of integration on several types of loan products. Based on the Price Waterhouse results, Cecchini (1988) reported that liberalization of financial services would lower the price of credit for borrowers. Although noting that the estimates were subject to considerable uncertainty the Cecchini report concluded that consumers were expected to benefit from lower interest rates on credit for consumer purchases (about 2 percentage points) and mortgage costs

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7. This benchmark also allows for estimates of both increases in prices for "low" price countries and decreases in prices for "high" price countries; a result that is not intuitive with increased competition. These estimates are presented in Table 2.

8. See Neuberger and Zimmerman (1990) for a discussion of the difficulties of measuring and explaining interstate interest-rate differentials while holding deposit service quality measures constant within a relatively uniform banking market like the United States. A sizeable portion of the interest differentials between California and the U.S on transaction-oriented accounts could not be explained, hence the existence of the "California Rate Mystery." The Price Waterhouse study tried to find comparable services and then estimate the differentials across eight countries, a much more difficult task.

9. Commission of the European Communities (1988b) reports the results of the Price Waterhouse study.

TABLE 2

Estimates of Potential Changes in Financial Product Prices
as a Result of Completing the Internal Market
(For eight EC member states—changes in percent)

	Belgium	France	Germany	Italy	Luxembourg	Netherlands	Spain	UK
Banking Services:								
Consumer Credit	41	–105	–136	na	26	–31	–39	–121
Credit Cards	–79	30	–60	–89	12	–43	–26	–16
Mortgages	–31	–78	–57	4	na	6	–118	20
Letters of Credit	–22	7	10	–9	–27	–17	–59	–8
Foreign Exchange Drafts	–6	–56	–31	–23	–33	46	–196	–16
Travelers Checks	–35	–39	7	–22	7	–33	–30	7
Commercial Loans	5	7	–6	–9	–6	–43	–19	–46
Theoretical Potential Price Changes (%) by Type of Financial Service								
Banking	–15	–25	–33	–18	–16	–10	–34	–18
Insurance	–31	–24	–10	–51	–37	–1	–32	–4
Securities	–52	–23	–11	–33	–9	–18	–44	–12
Total	–23	–24	–25	–29	–17	–9	–34	–13

Source: Price Waterhouse Study, reported in *European Economy,* "The Economics of 1992," Commission of the European Communities, Brussels, Number 35, March 1988.

(about 0.3 percentage points). Businesses also would benefit from a reduction in the rate of interest on long-term credit (about 0.5 percentage points).

Macroeconomic Benefits

The EC also tried to evaluate the macroeconomic effects to the EC of the single market for financial services, including banking. Integration was expected to reduce cost differentials between domestic and foreign banks operating within the EC market, although it would not necessarily eliminate them. Some cost differentials arising from different languages, customs and local business practices likely would remain. Still, EC studies suggest that the integration of the EC financial markets would have a positive impact on the EC economy and financial services in the long run. For example, Cecchini (1988) reported combined estimated savings from three areas, banking and credit, insurance and brokerage and securities, in eight EC countries included in the study. Combined macroeconomic benefits were estimated to be on "…an order of magnitude of ECU 22 billion [about $18.6 billion, or] 0.7 percent of

[EC] GDP."[10] Of course, even relatively small benefits on an annual basis may be significant within the context of the EC, given the size of the EC financial services market and the importance of the EC's financial sector (Commission of the European Communities (1988b) p. 92 and Hunter (1991) p. 17).

Winners and Losers

While the EC evidence pointed to a positive overall benefit from EC 1992, not all of the EC's 2,500 banking institutions may be beneficiaries. Table 1 provides a snapshot of the European banking system when the single market was created on January 1, 1993. As noted by Klausner and Schwartz (1989), Hunter (1991) and Vives (1991) vigorous competition in the single market likely will allow banks with technical expertise and efficient operations and mar-

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10. See Annex B, page 193, of Commission of the European Communities (1988b) for a discussion of the methods used to estimate these "macroeconomic" benefits.

keting to take advantage of "deregulation."[11] More competitive markets will favor more competitive firms, while other firms may find that increased competition in overbanked or protected national markets reduces prices and profits (Klausner and Schwartz (1989) pp. 5–6).

Across countries, the impact of integration then may be influenced by the history of the existence of competitive restrictions facing the industry. Newer member states like Spain, Portugal and Greece, for example, generally have liberalized their capital markets more recently than countries like Belgium, Denmark, Germany, Luxembourg, the Netherlands and the United Kingdom. France, Ireland and Italy also have a history of competitive restrictions in the capital markets and financial services areas (Eizenga and Pfisterer (1987) pp. 338–341).

Within countries, actions and opportunities may depend on a bank's size and situation and ability to diversify. In Germany for example, Deutsche Bank, that country's largest bank, has already taken actions to expand its banking and financial services and to broaden its competitive position in the EC. Other large EC financial institutions also have expanded their activities to coincide with the move to a single market. In contrast, the potential price reductions estimated by the Price Waterhouse study suggest that many small German banks may find that their competitive positions deteriorate as barriers to entry into the German retail banking market are removed and new entry occurs. This is not unlike the occasional splits in the U.S. banking industry, when large and small banks may face differing prospects as a result of a policy change.

With respect to the type of banking firms that likely will prosper in the integrated banking market, the European Financial Management and Marketing Association (EFMA)'s "European Banking: A View to 2005" suggests several types that European bankers believe are likely to successfully adapt to the single market. Their list of "winners" (with the percent of banks providing this response) includes European banks (70%), large banks (68%) and specialist banks (55%). Regional banks and insurance companies were expected to be the major losers. Furthermore, 68% of the bankers surveyed believed that by 2005 the European re-

tail banking market would be dominated by about fifteen to twenty major retail banks, a forecast that would foreshadow a major consolidation in retail banking in the EC nations.[12]

Getting Ready

With the 1989 passage of the Second Banking Directive for implementation on January 1, 1993, EC banks had several years to prepare and position themselves for the single banking market. During that period a number of major EC banks had been involved in mergers and acquisitions, some increasing their presence in other EC nations, some adding insurance or securities firms to their product lines. Other EC banks, some faced with the high cost of new entry, have entered into cross-border "alliances" with banks in other countries as a way to improve their competitive prospects. These alliances typically involved cross-border participation agreements that allowed the participants to cooperatively provide services over a broader market area than would be possible individually.[13] The established universal banks of the EC played a prominent role in this jockeying for competitive position prior to implementation of the single market in 1993.[14,15]

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11. Klausner and Schwartz, page 6, point out that there will be both winners and losers as a result of EC 1992. Some banks that had been "protected" may find that they experience serious margin pressure from more efficient competitors and they will find that their share values will erode along with their protection. Vives (1991) also notes that the benefits may be "overstated" because the single banking market will not become "perfectly competitive." Language and cultural barriers will remain, and depositors face costs of "switching" from bank to bank as well.

12. EFMA (1993). This survey of bank executives from fifteen European countries was conducted by Gemini Consulting for the EFMA.

13. The Bray (1993) article describes several types of alliances, such as Societe Generale's bilateral cooperative agreements with banks in several markets, or agreements where banks share office space and refer business to each other and share in the proceeds from that business. BNP (France) and Dresdener Bank (Germany), Commerzbank (Germany) and Central Hispano (Spain), Banco Popular Español (Spain) and Rabobank (the Netherlands), Bayersiche Hypotheken- und Wechselbank (Germany) and Banco Commercial Portugues (Portugal) have entered into cross-border agreements. Banks from Spain, the U.K., Portugal and France are establishing a joint real-time, cross-border payments system.

14. Deutsche Bank, Germany's largest bank, France's largest bank, major UK banks, and Dutch and Belgium banks have expanded their financial services activities during this period. Since 1990 banking leaders like Deutsche Bank acquired Gerling Konzern, an insurance firm, Crédit Lyonnais acquired BFG Bank, while Cassa di Risparmio purchased large interests in Banco di Roma and Banco di Santo Spirito. See *European Economy,* "Evolution of Mergers in the Community," number 57, 1994.

15. Over the 1991–1992 period, EC documents indicate that cross-border mergers accounted for almost half of the total mergers, and a number of these mergers involved financial institutions. The report noted the following significant patterns in banking and finance mergers: Belgian and French institutions were likely purchasers, Spanish institutions were likely sellers, and Irish institutions were active both as purchasers and sellers.

While there were a number of well publicized mergers, acquisitions and strategic alliances that took place in anticipation of the enactment of the single market, the severity of the European recession between 1991 and 1993 hurt many EC financial institutions and therefore likely slowed the pace of consolidation. During this period, many banks also were constrained by more stringent capital and risk-based capital standards that limited their ability to expand.

Now that we have examined some of the actions taken by the banking industry in Europe in anticipation of the single market, let us move to the crucial actions taken by the member states to implement the single market reforms.

III. IMPLEMENTATION PROCESS

Banking is only a small part of the single market, and it may not be the driving force behind the move toward EC integration. Thus, the actions of the member states with respect to the impact on their domestic banking industry also may play a role in the implementation process and the speed of integration. Given the infringement process, member states that expect to experience large adjustments to a particular industry, like banking, may drag their feet on the implementation of the banking directives.

The Price Waterhouse results identify which of the member states (in this case, Germany and Spain, and perhaps France) might be expected to experience especially large adjustments that could make them strong candidates for a more "relaxed" pace of adoption. In the remainder of this paper, the pattern of adoption of EC banking directives is analyzed.

The speed and extent of implementation of the ten banking directives by the member states can be used as a way of measuring the success of the integration of the EC banking industry.

Single Market Implementation

By early 1993 most of the EC (directives and regulations) legislation necessary for the creation of the single market had been passed by the European Council. The Commission of the European Communities 1993 report, *The Community Internal Market,* noted that by the end of 1993, 265 of the 282 White Paper measures had been adopted by the European Council. This represents a 95 percent passage rate for the single market directives. The next stage is more difficult.

Progress has been somewhat slower at the national level, where each of the member states, including the three new members, must take actions to adopt the EC directives necessary to implement the single market. Of the White Pa-

per measures that have taken effect, 222 required adoption or implementation by the member states. Implementation rates vary, both across countries, markets, and products. The progress in implementing the entire single market is often evaluated using the percentage of EC directives transposed into legislation by the member states.[16]

EC documents point out that at year-end 1993, only about half of all the single market measures (including banking) had been enacted in all twelve member states (Austria, Finland and Sweden did not become members until January 1, 1995 and are not evaluated in the measures that follow). Still, about three-quarters of the measures had been enacted in at least ten of the twelve member states. At year-end 1993, Denmark and the United Kingdom, two countries that at times have been less than enthusiastic about the EC, were the leaders in converting EC directives into national legislation. Both had implemented over 90 percent of the measures. At the other end of the scale, Greece, France, Spain and Ireland had adopted less than 83 percent of the necessary measures. Based on these adoption rates, by 1993 the EC was making significant progress in its goal of creating a single market.

The Single Market for Banking

In the financial services sector, the adoption rate has been relatively fast with respect to laws designed to free the movement of capital and for the adoption of a single market for some types of financial services. The 1993 Commission Report notes that the implementation of the banking-related single-market measures has been good (Commission of the European Communities (1994c) p. 7).

At year-end 1993, the twelve member states were evaluated on the implementation of ten key banking directives.[17] Of the 120 possible implementations (ten measures times twelve member states), in 98 cases (about 82 percent) the banking directives were properly transposed into national statutes. As shown in Table 3, by April of 1994, the number transposed rose to 107, a transposition rate of 89 percent. Still, in 13 cases, or 11 percent, the countries had not implemented the measures, in some cases several years after the deadline. The European Commission has begun "infringement proceedings" in the cases where member states have failed to transpose the directives into law

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16. The EC and others commonly use these measures to evaluate the progress of the single market, both by sectors and overall. See *The Economist* (1993) p. 72.

17. The Deposit-Guarantee Directive was not implemented until 1994 and member states are now in the process of transposing the legislation, so it is not included in the measured adoption rate used here.

TABLE 3

SUMMARY OF THE IMPLEMENTATION OF BANKING DIRECTIVES

EU MEMBER STATES:	B	DK	D	GR	E	F	IRL	I	L	NL	P	UK		
DIRECTIVE: IMPLEMENTATION:														
First Banking Directive														
Dir. 77/780 12–16–79	I	I	I	I	I	I	I	I	I	I	I	I	12 of 12	100%
Second Banking Directive														
Dir. 89/646 1–1–93	I	I	I	I	IR	I	I	I	I	I	I	I	11 of 12	92%
CONDITIONS AND PRUDENTIAL RULES														
Own Funds														
Dir. 89/299 1–1–91	I	I	I	I	I	I	I	I	I	I	I	I	12 of 12	100%
Dir. 91/633 1–1–93	I	I	I	I	I	I	I	I	I	I	I	NN	12 of 12	100%
Solvency Ratio														
Dir. 89/647 1–1–91	I	I	I	I	I	I	I	I	I	I	I	I	12 of 12	100%
Derogations –Year			D–96	D–96	D–00									
Consolidated Supervision														
Dir. 92/30 1–1–93	I	I	IR	IR	I	I	I	I	I	I	I	I	10 of 12	83%
SUPERVISION AND ACCOUNTS														
Annual and Consolidated Accounts														
Dir. 86/635 12–31–90	I	I	I	IR	I	I	I	I	I	I	I	I	11 of 12	92%
Publication of Annual Account Documents														
Dir. 89/117 1–1–91	I	I	I	IR	I	I	I	I	I	I	I	I	11 of 12	92%
Prevention of Money Laundering														
Dir. 91/308 12–31–92	I	I	IR	IR	I	I	IR	I	I	I	I	IR	8 of 12	67%
Controlling Large Exposures														
Dir. 92/121 1–1–94	IR	I	IR	I	IR	I	I	I	I	I	IR	I	8 of 12	67%
Number Adopted (of 10)	9	10	7	6	8	10	9	10	10	10	9	9	107 of 120	
Adoption Rate (%)	90	100	70	60	80	100	90	100	100	100	90	90		89%

LEGEND: I=Implemented, IR=Infringement, NN=No Measure Necessary, NI=Not Implemented, D=Postponed. April 30, 1994.

within the allotted time span (Commission of the European Communities (1994c) pp. 137–139).

Across Countries

The progress in adopting the EC banking standards since 1991 has varied significantly across countries as can be seen from Table 4. By April of 1994, five of the twelve member states had adopted all of the banking directives. Those states included Denmark, France, Italy, Luxembourg and the Netherlands. Belgium, Ireland, Portugal and the United Kingdom had adopted all except one. As of April 1994 Ireland and the UK had not yet implemented the Directive on Money Laundering, while both Belgium and Portugal still needed to transpose the Directive on Large Exposures.

At the other end of the spectrum, as of April 1994, Spain had yet to implement the key Second Directive and the Large Exposures Directive. Germany had yet to implement three directives, Large Exposures, Money Laundering, and the critical Consolidated Supervision Directive, while Greece needed to implement four directives, including Consolidated Supervision (Commission of the European Communities (1994c) pp. 137–139).

TABLE 4

Percent of Key Banking Directives
Implemented, By Country

	1991	1992	1993	1994
Country:				
Belgium	60%	100%	90%	90%
Germany	40%	50%	70%	70%
Denmark	80%	88%	90%	100%
Spain	60%	63%	70%	80%
France	100%	88%	80%	100%
United Kingdom	60%	50%	90%	90%
Greece	20%	50%	60%	60%
Italy	40%	100%	90%	100%
Ireland	60%	88%	80%	90%
Luxembourg	20%	63%	90%	100%
The Netherlands	60%	63%	80%	100%
Portugal	100%	88%	90%	90%
EU TOTAL	58%	74%	82%	89%
Directives:				
Total Implemented	35	71	98	107
Total	60	96	120	120

In cases where member states have not yet implemented directives, there often were actions in progress to do so. In 1994 Germany was evaluating proposals on the Directives on Consolidated Supervision, Large Credit Exposure, and Money Laundering. In Greece, the Directive on Consolidated Supervision was scheduled for implementation later in 1994. And the United Kingdom was in the process of adopting EC-based money laundering legislation in 1994.[18]

The pace of adoption across countries appears to be negatively correlated with the expected reduction in prices in the banking sector reported in the Price Waterhouse study.

Of the eight countries where post-single-market price reductions were estimated, the six showing price reductions in the range of 10 to 25 percent had adopted either all, or all but one banking directive by April 1994. In contrast, the two member states, Spain and Germany, where prices were estimated to fall the most (34 and 33 percent, respectively), have been much slower to implement the directives.

Moreover, since 1992, three countries, Germany, Spain, and Greece, have lagged well behind the other member states in implementing the banking directives, as can be seen from Table 5. The banking industries in all three nations likely face relatively large adjustments to the single market.

Price differentials were not estimated for Greece, a newer EC member, however, its banking industry has had protection from competition through capital controls and other barriers. Although those barriers are now being removed, the Greek banking industry also remains relatively highly concentrated, both factors that are consistent with a slow adoption pace (*Financial Times* (1991) pp. 152–156, and Hawawini and Rajendra (1989) p. 20).

Performance by Directive

The community-wide adoption rate for the banking directives is similar to that for the securities directives. And, both are much higher than that experienced for the combined insurance directives (Third Insurance Directives for Life, Nonlife and Motor Vehicles).[19]

Four of the ten banking directives have been adopted by all twelve member states, as can be seen from Table 3. These include the First Banking Directive, and the two Own Funds Directives and the Solvency Directive, which deal with bank capitalization. Three other directives have been adopted by eleven of the twelve member states; they include the critical Second Banking Directive and the two accounting standards directives, the Directives on Consolidated Accounts and Publication of Account Data. Spain's failure to adopt the Second Banking Directive is the most serious setback to the completion of the single banking market.

18. The efforts to revise legislation and regulatory requirements to meet the EC standards has not been limited to the member states alone. Even before their entry into the EC in 1995, EFTA (European Free Trade Association) members had begun to conform their banking legislation to EC standards. Austria, in anticipation of EC membership adopted most of the key directives during 1994. Finland has taken similar steps, and Sweden is planning to do so in 1995. See Institute for International Bankers (1994).

19. Only three member states have adopted the life and nonlife directives. Moreover, a number of significant tax and premium treatment issues appear likely to continue to slow the creation of the single market for insurance. As of April 1994, nine member states had adopted the directive on motor vehicle insurance that was targeted for adoption by December 31, 1992. By December 31, 1993 both the third life and nonlife directives should have been implemented; however, by April 1994 only one member state had adopted the key third life assurance directive and only two the third nonlife directive. In contrast, the six securities-related directives covered had been adopted by either 11 or 12 member states. See European Commission (1994a) pp. 36–65.

TABLE 5

TRANSPOSITION RATES FOR BANKING DIRECTIVES, 1992 TO 1994

| | —MEMBER STATES— | | | | |
	OTHER NINE	ALL TWELVE	SPAIN	GERMANY	GREECE
1992	81%	74%	63%	50%	50%
1993	87%	82%	70%	70%	60%
1994 (April)	96%	89%	80%	70%	60%

The slow adoption of the important Consolidated Supervision Directive, which is a key to the single banking market supervision by home country regulators, also is a key concern, especially since the largest member and community leader, Germany, is one of the two member states lagging in the adoption of this key part of the integration process. This is another area of concern for regulators, since home country supervision is a key to regulation of multi-state EC banking institutions.

IV. CONCLUSIONS AND OBSERVATIONS

Despite these shortcomings, the EC has come a long way toward creation of the framework for a single banking market in Europe. The critical directives have been implemented, or are in the process of adoption by almost all the member states, both overall and for the banking industry. The EC describes a "profound change in the nature of cross-border competition" as a positive impact of its efforts in the financial services area (Commission of European Communities (1994c) p. 18).

The retail banking services market has been opened to competition from banks in other member countries. The "single passport" and companion directives now make it possible for banks to provide retail banking services throughout the EC based on business, rather than regulatory, considerations. This was a fundamental goal of the single market.

Harmonized regulations are now in place authorizing banks to operate outside their home country with a wide array of financial service powers determined by the EC and their home country. Standards for capitalization, solvency, risk exposure, supervision, disclosure, and money laundering are all in place in most member states. Furthermore, almost 90 percent of the major banking directives have been implemented, and most of the remaining cases are likely to be resolved by EC and member state efforts already underway.

While cross-border activity has been slowed by the European recession, EC financial institutions actually began taking steps toward an expanded market once the EC approved the proposal for a single market, well before its January 1, 1993 implementation date.

One area of concern is the continuation of efforts to minimize barriers, like "technical standards," that limit cross-border banking competition. Some of these types of barriers may exist even after the passage and adoption of all the single market legislation at the member state level. To some extent that reflects the difficulty of standardizing and harmonizing over many nations; however it may also reflect the powerful incentives some industries and firms may have to continue to protect themselves from competition. EC efforts to eliminate such protection can be a time-consuming process, but they are an important next step.

The EC has plans for a study of the effectiveness of the single market reforms in 1996. The plan reflects the EC's concerns about the progress of the single market and its potential remaining barriers. The study also is a way for the EC to try to evaluate the progress it has made since the White Paper of 1985 and since the creation of the single market on January 1, 1993. Clearly, the study also should identify areas where the EC needs to take further action to speed up implementation by member states that are lagging behind and to reduce the residual barriers that may be limiting the extent of cross-border activity and competition.

Finally, in the post-1992 EC banking environment in Europe, cross-border activity and financial services consolidation are likely to accelerate. Larger, well capitalized, better diversified and/or more efficient banks are likely to be able to take advantage of market opportunities to increase their activities. Less efficient banks, especially those that had been shielded from cross-border competition by "national" protection, must adapt to the new situation. Whether or not the projection of fifteen to twenty large banks dominating the retail banking industry in Europe over the next decade is correct, the single market has the potential to make major changes in the financial services industry in the European Community. It should revitalize the European financial system and it should cause the U.S. to reconsider again the future competitive and regulatory environment of our own banking and financial services industries.

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APPENDIX

TABLE A1

PERMISSIBLE ACTIVITIES FOR BANKING ORGANIZATIONS

	—BY ACTIVITY—	
	SECURITIES	INSURANCE
COUNTRY:		
Austria	Permitted	Permitted through subsidiaries
Belgium	Permitted, some activities through subsidiaries	Permitted through subsidiaries
Denmark	Permitted	Permitted through subsidiaries
Finland	Permitted	Sales as an agent permitted
France	Permitted	Permitted, usually through subsidiaries
Germany	Permitted	Permitted, through insurance subsidiaries
Greece	Underwriting permitted by certain credit institutions; B&D permitted through subsidiaries	Permitted to hold shares in insurance companies subject to limitations based on capital
Ireland	Permitted, usually through subsidiaries	Permitted agency and certain life insurance activities through an independent subsidiary
Italy	Permitted, but not permitted to operate directly on Stock Exchange	Permitted, but limited by own funds and aggregate investment
Luxembourg	Permitted	Permitted through subsidiaries
Netherlands	Permitted	Permitted through subsidiaries
Portugal	Generally permitted, mutual funds only through a subsidiary	Permitted through subsidiaries
Spain	Permitted; banks may own up to 100% of stock exchange members	Permitted through subsidiaries
Sweden	Permitted	Permitted
United Kingdom	Permitted, usually through subsidiaries	Permitted through subsidiaries
AUTHORIZATION:		
Permitted:	15	15
By Subsidiaries:	5	11
With Limitations:	2	4

SOURCE: Institute of International Bankers, 1994

TABLE A2

PERMISSIBLE BANK OWNERSHIP

	BANK INVESTMENTS IN INDUSTRIAL FIRMS	INDUSTRIAL FIRM INVESTMENTS IN BANKS
COUNTRY:		
Austria	Permitted, with limits	Permited, with limitations
Belgium	Permitted, with limitations	Permitted, subject to prior approval
Denmark	Permitted, with restrictions, permanent control prohibited	Not prohibited, but rare
Finland	Permitted, with limitations	Permitted
France	Permitted, with regulatory approval if greater than 10%	Not prohibited
Germany	Permitted, with limitations	Permitted, subject to regulatory consent
Greece	Permitted, subject to the EU directive on qualified holdings	Permitted, subject to the EU directive on qualified holdings
Ireland	Permitted, subject to approval of Central Bank if greater than 10%	Permitted, subject to Central Bank prior approval if acquisition is of more than 10% of bank shares
Italy	Not permitted	Permitted up to 15% of shares of bank subject to Bank of Italy approval
Luxembourg	Strictly limited	Investment may not exceed 50% of banking capital
Netherlands	Permitted, subject to regulatory approval for voting shares greater than 10%	Permitted, subject to regulatory approval for voting shares greater than 5%
Portugal	Permitted, but subject to limitations on own funds and voting shares	Permitted, subject to regulatory approval for acquisition of large shares
Spain	Permitted, subject to capital-based limits	Permitted, subject to approval of the Bank of Spain if 5% or more
Sweden	Limited	Not prohibited, but such investments are rare
United Kingdom	Permitted, subject to consultations with the Bank of England	No prohibitions contained in The Banking Act of 1987
European Union	Each 10% or more shareholding may not exceed 15% of the bank's own funds and such shareholdings on an aggregate basis may not exceed 60% of own funds	No general restriction; does not allow investments of 10% or more if home country supervisor is not satisfied with the suitability of the shareholder.

SUMMARY ACROSS EC MEMBER STATES

Permitted:	14	11
With Limitations:	14	10
Not Prohibited:	0	4
Not Permitted:	1	0

SOURCE: Institute of International Bankers, 1994

Structure and Pricing of Large Bank Loans

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This paper examines the characteristics of large bank loans as a form of corporate finance. We compare the characteristics of a sample of these loans with private placements and public issues of debt. The unique features of large bank loans that may encourage firms to continue using this source of financing include: borrower flexibility in deciding on the timing and amount of borrowing; the use of fixed-spread floating rate of interest, flexibility of changing and renegotiating contract features, such as covenants, during the life of the contract.

The role that bank debt plays in the capital structure of corporations has received much attention in recent years.[1] Among the issues addressed in this research are the possible unique role of bank loans in financing firms' activities and how contract features may serve to reduce the adverse consequences of differential information between the borrower and the bank. This body of literature focuses on contract features as a means to reduce the costs associated with debt when the incentives of the borrower and lender differ (see for example Berlin, 1987). Most of the research on contract features is theoretical due to the lack of detailed data on the contract features of bank loans. The scarcity of information results from the fact that these are private debt contracts and hence are often not available to researchers. In this study we examine a sample of large bank loans to gain insights into the nature of the lending arrangements between banks and large corporations. By examining loan characteristics we can gain insight into the unique aspects of this source of corporate finance as compared to private placements of debt and public debt issues. This also permits us to provide an update of information on the pricing of business loans since that available in Brady (1985) and Boltz and Campbell (1978).

We begin with a comparison of the characteristics of bank loans in private placements and public debt issues. This includes a discussion of contract features and the use of commitments in bank lending. We next focus on pricing issues across the markets, with special emphasis on large bank loans. In the loan pricing discussion, we focus on the use of fixed-spread, floating-index contracts to determine the borrowing rate, and the use of a variety of fees in bank loans. This is followed by a discussion of covenants in our sample of bank loans compared to those reported in earlier studies for private placements and public debt. The final section summarizes the unique aspects of this source of corporate finance relative to other sources of debt finance.

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1. See for example Bhattacharya and Thakor (1993).

# I. A COMPARISON OF BANK LOANS WITH PRIVATE AND PUBLIC DEBT

A firm's choice between bank loans and securities has been a topic of much interest to academics and policymakers over the years. A basic theme of much of this research is that, for some firms, it is too costly for outsiders to stay informed about the developments of the firm that affect credit risk. In turn, they are unable to influence the firm to protect their interests as creditors. Banks arise as delegated monitors to keep a check on the behavior of managers.[2] This argument may be extended to suggest that the degree of information asymmetry associated with the borrower will influence the market in which a firm borrows.

Evidence consistent with the role of information in the choice of finance is provided by Carey, Prowse, Rea, and Udell (1993). They suggest that small firms are dependent almost entirely upon banks because their loans require extensive lender due diligence and monitoring associated with bank lending. They argue that large firms capable of issuing securities with few information problems are able to borrow in any of the major debt markets, from banks, or by issuing commercial paper. Their findings are consistent with the notion that as a firm becomes larger, their informational problems diminish, and they increasingly rely on more direct sources of corporate finance.

One piece of evidence they use to support this is the relative characteristics of business loans, private placements, and public debt issues. Bank loan data used in their study is from the Federal Reserve Board's *Quarterly Survey of Terms of Bank Lending to Business* for 1989. As expected, their results reveal that most bank loans are quite small compared to private placements and public debt issues. Figures 1 and 2 show the percent of private and public debt issues distributed by loan size and length to maturity, respectively. From the 1989 survey, the median loan size was about $50,000 and the mean was about $1 million. They note that approximately 82 percent were under $1 million and 96 percent were under $10 million. These bank loans are smaller than their sample of private placements, with a median size of $32 million and a mean size of $76 million. Additionally, Figure 1 shows that around 80 percent of the private placement issues in Carey, et al.'s study were between $10 million and $100 million in size. This compares to a median and mean size for public debt issues of $150 million and $181 million, respectively. Examining the characteristics of firms that borrow in each market in 1989, they find support for the creditworthiness of the borrower playing a role in their financing choice.

2. For a formal development of this argument, see Diamond (1984).

FIGURE 1

SIZE DISTRIBUTION OF PRIVATE AND PUBLIC DEBT ISSUES BY PERCENTAGE OF ISSUES, 1989
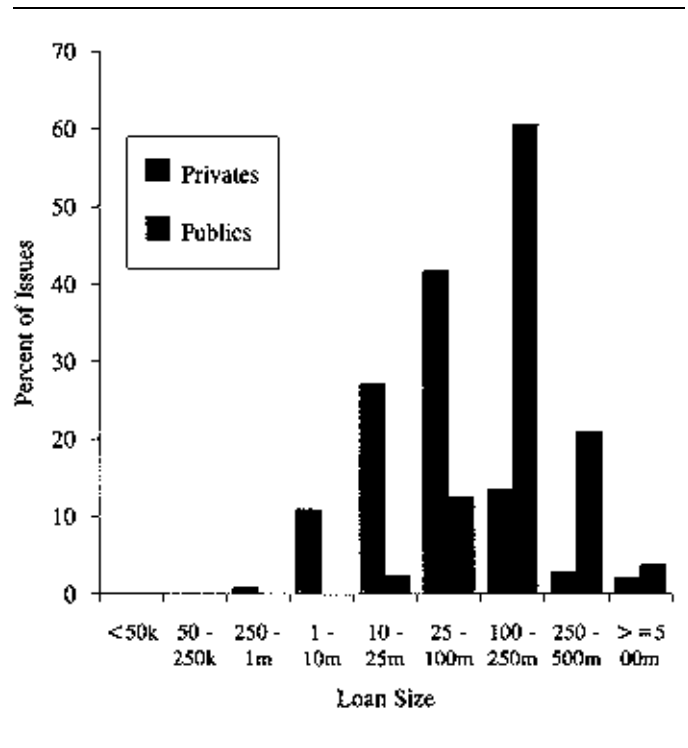
SOURCE: Carey, et al., 1993

The Carey, et al. study also provides comparisons of the maturity characteristics of these sources of business borrowing. They find that the average maturity of private placements is much longer than the average maturity of bank loans in their sample. Figure 2 shows that, of the private placements offered by nonfinancial corporations, 77 percent have maturities between three and fifteen years. The median and mean maturities were both nine years. They note that because most are amortizing, the median average life falls between five and seven years. The median for public bonds in their sample was ten years. The median maturity of bank loans to businesses, in 1989, was just over three months, and nearly 80 percent had maturities of less than one year. These findings confirm that average issue sizes and average maturities differ drastically between bank loans and both private placements and public debt issues. However, the data set they examine does not allow for a comparison of the characteristics of bank loans by large corporations having access to one or both of these nonbank sources of debt.

To focus on the issue of bank borrowing by large companies, we analyze a sample of large bank loans collected

by Loan Pricing Corporation, provided in their Dealscan database. Using the data provided for the year of 1989, we are able to gain insight into the structure of the loan market for large bank loans during the same time period as Carey, et al. (1993). The sample data is collected from loan contract information included in corporate filings with the Securities and Exchange Commission. This data is supplemented with information from publications such as *American Banker,* among others. Because of news coverage and filing requirements, the sample is biased toward large loans and large firms. To gain some insight into the types of firms in the sample data provided by Loan Pricing, we note the mean sales level of borrowing firms is approximately $1.1 billion. This average size of sample firms is expected to be much larger than that of an average firm that borrows from a bank since sample firms are required to file with the Securities and Exchange Commission. Typically, this involves only firms that have public debt or equity outstanding. Though this data is incomplete and thus may be upwardly biased, it allows a suggestive comparison with the sample firms examined in Carey, et al. (1993). They find that for the same year, firms with public debt out-

standing have sales of $3.2 billion and firms with privately placed debt have sales of $1.0 billion. Both were much larger than firms that relied on bank or equity only, at average sales of $40 million. Thus our sample firms appear to be much closer to the types of firms that issue privately placed debt than those that only use equity or bank debt.

Data on the size of loans in the sample suggest these may be substitutes for either the private placement or, in some cases, public sources of debt. In Figure 3, we provide summary statistics on the sample of large loans we examine. Several differences exist relative to those reported in Carey, et al. (1993). The most notable is that our sample is comprised of much larger loans than those included in the *Quarterly Survey of Terms of Bank Lending to Business.* The median loan size is $36 million as compared to $50 thousand for the *Survey.* The mean loan size is $184 million, with approximately 96 percent of the loans above $1 million in size. Moreover, around 73 percent of the bank loans in our sample are above $10 million in size. This suggests that in terms of size, a large fraction of sample loan contracts could compete with private placements. Additionally, based on percent of issues distributed by size between

FIGURE 2

MATURITY DISTRIBUTION OF PRIVATE AND PUBLIC
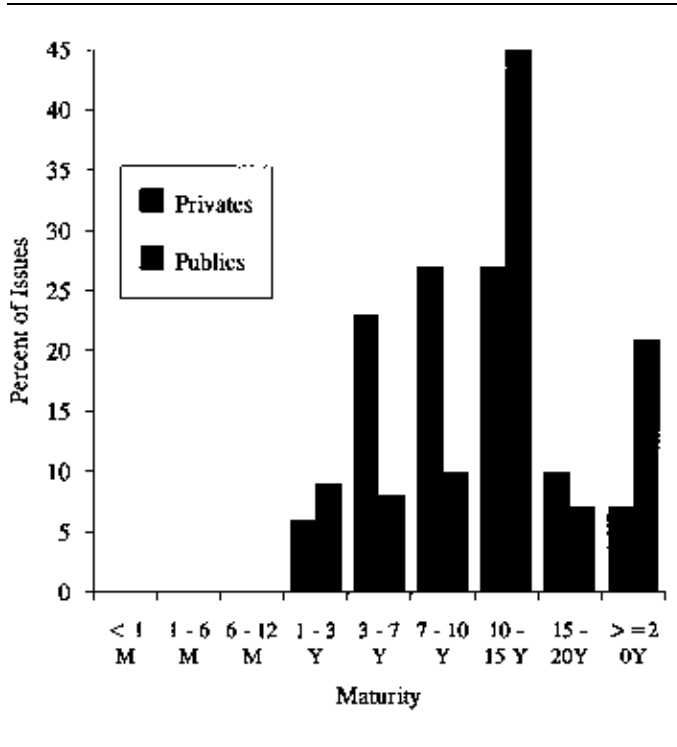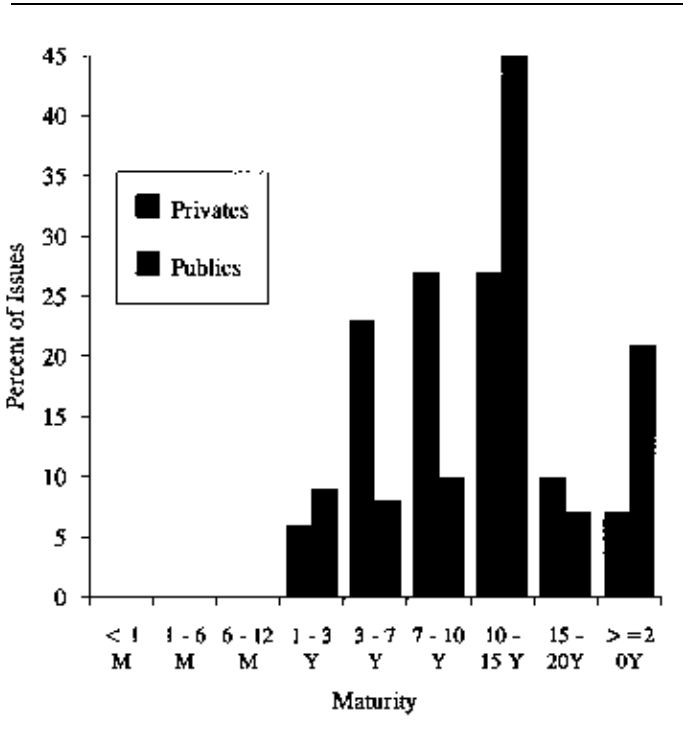DEBT ISSUES BY PERCENTAGE OF ISSUES, 1989

FIGURE 3

SIZE DISTRIBUTION OF LARGE BANK LOANS
IN OUR SAMPLE BY PERCENTAGE OF ISSUES, 1989

SOURCE: Carey, et al., 1993

private placements and public issues of debt, as reported in Carey, et al. (1993), many sample loans could be competing with public issues. For our sample, approximately 32 percent of the loans are above $100 million in size and would thus likely be of sufficient size to compete with public issues of debt.

The maturity of the loans in our sample vary widely (see Figure 4), but, on average, they are much longer than those reported in the Fed survey. With an average maturity of 44.86 months, these contracts are shorter than those reported for the private placement market and the public debt market for 1989. Compared to the private placement market studied by Carey, et al. (1993), the average maturity of loans is approximately 45 percent of the average for the private placements. The reported maturities for our sample may understate the true maturity since, for a substantial percentage of revolving credit agreements, the borrower is allowed to convert the outstanding balance of the commitment at maturity to a term loan typically payable over a three-to-five year period. An examination of the loan contracts that take the form of commitments to lend have an average maturity of 44 months. This permits the borrower to extend the

FIGURE 4

MATURITY DISTRIBUTION OF LARGE BANK LOANS IN OUR SAMPLE BY PERCENTAGE OF ISSUES, 1989

maturity to approximately seven years in the commitments with an option to convert to a term loan. Thus our sample includes lending arrangements that are longer, on average, than those reported in previous studies. This difference may reflect the fact that very short-term borrowing from banks may not be outstanding at the time the firm files with the Securities and Exchange Commission.

II. CONTRACT FEATURES IN LARGE BANK LOANS

Use of Loan Commitments

Avery and Berger (1990) report that over 70 percent of bank loans are created under commitments to lend. These may take different forms, the most common of which are revolving credit agreements. These arrangements are formal commitments which represent official promises to lend a customer up to a preset amount within a set time period at a predetermined loan rate. In our sample this is the most common type of lending arrangement. We also have loans defined as lines of credit. These contracts are frequently referred to as informal lending contracts in which the lending terms are not set. To be included in our sample, the loan must include the pricing terms. Thus our sample of lines of credit are formal agreements in which pricing and other contract features are negotiated at the beginning of the commitment. Under these lines and revolving credit agreements, the timing and amount borrowed are at the borrower's discretion. The loan rate usually involves a fixed markup over a reference rate such as the prime or LIBOR. Frequently these contracts are for multiple years and are revolving so that funds may be borrowed and repaid multiple times without contract renegotiation. Also the revolving commitments frequently call for the outstanding balance to be converted to a term loan payable over a fixed number of years.

The motivation for purchasing loan commitments is addressed in the May 1988 *Senior Loan Officer Opinion Survey on Bank Lending.* Those surveyed responded that their customers' motivations for borrowing under formal revolving commitments, as opposed to other lending arrangements, were most frequently related to convenience and loan arrangement costs. Additional reasons provided are related to ensuring their access to credit against deterioration in their creditworthiness and against a general credit crunch affecting their access to noncommitment loans. These results emphasize that the nature of a typical bank loan contract differs substantially from that of the private placement and public market alternatives.
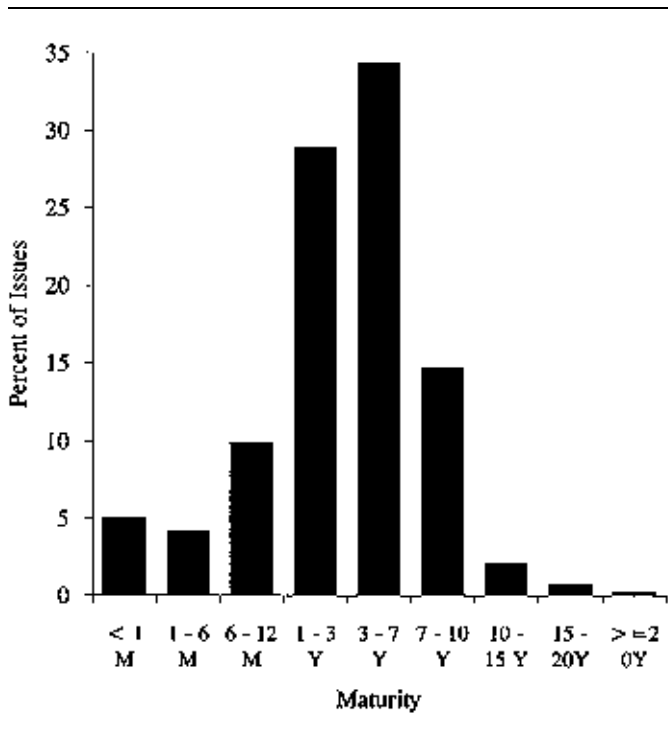
Primary use of funds

Since our sample of loans provide data on the purposes of the borrowing, we can gain insights into the primary reasons stated by the firm (in the loan contract) for the borrowing. In Table 1, we provide a list of the frequencies of the primary reason given for a loan. As indicated, a number of reasons exist for the borrowing. Five primary reasons were given for approximately 88 percent of sample loans. These include working capital, debt repayment or consolidation, general corporate purposes, takeover, or leveraged buyout. The most popular reason provided in our 1989 sample was for working capital purposes (approximately 23 percent of sample loans). These loans show that a strong amount of corporate restructuring occurred in industrial firms during 1989. Data on the use of funds for the private placements are not reported by Carey, et al. (1993) for comparison. Data provided in Eckbo (1986) suggest that the primary reasons listed for the issuance of public debt are to refund old debt, finance capital expenditures,

TABLE 1

NUMBER AND PROPORTION OF 1,347 SAMPLE LOANS DISTRIBUTED BY LOAN PURPOSE AND LOAN TYPE

	NUMBER	PROPORTION
PANEL A: BY LOAN PURPOSE		
Working Capital	305	0.227
Debt Repayment/Consolidation	243	0.181
General Corporate Purposes	235	0.175
Takeover Acquisition	218	0.162
Leveraged Buyout	185	0.137
Recapitalization	36	0.027
Security Purchase	29	0.022
Real Estate Loan	24	0.018
Other[a]	72	0.053
PANEL B: BY LOAN TYPE		
Revolving Credit	605	0.449
Term Loan	432	0.321
Other[b]	310	0.230

[a] Other loan purposes include general acquisition program, employee stock ownership plan, commercial paper backup, project finance, stock buyback, and trade credit.
[b] Other loan types include bridge loans, demand loans, letters of credit, notes, multi-option facilities, and subordinated debt.

and fund general business activities. Thus large bank loans more often are used for working capital, LBO and restructuring. The large percentage of loans used for restructuring may reflect unique aspects of the sample or the wave of corporate restructuring in the late 1980s.

III. PRICING CONSIDERATIONS

Much of the focus on bank loan pricing has been on the structure of the loan rate. In this paper, we not only focus on the loan rate, but also on an additional component cost of these loans, the various fees. As noted in the study by Berger and Udell (1990), bank loans almost always carry floating rates of interest. However, the procedures for adjusting the rates vary across contracts and have been the subject of much controversy. Other sources of private and public finance traditionally carry fixed rates of interest. Carey, et al. (1993) note that only 2 percent of private placements in 1989 had floating interest rates. They note that private placements of debt, like public bonds, generally have fixed rates. In our sample of large bank loans, the pricing includes many components and it frequently permits the borrower a choice of indices to be used to determine the loan rate.

Fixed-Spread Floating-Index Loans

One of the early explanations for the use of loan commitments was that firms were attempting to lock in the interest rate. However, as noted in the 1970s study by Boltz and Campbell (1978), the use of fixed interest rates in bank lending was on the decline. Today, virtually all large bank loans include interest rates that float over the life of the loan. Today, pricing is most frequently tied to one or more indices. Under this arrangement, the loan is fixed at a spread relative to one or more floating indices. The most popular pricing index for spreads has been the, sometimes controversial, prime rate of interest. Boltz and Campbell (1978) note economists traditionally had difficulty providing explanations for the purpose and role of the prime rate convention. The accepted view until the mid-1960s, when a higher percentage of loans were fixed rate, was that the prime represents the rate charged to the class of customers with the least risk of default. The advent of below-prime pricing and the increased use of a fixed-spread, floating rate have changed the role of this index.

Much of the debate over the role of the prime rate in bank loan pricing has focused on its use as a means of maintaining discretionary control over the contract rates on outstanding floating-rate loans. The inability of borrowers to switch costlessly from one bank to another frequently allows banks to retain their customers and increase

their profits. This view, frequently espoused by the popular press, is that the bank may be able to increase the rate charged to an existing customer as long as the increase does not exceed the borrower's costs of locating and contracting with the new lender.

Boltz and Campbell (1978) note that if the prime rate is a means for maintaining discretionary control over outstanding floating-rate loans, then banks may find it advantageous to leave the prime rate stable to protect the return on existing loans but to use below-prime rates on new loans. This is the rationale for below-prime pricing. Others have predicted that because of competition from direct finance, the prime would be replaced by some rate more responsive to market rates. From Table 2, we can observe how the role of the prime rate has evolved.

In examining Table 2, we find that the usefulness of the prime as a management tool relating the costs of funds to returns on loans continues in the late 1980s. Its role in pric-

ing large bank loans has evolved from that described in earlier studies. In our sample, the prime continues to be the most frequently quoted index in pricing large bank loans. Perhaps due to concerns over the responsiveness of the prime to changing market conditions, many large bank loan contracts include quotes to two or more indices. Under these pricing arrangements, the borrower is permitted to choose, at each pricing interval, the desired index and the associated spread for the next pricing interval. This represents a major innovation in loan pricing. As an additional feature, contracts often permit the borrowing firm to lock both the index and spread for three, six, nine, or twelve month periods.

Approximately 39 percent of the loans in our 1989 sample included a fixed spread to more than one index. Of the loans that contained quotes to more than one index, approximately 27 percent of these contained quotes to two indices and approximately 12 percent contained quotes to

TABLE 2

Number and Proportion of 1,347 Sample Loans with Different Pricing Indices in 1989, Distributed by Loan Size

| | | | | | Loan Size | | | | |
	< 250k	250k–1m	1m–10m	10m–25m	25m–100m	100m–250m	250m–500m	>= 500m	Overall
Prime Only	5 (.36)	25 (.61)	173 (.56)	81 (.39)	84 (.24)	23 (.10)	9 (.09)	14 (.14)	414 (.31)
LIBOR Only	3 (.21)	2 (.05)	24 (.08)	25 (.12)	53 (.15)	37 (.17)	28 (.27)	22 (.22)	194 (.14)
CD Only			6 (.02)		2 (.01)				8 (.01)
Prime, LIBOR and CD			5 (.01)	19 (.09)	52 (.14)	45 (.20)	20 (.19)	18 (.18)	159 (.12)
Prime and LIBOR			17 (.06)	32 (.16)	89 (.25)	56 (.25)	32 (.30)	21 (.21)	247 (.18)
Prime and CD			6 (.02)	3 (.01)					9 (.01)
LIBOR and CD			2 (.01)	7 (.03)	35 (.10)	35 (.16)	9 (.09)	19 (.19)	107 (.08)
Fixed and Other Index[a]	6 (.43)	14 (.34)	73 (.24)	39 (.19)	41 (.11)	25 (.11)	7 (.07)	4 (.04)	209 (.15)
Total	14 (1.0)	41 (1.0)	306 (1.0)	206 (1.0)	356 (1.0)	221 (1.0)	105 (1.0)	98 (1.0)	1347 (1.0)

[a] Other indices include T-bill rates, commercial paper rates, cost of funds indices, and federal funds rates.

three indices. For both single and multiple index loans, the prime rate continues to be the most popular pricing index. Approximately 62 percent of the loan contracts include a quoted spread to the bank's prime rate. Among those contracts quoting spreads to a single index, the prime was quoted in approximately 67 percent of these contracts. In the contracts in which a fixed spread was quoted to more than one index, the prime was included as one choice in approximately 80 percent of the contracts. One possible reason is casual evidence that banks offer more flexible early repayment features if the loan is priced relative to the bank's prime rate of interest. The next most popular index for both single and multiple choice contracts is the LIBOR. This is followed in popularity by the bank's CD rate. Much less frequently used indices include the treasury bill rate, the commercial paper rate, the federal funds rate, a cost of funds index, and an index of money market rates.

Among the contracts that quote fixed spreads to more than one index, the most popular is the combination of prime and LIBOR. A close second in popularity is prime, LIBOR, and the bank's CD, followed by a LIBOR and CD combination. An infrequently used combination is a spread to the prime and the bank's CD rate.

In Table 2, we provide summary statistics on loan size stratified by the pricing structure used. As a general rule, the contracts that utilize floating-index pricing relative to only one index are on average of smaller size than those that specify pricing to more than one index. An exception is pricing relative to LIBOR only. These contracts are on average much larger than the contracts that specify pricing relative to prime, CD, or any of the other indices. The same cannot be said of the contracts specifying more than one index. The largest of this class of loans are those that specify pricing relative to the LIBOR, but do not include the option for the borrower to price relative to the bank's prime rate.

Other Fees in Loan Pricing

The loan rate is not the only component in pricing sample loans. A typical bank loan commitment provides the borrower substantial flexibility in determining the quantity of borrowing during the life of the contract. To price these contracts so as to receive an adequate return on capital, the banks use a variety of fees. This appears to be in contrast with both private placements and public debt issues. The rationales for the use of fees in bank lending traditionally have focused on the presence of informational asymmetries related to the credit risk of the borrower. Specifically, James (1987) and Thakor and Udell (1987) develop models in which borrowers can be induced to reveal their credit risk class by the choice of loan rate and the fee structure

they select. Berlin (1989) also describes a similar use of a combination of fees and loan rates to control borrower's behavior.

In Table 3, we provide a list of the most frequently used fees in the sample. In addition to the loan spread relative to prime (the most frequently used index, averaging 11 percent in 1989), two fees are considered the most common; the first is an up-front fee based on the total amount of the loan or commitment. A close second is a fee on the unused portion of the loan commitment. The up-front fee is charged at the beginning of the loan arrangement; it is charged in approximately 45 percent of sample loan contracts with an average fee of 105 basis points of the total amount of the contract. The next most frequently reported fee, an annual fee on the unused balance of the loan, is charged in approximately 44 percent of sample loan contracts. The average amount of this fee is 41 basis points of the unused balance. The third most common fee is an annual fee based on the total amount of the loan contract. This fee appears in approximately 22 percent of the sample loans and averages 16 basis points in those contracts in which it appears. In approximately six percent of the contracts, a cancellation fee is charged for early termination of the contract, this fee averages 53 basis points of the loan contract. Also included in approximately 12 percent of the contracts is a letter of credit fee equal to approximately 143 basis points.

As noted above, studies have attempted to explain the use of fees as part of the pricing structure of loan contracts. These explanations have focused on the combination of fees and loan rates to elicit information about the likelihood of default for a particular borrower. In Thakor and Udell (1987), borrowers are shown to reveal their default risk characteristics based on their choice of contract terms. Alternatively, in Berlin (1987), borrowers are shown to self-select across contract types based on their probability of borrowing. Both of these models suggest that the use of different types of fees is expected to vary over the type of loan contract. For example, Berlin (1987) suggests that loan fees are designed to compensate the bank for the quantity risk and the credit risk associated with the loan. Clearly the quantity risk is larger under commitments to lend than under traditional or spot lending. In Table 3, we separate sample loans into revolving commitments, lines of credit, and term loans. As can be seen, the use of all types of fees is more frequent for revolving loan commitments than for either term loans or for lines of credit. The fact that lines of credit typically do not specify the fees in the contract likely reflects the lack of formal pricing in these arrangements.

The use of up-front fees are slightly more prevalent in term loans than revolving credit agreements. In term loans where these fees are charged, the fees are, on average, approximately 1.2 times as large as the average of this fee re-

TABLE 3

Proportions and Average Basis Points of Fees Used in the Sample of 1,347 Loans, Distributed by Types of Loans

Types of Loans			Types of fees		
	Up-front	Annual	Unused Balance	Early Cancellation	Letter of Credit
Revolving Loan Commitments					
Proportions	0.46	0.38	0.69	0.06	0.18
Average Basis Points	88	18	40	55	147
Term Loans					
Proportions	0.47	0.20	0.24	0.05	0.02
Average Basis Points	105	11	44	52	112
Line of Credit					
Proportions	0.21	0.13	0.21	0	0.11
Average Basis Points	55	38	33	—	106
Other Types of Loans[a]					
Proportions	0.43	0.15	0.25	0.07	0.13
Average Basis Points	148	20	44	51	142
Overall Sample					
Proportions	0.45	0.22	0.44	0.06	0.12
Average Basis Points	105	16	41	53	143

[a] Other types of loans include bridge loans, demand loans, letters of credit, notes, multi-option facilities, and subordinated debt.

ported in revolving credit agreements. The most frequently included fee in revolving credit agreements is an annual fee on the unused balance of the commitment. This fee is charged in approximately 69 percent of all revolving credit agreements in our sample. This fee, and the less frequently used annual fee on the total amount of the line, suggests the need for continuing fees associated with this source of potential funding during the life of the contract. These suggest a relatively high cost to the quantity uncertainty associated with these contracts. Early cancellation fees appear in about the same percentage in commitments as in term loans. Letter of credit fees are reported in approximately 18 percent of loan commitments and in only 2.3 percent of term loans.

Overall, these results suggest that substantial heterogeneity exists in the pricing structure of loan contracts. This pricing structure varies across contract types in a fashion suggesting customized contract features. Unlike the private placements and public debt samples examined by

Carey, et al. (1993), virtually all loans in our sample are floating-rate loans. Additionally, the pricing structure appears to reflect the complexity of the package of financing options the bank provides to the borrowing firm.

IV. Covenants to Protect Lenders

It is frequently suggested that, like other debt contracts, bank loans contain restrictions designed to protect the lender from the borrower behaving in an opportunistic way. Smith and Warner (1979) note that in public debt contracts, covenants usually take the form of restrictions regarding cash distributions, claim dilution, asset substitution, and underinvestment. Each of these may represent opportunistic behavior that can benefit shareholders at debtholders' expense.

In this section, we look at the covenants and collateral requirements that appear in the sample of loan contracts. Carey, et al. (1993) suggest that covenants tend to be used

more frequently in private placements and are more restrictive than in public debt issues. Compared to bank loans, covenants are less frequently used in private placements and they are less restrictive. Due to the private nature of bank loan contracts, as with private placements, a lack of data has resulted in limited analysis of covenants in these contracts. In general, Carey et al. (1993) note that participants in private placement markets indicate that bank loans contain roughly the same types of covenants as found in the private placement market, with two differences. First, financial covenants in bank loans are typically maintenance covenants, while most covenants in private placements are incurrence covenants. With maintenance covenants, the criteria set forth in the agreement, such as minimum ratios of assets to liabilities, must be met on a continuing basis. With incurrence covenants, default is triggered if an event, such as issuing public debt or equity, occurs at any time during the contract. The second difference is that the covenants of bank loans tend to be set at levels that are more likely to be binding during the life of the loan. They report that bank loan covenants tend to reflect a different lending philosophy than private placement covenants. Banks are argued to take an approach that emphasizes liquidity and/or working capital. In Table 4 we report the proportion of our sample of bank loans segmented by loan size that contain one or more of the most frequently discussed covenants.

The Role of Collateral

One of the most common covenants to protect the lender from losses associated with default risk is collateral. Berger and Udell (1990) find evidence that for a large sample of relatively small (median $50,000) business loans, approximately 70 percent were collateralized. Kwan and Carleton (1995) report that for a large sample of private placements, approximately one-third were secured. Carey, et al. (1993) note that both of these percentages are higher than for publicly issued bonds.

The traditional explanations for the use of collateral is that it reduces potential losses related to default. Smith and Warner (1979) note that this represents one of the most effective ways of combating the possibility of substituting more risky assets for less risky. Consistent with this, Berger and Udell (1990,1993) find evidence that riskier borrowers are more likely to pledge collateral. Loans in our sample of loans are much larger on average than those examined in earlier studies. Approximately 45 percent of the loans in our sample pledge collateral.

Earlier studies of the incidence of collateral suggest the presence of collateral is a positive function of default risk (see Berger and Udell, 1990, and Scott and Smith, 1986). Scott and Smith (1986) examine a sample of small business loans and find that the presence of security is a negative function of loan size and loan maturity. Berger and Udell (1990) find evidence that riskier loans are more likely to be secured and the commitments to lend tend to be less risky. In our sample, collateral is pledged in approximately 60 percent of loans used to finance takeovers and LBOs. This compares with approximately 45 percent for the entire sample. Highly leveraged corporate restructuring loans are frequently considered to carry a high level of default risk. This suggests that for our sample of large business loans, the presence of collateral is a positive function of default risk.

Other Covenants in Bank Loans

In addition to frequently requiring collateral, bank loans include additional restrictions on borrower behavior. Covenants in bank loans are either negative or affirmative. Negative covenants restrict certain actions by the borrower. Most of the negative covenants in bank loans take the form of financial covenants. Affirmative covenants require a borrower to meet certain standards such as discharging contractual obligations and providing information at regular intervals. The covenants reported for the sample of large loans we are examining are generally negative and are based on financial variables.

Historically, compensating balances have been used frequently as covenants in bank lending arrangements. Under these arrangements, the borrowing firm is required to maintain a compensating balance at the lending bank equal to a small percentage of the loan balance during the life of the loan. In our sample of relatively large loans, required compensating balances appear in only 1.8 percent of loan agreements. Thus, as shown in Table 4, in the market for relatively large bank loans, these covenants are largely missing. This may reflect the fact that our sample consists of relatively large borrowers and the trend to the reduced importance of this pricing feature in bank lending.

The most commonly reported negative financial covenant is the restriction on the debt ratio of the borrowing firm. The covenants related to this ratio appear in slightly more than 28 percent of sample loans. The next most frequently reported is a solvency covenant which appears in approximately 20 percent of loans. This is followed by an interest coverage ratio covenant in approximately 16 percent of sample loans. Also reported in approximately 16 percent of loans is a requirement that the borrower hedge interest rates through either futures or swaps. The next most frequently reported covenants are the maintenance of

TABLE 4

Proportion of Loans with Collateral Requirements and Covenant Restrictions, Distributed by Loan Size

Types of Loans	Loan Size								
	< 50k	50k–250k	250k–1m	1m–10m	10m–25m	25m–100m	100m–250m	250m–500m	> = 500m
Which are Secured	.50	.58	.63	.64	.48	.43	.38	.53	.38
With Solvency Covenants	—	.08	.05	.24	.23	.24	.16	.12	.02
With Debt Ratio Covenants	—	—	.15	.33	.31	.29	.28	.24	.18
With Interest Coverage Covenants	—	—	—	.11	.21	.19	.22	.17	.16
With Profit/Sales Covenants	—	—	—	.02	.01	—	.01	—	.08
With Agreement that Calls for Hedging the Interest Rate	—	—	—	.03	.11	.18	.25	.30	.36
With Compensating Balance	—	—	—	—	.01	.01	.04	.05	.06

a minimum borrowing base of assets (approximately 10 percent of contracts) and a profitability or sales constraint in approximately 1.2 percent of contracts.

These findings provide evidence consistent with the analysis of covenants for private placements in Carey, et al. (1993). They report that market participants suggest two differences between covenants in private placements and bank loans. First, financial covenants in bank loans are typically maintenance covenants, while most covenants in private placements are incurrence covenants. We find that most of the covenants reported for our large bank loans are maintenance covenants. They also suggest that bank covenants are set to restrict borrowers' behavior more closely. We have no direct evidence of this. However, a substantial percentage of sample loans include covenants that are set to be relaxed during the life of the loan. For example, the borrower may be required to maintain a long-term debt to equity ratio of .5 during the first year and .75 in subsequent years. In our sample, covenants are permitted to change in approximately 22 percent of the loan agreements. Consistent with the statement of Carey, et al. (1993) that bank loan covenants are tight, we find in approximately 22 percent of loan agreements that covenants are permitted to be relaxed in stages during the life of the loan. A related feature of many of the loan agreements is that the loan contract calls for the loan rate to reflect a violation in the covenants. For instance, the contract may call for the loan rate to increase the spread from 100 basis points over prime to 200 basis points over prime if the borrower violates the

total debt to net worth constraint. Assuming that incorporating such contract features is costly, the fact that violations are explicitly priced may indicate that they are seen as more likely to be binding. This is consistent with the proposition that bank loan covenants are normally tight.

Overall, our results suggest that a wide variety of covenants are used in large bank loans and that these covenants are set very tight. The covenants tend to be maintenance covenants and focus on the liquidity and leverage of the borrowing firm.

V. Summary and Conclusions

The evidence in this paper represents the first attempt at comparing the characteristics of large bank loans with private placements of debt and public debt issues. The motivation for this comparison has been to examine the unique aspects of large bank loans that encourage firms to continue this source of finance even though they have access to the private placement market, and in many cases, the public debt markets. By examining the characteristics of a sample of large bank loans, we are able to gain insights into this form of corporate borrowing compared to private placements and public debt issues. Among the major differences in these sources of corporate finance are that bank loan agreements are approximately one-half the maturity of private placements and one-third that of public bonds. Virtually all bank loan agreements are fixed-spread, floating-index loans. Most are in the form of commitments to

lend that permit the borrower flexibility in deciding on the timing and amount of borrowing.

Within these complex lending arrangements, we find that the prime continues to be the most popular index for fixed-spread floating-rate loans. However, a majority of the loans quote a fixed spread to more than one index. Additionally, in modern loan contracts, the loan rate is only one part of the pricing structure. Loans frequently include a variety of additional fees. These include one time fees, annual fees, cancellation fees, and in commitments to lend, fees on the unused portion of the credit agreement.

Evidence related to covenants in large bank loans indicates wide variety in the types of covenants used. Additionally, covenants often change automatically during the life of the contract and it is not uncommon for loan spreads to increase with covenant violation. Pricing covenant violations ex ante suggests that they are likely to become binding and perhaps be violated. This suggests that flexibility in contract features and the ability to renegotiate are important features in demand for large bank loans. These findings are consistent with the monitoring role of banks as unique sources of borrowing for businesses.

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