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East Asia in the Aftermath: Was There a Crunch?

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Abstract

This paper uses a disequilibrium framework to investigate a possible credit crunch in the East Asian crisis countries (Indonesia, Korea, and Thailand) during 1997-98. It defines a credit crunch as a situation in which interest rates do not equilibrate supply and demand for credit and the aggregate amount is supply constrained, *i.e.* there is quantity rationing. In all three countries, rising real interest rates and weakening economic activity lowered credit demand and (with the exception of Indonesia in late 1997) there is little evidence of quantity rationing at the aggregate level—although individual firms may have lost access to credit.

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I. INTRODUCTION

In recent months, there has been much discussion about tightening credit conditions in the East Asian crisis countries. In Indonesia, Korea, and Thailand, average lending rates rose sharply at the end of 1997 and in early 1998, with real interest rates peaking in the second quarter of 1998 at about 20 percent per year in Korea and 10 percent per year in Thailand. Both the sharp exchange rate depreciations, and the rising real interest rates, contributed to corporate sector distress and weakening economic activity.

Beyond the effects of rising interest rates, a key concern in light of declining (real) credit to the private sector has been the risk of a “credit crunch,” whereby interest rates do not equilibrate supply and demand for credit and there is *quantity rationing*. Indeed, since real interest rates rose only several months after the initial currency crises, some commentators feared that interest rates were not fully reflecting prevailing tight credit conditions, and that firms were simply unable to obtain credit. Such rationing may have occurred as banking system deposits shrunk, and banks were forced to hold greater reserves and increase their capital provisioning to meet capital adequacy standards. Conversely, the weakening macroeconomic outlook and falling production may have lowered the demand for credit as well. As such, the fall in real credit to the private sector may reflect declining demand for credit, contracting supply, or both.

In this note, we adopt an explicit disequilibrium framework for analyzing the behavior of real credit to the private sector in Indonesia, Korea, and Thailand with a view to assessing whether the supply of, or demand for, credit has been the *binding* constraint. We estimate a *credit supply* function—which depends upon interest rates, commercial banks’ lending capacity, and the level of economic activity; and a *credit demand* function—which depends upon the interest rate and indicators of current and expected economic activity. These estimated functions can be used to determine whether, in any period, it is the supply or demand for credit which is the constraining factor.

Our main results may be summarized briefly. In Indonesia, with the deepening banking sector crisis in late 1997, there was a sharp contraction in the real supply of credit which, coupled with a concomitant increase in credit demand, meant that the supply of credit *was* the binding constraint. Thereafter, however, the demand for credit contracted as well, and supply of credit was no longer the constraining factor. In Thailand, there was excess demand for credit in late 1996, but since then the decline in the demand for credit has generally outstripped the fall in real credit supply. Finally, in Korea, there was excess demand through 1996 and part of 1997, but little evidence of a “credit crunch” since then.

Two caveats to these findings bear emphasizing. First, the concept of a “credit crunch” refers to a situation in which credit is unavailable at prevailing interest rates—but high real interest rates themselves, of course, will impose a burden on borrowers. Second, the results presented here pertain to the aggregate economy — at the *microeconomic* level, individual

firms that were otherwise creditworthy may well have been unable to obtain capital at prevailing interest rates.

The paper is organized as follows. Section 2 describes the setting. Section 3 describes the methodology (and appendix I, the data). Section 4 presents the empirical results. Section 5 offers some brief concluding remarks.

II. THE SETTING

In the aftermath of the currency crises in Indonesia, Korea, and Thailand, a particular concern—beyond the effects of rising real interest rates—was that firms were facing credit rationing, whereby the supply of credit did not meet credit demand at prevailing interest rates.²

As such, a key question is the behavior of commercial banks' *lending* capacity, during and immediately following the currency crises.³ The banks' lending capacity is defined as total bank liabilities (plus net worth) *minus* required reserve and liquidity requirements *minus* cash in vault *minus* capital. Note that, in calculating banks' pool of loanable resources, capital is subtracted from total liabilities (plus net worth) since banks cannot hold assets corresponding to capital in the form of loans to the private sector.

Figures 1(a)-(c) provide a first pass at this question. The height of each bar represents *total liabilities plus net worth* of the banking system, in turn broken into cash in vault, capital,

² As always, there are several different measures of the real interest rate. The concept used here is the lending rate deflated by average WPI inflation between months $t-1$ and t , and t and $t+1$. On this basis, real interest rates were generally negative in late 1997 and early 1998, turning positive (at about 1.5 to 2.0 percent per month) by the end of the first quarter of 1998 in Korea and Thailand. In Indonesia, real lending rates generally remained negative through the first half of 1998. As such, at least some observers feared that real interest rates did not adequately reflect the tightened credit conditions, and that firms were facing quantity rationing. As discussed below, to the extent that real interest rates are underestimated, the methodology adopted here will be biased *towards* finding a credit crunch. On the effects of higher interest rates on activity, see Domac and Ferri (1998).

³ This paper focuses on domestic commercial banks; in some countries (notably Thailand), finance companies also became an important source of private sector credit (accounting for about 24 percent of total credit to the private sector at end-1996 and declining to 20 percent by end-1997). A more subtle issue concerns the treatment of foreign currency components of banking system assets and liabilities in light of exchange rate movements (important in Indonesia, less so in Thailand and Korea). The measures used here include valuation changes as they nonetheless affect the amount of real financing being provided to the economy (see IMF (1999) for a discussion).

required reserves, and the residual lending capacity. Two points are noteworthy. First, there was generally a decrease in the real value of banking system liabilities during the first few months of 1998 (the exception being in Indonesia, where liquidity support from Bank Indonesia rose strongly between end-December 1997 and end-January 1998). Second, over the same period, the fall in real lending capacity generally reflected declining liabilities of the banking system (with the fall in deposits outstripping liquidity support from the central bank), rather than increased reserve requirements or capital provisioning. The one exception is Korea, where the change in real lending capacity during the first quarter of 1998 (as a percentage of initial banking system liabilities) was -9.3 percent and the increase in bank capital (also as a percentage of initial banking system liabilities) was 1.8 percent (while the December 1997-March 1998 change in banking system liabilities in real terms was -7.8 percent).⁴

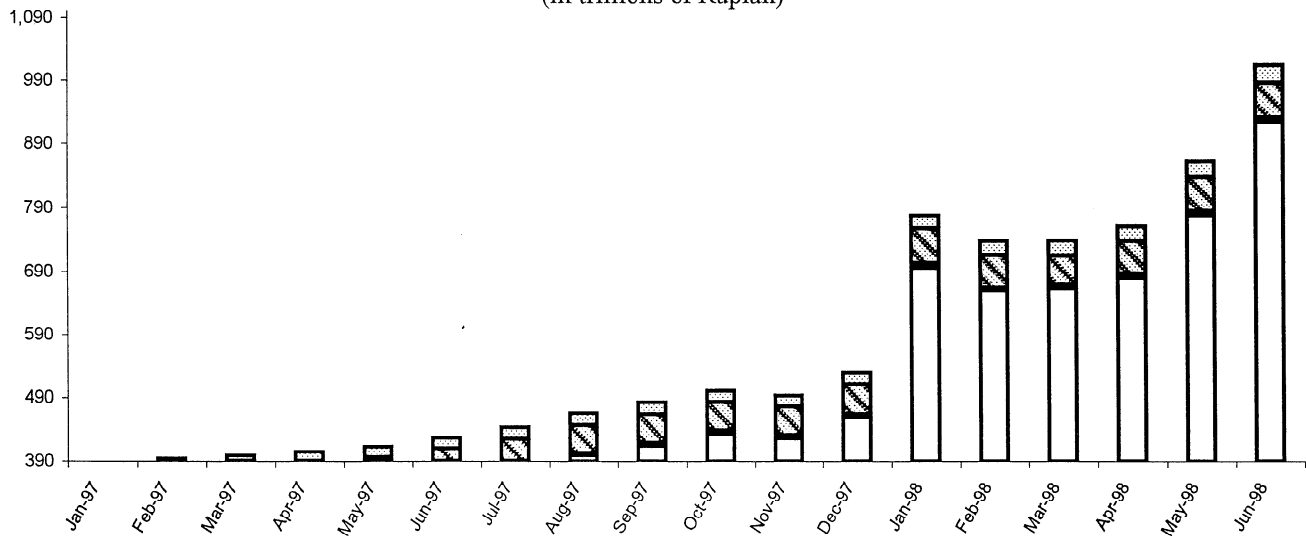
A separate constraint on banks' lending capacity comes from the capital adequacy requirement (CAR), which requires a specific ratio of capital to assets. The capital adequacy requirement varied by country and, especially during the crisis, compliance by individual banks was mixed (indeed, the Asian crisis countries either relaxed the risk weighting in the calculation of the capital adequacy requirement, or allowed banks an extended timetable for meeting the requirements). At an aggregate level, this is difficult to capture precisely, but the lending capacity series used in the econometrics below is the *minimum* of the lending capacity as defined above, and the implied maximum assets given by the prevailing capital adequacy requirements. For each of the three countries, this capital adequacy constraint becomes binding (i.e. lower than the lending capacity given above) at least at some point during the crisis period.⁵

Banks' lending capacity—inasmuch as it represents banks' notional *ability* to make loans—is obviously an important determinant in the supply of credit to the economy. It is, however, only one of the determinants, and banks' *willingness* to lend will depend not only their lending capacity, but also on interest rates and perceived credit risks. Moreover, with declining real activity and higher real interest rates, there are likely to have been changes in

⁴ By contrast, in Indonesia the percent change in real banking system liabilities during 1998Q1 was -5.8 percent, while real lending capacity fell by only 2.3 percent (there was thus a decline in capital provisioning by banks). In Thailand, the fall in real lending capacity matched the fall in real banking system liabilities.

⁵ The minimum CARs for this period are assumed to be 7 percent for Indonesia, 6 percent for Korea, and 8.5 percent for Thailand. Yet a third possible constraint comes from the non-performing loans, and potentially negative networth of banks (at risk-adjusted valuation), which would be likely to reduce banks' willingness to make loans. While this constraint may have been important, the lack of adequate and consistent data on non-performing loans makes it difficult to capture explicitly here.

Figure 1(a): Indonesia: Banking System Liabilities and Lending Capacity
(in trillions of Rupiah)



Indonesia: Banking System Liabilities and Lending Capacity
(in trillions of constant Rupiah)

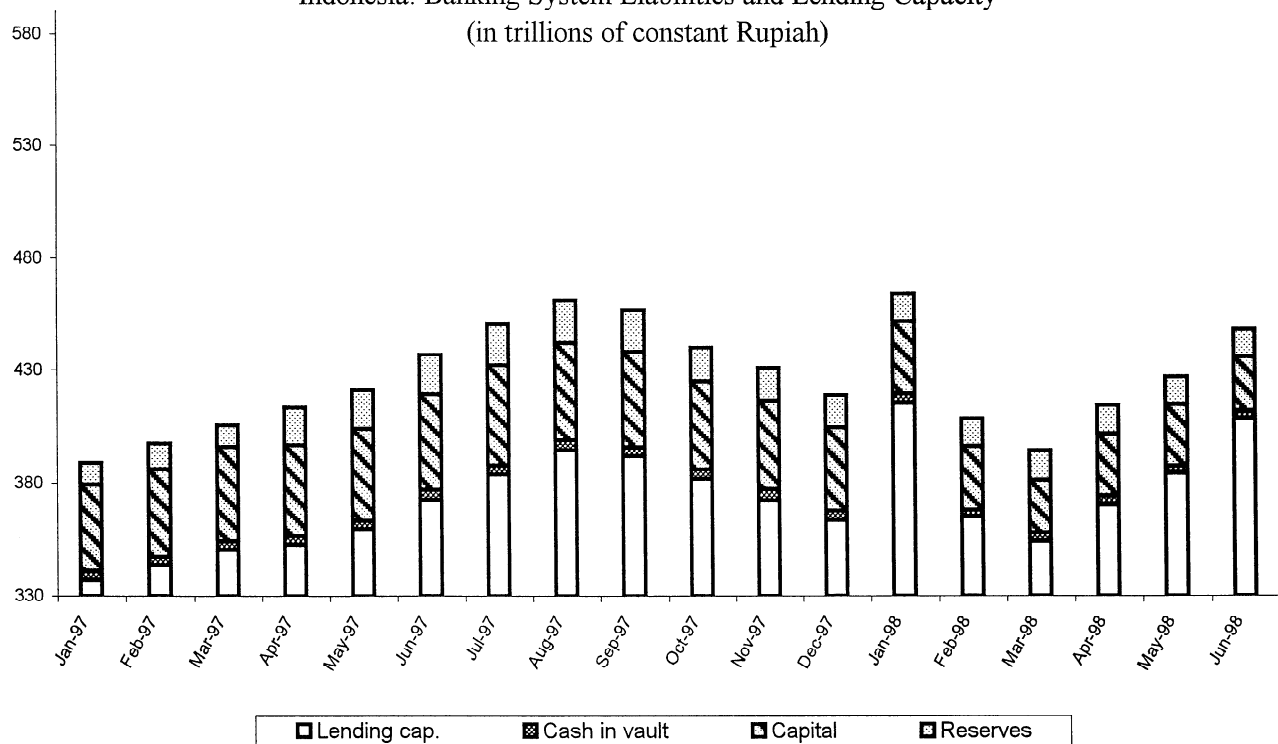
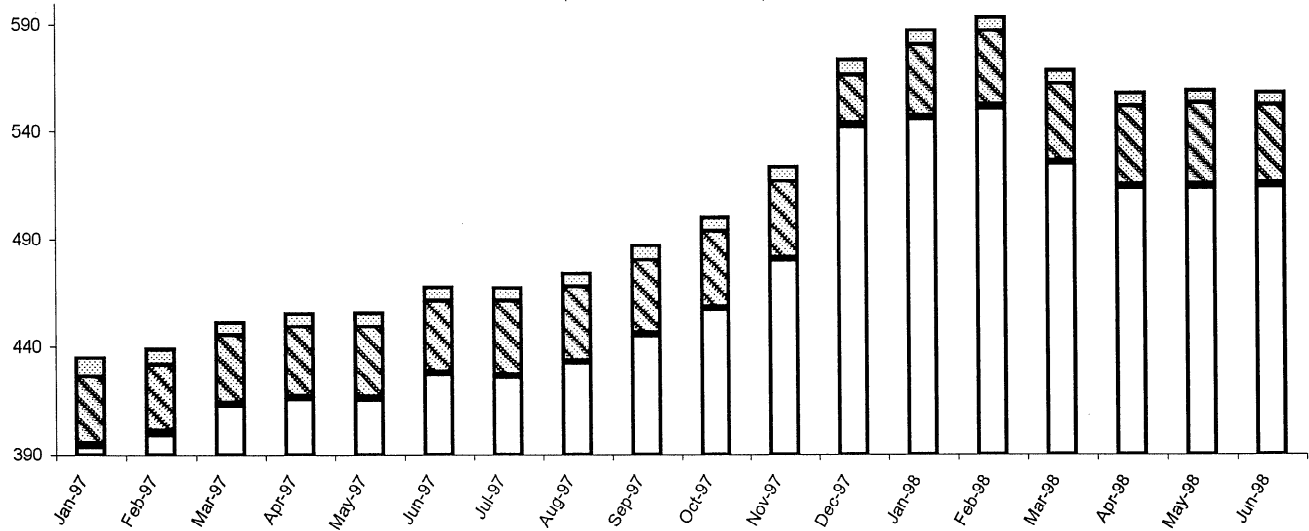


Figure 1 (b) Korea: Banking System Liabilities and Lending Capacity
(in billions of Won)



Korea: Banking System Liabilities and Lending Capacity
(in billions of constant Won)

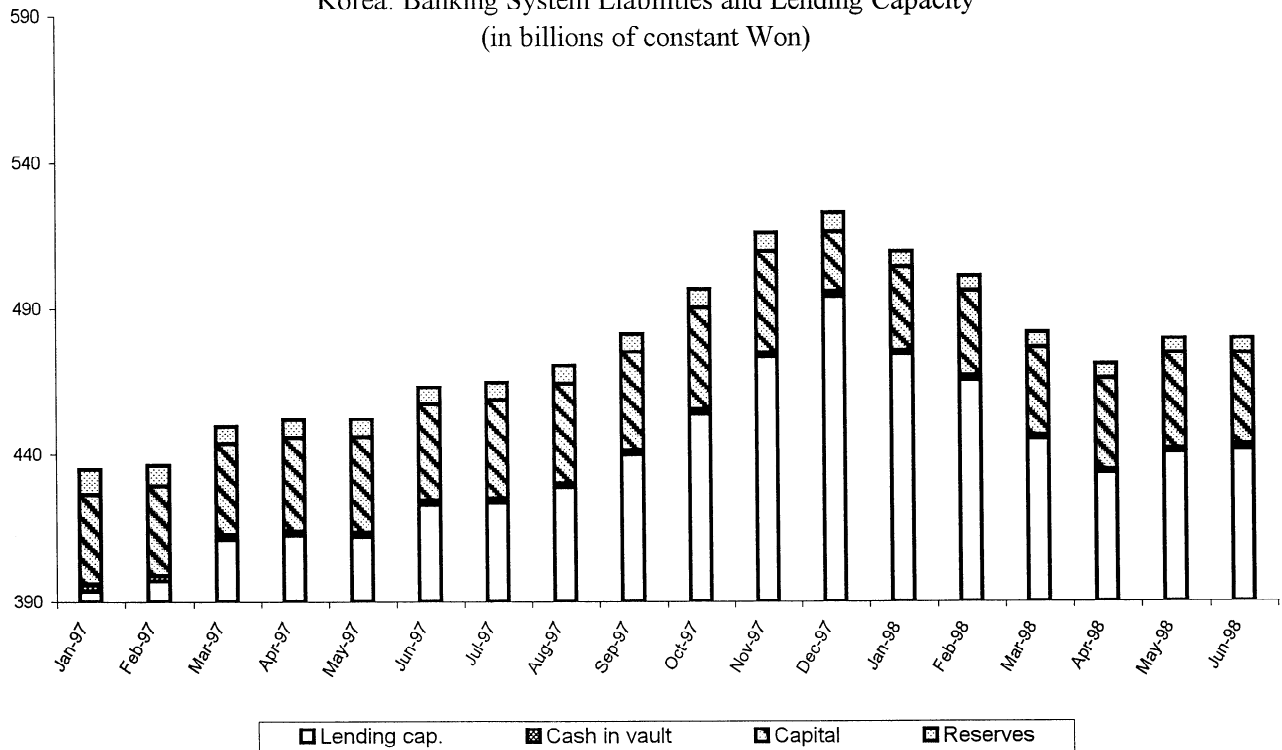
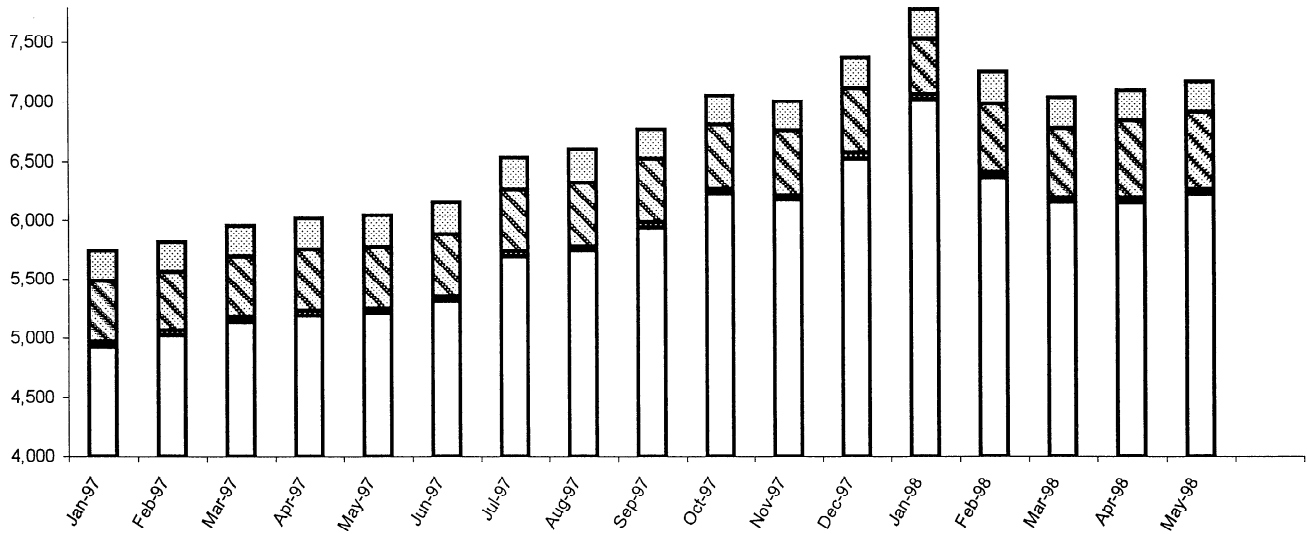
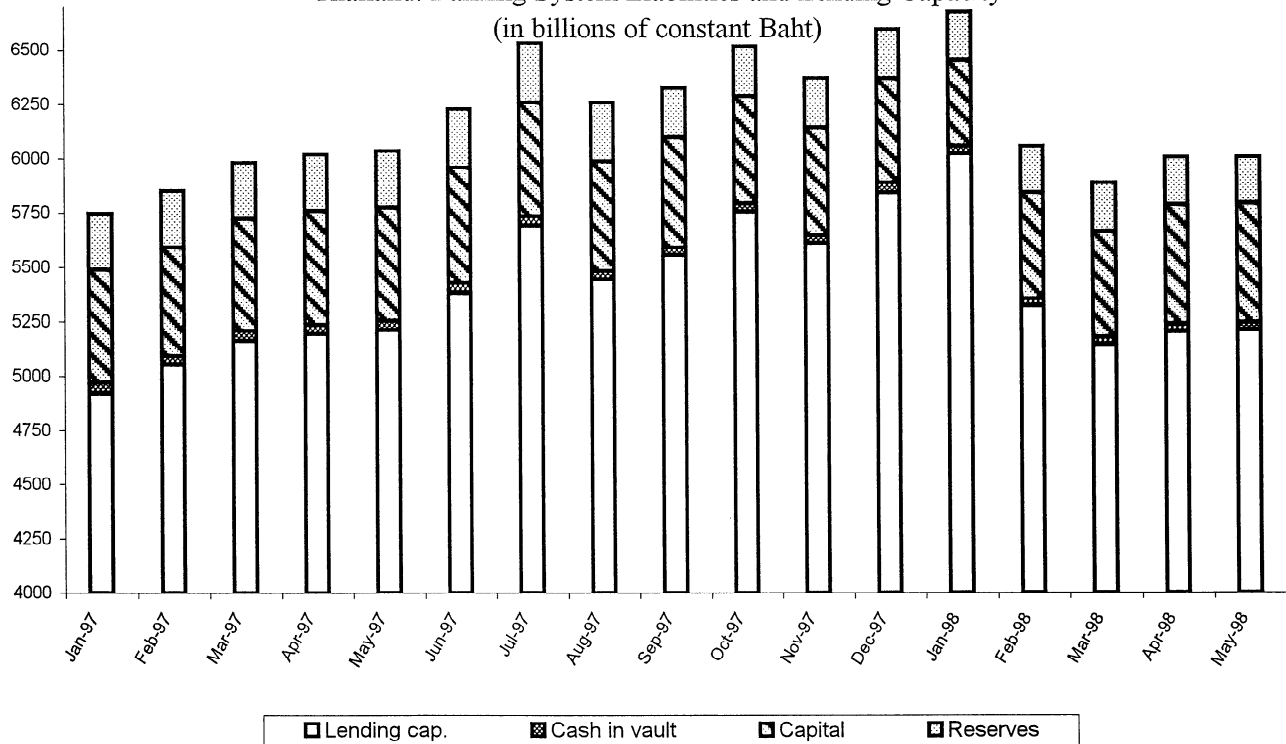


Figure 1 (c) Thailand: Banking System Liabilities and Lending Capacity
(in billions of Baht)



Thailand: Banking System Liabilities and Lending Capacity
(in billions of constant Baht)



credit demand as well. Therefore, determining whether quantity rationing developed in East Asia requires an explicit model of both the supply of and the demand for real credit.

III. METHODOLOGY

An observed decline in real credit is consistent with falling supply of credit, falling demand for credit, or both. The key identification problem lies in attributing the observed changes in actual private sector credit to underlying movements of the credit supply and credit demand function. This identification problem is resolved in a switching regression framework by imposing a priori exclusion restrictions (e.g. that the banks' lending capacity affects the supply of credit, but not the demand for credit).⁶

If the market for bank loans clears continuously, the interest rate adjusts to ensure that the supply of credit equals the demand for credit. If interest rates do not adjust (sufficiently), or if there are directed credits or credit rationing, demand for bank credit, C^d need not equal its supply, C^s , with the actual level of credit given by:⁷

$$C_t = \min(C_t^s, C_t^d)$$

The real supply of bank credit is assumed to depend upon the real interest rate, r_t , relative to the cost of funds (proxied by the deposit rate); current output (industrial production) as a measure of firms' ability to repay; and commercial banks' real lending capacity, I_t :

$$C_t^s = \beta_0^s + \beta_1^s(r_t - r_t^d) + \beta_2^s I_t + \beta_3^s y_t + \epsilon_t^s$$

⁶ Pazarbasioglu (1997) also uses a disequilibrium model to analyze the banking crisis in Finland, on which this paper draws heavily. One difference in the approach of this paper is that the lending capacity is taken an explicit determinant of the supply of bank credit, which allows a distinction to be made between banks' lending capacity and factors that may affect their willingness to lend, at a given lending capacity. As noted in the text, this also helps to reduce the potential problem of identification. For other approaches in the "credit crunch" literature, see Bernarke and Lown (1992).

⁷ In this framework, there can be disequilibrium whenever supply does not equal demand at the prevailing interest rate (for whatever reason), with the quantity traded determined by the short-side of the market. The framework thus does not require a specific model of *why* there may be credit rationing (e.g. perceived risk by lenders) or excess credit supply. More generally, a dynamic equation determining the evolution of the interest rate to disequilibrium in the previous period may be specified, although this is not done here. Instead, as a robustness check, the interest rate variables are instrumented (using their own lags).

Lending capacity, in turn, is given by the *minimum* of (i) total bank liabilities plus net worth *minus* required reserves and liquidity requirements *minus* cash in vault *minus* equity capital and (ii) the implied maximal banking sector assets implied by the prevailing capital adequacy requirement.

Specifying the demand function is more tricky. The need for working capital presumably depends upon production, with higher output requiring greater credit. A firm suffering an adverse shock, however, might require additional credit to “tide it over” until economic conditions improve. Therefore, the deviation of current production from expected future production is likely to matter as well: when output falls temporarily, demand for credit may increase—and the econometric estimation should at least allow for this possibility. With these considerations in mind, the demand for real credit is assumed to depend upon the real interest rate; current output, y_t , to capture both working capital requirements and as an indicator for future output (averaged over periods $t-2$, $t-1$, and t to reduce endogeneity problems); the output gap, measured as the deviation of current industrial production from its (Hodrick-Prescott filtered) long-run trend; the price of the stock market (as a proxy for future expected output), S^p ; and inflation (as an indicator of the general macroeconomic environment), π_t :

$$C_t^d = \beta_0^d + \beta_1^d r_t + \beta_2^d y_t + \beta_3^d y_t^{gap} + \beta_4^d S_t^p + \beta_5^d \pi_t + \epsilon_t^d$$

Use of a Hodrick-Prescott filter to estimate trend output gives a very simple measure of the output gap, but one that is likely to be robust in the face of the very sharp contraction in output observed in the aftermath of the crisis. As such, including this output gap in the demand function proxies for the intuition that, in hard times, firms may seek greater credit financing, and ensures that *estimated* demand for credit does not fall simply because of the observed output collapse. If only current industrial production were included, there is a danger of biasing the results against finding a credit crunch (since estimated credit demand would necessarily fall with the decline in current output).

The probability that any observation t is supply constrained (i.e. quantity is determined by credit supply) is simply:

$$\theta_t = Prob(C_t^d > C_t^s) = \Phi((C_t^d - C_t^s)/(\sigma^{s2} + \sigma^{d2}))$$

where σ^s and σ^d are the estimated standard errors of the credit supply and credit demand functions and $\Phi(\bullet)$ the cumulative Normal distribution function.

If observation t is on the demand function, then $C_t = C_t^d < C_t^s$ and the density of C_t , $h(C_t)$ is given by:

$$h(C_t | C_t = C_t^d) = \int_{C_t}^{\infty} \phi(C_t, C_t^s) / \theta_t dC_t^s$$

where $\phi(\bullet)$ is the joint density of C_t^d and C_t^s . Conversely, if in period t there is a credit crunch then, $C_t = C_t^s < C_t^d$ and:

$$h(C_t | C_t = C_t^s) = \int_{C_t}^{\infty} \phi(C_t^d, C_t) / (1 - \theta_t) dC_t^d$$

Hence

$$\begin{aligned} h(C_t) &= \theta_t h(C_t | C_t = C_t^d) + (1 - \theta_t) h(C_t | C_t = C_t^s) \\ &= \int_{C_t}^{\infty} \phi(C_t, C_t^s) dC_t^s + \int_{C_t}^{\infty} \phi(C_t^d, C_t) dC_t^d \end{aligned}$$

and the associated log likelihood is $\sum_{i=0}^T \log h(C_i)$.

As discussed by Maddala (1989), for certain parameter values the likelihood function may be unbounded, but in practice, few estimation difficulties were encountered. A more subtle issue concerns the stationarity of the data, since observed real credit (in each of the three countries) exhibits a unit root. In much of the literature on disequilibrium models, the issue of stationarity is not explicitly addressed and the model estimated in *levels* (see e.g. Maddala and Nelson (1974), Pazarbasioglu (1997)). In part, this is because estimation in first differences loses too much information. (Simply put, just because the *growth* of credit supply exceeds the *growth* of credit demand, it does not necessarily follow that credit supply is not the binding constraint.) Estimation in levels is legitimate as long as the determinants of credit supply and credit demand form a cointegrating vector. Once the model's parameters have been estimated via maximum likelihood, this can readily be tested by checking whether the implied credit demand, C_t^d , is cointegrated with observed real credit, C_t (and, likewise, that C_t^s is cointegrated with C_t). Since these are cointegrating vectors, however, the reported *t-statistics* provide a measure of the precision of estimation of individual parameters, rather than of formal statistical "significance."

IV. EMPIRICAL RESULTS

The data are monthly, and cover the period 1992:1 to 1998:6 (with two months used for creating differences and lags); data sources are described in appendix I. Based on these monthly data, it is not possible to reject a unit root in real private sector credit for any of these countries, with Augmented Dickey-Fuller test statistics ranging from about -1.0 to -2.4. Accordingly, it is useful to check that, for each country, the determinants of the credit supply (demand) function form a co-integrating vector with observed real private sector credit. These tests are based on the Reimers small-sample correction of the Johansen statistics (with 95 percent critical values for the maximum eigenvalue and the trace given by 14.1 and 15.4 respectively). For Korea, the trace statistic readily rejects the hypothesis that the rank of the cointegrating vector is zero ($\rho = 0$) for both credit supply and credit demand ($\lambda_{tr} = 15.8$, $\lambda_{tr} = 15.9$), but the maximum eigenvalue is just below the critical values ($\lambda_{max} = 12.3$, $\lambda_{max} = 11.7$). For Thailand and Indonesia, both credit supply and credit demand are found to be cointegrated with actual real private sector credit.⁸

Table 1 reports the parameter estimates for each of the three countries. In the credit supply function, the banks' lending capacity has the expected positive sign (and close to a unit coefficient). The interest rate spread has a positive coefficient, with an elasticity of about 0.5 for Indonesia, but only 0.2 for Korea, and is negative for Thailand.⁹ Finally, higher industrial production appears to portend better repayment capacity, with correspondingly higher credit supply (with elasticities of about 0.1 to 0.2).

For the credit demand function, the results are more mixed. Higher real interest rates are indeed associated with lower credit demand, while higher industrial production is associated with greater credit demand (with the elasticity ranging from 0.9 to 1.3).¹⁰ The output gap has a positive sign for Indonesia and Korea, but is (slightly) negative for Thailand. The stock market price is positively related to real credit demand in Indonesia, but negatively related to credit demand in Korea and Thailand. This may reflect two opposing effects. A high stock market price may reflect buoyant economic conditions and therefore greater need for credit to provide working capital as enterprises expand production. Conversely, if stock prices

⁸ Indonesia, credit demand ($\lambda_{max} = 23.1$, $\lambda_{tr} = 25.2$); credit supply ($\lambda_{max} = 17.2$, $\lambda_{tr} = 19.9$). Thailand, credit demand ($\lambda_{max} = 15.9$, $\lambda_{tr} = 19.2$); credit supply ($\lambda_{max} = 15.7$, $\lambda_{tr} = 21.3$)

⁹ If the capital adequacy constraint on lending capacity is dropped, the coefficient becomes +0.1; presumably, the CAR prevented banks from increasing credit supply in line with the increase in spreads.

¹⁰ Since higher real interest rates are associated with greater credit supply, and lower credit demand, to the extent that real interest rates in the crisis period are underestimated, the estimation results will be biased towards finding a credit crunch.

Table 1: Parameter Estimates

	Indonesia		Korea		Thailand	
	Parameter Estimate	t-stat.	Parameter Estimate	t-stat.	Parameter Estimate	t-stat.
<i>Demand function</i>						
Constant	7.756	34.85	0.445	1.97	5.289	13.08
Interest rate	-1.659	-4.50	-2.460	-2.92	-0.726	-1.68
Industrial production	1.111	24.64	1.434	34.18	1.177	13.27
Stockmarket price	0.053	1.35	-0.081	-3.59	-0.139	-16.51
Output gap	-0.079	-0.36	0.383	1.79	0.720	4.71
Inflation	-1.384	-3.22	-4.106	-4.17	-0.960	-1.39
σ	0.012	4.50	0.018	7.62	0.020	6.95
<i>Supply function</i>						
Constant	6.730	35.61	-0.583	-4.89	-0.821	-3.14
Lending capacity	0.864	13.41	0.877	12.90	1.043	13.15
Interest rate	0.460	5.32	0.184	0.21	-1.621	-2.85
Industrial production	0.187	1.89	0.206	2.14	0.070	0.44
σ	0.030	8.02	0.017	3.19	0.017	5.57
Log Likelihood	191.1		202.2		199.3	
Number of observations	76		76		76	

Source: Authors' estimates

are high, firms may be better positioned to tap the capital markets directly. Finally, inflation is negatively correlated with real credit demand in each of the countries, suggesting the importance of macroeconomic stability for business activity.

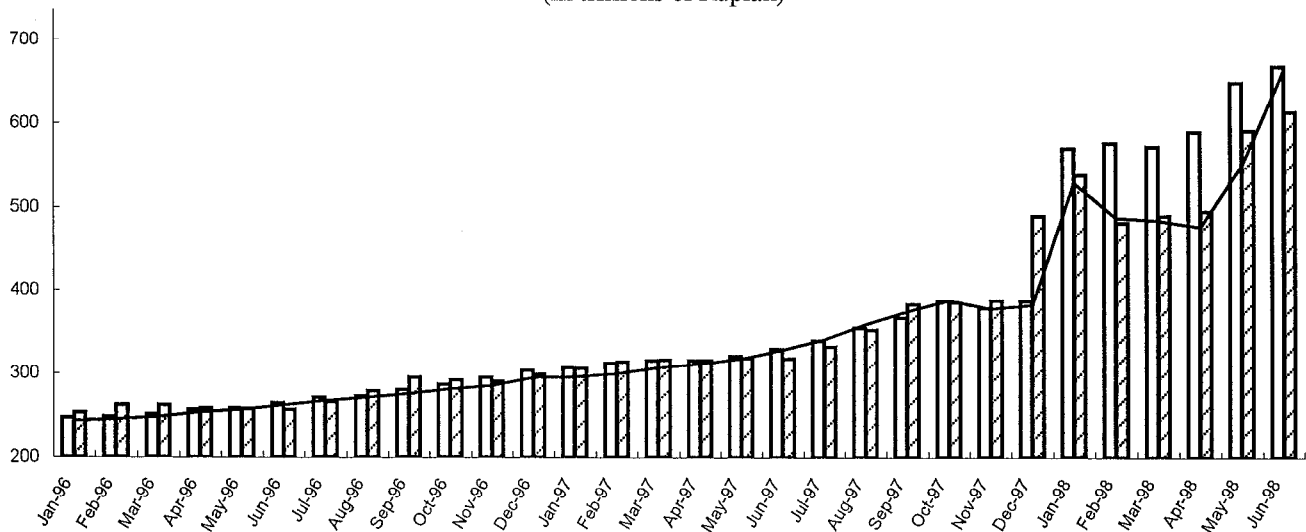
Two simple robustness checks were performed. First, structural breaks in the supply and demand functions were included for the respective crisis periods (1997Q2 and onwards for Thailand, and 1997Q4 and onwards for Indonesia and Korea), but these turn out to be statistically and economically insignificant, with the resulting estimated supply and demand very similar to those reported here. Second, to correct for potential endogeneity of the interest rate variables, these were instrumented using two lags of the respective variables. Again, the parameter estimates and resulting estimated supply and demand are very similar to those reported here.¹¹

Given the estimated credit supply and credit demand functions, the *probability* that there is a supply-side credit crunch is given by θ^d , while the *extent* of the (supply-side) credit crunch is given by $(C_t^d - C_t^s)$. If the estimated supply and estimated demand are sufficiently close, then the market is essentially in equilibrium, and the probability that it is either supply or demand “constrained” will be close to 50 percent. In fact, for our dataset, the magnitude of the deviations between estimated supply and demand are usually quite large, so that when $C_t^d > C_t^s$, the probability that the supply of credit was indeed the constraining factor is very high (i.e. above 0.95) and *vice versa*.

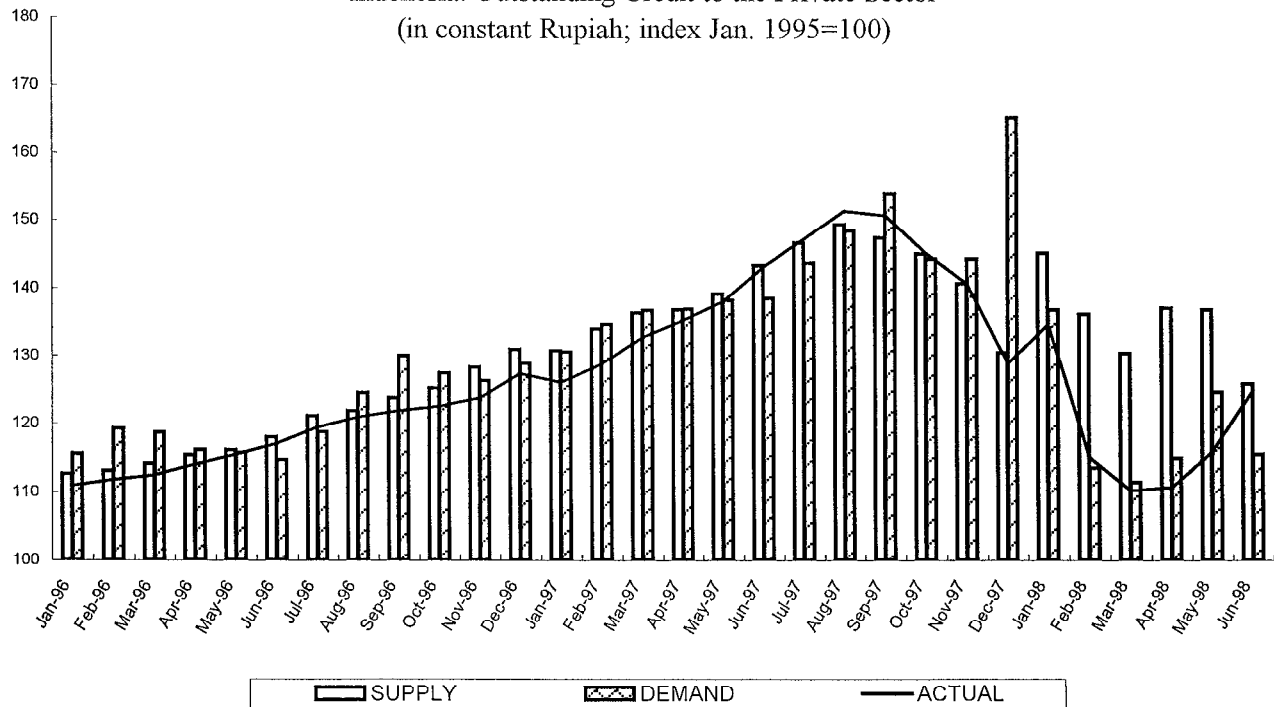
Figures 2(a)-(c) simply graph the estimated credit supply and credit demand functions (bars) as well as actual credit to the private sector (solid line). The overall fit of the model may be judged by the correspondence between the actual private sector credit and the *minimum* of the contemporaneous credit supply and credit demand functions.

¹¹ These estimates are available separately.

Figure 2 (a) Indonesia: Outstanding Credit to the Private Sector
(in trillions of Rupiah)

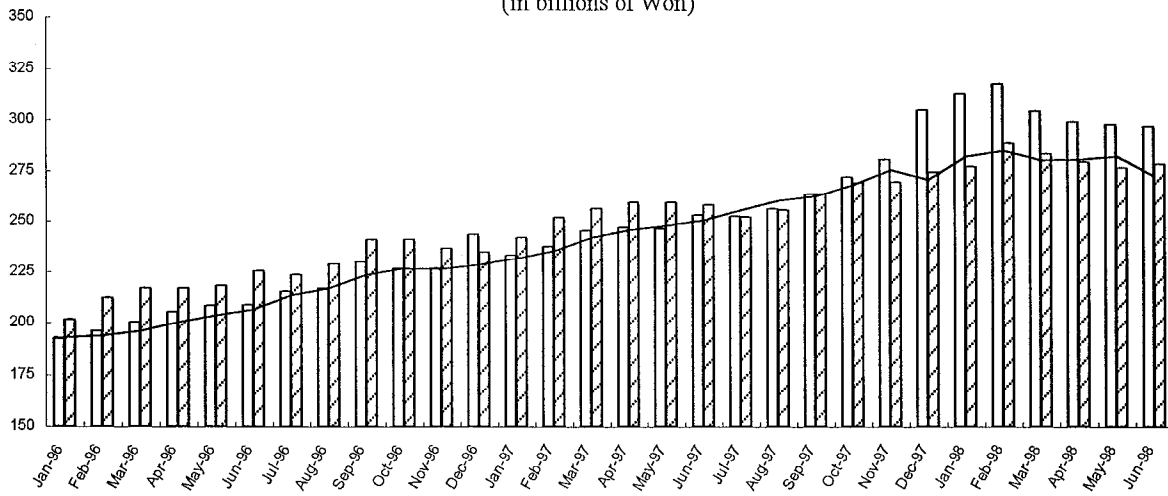


Indonesia: Outstanding Credit to the Private Sector
(in constant Rupiah; index Jan. 1995=100)

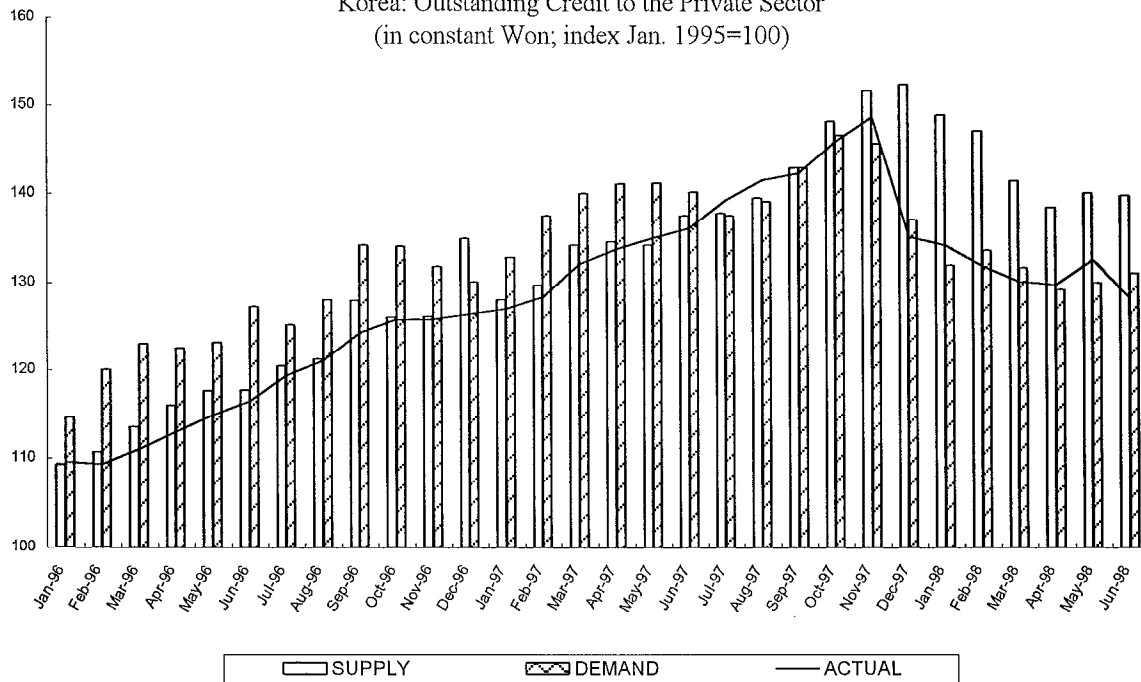


Sources: Authors' calculations

Figure 2(b): Korea: Outstanding Credit to the Private Sector
(in billions of Won)

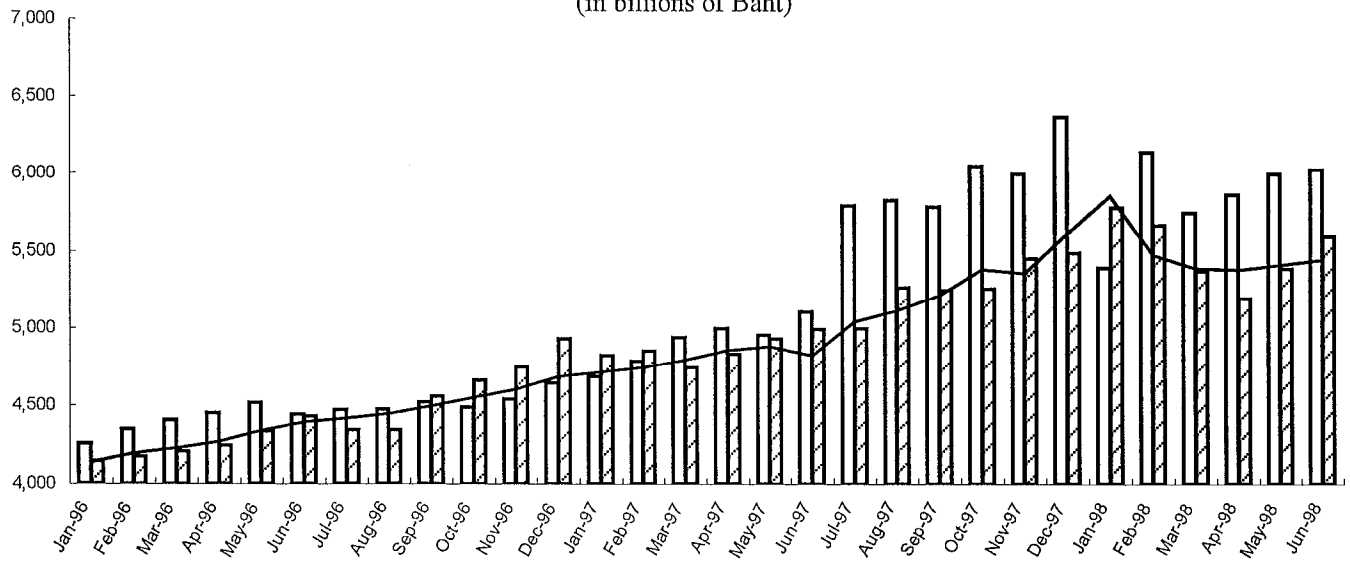


Korea: Outstanding Credit to the Private Sector
(in constant Won; index Jan. 1995=100)

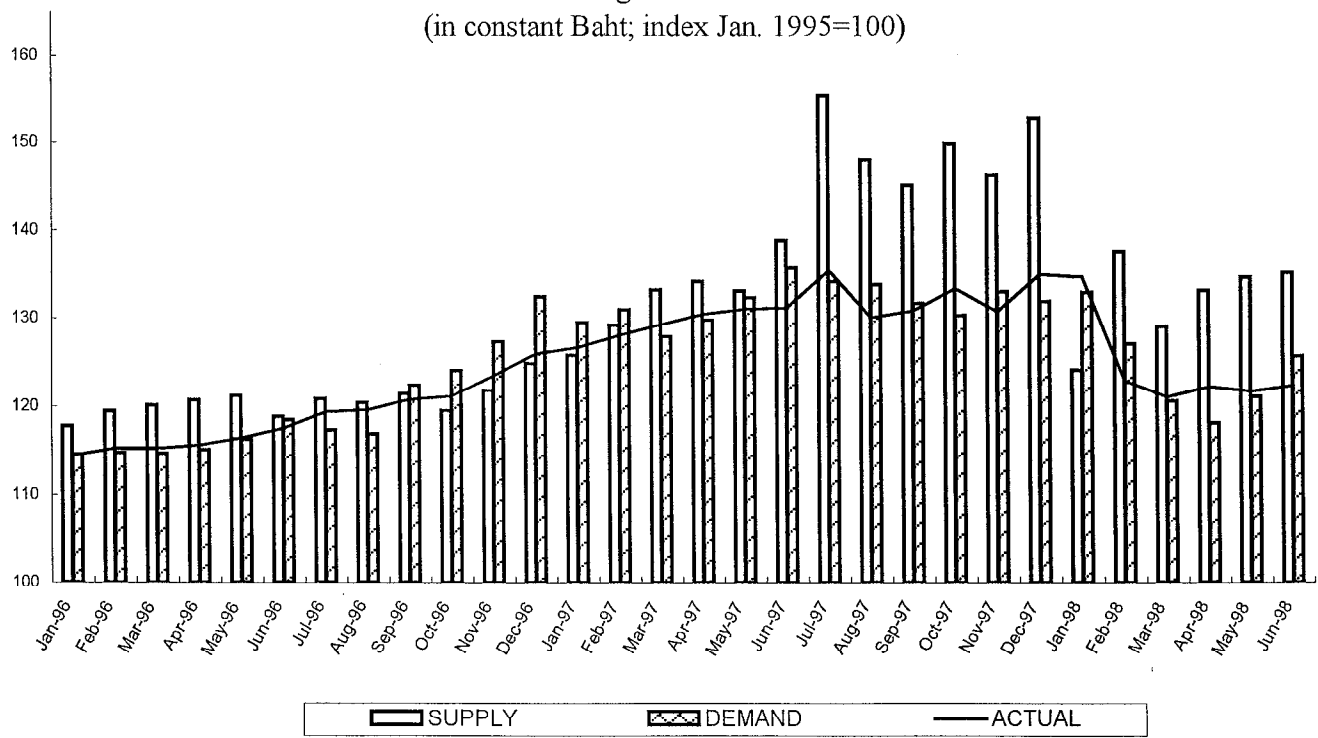


Sources: Authors' calculations

Figure 2(c) Thailand: Outstanding Credit to the Private Sector
(in billions of Baht)



Thailand: Outstanding Credit to the Private Sector
(in constant Baht; index Jan. 1995=100)



Turning to the crisis period, in Thailand, although both credit supply and credit demand fell in real terms (especially at the turn of the year), estimated credit demand has generally fallen faster. Only in January 1998 is there evidence of a “credit crunch” (driven, in fact, by the capital adequacy constraint on bank lending), with credit demand outstripping credit supply.¹²

In Korea, there was excess credit demand during the first half of 1997 (i.e. before the crisis broke), which had become very small by the onset of the crisis, before contracting sharply in late 1997 and early 1998.¹³ Indonesia is the only country for which there is evidence of (substantial) excess demand for credit (i.e. a credit crunch) in November-December 1997, with the real supply of credit contracting (as the banking crisis deepened) and the demand for real credit expanding sharply. Thereafter, however, there is no evidence of credit rationing.

V. CONCLUSION

In this note, we examine whether a “credit crunch” — defined as a situation in which there is excess demand for credit at prevailing interest rates — developed in the aftermath of the East Asian currency crises.

In principle, any observed decline in real credit growth rates could reflect three factors—each with quite distinct policy implications. First, banks’ *ability* to lend may be curtailed—both as they try to meet new (or newly enforced) capital adequacy ratios (the

¹² If the model is estimated without the capital adequacy constraint, the “credit crunch” in January 1998 disappears—suggesting that it was driven mainly by the efforts of banks to meet capital adequacy requirement. As such, it perhaps better termed a “capital crunch.”

¹³ Ghosh (1998) has estimated a similar model using quarterly data for Korea, obtaining very similar results, with the exception that, in the last quarter of 1997, there is evidence of excess demand for credit (in part, because bank capital fell sharply at the end of 1997, thus lowering lending capacity—and, with quarterly data, this lower lending capacity is applied to the entire fourth quarter). Kim (1998) has also recently estimated a disequilibrium model for Korea. In contrast to the results here, he finds evidence of excess demand for credit, starting at the beginning of 1997, increasing sharply during the crisis, and continuing through May 1998 (the end of his sample). There are important differences in specification, however. Most importantly, Kim includes only bank deposits (i.e. excludes other liabilities of the banking system, such as liquidity support from the central bank) in specifying his credit supply function. In addition, credit demand in his specification is assumed to depend the *spread* between loan rates and corporate bond yields, but not on the *level* of the loan rate. Since the increase in real interest rates probably exceeds the widening of the spread during the crisis period, his estimated credit demand is likely to be higher. As a result, both his estimated credit supply is lower, and his estimated credit demand is higher.

“capital crunch”), and as withdrawals of bank deposits shrink banking system liabilities in real terms. Second, banks’ *willingness* to lend might fall if weakening economic activity makes lending too risky (with interest rates inadequate to compensate for the risk). Third, in the context of weakening aggregate demand and activity, credit demand might fall as well. The disequilibrium framework adopted here (together with the capital crunch constraint) allows for each of these possibilities to be distinguished.

Over all, our results suggest that, while the supply of (real) credit to the private sector did indeed decline, estimated demand for real credit fell even more sharply. As such, there is relatively little evidence of a quantity rationing “credit crunch.” If, indeed, demand for credit was contracting, why did real interest rates not decline? In fact, real interest rates in Korea and Thailand have been slowly declining, especially in the second and third quarters of 1998, with the delay in the fall of real rates presumably reflecting the higher risk premium.

Our findings are very much consistent with the findings of Dollar and Hallward-Driemeier (1998) who survey some 1200 Thai manufacturing firms and find that “lack of access to capital” was ranked fourth (out of 4 choices) as the major cause of firms’ output decline — after, respectively, “lack of demand,” “rise in input costs following the exchange rate depreciation,” and the “cost of capital.”

It bears emphasizing, however, that our results are preliminary and relate to whether a credit crunch, in the sense of *quantity rationing*, occurred. There is little doubt that rising real interest rates themselves (quite aside from any possible “credit crunch”), together with weakening activity, contributed to corporate sector distress (as well as to declining credit demand)—although it does not follow that there were viable policy alternatives. Moreover, as noted above, our results pertain to the aggregate economy. Thus no distinction is made between rollover of debt and provision of new credit. Evidence suggests that, in Korea, for example, much of lending in the first quarter of 1998 reflected rollover of credit to large corporations (with smaller enterprises less able to obtain credit).

More generally, our results certainly do not preclude the possibility of individual (creditworthy) firms being unable to obtain credit at prevailing interest rates at the microeconomic level. Indeed, there is at least anecdotal evidence from these countries which suggests that small and medium-scale enterprises—especially those without well-established relationships with banks—may have been unable to obtain adequate credit even at high interest rates, perhaps because of the informational asymmetries emphasized by Stiglitz and Weiss (1981).

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Data Sources

Data are monthly (except for Indonesian industrial production which is available only quarterly), and cover the period 1992:1 to 1998:6.

r_t	Real interest rate. Lending rate, deflated by average WPI inflation between periods (t+1,t) and (t,t-1)	<i>International Financial Statistics.</i> Indonesia: weighted average lending rate on loans to private sector. Korea: Minimum rate charged to general enterprises by banks on loans of general funds (from July 1996, the rate is an average, weighted by loans extended during the period by nationwide commercial banks). Thailand: minimum lending rate charged to prime customers.
C_t	Real credit to the private sector. Nominal credit deflated by WPI; logarithm	<i>International Financial Statistics.</i>
l_t	Real lending capacity. Total commercial bank liabilities plus net worth - cash in vault - capital accounts - required reserves/liquidity, deflated by WPI; logarithm;	Indonesia: Bank Indonesia: <i>Indonesian Financial Statistics.</i> Korea: Bank of Korea, <i>Monthly Bulletin.</i> Thailand: Bank of Thailand, <i>Monthly Bulletin.</i>
y_t	Industrial production; logarithm. (Three month backward moving average).	Indonesia: <i>Biropustat Statistik.</i> Korea: <i>International Financial Statistics.</i> Thailand: Bank of Thailand, <i>Monthly Bulletin.</i>
S^p	Stockmarket price index; logarithm.	Indonesia: Jakarta Stock Exchange. Korea: Korea Stock Exchange. Thailand: Stock Exchange of Thailand.
π	Consumer price inflation; $\Delta \ln(\text{CPI})$.	<i>International Financial Statistics.</i>