

**FOR
AGENDA**

SM/08/266

August 15, 2008

To: Members of the Executive Board

From: The Acting Secretary

Subject: **Republic of Korea—Selected Issues**

This paper provides background information to the staff report on the 2008 Article IV consultation discussions with the Republic of Korea (SM/08/264, 8/11/08), which is tentatively scheduled for discussion on **Monday, September 8, 2008**. At the time of circulation of this paper to the Board, the Secretary's Department has not received a communication from the authorities of the Republic of Korea indicating whether or not they consent to the Fund's publication of this paper; such communication may be received after the authorities have had an opportunity to read the paper.

Questions may be referred to Mr. Schiff (ext. 38717) and Mr. Khatri (ext. 38270) in APD.

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INTERNATIONAL MONETARY FUND

REPUBLIC OF KOREA

Selected Issues

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Approved by the Asia and Pacific Department

August 14, 2008

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EXECUTIVE SUMMARY

In the context of an unsettled global economic environment, Korean policy makers are confronting difficult macroeconomic choices and addressing emerging financial sector risks. At the same time, the new government remains focused on raising potential growth over the medium term, and raising investment is central to their plans. This year's Selected Issues papers focus on these various challenges.

Chapter I analyzes the role of monetary policy in the current context of slowing growth and rising inflation pressures. Utilizing a small structural macro model, the paper argues that modest but timely monetary tightening would likely allow Korea to experience a soft landing, with growth slowing modestly before recovering during 2009, and inflation gradually returning to the Bank of Korea's target zone. However, the analysis also underlines the need for monetary policy to remain flexible and forward-looking, given for example the possibility of further sharp oil price movements or a slower-than-anticipated global growth.

Chapter II examines Korea's high household debt levels, which represent a potential constraint on monetary policy, and also raise financial sector risks. Utilizing household level data, the chapter finds a sizable impact of interest rate hikes on the extent of distressed household debt and also points to risks from the expiry of grace periods on a significant number of mortgages over the next several years. These findings underline the need for monetary policy to remain ahead of the curve, avoiding large and potentially costly rate hikes, and the importance of continuing to strengthen financial sector risk management.

As emphasized in Chapters III and IV, Korea is embarking on a major financial liberalization, with potentially large benefits and risks. The implementation of the Capital Markets Consolidation Act in 2009 should lead to a more dynamic financial sector, but will pose a stiff challenge for financial oversight. Chapter III examines the structural factors that have led to Korean banks' heavy reliance on wholesale financing—and the resulting liquidity risks—and argues that this may be exacerbated as banks are subject to greater competition from other financial institutions. Addressing this risk will require a change in behavior by banks and a greater focus on liquidity by the regulator. The expected increased innovation will also require improvement in oversight, in particular to deal with more sophisticated financial products and institutions. In this context, Chapter IV analyzes lessons for Korea of the ongoing “subprime” financial crisis, with emphasis on recent policy recommendations from international bodies, such as the Financial Stability Forum and IOSCO.

Finally, Chapter V estimates the determinants of investment in Korea, and examines the government's proposed approach to raising investment levels. Utilizing a panel of firm-level data, the chapter finds that scope for raising investment may be greatest for smaller firms, and that approaches which encourage restructuring and market-based financing, and improve the business climate are likely to be most effective.

I. RISING PRICES, SLOWING GROWTH, AND THE IMPLICATIONS FOR MONETARY POLICY¹

A. Introduction

1. **Like many countries, Korea is facing an increasingly challenging environment for conducting monetary policy.** Commodity prices are fueling headline inflation and what started largely as a supply-side shock is feeding into higher core inflation. Given the large terms of trade shock—Korea is the fifth largest oil importer in the world—the won has lost 16 percent of its value since mid-2007, further adding to inflationary pressures. In addition, Korea has not remained immune to the global slowdown and with the cycle turning downward, the trade-off between inflation and growth is deteriorating. Finally, subprime-related turbulences in financial markets add an extra element of uncertainty to the economic outlook, and have led to a noticeable increase in Korea's stock market and exchange rate volatility.
2. **In addition, current events pose the first real test to Korea's inflation targeting framework.** With inflation now exceeding its target for several quarters, the main challenge will be to keep inflation expectations well anchored. If inflation expectations get out of hand a wage-price spiral may ensue and make the eventual adjustment more costly in terms of lost output. It is therefore paramount that monetary policy remain ahead of the curve and that the Bank of Korea (BOK) communicate clearly the rationale of its rate decisions.
3. **This chapter uses a small structural macro model to analyze the inflation outlook and challenges for monetary policy.** The model is the IMF's forecasting and policy analysis system (FPAS) and is used, in similar forms, by central banks around the world.² Parameter specifications have been chosen such that the model reproduces key characteristics of the Korean economy. The chapter proceeds as follows. The next section reviews Korea's monetary policy framework, discusses its track record, and describes recent inflationary developments. Section II presents the model and its calibration to Korean circumstances. Section III reports the baseline projection and various shocks to the baseline, including policy responses. Section IV concludes.

B. Background and Recent Developments

4. **In 1998, Korea adopted inflation targeting, as financial innovation had made the earlier framework of monetary targeting impractical.** For a transitional period the BOK used both systems in parallel, but from 2001 onwards monetary aggregates were dropped as intermediate targets. The Bank of Korea Act stipulates price stability as the purpose of the central bank and every three years the bank sets a medium-term inflation target which it

¹ Prepared by Erik Lueth.

² See Berg and others (2006).

seeks to achieve on average. The central bank targets headline inflation, except for the period 2000–06, when it targeted core inflation, and since 2003 the target band has been 2.5–3.5 percent. Once a month the bank’s monetary policy committee decides on the policy interest rate, which was changed from the overnight call rate to the 7-day repo rate in March 2008.

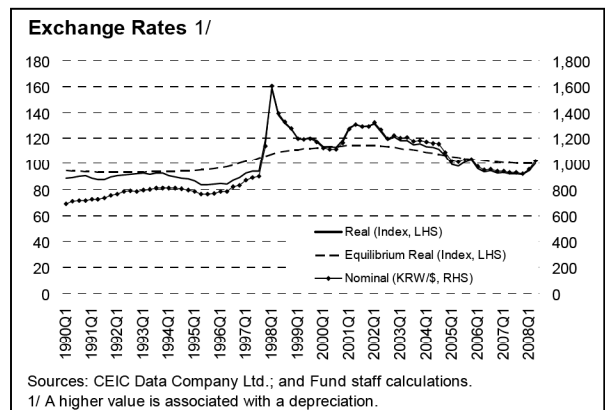
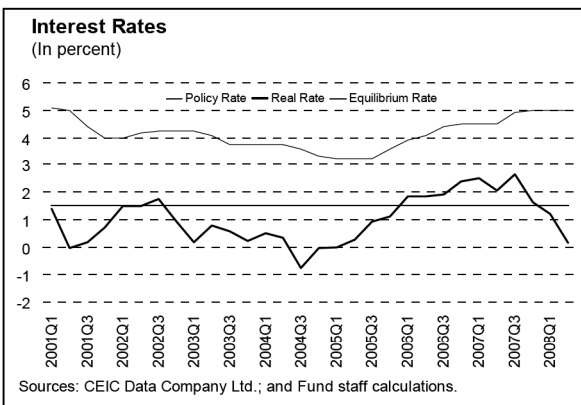
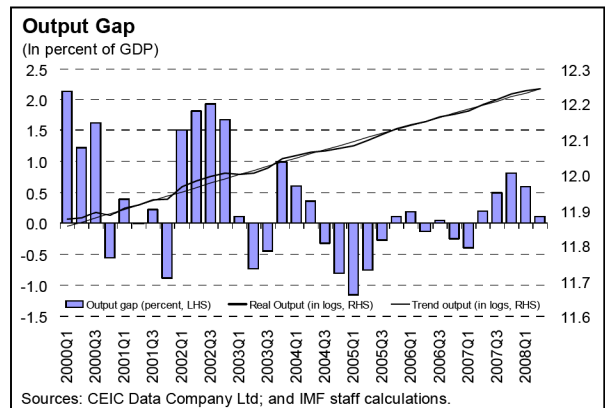
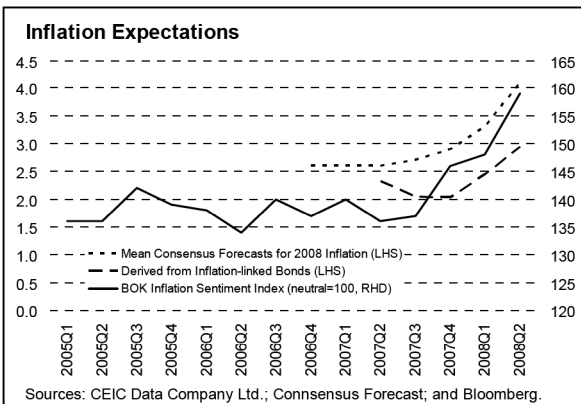
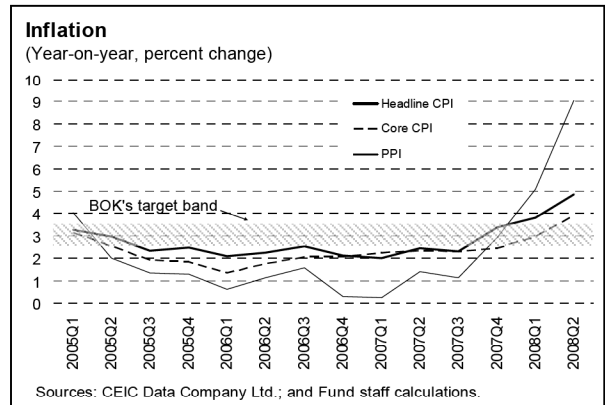
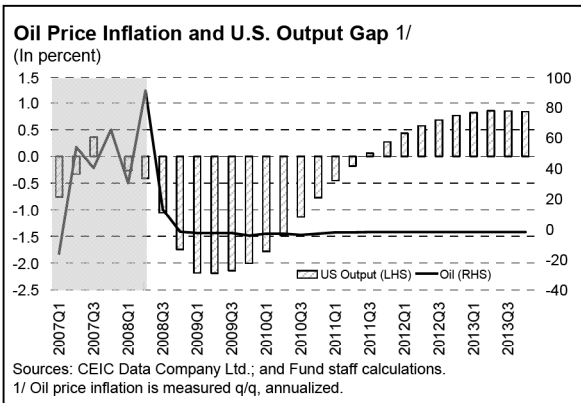
5. **The inflation targeting framework has served the country well.** Between 1998 and late-2007, the year-on-year inflation rate exceeded the upper target band on only one occasion lasting for two months. In addition, Kim and Park (2006) observe that inflation has been lower and less volatile under inflation targeting even after controlling for the size of shocks. Also, inflation expectations seem to be better anchored under the new framework as evidenced by lower inflation persistence and a lower influence of actual inflation on inflation expectations.

6. **However, until recently the inflation targeting framework had not been put to a real test.** The relative success of inflation targeting may owe much to the special economic circumstances of the last years. For one thing, the sizeable and steady increase in the exchange rate—the won appreciated by 70 percent in NEER terms between 1998 and mid-2007—helped keep inflation at bay. Also, inflation targeting in Korea may have been helped by the integration of China’s and India’s vast labor pool into the global economy and the wage moderation that this induced.

7. **Meanwhile global and domestic circumstances have become more challenging** (Figure I.1). Real oil prices are at historical highs at a time when the global economy is slowing and key domestic variables point to a risk of sustained inflation:

- Oil price inflation reached 90 percent q/q annualized, in the second quarter of 2008 and is projected to stay above 10 percent through the third quarter. Beyond that oil prices are projected to stay broadly flat.
- The U.S. output gap is estimated to have fallen to a negative 0.4 percent in the second quarter of 2008. By the first quarter of 2009 U.S. GDP is projected to fall 2.2 percent below potential and remain close to this value throughout 2009.
- Headline inflation in Korea reached 4.8 percent y/y in the second quarter and 8.2 percent q/q annualized, breaching the Bank of Korea’s target band for the second quarter running. Core inflation has been trending up for some time and stood at 3.9 percent y/y in the second quarter. The gap between producer and consumer price inflation and measures of inflation expectations are also trending upward boding ill for a quick reversal of inflationary trends.

Figure I.1. Korea: Recent Inflationary Developments



- Given the lags in price dynamics, the unfolding slowdown of domestic demand may take some time in providing inflation relief. The estimated output gap for Korea was positive through the second quarter. Other variables that support domestic demand (but are not captured in the model) are rapid money and credit growth of 14 percent and 15 percent, respectively, in June, and an accommodative fiscal stance, with a stimulus projected at 1½ percent of GDP in 2008.
- The policy interest rate was kept at 5 percent in the first two quarters of 2008. While this constitutes a 7-year high, the monetary policy stance is accommodative: in the second quarter, the real interest rate was 0.2 percent, well below the 1.5 percent that has, on average, prevailed under the inflation targeting framework and is, hence, assumed to constitute the neutral real rate of interest.
- The real exchange rate fell by 9¼ percent over the first two quarters of 2008. The real exchange rate is estimated to be broadly in equilibrium and, therefore, does not add to demand pressures. However, the pass-through of the weaker currency has fueled inflation more directly.³

C. The Model

8. **The FPAS model describes a small open economy with an inflation targeting framework.** It combines the New Keynesian emphasis on nominal rigidities and the role of domestic demand in output determination with the rational, forward-looking behavior propagated by the real business cycle literature. The model expresses each variable in terms of its deviation from equilibrium and does not attempt to explain the equilibrium values themselves.⁴ It is a two-country model, in which Korea's economy is depicted by four key equations, that can be derived from micro foundations (see also Appendix I.1):

- **IS Curve.** This equation describes the interest rate channel of monetary policy. By raising borrowing costs interest rate hikes are assumed to reduce domestic demand and, hence, the output gap. However, significant lags in the monetary transmission mechanism mean that the interest rate coefficient is small relative to the coefficient on the lagged output gap. External demand is assumed to depend on the U.S. output gap and exchange rate misalignment.
- **Phillips Curve.** Underlying this equation is mark-up pricing by enterprises over wage costs, where workers take into account in their wage negotiations the level of

³ The equilibrium real exchange rate in Figure I.1 has been derived with an augmented HP-filter and is distinct from the equilibrium exchange rate generated by the CGER exercise.

⁴ Equilibrium values are derived with the help of an augmented HP-filter that leaves room for value judgments. For example, the smoothing procedure can be programmed to produce a zero output gap in a particular year.

unemployment (output gap) and expected inflation. The more backward-looking agents are in forming inflation expectations, the higher the cost of disinflation in terms of lost output. Other determinants of inflation in this equation are oil price inflation and the rate of exchange rate depreciation.

- **Interest Parity Condition.** This equation states that the expected depreciation of the won relative to the dollar is equal to the risk-adjusted interest rate gap over the United States. In projecting the exchange rate, some actors have perfect foresight while others have adaptive expectations. This leads to Dornbusch-like exchange rate overshooting in slow motion.
- **Monetary Policy Rule.** The central bank is assumed to raise nominal interest rates when actual inflation exceeds the target and output exceeds potential. The coefficient on the inflation gap is usually greater than 1 to yield a positive real interest rate response, and greater than the coefficient on the output gap. Moreover, central banks usually give some weight to past policy rates as a smoothed interest rate path is less demanding on the financial sector.⁵

In sum, the model has four endogenous variables—output gap, inflation gap, real interest rate gap, and exchange rate gap—which equal zero in the steady state. In the event of a positive shock to inflation, interest rate increases lower inflation directly by curbing domestic demand and indirectly through exchange rate appreciation and the dampening effect this has on external demand and pass-through.

9. **The model has been parameterized to reproduce key characteristics of the Korean economy** (see also Appendix I.1). In a first step, models of similar countries were used to inform the parameter specification; in particular, the Canadian model by Berg and others (2006) was used as a benchmark. In a second step, shocks were applied to the model's steady state, and the stylized facts generated in this way were compared to what is known about the monetary transmission mechanism in Korea. For example, the model's sacrifice ratio, the effect of oil price and exchange rate movements on growth and inflation, and the lag in monetary transmission are broadly in line with the Korea-specific literature and accounts by Korean researchers and policy makers. However, the short track record of the inflation targeting framework and the absence of major shocks complicates the parameterization of the model and warrants more than the usual caution in interpreting the results.

⁵ In the Korean context it may also be explained by the strain abrupt interest rate hikes would put on households given the predominance of flexible rate mortgages.

D. Simulation Results

10. **This section uses the model to analyze the inflation outlook and risks to the outlook, as well as the implications for monetary policy.** While the baseline forecast is informed by the model's predictions it is, in effect, a judgmental forecast that takes into account a much broader set of available data, including short-term indicators, market expectations, and views of policy makers. To analyze key risks to the outlook, residuals in the main equations are chosen such that the model reproduces exactly the baseline forecast. Subsequently, this tuned baseline forecast is subjected to various shocks.

Baseline Forecast

11. **In the baseline, monetary tightening and slower growth help contain inflationary pressures** (Figure I.2). Using a standard parameterization of the monetary reaction function, as well as parameterizations more in line with past BOK behavior, the model calls for an interest rate hike in the third quarter of 2008. The baseline assumes an interest rate hike by 0.5 percentage points to 5.5 percent. While this move would leave real interest rates in accommodative territory, the resulting appreciation in the currency and, more importantly, the projected economic slowdown should help bring down inflation starting from the first quarter of 2009. The output gap should turn negative from the third quarter onward and growth is expected to remain below potential throughout 2009. Despite the projected moderation of inflationary pressures—oil price inflation is also expected to come down significantly—common measures of inflation persistence suggest that headline inflation would remain elevated for some time and stay above the target band for most of 2009.

Oil price Shock

12. **With higher oil prices, monetary tightening would need to be more aggressive** (Figure I.3). There is a lot of uncertainty surrounding the oil price baseline, with upside risks from low spare capacity and downside risks from slower global growth. The shock scenario assumes that oil prices reach US\$200 per barrel in the fourth quarter of 2008 and return steadily to the baseline by 2012. Under such circumstances, inflation would be about $\frac{3}{4}$ percentage points higher in 2009 relative to the baseline and return into the target band only by the second quarter of 2010. Policy rates would have to rise to above 6 percent when the shock occurs and remain at that level for three quarters. This would remove most monetary accommodation by mid-2009. Since U.S. and Korean monetary policy react similarly to the oil price shock, the exchange rate would be little affected. The additional monetary tightening in response to the shock, as well as the further slowdown in U.S. growth in response to higher oil prices, would reduce growth by up to 0.3 percentage points and delay the return to full potential by several quarters.

Figure I.2. Baseline Projections

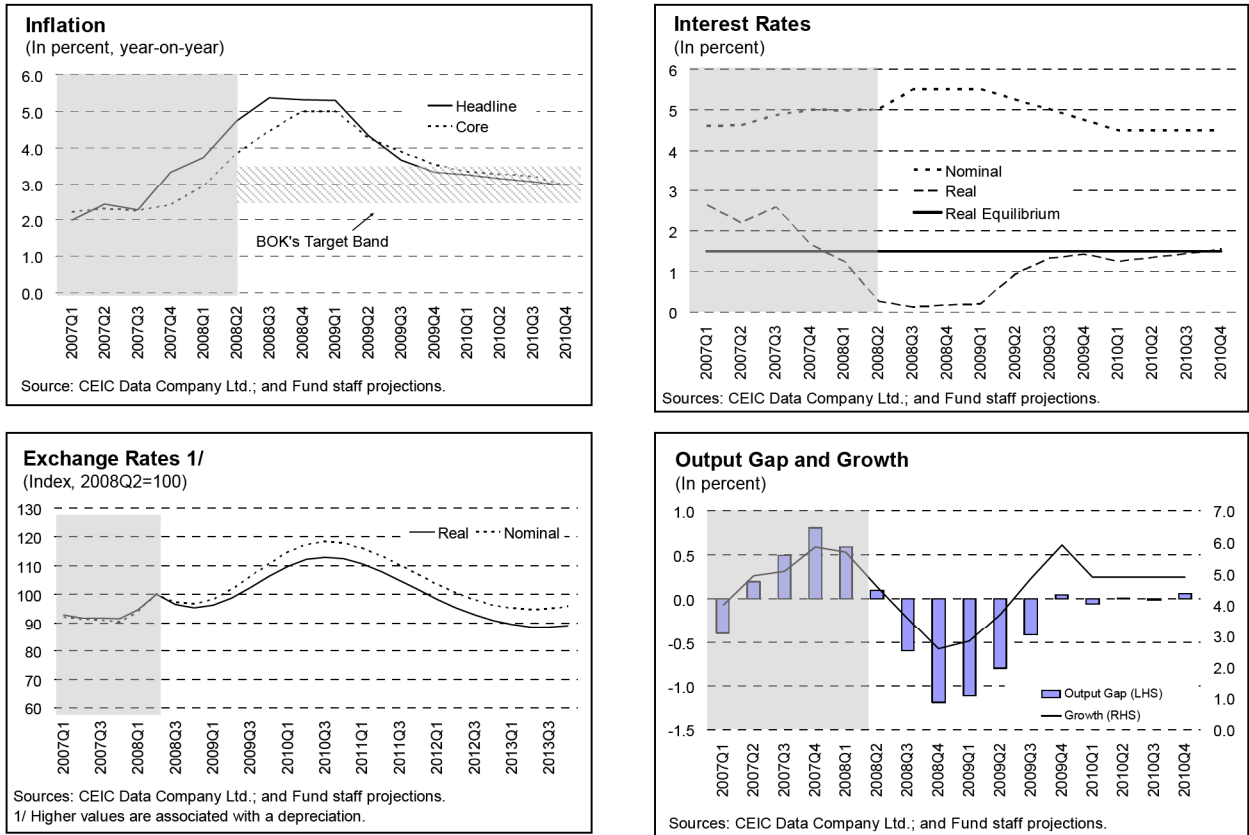
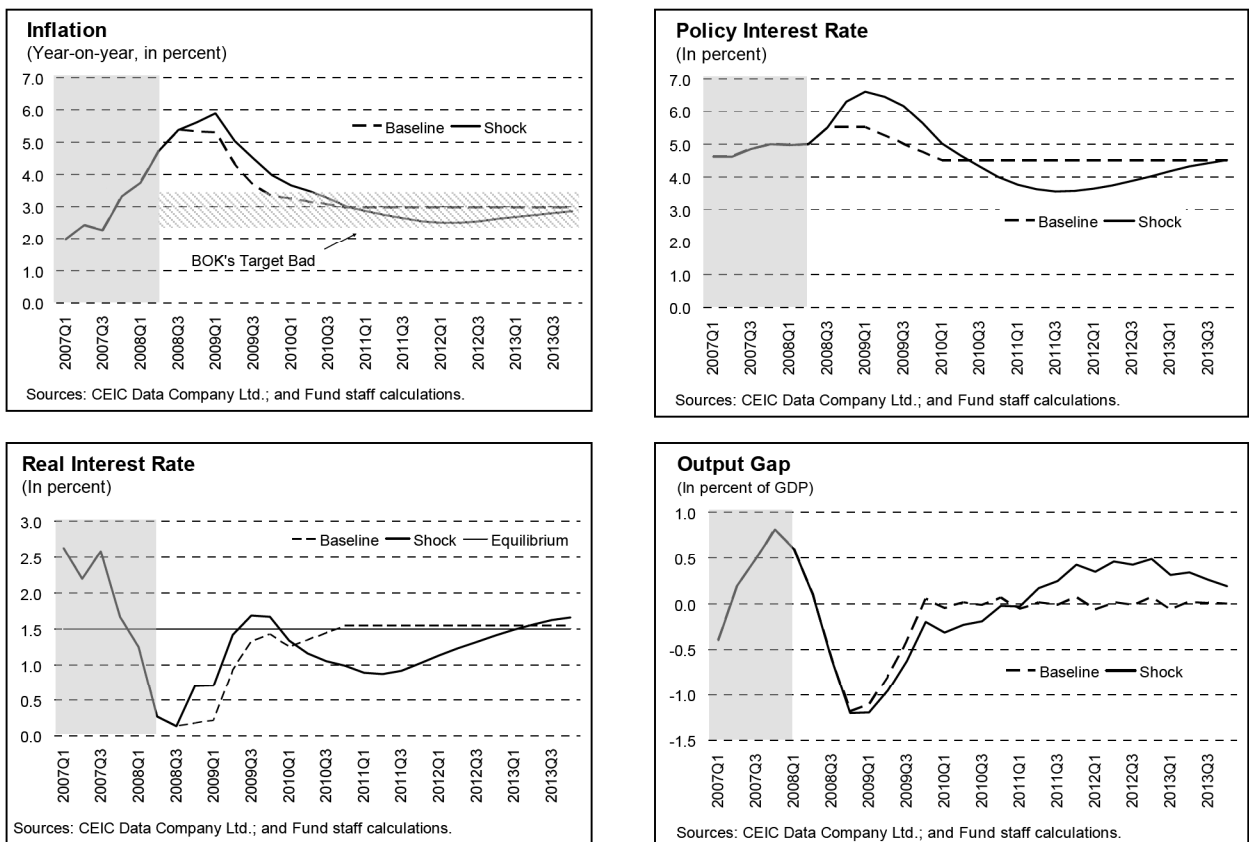


Figure I.3. Oil Price Shock



Lower U.S. Growth

13. **A deeper than expected U.S. downturn could require some monetary easing** (Figure I.4). An end to the U.S. subprime crisis is not in sight. Hence, this scenario assumes that U.S. growth will be 1 percentage point lower in the fourth quarter of 2008 relative to the baseline scenario and remain below the baseline until mid-2010.⁶ This will reduce growth in Korea by 0.3 percentage points in the quarter of the shock and 0.7 percentage points in the second quarter of 2009. The policy rate should be steadily reduced to a low of 2¾ percent in early 2010, thereby providing monetary stimulus over much of the medium term. Again, the exchange rate would be little affected as U.S. and Korean monetary policy would respond similarly to the demand shock. Despite the monetary accommodation inflation would be lower by up to 0.6 percentage points relative to the baseline, but the inflationary impact of lower growth would occur with a lag of 2 quarters.

Exchange Rate Shock

14. **Exchange rate depreciation should lead to monetary tightening if balance sheets remain intact** (Figure I.5). The global financial turmoil is far from over and markets remain volatile. In such a situation, another bout of bad news could trigger a substantial depreciation of the Korean won. This scenario assumes that capital outflows lead to a 10 percent depreciation of the won in the last quarter of 2008 without damaging balance sheets and, hence, constraining monetary policy. The weaker currency boosts inflation by 0.3-0.4 percentage points relative to the baseline and the return into the target band is delayed by one year. Monetary policy helps contain the inflationary impact of the devaluation by raising the policy rate by a maximum of 1¾ percentage points relative to baseline. If balance sheet effects can be avoided the weaker currency would give a boost to GDP.

E. Conclusion

15. **Current circumstances call for a tightening of monetary policy, despite the projected slowdown of global and domestic demand.** Higher oil prices, the weak won, and still-high money and credit growth will continue to exert inflationary pressure over the coming months. This needs to be weighed against the deflationary impact of slower global and domestic growth over the next quarters. Using a standard parameterization of the monetary policy reaction function, as well as parameterizations more in line with past BOK behavior, the model calls for an interest rate hike in the third quarter of 2008.

⁶ Since the model is a two-country model, U.S. growth is determined endogenously and stays below the baseline for several quarters. The U.S. growth shock does not affect oil prices which are exogenous in the model, hence, simulated effects on Korean growth and inflation should be considered as upper and lower bounds, respectively.

Figure I.4. Shock to U.S. Growth

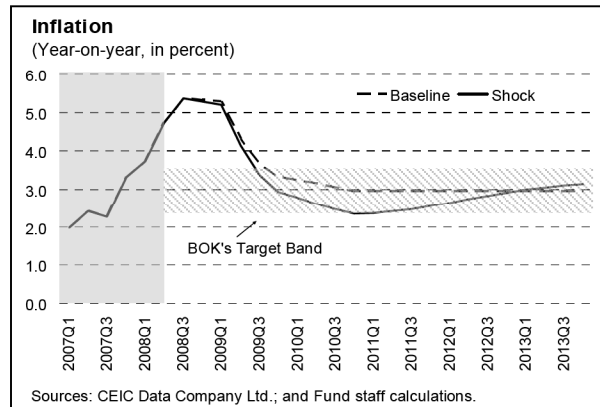
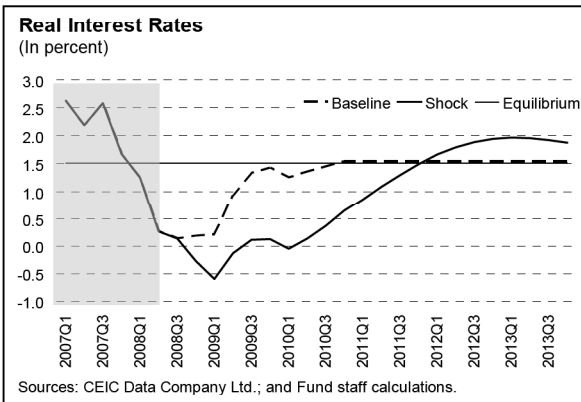
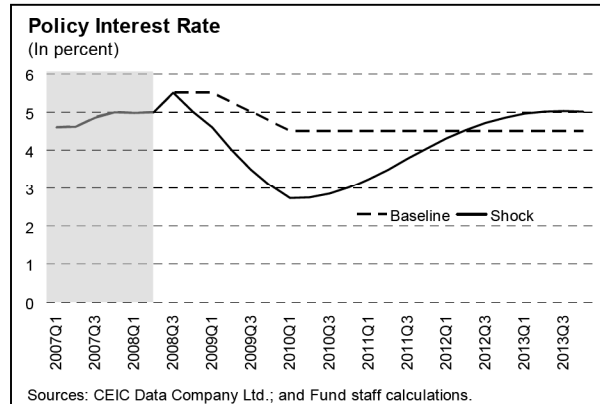
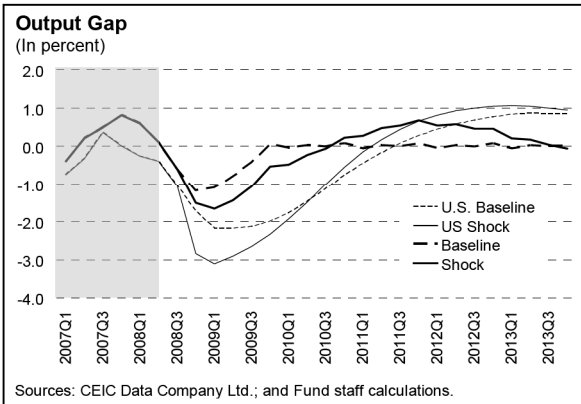
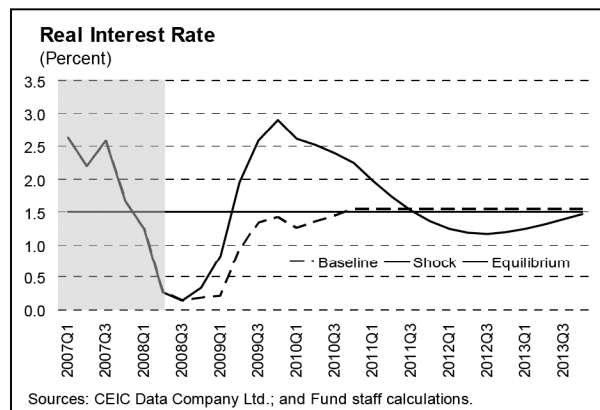
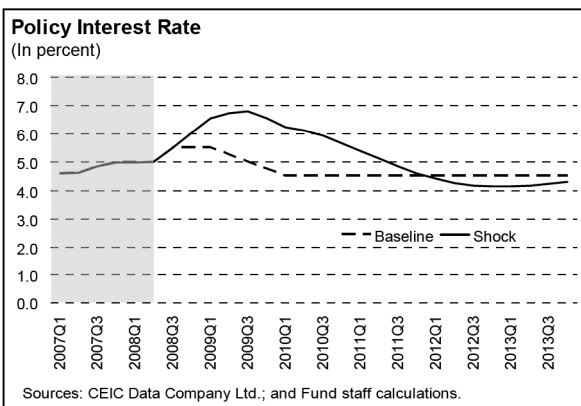
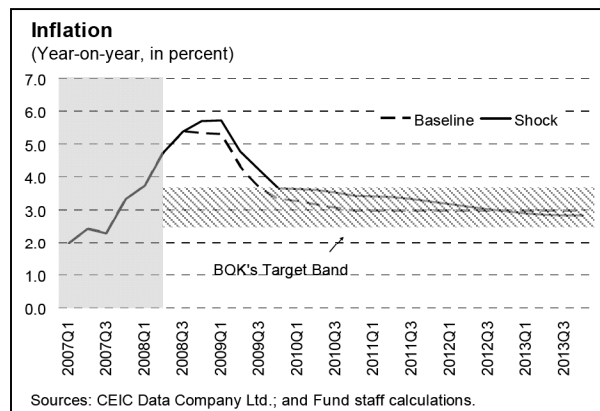
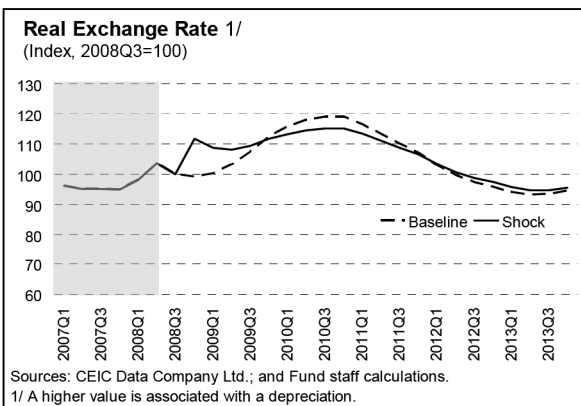


Figure I.5. Exchange Rate Shock



16. **Major risks to the baseline forecast, if realized, call for a significant monetary policy response.** Under a fairly common specification of the monetary policy rule, an increase in the oil price to US\$200 per barrel should raise the policy rate by 1 percentage point in the first year relative to the baseline; a 1 percentage point shock to U.S. growth should allow a 1 percentage point easing in the policy rate in the first year; and a 10 percent depreciation of the exchange rate would call for a 1¼ percentage point hike of the policy rate in the first year, if balance sheets remain intact.

Appendix I.1. Model Equations and Parameterization

A. Model Equations

IS Curve:

$$ygap_t = \alpha_1 ygap_{t+1} + \alpha_2 ygap_{t-1} - \alpha_3 (r_{t-1} - r_{t-1}^*) + \alpha_4 (z_{t-1} - z_{t-1}^*) + \alpha_5 ygap_t^{US} + \varepsilon_t^{ygap}$$

Phillips Curve:

$$\pi_t = \beta_1 \pi 4_{t+1} + (1 - \beta_1) \pi 4_{t-1} + \beta_2 ygap_{t-1} + \beta_3 (z_t - z_{t-1}) + \beta_4 \pi_t^{oil} + \beta_5 \pi_{t-1}^{oil} + \varepsilon_t^\pi$$

Interest Parity Condition:

$$z_t = z_{t+1}^e - (r_t - r_t^{US} - \rho) / 4 + \varepsilon_t^z, \text{ with } z_{t+1}^e = \delta z_{t+1} + (1 - \delta) z_{t-1}, \text{ with } r_t = i_t - \pi 4_t$$

Monetary Policy Rule:

$$i_t = \phi i_{t-1} + (1 - \phi) (r_t^* + \pi 4_{t+4} + \gamma_1 (\pi 4_{t+1} - \pi_{t+4}^*) + \gamma_2 ygap_t) + \varepsilon_t^i$$

B. Variable Definitions

$ygap$	output gap, percent
$ygap^{US}$	U.S. output gap, percent
r^*	equilibrium real interest rate, percent per annum
r^{US}	U.S. real interest rate, percent per annum
z	log of the real exchange rate times hundred (increase implies depreciation)
z^*	log of the equilibrium real exchange rate times hundred
z^e	log of the expected real exchange rate times hundred
ε	error term (e.g., to calibrate model predictions to actual data)
π	quarter-on-quarter CPI inflation, annualized, percent
$\pi 4$	year-on-year CPI inflation, percent
π^{oil}	quarter-on-quarter real oil price inflation, annualized, percent
π^*	target inflation rate, annual, percent
ρ	risk premium, percent per annum
i	nominal interest rate, percent per annum

C. Parameterization

Parameters were chosen such that the model, when shocked in steady state, reproduces key characteristics of the monetary transmission mechanism in Korea. In particular:

- *Sacrifice Ratio.* A permanent 1 percentage point reduction in the inflation target yields a cumulative negative output gap of 1.3 percent in the first year and 5.3 percent over 5 years. The first sacrifice ratio is in line with the Canada model, while the second falls within the range of 4.6-5.5 percent, the only known estimate for Korea, unfortunately predating the inflation targeting framework (Kim and Shon, 2002).
- *Monetary Transmission Lags.* An interest rate hike has its biggest effect on the output gap 3-4 quarter after the shock, or broadly in line with BOK accounts of actual transmission lags. The maximum effect on inflation takes 8 quarters to materialize, which is at the upper bound of BOK estimates (3-8 quarters).
- *Oil price Shock.* A permanent jump in the oil price by 10 percent (i.e., a one-off inflation shock) raises inflation by up to 0.2 percentage points and reduces growth by up to 0.2 percentage points. This is in line with rules-of-thumb cited by academics and policy makers in Korea.
- *Exchange Rate Shock.* A 10 percent depreciation of the won raises inflation by up to 0.5 percentage points. This is equal to the lower bound estimate (0.5-0.8 percentage points) of a recent unpublished study by BOK and somewhat lower than the 0.8 percent estimated by the Korea Development Institute (Dong-Chul and Jun-Hyuk, 2008).
- *Coefficient of U.S. Output Gap.* Based on a VAR and data for 1991-2007 the IMF estimates that a one percentage point decline in U.S. growth reduces Korean growth by 0.2 percentage points (IMF, 2008). The model parameter of 0.25 is slightly higher, given that global linkages have increased over time.
- *Monetary Policy Rule.* Korea's monetary policy rule has been estimated, e.g., by Eichengreen (2004) and Kim and Park (2006). While the coefficients on the inflation and output gap are not too dissimilar from the model coefficients, the estimated coefficient on the lagged policy rate is above 0.9. Under current circumstances this degree of smoothing leads to explosive inflation dynamics in the model. Hence, a policy rule was chosen that leads to reasonable results in similar countries.

$$\begin{array}{lll}
 \alpha_1 = 0.1 & \beta_1 = 0.2 & \delta = 0.5 \\
 \alpha_2 = 0.85 & \beta_2 = 0.3 & \phi = 0.5 \\
 \alpha_3 = 0.1 & \beta_3 = 0.1 & \gamma_1 = 2 \\
 \alpha_4 = 0.05 & \beta_4 = 0.005 & \gamma_2 = 0.5 \\
 \alpha_5 = 0.25 & \beta_5 = 0.005 &
 \end{array}$$

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II. STRESS TESTING HOUSEHOLD DEBT IN KOREA⁷

A. Introduction

17. **Korean household debt has reached 148 percent of disposable income, high by emerging market standards.** Most of this debt remains at variable rates, shifting the interest rate risk from better diversified financial institutions to households and increasing their sensitivity to macroeconomic shocks. In this context the chapter conducts stress tests on household level data. Results suggest that a 100–300 basis points (bps) increase in interest rates could increase distressed household debt by 8½–17 percentage points (ppt). A drop in real estate prices by 10–30 percent could add another 4 ppt to distressed debt. Ongoing transition from bullet to amortizing mortgages in 2008–09 presents additional challenges as interest payments on debt are likely to increase further. With high levels of bank capitalization and low levels of nonperforming loans, systemic financial risks from high household debt remain manageable, but such debt may limit upside potential for consumption in a slowing growth environment.

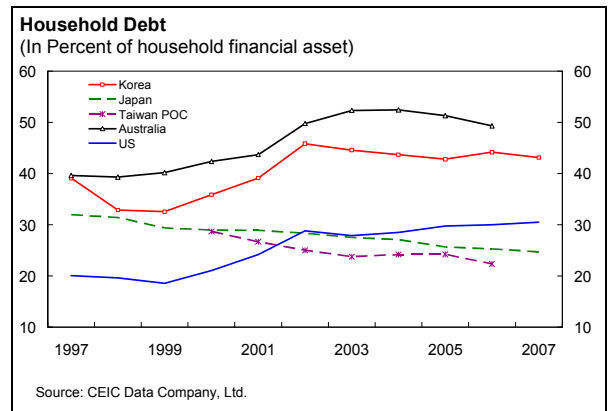
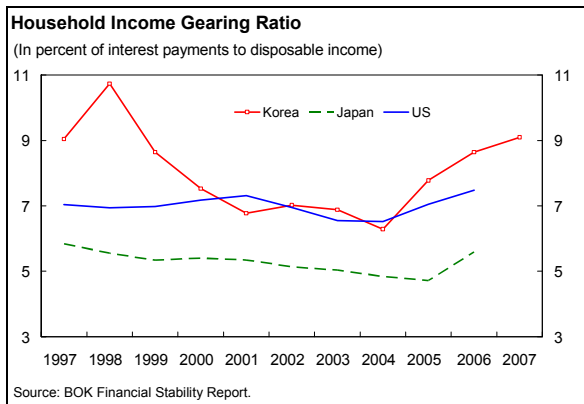
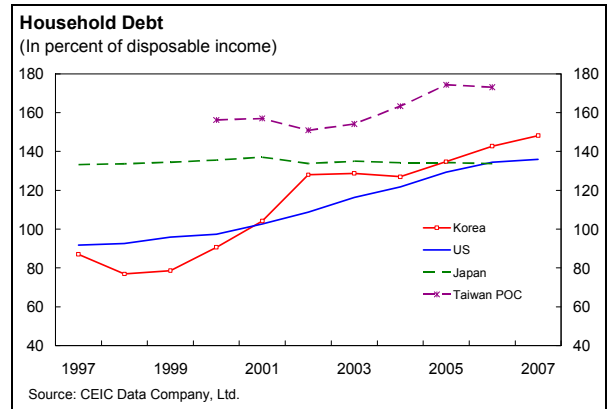
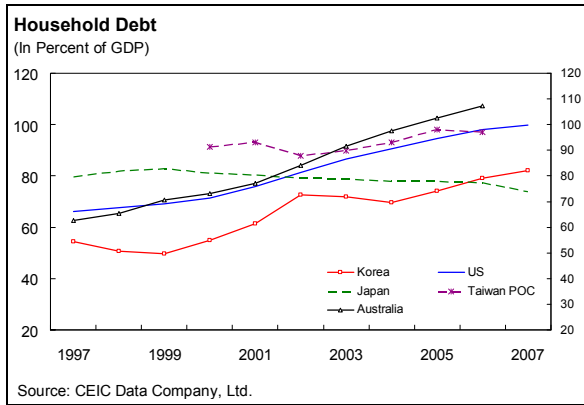
18. **An increase in household debt has been flagged as a concern for macro-financial stability in Korea.** The debt of Korean households reached 82 percent of GDP in 2007 (Figure II.1). This is still below levels of the United States, but is high for emerging markets. Relative to disposable income Korea's household debt is comparable to U.S. and Japanese levels, at 148 percent. Moreover, the household gearing ratio—the share of interest payments to disposable income—has risen sharply, from about 6 percent in 2004 to nearly 9 percent in 2007. Korean households now pay a larger share of their income as interest than their counterparts in the United States or Japan. This rise has occurred even as interest rates in Korea have been on a generally declining trend, and reflects both the rising debt and generally modest gains in personal incomes (below GDP growth) over the past several years.

19. **The indebtedness of households may have important macro-financial implications.** First, high levels of debt raise the sensitivity of household balance sheets to interest rate and income shocks. Second, such shocks could have important implications for the financial health of lenders. And third, as illustrated by the credit card crisis in 2003–04, a subsequent retrenchment of credit from the household sector could further depress consumption and economic growth. Even in the absence of an adverse shock, high levels of indebtedness would limit the extent domestic consumption growth can be sustained by further debt accumulation.

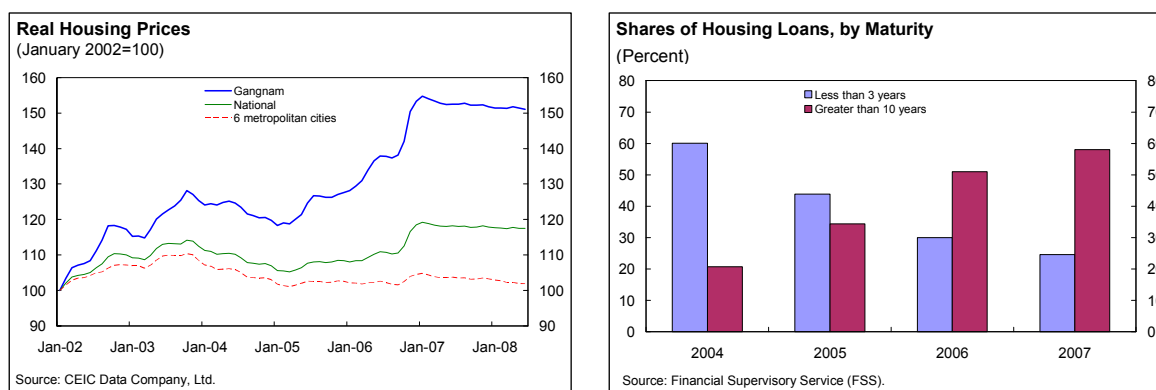
20. **In Korea, financial institutions appear to be well-protected from risks arising from heavily indebted households.** In the decade since the Asian crisis, Korea's financial

⁷ Prepared by Meral Karasulu.

Figure II.1. International Comparison of Household Debt



sector has strengthened considerably. Nonperforming loans have been reduced dramatically, to low levels, capital adequacy has improved and financial sector supervision and corporate governance have been enhanced. Reflecting these improvements—and despite the recent global capital markets turmoil—the financial sector’s vulnerability to risks from worsening loan quality appears low. Furthermore, the delinquency rate on household debt remains at a low ½ percent at end-2007 with over 247 percent provisioning.



21. **In contrast, the characteristics of household debt in Korea shift the risk to households and consumption growth.** A large share of household debt is in the form of home mortgages which remain overwhelmingly variable rate, and ¼ of mortgages are three-year bullet loans. This has generated concern that, following a run-up in home prices in recent years, a turnaround in prices, or a rise in interest rates could limit the ability of households to roll over their loans or meet their payment obligations. If a significant number of consumers are unable to repay loans, financial institutions could also suffer as the value of collateral would likely decline, although low loan-to-value ratios do provide ample room before such systemic financial risks emerge.⁸ In the last several years, the mortgage market has changed significantly—with a rising share of longer maturity and amortizing loans⁹—shifting some risk to the financial sector (Frydl, 2007). This should, given the generally good health of the financial sector and its ability to better diversify risks, reduce overall vulnerabilities for the Korean economy.

⁸ In the United States (2005), the EU (2004), and the United Kingdom (2004), variable rate mortgages constituted 31 percent, 46 percent, and 72 percent of all mortgages, respectively. The comparable figure for Korea at end-2007 was 91.7 percent. Loan-to-values in Korea have been declining against the global trend, going down from 56.4 percent at end-2004 to 47.9 percent at end-2007.

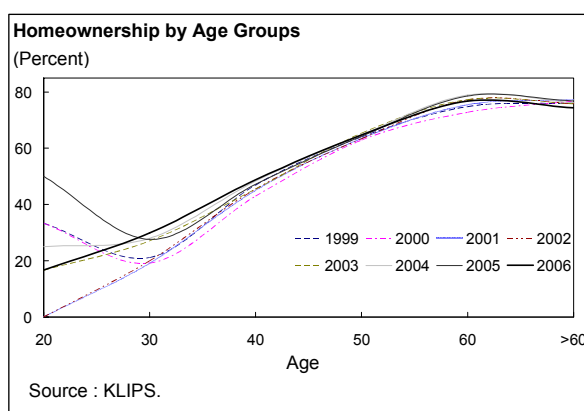
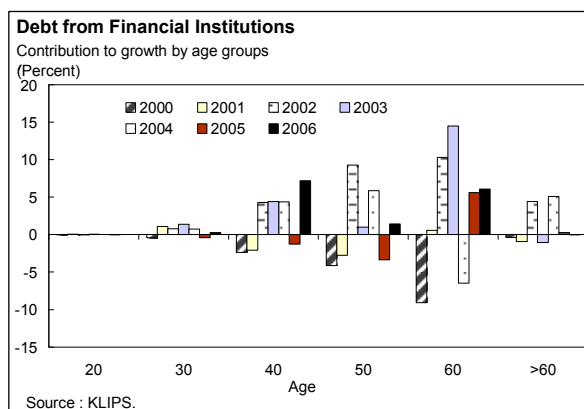
⁹ According to Bank of Korea (BOK), average maturity of housing finance loans increased from 4.7 years at end-2003 to 12.7 years in 2007 and the share of amortizing loans increased from 14 percent to 59.2 percent in the same period.

22. **This paper examines the sources of, and risks from, household debt in Korea by employing stress tests on household level panel data.** Analyses based on aggregate data provide insights only for a notional average household and do not address the differences across households or more generally the vulnerability of their balance sheets to various shocks. These differences can be captured by the household level panel data and are important not only to understand the recent rise in household debt but also to assess the household sector's sensitivity to shocks.

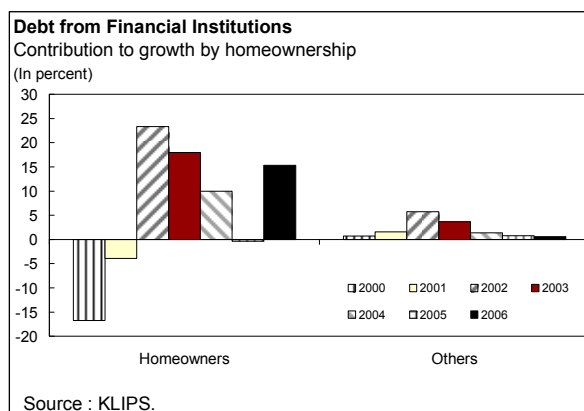
B. What Explains Korean Households' Debt Levels?

23. **A combination of demand and supply side factors seem to have contributed to the increase in household debt:**

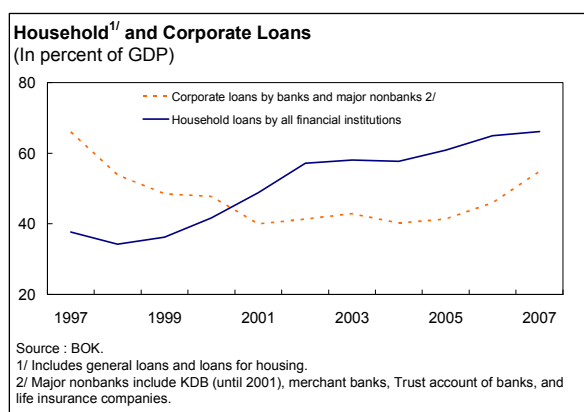
- Declines in real interest rates appears to be a key driver for household debt growth, but contrary to predictions of life-cycle hypothesis this has been driven by older cohorts.** In 1999–2006 real interest rates on household credit in Korea declined from over 10 percent to 3½ percent while real debt grew by about 61 percent. However, only ⅓ of this increase is accounted by cohorts below 40 years of age.
- The late homeownership in life, mostly due to the structure of housing finance in Korea, is closely related to the age profile of household debt.** With low loan-to-value ratios and short maturities, financing a house in Korea requires higher down payments increasing the average age of first time home-owners. Also, real assets act as collateral enabling homeowners easier access to financing.



- **A rise in real estate values contributed to increasing debt levels.** Although homeownership rates remained stable at about 61 percent in 1999–2006, debt growth is driven by homeowners whose real assets have increased in value. This is mostly explained by a move towards larger apartment sizes by existing homeowners.

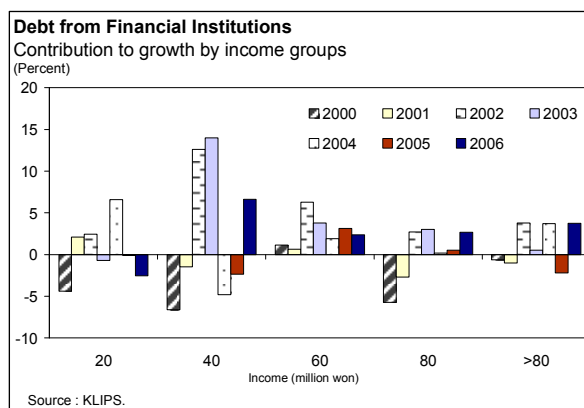


- **Shifting financial sector trends also appear to have contributed to higher household lending.** Lending to households increased from 38 percent of GDP in 1997 to 66 percent of GDP in 2007, coinciding with a retrenchment of credit from the corporate sector following the financial crisis, and since 2000 through an expansion of credit card use. Competition for



retail market share, especially by commercial banks, contributed to the rapid rise in household debt. Since 2000, lending rates to household sector declined faster than those charged to the corporate sector, despite the expectations—revealed by lending surveys—of higher risk from such lending.

- **Financial deepening and improved access have played only a moderate role.** Evidence from panel data points to a moderate relaxation of borrowing constraints for lower income groups. Since 2000, five percent more households in lower income groups acquired debt, but accounting for only a limited portion of debt growth. Instead, the



increase in aggregate debt is largely due to borrowing by households who had prior access to debt and have income levels above the median income in the sample. Their borrowing accounts for about 70 percent of the real increase in household debt since

2000. In fact, lower income groups now account for a lower share of aggregate debt. Thus, the moderate decline in the number of liquidity constrained households does not appear to be the leading cause for increased household debt.

C. Stress Tests

Description of the Data

24. **The data used in the analysis comes from the Korean Labor and Income Panel Study (KLIPS), an annual panel data survey of households conducted by the Korea Labor Institute during 1998–2006.** (The appendix describes the key variables and Table II.1 provides summary statistics of the data.) The panel includes about 5000 households and records many household characteristics such as age, education, and homeownership, besides debts, assets, after tax-income and expenditure items.

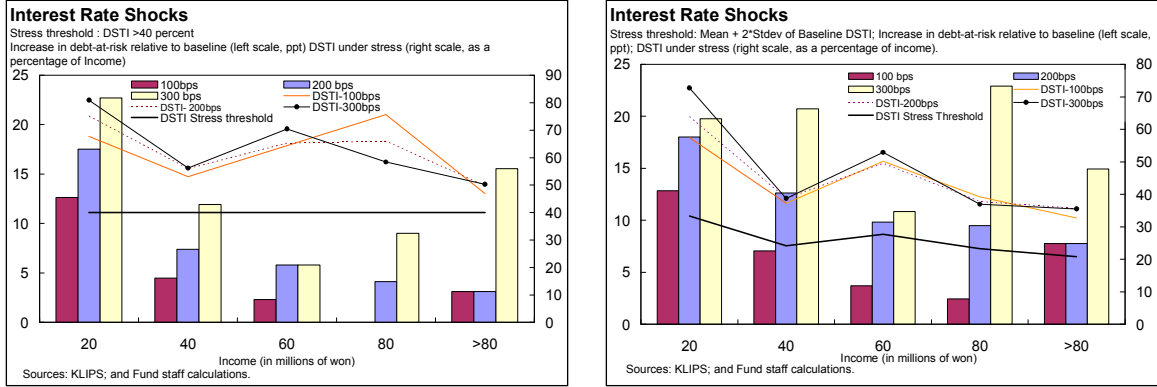
Stress Tests¹⁰

25. **Stress tests are employed to assess implications of some macroeconomic shocks on households' debt payment ability.** Stress tests are based on household balance sheet information at end-2006, the latest available data, and simulate the static impact of a shock, keeping all other variables, including income and assets, unchanged. As such they can provide only approximate sensitivities for the future. However, compared with 2006, aggregate household debt increased by 10 percent by mid-2008, while household income (as measured by GNI) and assets grew by about 9 and 12 percent, respectively. Hence the estimates remain indicative of the risks going forward. Since household level default data are not available, the increase in debt-at-risk after a shock should be interpreted as household debt that could come under financial strain, rather than an increase in nonperforming loans.

26. **In the absence of household-level data on debt payment problems, financial stress is defined using two alternative definitions of debt-at-risk.** The first measure defines a household to be financially stressed if its total debt service-to-income (DSTI) ratio increases above a certain threshold. In the simulations, two alternative thresholds are chosen: (i) two standard deviations of the average baseline DSTI within each income group, and (ii) 40 percent of income. The first threshold is high enough to capture only the most vulnerable households, which tend to have high DSTI ratios to begin with and are most likely to be affected from a shock. The alternative threshold of 40 percent is motivated by the DSTI ratio commonly used by lending institutions in Korea. However, these measures do not take into account households' ability to reduce consumption or liquidate assets to service debt when faced with payment difficulties. Furthermore, since stress is defined only by reference to

¹⁰ Further details are included in a forthcoming Working Paper.

DSTI, only shocks that can be directly linked to debt payments can be considered. This limits shocks that can be applied in the dataset—without making heroic assumptions—to interest rate shocks.



27. **The results suggest that an increase in interest rates of 100–300 bps could increase distressed household debt by 8½–19 ppt depending on the stress threshold used.** Using a threshold that varies across income groups places a lower bar on defining a household as under stress compared to the uniform 40 percent DSTI threshold. As a result, the impact of an interest rate increase on debt-at-risk is higher, but with less onerous DSTI ratios. For example, a 300 bps rise in interest rates could lead debt-at-risk to reach 43 percent of total debt, up 19 ppt from the baseline, as compared to 32 percent, or up 17 ppt from the baseline under the uniform 40 percent threshold. The same shock would increase average debt servicing cost of distressed households to 52 percent of income, as opposed to 71 percent of income with the uniform threshold. For low income households the impact would be more severe with a 40 percent DSTI ratio, as they tend to have high DSTI ratios to begin with.

28. **The second definition of financial stress is based on a household budget constraint** (see Del-Rio and Young, 2005; and Herrala and Kauko, 2007). A financially distressed household has a surplus—defined as income net of debt payments plus a portion of pledgeable wealth that falls below a “comfortable” level of consumption. By linking financial stress to consumption and wealth this measure attempts to capture the ability of households to reduce consumption or liquidate assets in order to service debt before default:

$$SR_{ti} = Y_{ti} - (r_{ti} D_{t-1,i}) \quad (1)$$

where SR is household surplus, Y is disposable income, D is household debt and r is the interest rate. Denoting MC_{ti}^* as the minimum level of consumption that household i is “comfortable” with at time t and household wealth as W_{ti} , a household is defined as

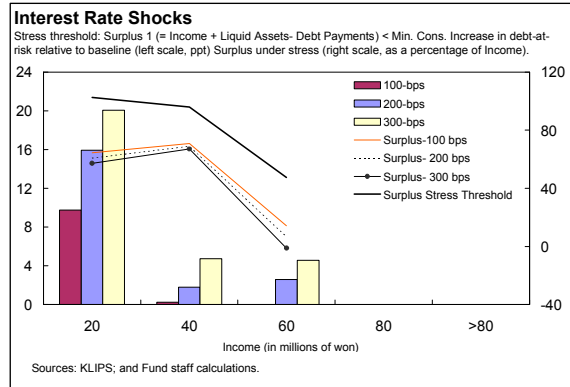
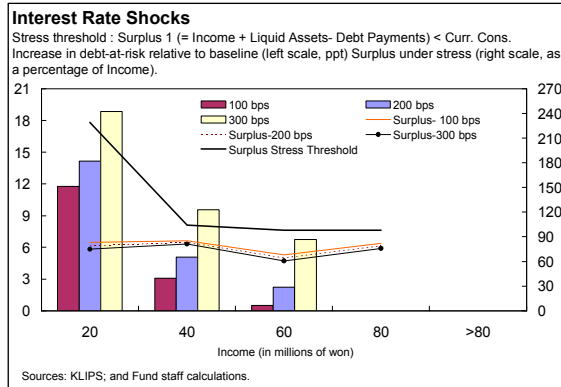
financially distressed if the surplus income supplemented by the possibility of pledging a fraction, γ , of wealth to take more debt to temporarily sustain consumption or to draw down on assets, is below the desirable minimum level of consumption:

$$SR_{ti} + \gamma W_{ti} < MC_{ti}^* \quad (2)$$

29. **The paper uses two approaches to estimate MC_{ti}^* , the desired minimum consumption.** MC_{ti}^* depends on a number of factors including tastes, family size and other family characteristics. In the first approach, it is assumed that the MC_{ti}^*/Y_{ti} is given by the actual share of household expenditure in income at end-2006. In the second approach MC_{ti}^* is assumed to be given by the respective minimum share of household expenditure in income in 1999–2006 for each household. Since the sample includes the credit card crisis, this is a reasonable approximation to define the minimum consumption that households would be comfortable with based on their past behavior. By normalizing equation (2) by income we define households under financial stress if:

$$SR_{ti}/Y_{ti} + \gamma W_{ti}/Y_{ti} < (MC_{ti}^*/Y_{ti}) \quad (3)$$

30. **Two alternative definitions of wealth, W are considered in estimating the household surplus.**¹¹ The first definition (Surplus 1) includes only liquid assets, while the second one (Surplus 2) also incorporates net real assets, where it is assumed that the



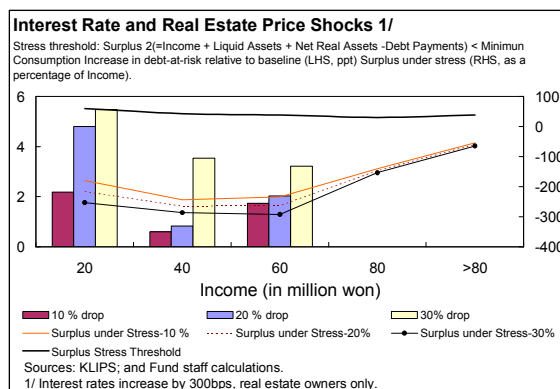
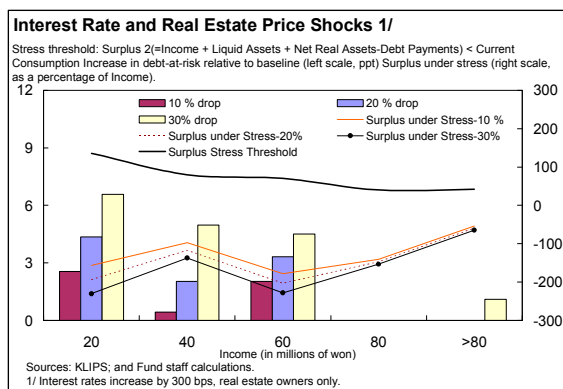
¹¹ Ideally in an intertemporal budget constraint the relevant wealth variable would include not only current assets, but also the net present value of tangible and human capital as well as future discounted value of life time earnings. Insufficient data precludes estimating life-time wealth in the sample. However, such life-time wealth calculations are not a part of standard tools of banks either when granting loans and do not impair the interpretation of the results.

pledgeable value of real estate is given by the difference of its market value and household's total debt from financial institutions.¹² Although real estate assets are not liquid, they could be pledged for additional debt to smooth consumption. The latter approximation to W is defined for real estate owners only and can be used to test the impact of real estate price changes on their balance sheets.

31. When household surplus is used to define financial stress, a 100–300 bps increase in interest rates could increase distressed household debt by 8–17 percentage points from the respective baseline. Allowing households to smooth income with their liquid assets reduces the impact of the shocks as compared to DSTI-based definitions of stress used above. Nonetheless, the baseline share of debt that can not be covered by surplus without altering current consumption is 38 percent, pointing to underlying balance sheet weaknesses of indebted households, especially at lower income levels. If alternatively, the threshold is lowered to the minimum consumption share in income observed in the sample, the baseline stressed debt drops to 11 percent on average. The debt-at-risk under a 300 bps interest rate shock would reach on average 28–54 percent of total debt depending on the households' willingness to reduce their consumption expenditures. The debt servicing cost, on the other hand, could increase to 30–47 percent of income depending on the threshold consumption share chosen. The impact would be more severely felt by low income households, who also tend to have very limited liquid assets to smooth consumption.

32. The effects of a decline in real estate prices in the sample are difficult to examine without regard to the macroeconomic environment in which they are falling. The household financial distress need not increase if real estate prices fall in an unchanged macroeconomic environment. This is because financial distress is primarily a function of the household's ability to service the mortgage, which is more closely linked to households' net total asset position rather than their gross real estate debt or the value of the real estate alone. Hence in the simulations we consider a combined shock of an interest rate increase and decline in real estate prices. Since the latter shock applies only to real estate owners, this stress test should be interpreted as analyzing the additional marginal impact of a real estate price shock on real estate owners, above and beyond the impact of an interest rate shock on all debtors, while allowing the real estate owners to smooth income with net real assets.

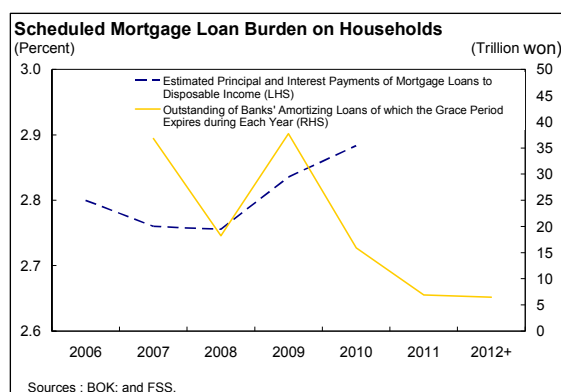
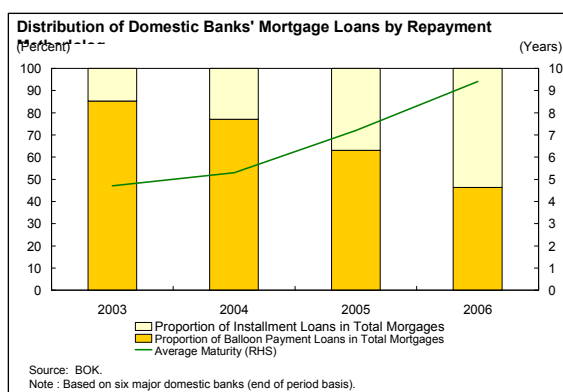
¹² This simplification may underestimate the pledgeable net equity value of real estate if majority of debt was unsecured to begin with and the real estate holdings at end-2006 were not encumbered. However, in the sample real estate ownership and indebtedness are closely linked, limiting the scope of underestimation.



33. **An additional shock to real estate prices (10–30 percent) is likely to increase debt-at-risk for real estate owners by 4–5 ppt beyond the impact of an interest rate shock on all debtors.** The primary reason behind the small marginal impact is the large positive net asset position of real estate owners. While an interest rate shock of 300 bps alone increases debt for all households by about 16–17 ppt depending on compression in consumption allowed, an additional shock of a 30 percent drop in real estate prices would put an additional 4–5 percent of debt of real estate owners at risk.

34. **A potentially more pressing risk related to real estate ownership in Korea is linked to the changing structure of housing finance.** As mentioned above, mortgages increasingly are of longer maturities and also are of amortizing-type rather than bullet loans, lowering the average monthly payments and reducing the rollover and refinance risk to households. However, around 94 percent of all mortgages remain linked to 91-day CD rates exposing the households to interest rate risk. In addition, the BOK estimates that during the shift from bullet-type loans to amortizing loans, 88 percent of all outstanding amortizing loans in June-2007 offered grace periods during which no principal payments are required. For 57 percent of such loans grace periods are between two and three years. Based on the age and grace period profile of outstanding mortgages, the BOK estimates that each year about W20 trillion of mortgage loans, or 7 percent of total outstanding mortgage loans in 2007, will reach the end of their grace period. For 2009 the estimated figure is about W40 trillion or about 13 percent of estimated total outstanding mortgage loans as of end-2008.¹³ This transition is expected to increase the aggregate principal and interest payment burden from W13.2 trillion in 2006 to W14.7 trillion in 2007 and W14.4 trillion in 2008. For Korean households, the ratio of interest payments to disposable income increased to 9 percent in 2007. After this transition, the additional principal payments would increase this ratio by an additional 2–2.5 percentage points by 2010.

¹³ Assuming housing related lending will grow at an annual nominal growth rate of 7 percent.



35. **These aggregate numbers point to a potentially substantial aggregate impact, although delinquency rates on mortgages are currently at a low 0.37 percent.** The affected mortgages in 2008–09 represent about 7–13 percent of total outstanding housing loans. If a significant share of these mortgages are held by lower income groups, who tend to have higher debt servicing costs to begin with, their ability to service the additional installment payments could be stretched leading to a rise in nonperforming housing loans. However, if the distribution of home ownership and indebtedness in the panel data is taken into account, it is more likely that a larger portion of indebted households to have above median income levels and sufficient liquid assets to service their debt. This is also reflected in the low levels of mortgage delinquency since the beginning of transition in 2007, limiting the potential for a systemic financial impact, but close monitoring of these trends would be needed in the period ahead, as economic cycle turns.

D. Conclusions

36. **The rise in household debt appears to be driven by both supply and demand side factors.** The decline in real interest rates and competition to extend retail market share by banks appear to have played an important role in increasing debt levels. Household level analysis, on the other hand, suggests that most of the increase in debt can be attributed to increased indebtedness of above-median-income and older households and is closely linked to homeownership. Access to credit by lower income and younger age groups improved only marginally in the sample and does not appear to be a leading cause of higher debt levels.

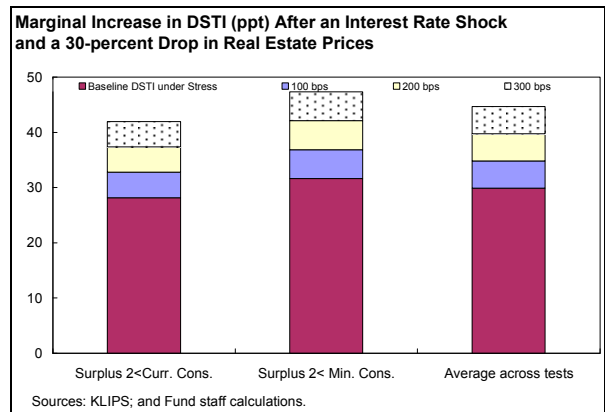
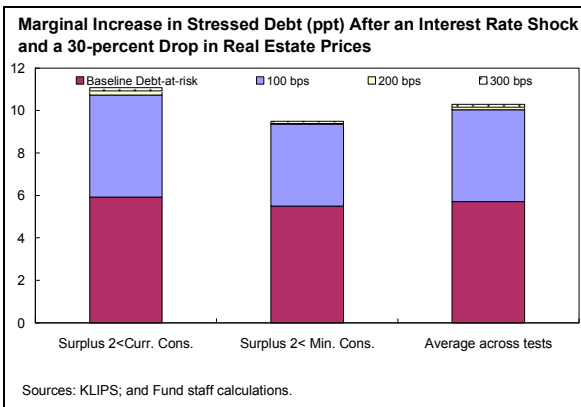
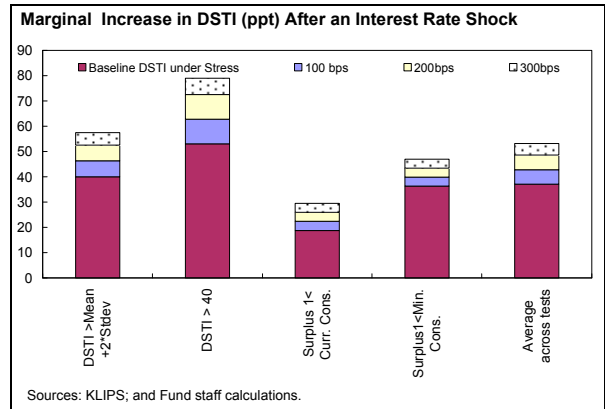
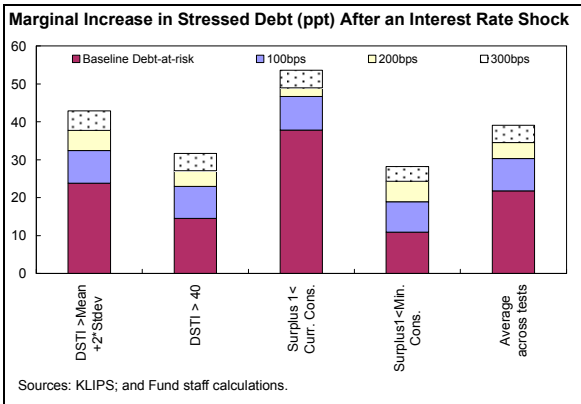
37. **A set of stress tests analyzing the impact of interest rate and real estate price shocks point to potentially large risks to households** (Figure II. 2). Depending on the shock size and the definition of financial stress applied, the results indicate that on average an increase in interest rates of 100–300 bps could lead to about 8½–17 percentage points increase in household debt-at-risk. Debt servicing costs relative to income could increase by 6–16 ppt, reaching 43–53 percent of disposable income on average. A real estate shock, on the other hand, could increase distressed debt on average by an additional 4–5 ppt for real

estate owners, beyond the impact of an interest rate shock on all debtors. Indebted lower income groups, as expected, appear more vulnerable to any shock.

38. **The jump in mortgage installment payments could add to household strains as converted loans' grace periods end.** Although the recent conversion of bullet type short term mortgages to longer term amortizing mortgages will reduce overall vulnerability of households in the longer term, the adjustment could be bumpy in the next two years adding another 2–2.5 percentage points of GDP to already high debt service payments.

39. **Low levels of nonperforming loans and high bank capitalization levels limit systemic financial risks, but potential risks to household balance sheets point to a need for vigilance and further strengthening risk management capacities.** Ensuring that the debt payment ability of households at the end of grace periods is taken into account when loans are extended would help reduce future vulnerabilities. Financial institutions would also need to be more pro-active in monitoring potential credit problems before the end of the grace periods. Going forward, there may also be a need to reconsider tax incentives for loans with such grace periods to discourage these nontraditional mortgages. With an economic downturn and stagnant real estate prices, provisioning levels for all household debt may also need to be revisited. Consistent with the move to Basel II, banks and supervisors could also extend stress testing to household loan portfolios taking into account the impact of lapsing grace periods. In the long run, deregulation measures to increase supply elasticity of housing could help reduce the amplitude of housing price cycles, which exacerbate debt accumulation by households.

Figure II.2. Comparison of Stress Tests



Appendix II.1. Description of the Data

The panel data used for the analyses are from the Korea Labor Institute (KLI). KLI's Korean Labor and Income Panel Study (KLIPS) is conducted annually on a sample of 5,000 urban households, which constitute the original baseline sample, and their branch families are also traced. The survey started from 1998 and the latest available data is on Wave 9 (2006). The dataset includes demographics, type of residence and financial information such as income, expenditure, assets, and debts. The first wave (1998) is excluded from the sample because it lacks debt variables which are critical to the analysis of households' balance sheets. The summary statistics are in Table II.1. Table II.2 provides information on the coverage and representative qualities of the KLIPS database as compared with the census data. The comparison of age representation is based on the census data published by the NSO and confirms that the KLIPS database adequately captures the demographics in the country. A population-wide comparison of financial information at household level is not available. Household Income and Expenditure survey (HIES) of the NSO is the only other available database that captures household financial information for 9000 households. However, KLIPS and the HIES are not directly comparable since the latter includes information on pre-tax income, while in the KLIPS database income variables are after taxes and deductions. Furthermore, the HIES database does not cover single households. Despite these differences, the comparisons suggests that the KLIPS database is broadly representative.

The following list of definitions were used in stress tests:

Income

Financial Income: annual income from interest on financial asset + interest from private loans and nonfinancial institutions + dividends + other financial income.

Income from Real Estate: annual income from rents on real estate + net gains from real estate transactions + other income from rental real estate.

Other Income: annual income from social insurance such as pension and unemployment benefits + transfer income from both public and private sectors + other income such as income from insurance, retirement benefits, income from lottery, etc.

Total Income: annual wage + financial income + income from real estate + other income.

Debt

Total Debt: debt from financial institutions + debt from nonfinancial institutions (firms where household member is employed) + debt from private sources + debt related to Chonseil + debt from loan clubs (kye) + other debt.

Total Debt Service and Amortization: debt service and amortization of total debt. In the dataset the two cannot be separately identified.

Assets

Total Financial Assets: bank deposits + stocks, bonds, trusts accounts + insurance policies + money put into private loan club (Kye) but not yet received + loans to friends or relatives + other financial assets.

Total Financial Assets including Real Estate Related Deposits: total financial assets + Chonsei + rental deposits.

Nonfinancial Assets: current market value of real estate holdings.

Liquid Assets: bank deposits + stocks, bonds, trusts accounts + insurance policies + other financial assets.

Total Real Assets: home + other real estate holdings.

Table II.1. Summary Statistics								
	1999	2000	2001	2002	2003	2004	2005	2006
Number of households	4,187	3,994	3,843	3,920	4,130	4,214	4,255	4,224
Percentage of homeownership	60.4	59.0	60.7	60.5	61.5	61.9	61.4	60.7
Homeowners	2,527	2,355	2,332	2,370	2,538	2,610	2,613	2,565
Percentage of real estate ownership	62.2	60.9	62.8	63.1	63.8	63.8	63.6	62.8
Percentage of household with debt	48.8	45.2	45.6	48.5	48.3	49.8	51.7	53.0
Percentage of those owning homes	56.2	52.1	50.6	53.6	53.0	54.8	57.7	59.3
Percentage of those paying choense	41.5	38.9	39.9	41.3	41.8	42.3	42.3	44.7
Total household debt (in 10,000 Won)	7,531,805	6,654,625	6,237,610	7,931,960	10,068,331	10,951,863	12,213,729	13,092,864
From financial institution (in percent)	60.6	58.6	63.4	64.9	66.1	67.6	63.2	63.6
From non-financial sectors (in percent)	39.4	41.4	36.6	35.1	33.9	32.4	36.8	36.4
Debt service / total earnings (in percent) 1/	9.39	8.08	7.39	6.47	6.89	6.52	6.19	6.85
Debt service / total wage (in percent)	10.96	9.14	8.27	7.51	7.78	7.35	7.02	8.00
Debt/income (in percent)	99.05	86.74	79.32	79.33	91.16	90.02	96.03	95.11
Interest rate on household loans	11.10	10.25	8.75	7.23	6.85	6.27	5.66	5.68

Sources: NSO Population and Housing Census; and NSO Household Income and Expenditure Survey.
1/ Earnings include wage, financial income, income from real estate, transfer income, etc.

Table II.2. How Representative is KLIPS?												
(As a percent of total observations)												
KLIPS	1999	2000	2001	2002	2003	2004	2005	2006	NSO	2000	2005	
Age Group												
<=20	0.14	0.17	0.12	0.07	0.14	0.16	0.09	0.13	15~19	0.56	0.44	
21~30	7.58	7.04	7.59	7.59	8.43	8.89	8.33	7.90	20~29	9.47	8.29	
31~40	26.24	24.83	23.39	22.25	22.28	21.98	22.62	23.00	30~39	26.47	22.57	
41~50	26.30	26.77	26.84	27.25	25.94	25.80	25.19	23.76	40~49	26.6	27.50	
51~60	19.76	19.13	19.22	18.74	18.95	18.79	19.19	20.52	50~59	17.55	18.75	
>60	19.99	22.05	22.84	24.10	24.26	24.37	24.57	24.69	>=60	19.35	22.44	
Income Group												
(In millions of won)												
20	67.07	62.25	60.53	49.72	45.72	42.91	40.54	37.09	18	24.76	23.2	22.53
40	26.51	31.27	30.53	36.10	36.41	36.72	35.94	36.58	42	51.68	49.77	48.08
60	4.41	4.77	6.34	9.19	12.50	12.26	14.79	15.70	60	15.04	16.71	17.96
80	0.96	0.84	1.23	2.61	2.76	5.03	5.42	5.76	72	3.98	4.75	5.2
>80	1.05	0.86	1.38	2.38	2.62	3.08	3.30	4.88	>72	4.55	5.57	6.24

Sources : NSO Population and Housing Census; and NSO Household Income and Expenditure Survey.

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III. KOREA'S BANKING SECTOR—LIQUIDITY RISK MANAGEMENT IN THE FACE OF STRUCTURAL TRENDS AND DEREGULATION¹⁴

A. Introduction

40. **While Korea's financial system is generally healthy, the need for further financial sector development is well recognized.** Indeed, this recognition underlies reform plans, including for deregulation and bank privatization. The Financial Investment Services and Capital Market Act, also referred to as the Capital Markets Consolidation Act (CMCA), comes into effect in February 2009. It is expected to lead to consolidation of the securities industry and the emergence of domestic investment banks, and bring important benefits.

41. **This deregulation will put a premium on efforts by banks and supervisors to limit liquidity risk.** A trend decline in household deposits and an interest-income/asset-expansion based banking model have raised wholesale funding dependence and liquidity risk—particularly in the context of global credit market stresses. The planned deregulation is likely to increase the rate of disintermediation away from deposits and increase competition for funding, thus further narrowing net interest margins and raising wholesale funding dependence. In the face of these challenges, banks and regulators will need to improve liquidity risk management (LRM) and adapt banks' business models. Further deregulation may be warranted beyond 2009 and banks' business models will depend in part on the how financial oversight evolves. This chapter examines Korean banks' increasing wholesale funding dependence, and the associated need for improving LRM and adapting banks' business models, drawing on some lessons from international experience. The next chapter considers broader lessons from the ongoing financial turmoil.

B. Banks' Increasing Wholesale Funding Dependence and Liquidity Risk

Funding Developments of Korean Banks in International Perspective

42. **Korean banks have some of the highest loan-to-deposit ratios (LDRs) in the region, reflecting the shift away from bank deposits by households and the interest-income-focused business model of banks.** These factors have increased banks' reliance on wholesale financing to fund lending operations. Elevated global credit strains and the experience with Northern Rock have drawn attention to banks reliant on wholesale financing as vulnerable to heightened liquidity risk.¹⁵

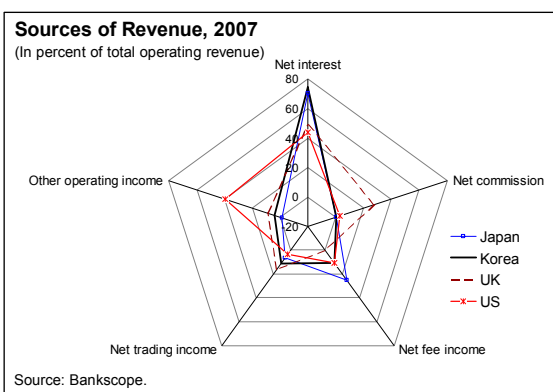
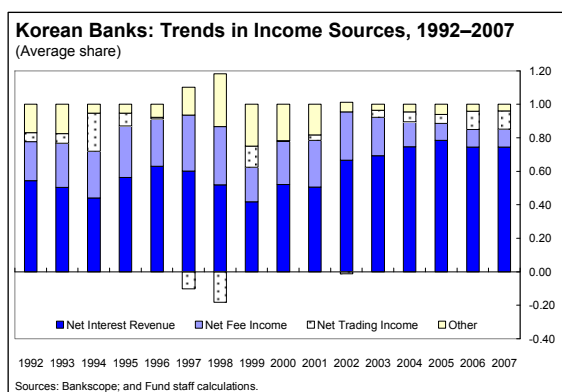
¹⁴ Prepared by Yougash Khatri.

¹⁵ Wholesale funding here refers to funding sources of banks other than deposits, such as CDs, bonds/debentures, money market and borrowing. Liquidity risk, broadly, refers to vulnerabilities on liabilities side of an institutions balance sheet. The focus here is on funding liquidity risk more than market liquidity risk but the two are integrally related.

Indeed, such concerns are manifest in the relative performance of Korea's banking stocks and credit default swap spreads (Figure III.1).¹⁶

43. **There has been a trend shift of household assets away from deposits to other assets, mainly securities.** Factors driving the rebalancing of household assets away from deposits include: (i) further liberalization of outflows and tax benefits in 2006; and (ii) portfolio rebalancing in the context of declining home-bias, increasing risk tolerance, and search for yield. There has been some return to deposits recently with active efforts being made by banks to attract deposits, and as a safe haven in the context of the global financial turmoil. The trend decline however is unlikely to reverse in the longer term (see below).

44. **The focus of Korean banks on interest income and asset expansion has contributed to increasing wholesale funding dependence.** Korean banks' returns on average assets and average equity are in line with the rest of Asia and similar to those of the G-7 countries (Table III.1). Korean banks' reliance on interest-income increased sharply between 2001 and 2005, but has declined since.¹⁷ The interest-income share in total income is higher in Korea than that of the OECD countries considered. Korea's interest-income share is however similar to non-OECD Asia, consistent with the bank-centric and lending-based nature of most financial systems in Asia.¹⁸ Competition and more recently the global credit market stresses have pushed up funding costs and net interest margins (NIMs) and profitability (net of one-offs) have



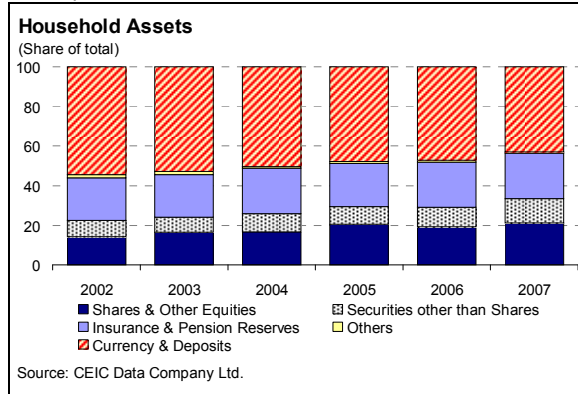
¹⁶ Foreign currency borrowing by banks remains modest (around 7 percent of their total funding), and only part of this is related to their onlending in foreign currency.

¹⁷ The ratio of net interest income to operating income shot up from 50 percent in 2001 to almost 80 percent in 2005. This could reflect a number of factors including tighter post-crisis bank regulation; consolidation and increased competition in the banking industry (affecting fees and other charges); and the move to financial holding company structures (with some of the banks' non-interest income shifting to affiliates).

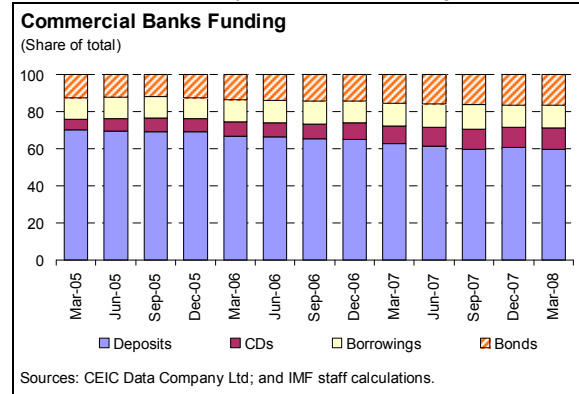
¹⁸ Financial disintermediation in most Asian countries lags that in Korea and thus asset growth of banks elsewhere in Asia has not been associated with similar degrees of wholesale financing reliance seen in Korea.

Figure III.1. Liquidity Risk in the Banking Sector

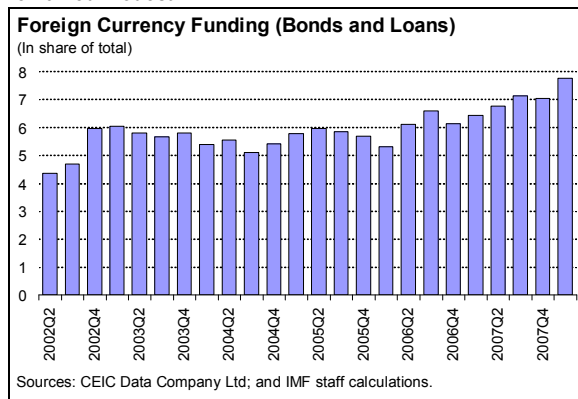
As household portfolios have shifted assets away from cash and deposits...



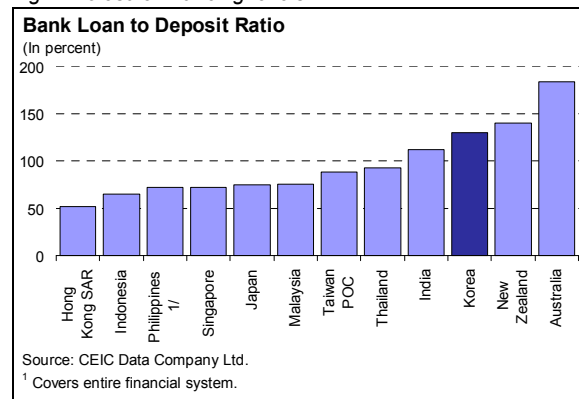
... wholesale financing of Korean commercial banks has increased to around 40 percent of total funding



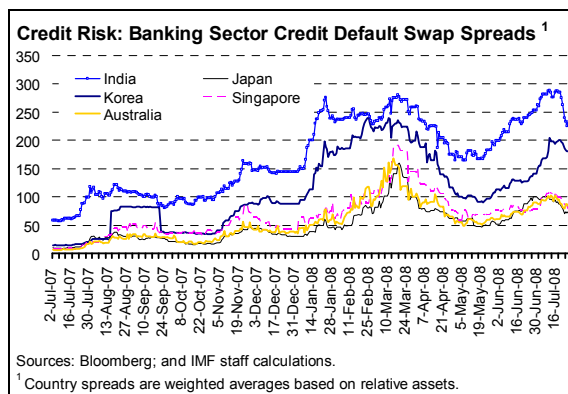
...although the share of foreign currency funding has remained modest.



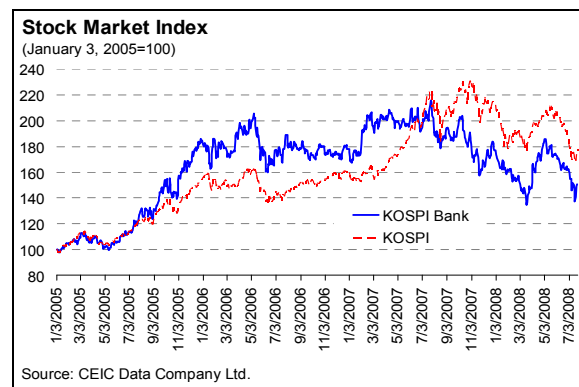
The global credit crunch focused attention on banks with high wholesale financing levels...



... and elevated CDS spreads...



...and relative equity prices for Korean banks signal concern.



trended downward.¹⁹ Korean banks' reliance on interest income and their attempts to maintain profits and compete for market share mean that declining deposits together with continued rapid asset expansion have resulted in increasing wholesale financing dependence. The main sources of the increased wholesale financing have been debentures and CDs.

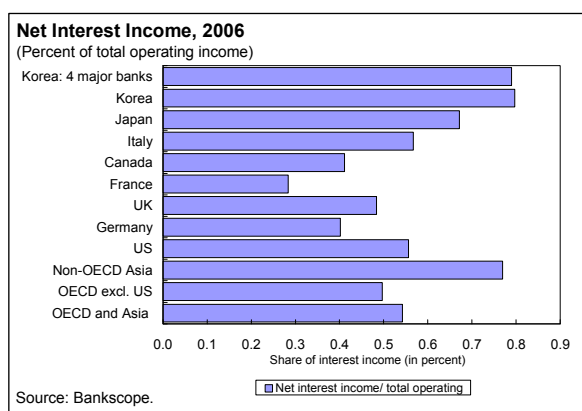


Table III.1. Indicators of Commercial Banks' Performance and Business Models in OECD and Asia
(2006 averages) 1/

	Return on average assets	Return on average equity	Impaired loans/ gross loans	Net interest income/ total operating income 2/	Total Assets
	(In percent)				(In billion of U.S. dollars)
OECD and Asian commercial banks 3/	1.13	10.55	0.97	0.54	8
OECD commercial banks excl. United States 4/	1.19	11.27	3.49	0.50	37
OECD	1.14	10.65	0.84	0.51	7
Asia (excl. Japan and Korea)	0.89	7.99	4.90	0.77	23
G-7 Countries	0.92	9.33	3.24	0.48	
United States	1.10	10.52	0.61	0.56	2
Japan	0.36	2.78	4.46	0.67	51
Germany	1.11	8.27	3.60	0.40	32
United Kingdom	0.49	9.97	3.34	0.48	86
France	1.51	13.18	5.75	0.28	58
Canada	0.85	9.88	0.57	0.41	54
Italy	0.99	10.72	4.35	0.57	27
Korean Commercial Banks (incl. foreign banks)	0.93	7.95	0.90	0.80	64
Major Korean Commercial Banks 4/	1.17	17.59	0.91	0.79	172

Sources: Bankscope; and Fund staff calculations.

1/ 2006 data are more consistently available than 2007 and so the averages are more representative; ratios are simple averages, unless otherwise stated.

2/ Calculated as the sum of interest income of all banks relative to the sum of total operating income of all banks.

3/ Non-OECD Asia includes: China, Hong Kong SAR, India, Indonesia, Malaysia, Philippines, Singapore, Taiwan Province of China, Thailand, and Vietnam.

4/ The very large number of small US banks can distort the averages.

5/ Hana Bank, Kookmin Bank, Shinhan Bank, and Woori Bank.

45. **The potential advantages of debentures may also explain in part their increasing share of wholesale funding.** Debentures do not require deposit insurance or incur reserve requirements, and have relatively low overhead costs. These can shave off more than 50 basis points on funding costs. However, deposits are still important from the perspective of creating a customer base and relationship building from the longer-term perspective.

46. **International comparisons of loan-to-deposit ratios and wholesale funding dependence may be misleading for a number of reasons.** Firstly, there has been relatively little securitization of assets by Korean banks, so loans have largely stayed on their balance

¹⁹ NIMs were 2.81 percent in 2005, 2.64 percent in 2006, and 2.45 percent in 2007. Helping to support profitability were stronger sales of wealth management products (Fitch Ratings, 2008).

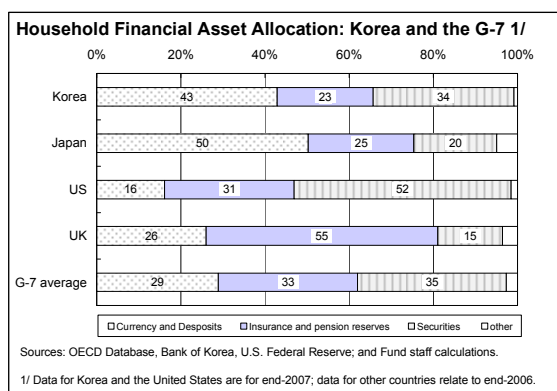
sheets, which makes comparisons—particularly with U.S., European, and Australian banks—less straightforward. Secondly, as Korean banks have moved to financial holding company structures, declines in the banks' deposits may in part end up with subsidiaries under the bank holding companies (such as AMCs), and these could provide funding if necessary.²⁰ Finally, a large part of the recent growth in lending reflects mortgage loans, including the new amortizing mortgages with 3 year grace periods. As the grace periods expire, principle repayment should work to reduce these outstanding loans. Thus banks' loan-to-deposit (and wholesale funding) ratios should be used cautiously in cross-country comparisons.

Pressures on Bank Financing and NIMs are Likely to Continue

47. Portfolio rebalancing by households seems likely to continue in the longer-run, if major OECD countries provide a useful reference point. The

share of Korean household financial assets in the form of cash and deposits has already declined from 54 percent in 2002 to 43 percent in 2007. If Korean households continue to rebalance their portfolios towards the G-7 average, this would imply a fall in share of deposits to 29 percent. In

2007, the average G-7 ratio of cash and deposits for Korean households would have meant that wholesale financing—holding the asset size constant at the actual end-2007 level—would have been around 60 percent of total funding (compared to the actual 40 percent).



48. **The adoption of the CMCA is likely to increase wholesale funding dependence of banks.** The CMCA is expected to bring important benefits (Semblat, 2006) and is in the direction of global trends towards financial sector conglomeration and deregulation (Box III.1). The likely increased competition for funds suggests increased wholesale funding dependence of banks and lower NIMs. Experiences from other countries such as the United Kingdom and Australia (that introduced comprehensive definitions of financial products and services and functional regulatory frameworks, similar to the CMCA), corroborate the expected weakening of banks' deposit bases and increases in wholesale funding reliance.²¹ Increasing wholesale funding is also a global trend among developed countries (De Nicolo and others, 2003; IMF, 2008).

²⁰ An affiliates' extension of credit to another affiliate must be fully secured and cannot exceed 10 percent of its capital; and extension of credit to all affiliates combined cannot exceed 20 percent of its capital.

²¹ BOK's April 2008 *Financial Stability Report* (Box IV-1) describes the experiences in the United Kingdom and Australia.

Box III.1. Global Banking Sectors Trends

Deregulation between different financial activities and financial institutions is a global trend. The trend began in Europe in the late 1980s, following the adoption of a European Commission Directive that extended the German system of universal banking throughout Europe. In 1993, Japan allowed banks and insurance companies to enter each others' sectors through subsidiaries, and financial holding companies were permitted in 1998. The global trend accelerated in the United States when the Gramm-Leach-Bliley Act replaced Glass-Steagall in 1999 which opened up competition between banks, securities firms, and insurance companies (Semblat, 2006). An associated trend has been the consolidation of financial sector regulatory/supervisory agencies.

There are also well-documented trends of bank consolidation, conglomeration and internationalization (De Nicolo and others, 2003). The financial consolidation trend has been driven by real and financial sector globalization, deregulation, technological developments, increased performance pressures from shareholders, bank privatization, and in some cases (such as Korea) banking crises. Consolidation has been contributing to greater banking sector concentration, although the concentration trend presents uneven patterns across different regions and/or countries. Internationalization, as evidenced by the number financial institutions that operate across national borders and the ratio of foreign-controlled assets to total assets, also exhibits uneven trends but has increased markedly.

Banks in developed countries have been increasingly reliant on wholesale funding and liquid asset ratios have been declining, IMF (2008). Rather than retail deposits, banks have increasingly been relying on interbank borrowing, short- and long-term debt, or the sale of marketable securities. Evidence for the period 1995–2000 shows that banks in developed countries relied mainly on wholesale deposit or nondeposit liabilities to fund asset growth. In contrast, major emerging markets showed greater reliance on deposit funding. (De Nicolo and others, 2003).

Globally, banks are increasing reliance on nontraditional activities that generate fee, trading and other types of non-interest income. This trend might be explained in large part by new technologies (such as the introduction of ATMs and associated fees), and regulatory changes (including deregulation which has created greater competition and reduced net interest margins, creating a push for new areas of income growth). Banks may also have been attempting to benefit from diversification of income sources. However, some empirical evidence suggests that expansion into nonbanking activities may increase the variability of profits and thus offset some of the benefits of diversification; and the benefits may decline as the share of non-interest income grows.¹

¹ Stiroh (2002) finds for U.S. banks that declining volatility of net operating income reflects reduced volatility of net interest income and is not a benefit of diversification as non-interest income has been quite volatile and is increasingly correlated with interest income. Also, reliance on non-interest income such as trading income, is associated with higher risk and lower risk-adjusted returns.

C. Liquidity Risk Management—Recent Developments and Next Steps

49. **In recognition of the elevated liquidity risks, regulators have strengthened their monitoring of short-term liquid asset ratios and other indicators of possible liquidity strains.** Banks and financial regulators have been pushing to diversify funding sources, revenues, and scope of operation. Recent international experiences provide an opportunity for Korea to learn from shortcomings in LRM elsewhere.

Key Elements of LRM in Korea

50. **Beyond reserve requirements, the main liquidity risk management (LRM) mechanisms are the statutory won and foreign currency liquidity ratios.** Banks are required to ensure that their won liquidity ratio (the ratio of their assets and liabilities with maturities of 3 months or less) is at least 100 percent; and banks are subject to 7, 30, and 90-day liquidity ratios in foreign currency.²² Nonquantitative aspects of regulators evaluations of liquidity risk include assessing the adequacy of banks' LRM and the reasons for changes in liquidity; and the reasonableness of fund raising and operation structures. Reporting intervals for the won liquidity ratio were shortened in September 2007 from a quarterly to a monthly basis and regulators have stepped up monitoring of liquidity indicators on a daily basis.

51. **Banks are also required to undertake stress tests on a regular basis and prepare contingency plans.** How the stress tests are conducted and whether senior management develop effective contingency plans are also non-quantitative elements of the risk assessment system. Stress testing is also a minimum requirement for banks applying to use the internal-ratings based (IRB) approach in the move to Basel II. However, stress tests focus on credit and market risks.

52. **If banks face liquidity difficulties, the BOK can provide liquidity support.** Banks can access BOK's standing repo facility using eligible collateral (government guaranteed bonds). BOK can, if required, relax collateral requirements and under exceptional circumstances, could extend liquidity to individual banks or companies.

What Does Recent International Experience Suggest for Korea's LRM?

53. **The global financial turmoil has revealed that liquidity risk is far more pervasive than previously thought—liquidity can dissipate very quickly and stresses can persist for long periods.** With the central importance of liquidity to the functioning of financial markets

²² The ratio of asset/liabilities with residual maturity of three months should be at least 85 percent. The ratio of assets exceeding liabilities to total assets, when the residual maturity is 7 days and 30 days should be zero and 10 percent respectively. There is also a requirements that banks foreign currency loans of one year or longer should be at least 80 percent funded by foreign currency borrowing with a maturity of one year or more (unless the outstanding foreign currency loans are less than \$50 billion).

re-emphasized, various international institutions and fora have issued preliminary guidance for improving LRM and supervision in light of recent events (as listed in the next chapter).

54. **Lessons point to the importance of Korean banks:**

- **Establishing funding strategies that provide effective diversification in sources and tenor of funding.** Issuance of longer-term notes, securitization, and covered bonds could help match the associated asset's maturity and thus reduce liquidity risk (see below).
- **Strengthening stress testing.** In particular, these test should allow for the possibility of large and multiple shocks and account for the possible evaporation of liquidity in some asset classes during a crisis; closure of multiple wholesale markets; and widespread calls on liquidity commitments, taking into account commitments to off-balance sheet entities.
- **Establishing formal contingency plans, closely linked to stress tests.**
- **Greater transparency and disclosure of LRM policies and practices.** Sufficient details should be regularly disclosed to allow market participants to assess banks' LRM, including funding sources, liquidity commitments (especially to off-balance-sheet entities), maturity mismatches, assumptions made over deposit withdrawal prospects, contingency plans, and stress test (assumptions and results).

55. **Financial regulators and supervisors should ensure Korean banks make progress towards “best practice” in their LRM.** This could involve, regular and comprehensive assessments of banks' overall LRM frameworks, particularly their stress-tests and contingency plans; and guidance should be provided or remedial actions required, as necessary. (IMF (2008) provides a more general discussion of the options).

56. **BOK, regulators, and government could also strengthen their own system-wide analysis, contingency planning and cooperation.** BOK and financial regulators should ensure their own stress-tests adequately account for the possibility of extreme and multiple shocks (tail events), contagion between institutions, and macroeconomic effects, and are linked closely to their contingency planning. Communication and coordination between supervisors, the BOK and the government should be reviewed to ensure the necessary procedures exist for effective coordinated responses under stress scenarios.

57. **Central banks in the most affected countries seemed less than fully prepared for the extent of the liquidity stresses.** Central bank actions have limited wider damage, yet the extensive, sudden and, in some cases, ad hoc nature of the changes to their operational frameworks suggest the extent of the liquidity problems were not anticipated. BOK (as ultimate provider of liquidity) may need to review its range of counterparties, the maturities of their facilities, and what is acceptable as collateral. However, while it is expedient during a crisis to

be able to operate with wide ranges of counterparties/collateral, this creates difficult trade-offs, such as reducing the incentives for banks to hold or provide high-quality collateral (IMF, 2008).²³ Well functioning repo markets were also demonstrated to be particularly important under stress conditions and so the strategy to deepen Korean money markets and increase secured lending should be expedited.

Efforts to Diversify Funding Sources and Income Sources

58. **There has been some movement by Korean banks to diversify funding sources and currencies.** Korean banks have recently tapped the Malaysian ringgit and Brazilian real markets; and started to offer structured deposits.²⁴ Two major Korean banks have also recently issued securitized bonds; and banks are also looking towards alternative forms of funding (such as covered bonds once these are permitted—see below).

59. **There are encouraging signs of Korean banks diversifying their income sources.** Korean banks' non-interest income has been increasing as a share of overall income in recent years, mainly benefiting from the fast-growing wealth management industry. Their ability to generate fee and other non-interest income, however, seems to be lagging behind banks in more developed markets (Fitch Ratings, 2008).²⁵ While the evidence internationally on the benefits of banks' diversifying income sources is mixed, a recent study (BOK, 2006) found that expanded nonbanking activities of Korean banks led to improved profitability and lower volatility of profits. This could be because the scope of nonbanking activities is still relatively limited, and because Korean banks have focused on relatively stable income sources such as fee income and credit card businesses.

60. **Korean banks have also been expanding internationally, but from a low base.** Korean banks' overseas assets have been steadily increasing since 2001 and the number of overseas networks is also increasing.²⁶ The drivers include competition and narrowing scope for domestic expansion; the substantial growth potential in regional neighbors; and the increasing need/demand for integrated regional and global services from existing customers also operating internationally. Korean banks are still largely domestically oriented—with overseas assets

²³ Other key issues include the balancing of a central bank's role with respect to macroeconomic stability (through monetary policy) and financial stability (including through liquidity provision); and the need for international coordination of emergency arrangements and convergence of practices (IMF, 2008).

²⁴ Structured deposits are basically an interest rate derivative product where the principal is protected and the interest received varies depending on some underlying financial instrument. These may help to increase the deposit base but may also raise concerns about "suitability".

²⁵ Fitch Ratings reports a doubling of the share of net non-interest income between FY2005 and FY2007 (from 13 percent to 26 percent of net revenue).

²⁶ KEB has 26 overseas networks, Woori Bank has 18 and Shinhan Bank has 16.

accounting for only 4 percent of total assets, compared with 30 percent for DBS, and nearly 60 percent for Citi and HSBC (Noh, 2007).

61. Regulators have been encouraging Korean banks to further diversify their funding and revenue sources, and to explore global opportunities:

- **Financial regulators recently announced they will permit banks to issue covered bonds.** Covered bonds—which are debt securities backed by cash flows from mortgages or other loans—are usually highly rated and it is hoped these will help banks lower funding costs, and generally improve their liquidity conditions. (The timeline for permitting issuance of covered bonds has yet to be confirmed).
- **Regulators will also allow banks to trade derivatives from August 1, 2008.** Trading of derivatives is currently allowed only as a hedging tool. This could help support income diversification, but could also increase risk.
- **Regulators have indicated intentions to:** (i) allow banks to issue Derivatives-Linked Securities and Credit-Linked Notes (the planned deregulation is at the review stage); (ii) allow banks to provide asset management advisory services; and (iii) simplify the process for banks to enter offshore markets.

D. Deregulation, Competition, and Banks' Business Models

62. Korean banks are preparing for the adoption of the CMCA next year. Banks' seem to be diversifying their sources of income as evidenced by the increase in the share of non-interest income in recent years; and there has been some move towards greater global operations by Korean banks. This section considers the international experiences of banks post-deregulation and draws some tentative lessons for Korea going forward.²⁷

International Experience Post-Deregulation

63. The global financial policy direction has been towards deregulation between financial activities. Despite concerns about risk, this deregulation trend reflects the general belief that there are net benefits from financial sector consolidation and conglomeration. These can come from *improved information* (from wider and longer-term customer relationships), *economies of scale and scope* (e.g., the sale of mutual funds through bank branches), the *development of capital markets* (if banks have direct access to capital markets), and providing a *one-stop-shop* for customers (reducing their transactions cost). Allowing banks access to capital market activities provides a strong incentive for them to foster the diffusion of nondeposit financial products. While this helps the shift of savings from deposits to capital market-based

²⁷ Discussions of the broader experiences with deregulation in advanced countries and lessons for Korea can be found in KDI (2006) and Semblat (2006).

financial products, adding to funding risks, it also permits banks to reduce reliance on interest-income.

64. **However, easing of barriers can create new risks.** The experience of Europe and the United States shows that conglomerates are exposed to higher financial markets risks and counterparty exposure to market and liquidity risk than nondiversified financial institutions. Allowing a number of activities under one roof can create numerous conflicts of interest. Conglomeration may also contribute to the contagion within a group (e.g., reputational risk becomes correlated). Lown and others (2000) found that U.S. banks' mergers with securities firms increased risk modestly; and De Nicolo and others (2003) finds that large and conglomerate firms exhibited higher risk-taking than smaller firms.

Financial sector deregulation and denationalization in Korea during the 1980s

65. **Gilbert and Wilson (1998) found that Korean banks responded to privatization and deregulation by dramatically altering their mix of inputs and outputs, which yielded large productivity gains.** Deregulation in the 1980s included: abolishing or simplifying regulations; relaxing direct controls on interest rates; easing restrictions on bank entry; and broadening the scope of banks' business activities (see details in Gilbert and Wilson, 1998). At the same time, IT developments allowed banks to sell more sophisticated financial services. Entry barriers were also lowered substantially for nonbank financial institutions. Banks thus faced increased opportunities but also increased competition, and still had high levels of nonperforming loans. This combination of having to write off bad loans out of current earnings while facing competition may explain the strong incentives to cost-cut: during 1980–94, banks increased their assets substantially while reducing average employment.

Financial deregulation in the United States during the 1990s

66. **U.S. banks during the 1990s seem to have maintained productivity through providing additional services or higher quality service, which may have raised costs, but also raised revenues by more than costs** (Berger and Mester, 2003). The Gramm-Leach-Bliley Act (GLB) of 1999 repealed the Glass-Steagall Act of 1933, allowing banks, brokerage firms, and insurance companies to merge. GLB to some extent simply ratified what was already being practiced in the context of a gradual liberalization of Glass-Steagall. There is thus mixed evidence on the benefit of GLB for banks, although Al Mamun and others (2004) find commercial banks, brokerage firms, and insurance companies all benefited from the introduction of GLB, with commercial banks and large firms benefiting the most. Berger and Mester (2003) note that, due to consolidation and deregulation, the banking sector has become more competitive; and examine the effects of technological change, deregulation and dynamic changes in competition, on the performance of U.S. banks. They find that during 1991–97, cost productivity (the predicted cost of producing a given level of output annually, controlling for

business conditions) increased and profits (controlling for business conditions) improved dramatically over the period.²⁸

Performance of Japanese banks post-Big-Bang reform

67. **Selected elements of Japan's financial sector reform and deregulation during 1998–99 include:** permitting of financial holding companies; a new regulatory framework; an improved framework for securitization; the shift from licensing to registration for entry of securities businesses; permitting the sale of mutual funds by banks; permitting securities firms to offer asset management services; and the abolition of the fixed commission system for securities brokers.²⁹ Loukoianova (2007) examines the efficiency and profitability of Japanese banks during 2000–06, and finds banks' performance has steadily improved since 2001, but profitability and NIMs were low compared to other advanced countries. Banks would likely benefit from greater diversification of their products and activities, further deepening of capital markets,³⁰ and from cost-sharing arrangements.³¹ Hence, further deregulation and development of the capital market would likely increase business opportunities and improve the performance of banks.

Lessons from International Experience for Korea Post-CMCA

68. **The international evidence seems to suggest that banks have effectively adapted their business models to competitive pressures and revenue opportunities in post-deregulation environments.** Korea's own experience points the potential for large productivity gains from restructuring and cost-cutting. The experience in the U.S. post-GLB suggests that the model of providing new, innovative, and higher quality financial services can support profitability despite involving higher costs (such as more skilled staff and more extensive investment in IT-capital). Japan's experience highlights the potential benefits of further relaxing regulations between banks and securities companies, and the associated development of the capital market.

²⁸ Over time, banks have provided a wider variety of services and offered additional convenience (ATMs, proliferation of credit/debit cards, and online banking). These seem to have increased costs but seem to have been necessary expenditures to maximize profits.

²⁹ KDI (2006) provides a fuller discussion, including other important legislation passed in 2000.

³⁰ In Japan (as in Korea but in contrast to other industrial countries), corporations rely less on capital markets for financing and individual investors hold a larger share of their wealth in bank deposits. Banks in other countries engage in a wider range of activities, including greater securitization of their loan books, and more sophisticated deposit and savings products (also ABS and REITs are growing in Japan).

³¹ Japan's regional banks have already been taking steps to reduce costs by sharing computer systems, pooling risk management, and joint outsourcing.

69. **In the longer term, beyond the CMCA, universal banking may be an appropriate goal.** Korea's CMCA differs in one important dimension from the global trend towards the elimination of barriers between banks, securities firms, and insurance companies. In Korea, only through subsidiaries are financial holdings companies able to operate in these different financial activities. The idea is to develop investment banks separately from commercial banks, while elsewhere, the share of investment bank activities in universal banks has increased.³² The choice of regulatory structure and the extent of easing of barriers between financial activities depend on a host of factors, including countries' differing assessments about the net benefits and risks. Allowing banks to undertake investment bank activities could hasten the development of capital markets in Korea but a gradual approach is appropriate. In particular, some separation of these activities may be appropriate until supervision and market discipline are in place to deal with the risks of deregulated financial activities. With these in place, further easing could be appropriate (Semblat (2006) discusses the benefits and challenges of further easing barriers).

E. Conclusions

70. **Korea's wholesale funding dependence will likely continue to increase with the shift of households portfolios away from deposits, particularly in the context of the deregulation next year and underlying structural factors (such as the interest-income focused model of banks).** Liquidity stresses in Korea have not yet been very disruptive. Recent international experience demonstrates how quickly and unexpectedly liquidity problems can manifest (particularly in the context of high wholesale funding dependence), and how severe the consequences can be. Korean policymakers have acknowledged the increasing liquidity risk concerns and have taken measures, such as enhancing monitoring of liquidity indicators, and expanding the options for banks to diversify funding and income sources. Regulators should also push to move Korean banks towards international LRM best practice (as recently revised in light of the subprime crisis). Korean banks' business models have evolved—and will likely continue to evolve—in preparation for increased competition under CMCA. There are likely to be net benefits from continued diversification of income for Korean banks; but scope to do so depends in part on the extent to which banks are allowed to operate in investment banking activities. Ultimately a move to universal banking could be appropriate for Korea, once the key safeguards are in place.

³² Investment bank businesses at major global commercial banks generate 30–40 percent of their total profits, compared to less than 5 percent currently in Korean commercial banks

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IV. LESSONS AND POLICY RECOMMENDATIONS FROM THE FINANCIAL CRISIS³³

A. Introduction

71. **The ongoing global financial crisis has thus far had only a small direct and moderate indirect impact on Korea, reflecting the overall soundness of the Korean financial system.** However, the crisis has proven to be, at times, powerful and fast moving. In this light, lessons from the causes and impacts of the turmoil could serve as useful advice to help inform Korea's financial markets as well as their regulatory and supervisory authorities. This is especially true as Korea attempts to promote major changes to its financial sector through regulatory reform.

72. **In 2007, turmoil in the U.S. subprime mortgage market began spreading into other market segments and reaching across borders into other regions.** A credit crunch swept internationally across the interbank lending market. Similarly, key over-the-counter (OTC) markets in securities and derivatives began suffering from a lack of trading if not outright illiquidity. Of the cross-border impacts, European banks were especially hard hit, first by losses on subprime-related assets and then by a contraction in wholesale funding through the interbank market.

73. **Emerging market financial systems were not immune from the financial crisis, although they experienced less severe outcomes.** One reason emerging economies were spared from the worst of the crisis is that they were treated by international investors as a safe haven from the sharp downturn in developed country financial markets. For Korea, there are two other factors that have contributed to its resilience. First, while it is an advanced economy, it has a relatively less developed—and thus less complex—financial system. And, second, its financial regulatory framework is based on a rules-based approach where permitted activities are prescribed by law, resulting in more gradual and careful market changes.

74. **Upcoming changes in Korea's financial markets will likely result in larger, more complex financial firms, and new markets in more sophisticated financial instruments.** By February 2009, Korea will have implemented new legislation intended to promote financial market development through changes in market regulation.³⁴ One main feature is to permit the formation of larger, multi-service financial firms, modeled along the lines of the major U.S. broker-dealers such as Goldman-Sachs, which will be more capable of introducing financial innovation into the marketplace. The law will also promote the further development of the asset-backed securities (ABS) market, and encourage more growth and market participation in

³³ Prepared by Randall Dodd.

³⁴ A fuller discussion of the Financial Investment Services and Capital Markets Act of 2007 can be found in *Republic of Korea: Selected Issues, 2006*, IMF Country Report No. 06/381; and Chapter III of this Selected Issues paper.

OTC derivatives markets. Other aspects of the financial reforms will weaken the existing separation between banks and commercial firms.

75. **As part of this process, Korean authorities will need to consider the most recent recommendations on financial policy reforms from international organizations.**³⁵ Since the financial reform legislation was passed in July 2007 the global financial situation has changed significantly. During this period of change, both regulators and financial firms will need to consider the lessons of the financial crisis and adopt the relevant policy recommendations in order to avoid similar troubles. This will be especially important as the financial system faces risks from the new large complex financial firms, new lines of business, new governance challenges to address potential conflicts of interest, and new financial instruments.

B. General Lessons from the Financial Crisis

76. **The subprime market turmoil has highlighted several shortcomings in the functioning of the U.S. mortgage market.** It is widely viewed that underwriting standards were too lax, especially in relation to the mortgage interest rates. Furthermore, these low standards were inadequately disclosed by originators as the mortgages were sold or distributed through secondary markets. The originate-to-distribute model facilitated conflicts of interest and lax market discipline as credit risks were quickly passed along from origination to securitization and re-securitization. Moreover, gaps in the U.S. regulatory and supervisory framework left many of the financial firms involved in this process out of the supervisory network.

77. **OTC securities and derivatives markets proved to be lacking in resilience in the face of the turmoil.** The FSF, the NYFRB, and others have pointed to weaknesses in OTC markets and the need to develop better market infrastructure to confirm and settle transactions and improve price transparency. When the crisis hit, key market participants failed or quit trading and dealers ceased acting as market makers. As a result, markets “froze” or became illiquid. This not only locked investors into losing positions and impaired efforts to hedge new risks, but also left the wider marketplace without prices to mark positions to market. This in turn led to accounting and valuation problems. The sudden lack of liquid markets further diminished the values of these assets and contributed substantially to the massive writedowns by banks and securities firms.

³⁵ See Box IV.1 for a selected list of recommendations from the major International Financial Policy Organizations (IFPO). These include the Bank for International Settlements (BIS), the Financial Stability Forum (FSF), the International Accounting Standards Board (IASB), the International Monetary Fund (IMF), the International Organization of Securities Commissions (IOSCO), the Institute for International Finance (IIF), and the Organization for Economic Cooperation and Development (OECD). The New York Federal Reserve Bank (NYFRB) and the President’s Working Group (PWG) on Financial Markets are U.S. organizations, but with an international focus and presence.

Box IV. 1. Summary of Recommendations by International Financial Organizations

Mortgage Market

Improve underwriting standards	PWG
Improve disclosure requirements and practices	PWG
Remove conflicts of interest & restore market discipline in O2D model	BIS, IIF, PWG
Prevent fraud and consumer abuse	PWG

OTC Market Reforms

Establish OTC Registry	NYFRB, FSF, PWG
Establish clearing house for OTC derivatives	NYFRB, FSF, PWG
Improve counterparty risk for OTC derivatives	BIS, FSF, PWG

Liquidity

Higher standards for liquidity management	BIS, FSF, PWG
Liquidity cushion and contingent funding plan	BIS
Internal controls and risk management	BIS

Complexity

Higher standards for disclosure	IOSCO, BIS
Modeling problems—errors with existing models, dangers of relying on one model or methodology	BIS, PWG, IASB, IOSCO
Reform accounting and valuation methods	PWG, IOSCO, BIS
Reform credit rating agencies	PWG, IOSCO
Promote greater due diligence, sophistication & obtaining disclosures	BIS
Suitability	FSF

Inadequate Prudential Regulation

Need to adequately govern leverage	BIS, IMF
Need greater capital requirements for off-balance sheet exposures, including liquidity obligations to SIVs	BIS, FSF, IMF, PWG
Need greater capital requirements for liquidity risks	BIS
Need greater capital requirements for complex assets	BIS, FSF, PWG
Eliminate regulatory gaps - prevent financial firms from operating outside the prudential regulatory framework	FSF, IMF, PWG
Special supervisory attention to firms such as monoline insurers that serve critical role in multiple financial markets	FSF
Executive compensation reform	IMF

Policy Response Measures

Central bank provision of liquidity, including new procedures	FSF, BIS, IMF
Managing failures through receivership, purchase and acquisitions, nationalization	FSF
College of supervisory for global financial firms	FSF

78. **In addition, there was excessive leverage at some of the key financial firms in the mortgage market.** The unregulated mortgage originators—often the subsidiaries of regulated and well-capitalized banks and securities firms—operated with little capital and relied heavily on wholesale funding markets to finance their holdings of mortgages until they could be sold in the secondary market. The structured investment vehicles (SIVs) and conduits—which were sponsored by major banks but not consolidated for accounting or regulatory purposes—financed over 90 percent of their assets with asset-backed commercial paper and medium-term notes. Some hedge funds (the primary broker clients of the same banks and securities firms) operated with even greater leverage. High degrees of leverage led sometimes to crippling losses for the enterprise, and at other times it resulted in their inability to maintain operations in the face of margin or collateral calls. In the case of SIVs and conduits, it triggered liquidation provisions that led their bank sponsors to take the assets onto their balance sheets.

79. **The subprime crisis has revealed that innovations involving new or higher levels of complexity can result in mispricing and inadequate risk management.** Investors often relied too heavily on existing market prices and credit ratings as the low-cost alternative to investing heavily in the time and techniques required to conduct proper due diligence.

80. **Yet another lesson is that gaps in regulation can amplify risks, in particular during a crisis.** While regulated banks and securities firms formed the core of the major developed financial markets, there were many unregulated firms that played critical roles in the mortgage and overall financial markets and these often proved far less resilience to the market turmoil.

81. **Finally, the crisis has highlighted the role that large, diversified financial firms can play in spreading turmoil across market segments and borders.** The funding illiquidity experienced among major banks in the U.S. subprime mortgage market quickly spread to other banks and securities firms in the United States and Europe through wholesale interbank markets. The subprime mortgage turmoil, by inflicting severe losses on monoline insurers, was also transmitted into refunding crises in auction rate securities and tender option bonds backed by U.S. municipal bond and student loan ABS.

C. Lessons for Korea's Mortgage Market

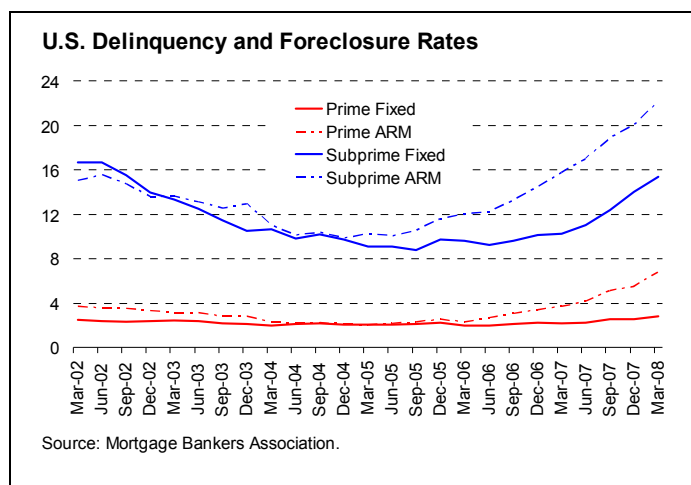
82. **Korea's mortgage market is characterized by strong underwriting standards and some encouraging developments.** Mortgages in Korea are usually originated with at least a 60 percent loan-to-value (LTV) ratio. This implies a 167 percent collateralization rate on mortgage loans and provides mortgage lenders, offering a substantial degree of protection against declining home prices. One important positive development is the increasing use of long-term mortgage contracts. There is also a small but growing share of fixed-rate mortgages, but at present the market still consists of over 90 percent adjustable rate mortgages (ARM).³⁶ The market for mortgage-backed securities (MBS) is small but growing, and as in the United States,

³⁶ As of April 2007.

it is dominated by a government-sponsored firm, Korean Housing Finance Corporation (KHFC), but also includes private sector issuers. Moreover, the regulatory authorities have dampened growth in the market when it was viewed that the growth in household mortgage debt and the pace of growth of housing price was excessive.

83. Nevertheless, some concerns regarding the mortgage market should be addressed based on the lessons of the financial crisis.

One issue is the recent use of grace periods in long-term amortized mortgages. The grace period is usually for 2 to 3 years and allows for only interest payments to be made during that time. This raises concerns both about underwriting quality—since initial interest-only payments may be used as an



affordability provision to qualify borrowers—and the consequences for the ability of homeowners to pay their mortgages when the grace period ends.³⁷ Such payment problems could be limited in the future by limiting the use of grace periods to mortgages with long maturities or by limiting tax incentives for such loans. Mortgage risks may also be exacerbated by the predominant use of variable rate mortgages in Korea, which transfer interest rate risk to household, and continued efforts to develop fixed-rate mortgages would be advisable. In fact, in the U.S. market turmoil a sharp rise in delinquency and foreclosure rates of U.S. ARM mortgages has been observed as a consequence of the rise in short-term rates.

84. The growth in MBS issuance may also raise concerns about the originate-to-distribute business model for mortgage financing. At present, the vast majority of MBS are issued by the state-owned KHFC. They guarantee interest and principal payments and issue pass-through type MBS, as do Fannie Mae and Freddie Mac. The KHFC's low and declining delinquency rates on the mortgage pools indicates strong underwriting standards. However, there is also a small but growing market in MBS issued by banks and other private sector financial firms. This is likely to grow more rapidly as the Capital Markets Consolidation Act (CMCA) is implemented and larger nonbank financial firms expand their securitization business. As private, independent MBS issuance grows, so will concerns about potential conflicts of interest and the lack of market discipline as credit risk is passed along in the securitization process. The IIF³⁸

³⁷ For further details, see Chapter IV of *Republic of Korea: Selected Issues, 2007*, IMF Country Report No.07/345; and Chapter II of this Selected Issues paper.

³⁸ Institute of International Finance, *Final Report of the IIF Committee on Market Best Practices: Principles of Conduct and Best Practice Recommendations*, July 17, 2008.

recommends that firms involved in the originate-to-distribute process should apply the same credit due diligence standards at all stages regardless of whether assets are to be held on the books or distributed.

D. Lessons for Korea's OTC Financial Markets

85. **As noted, another lesson from the financial crisis is that some OTC markets have weak market structures.** The most serious consequence was the loss of market trading liquidity in some securities and derivatives markets. It not only prevented investors from adjusting their positions, but also hampered proper asset valuations by eliminating the use of liquid market prices for marking to market.

86. **In response, the international financial policy organizations have made the following recommendations:**

- Establishment of an OTC registry or depository to record OTC trade confirmations and to make prompt public reports of market prices so as to improve the efficiency of price discovery and dissemination.
- Establishment of a clearing house or similar facility to handle post-trade infrastructure including prompt trade confirmation, resolution of trade errors, and settlement.
- Improvement of counterparty risk management through high standard and more efficient practice for the use of collateral for derivatives and lending transactions.

87. **A key concern in Korea is that rapid financial sector reforms stemming from the CMCA will lead to expansive growth in financial transactions conducted in nontransparent OTC markets.** The reforms will likely result in more financial transactions occurring in markets beyond the reach of Korea's current regulatory framework. In addition to gaps in reporting requirements, there are no prudential regulations governing the use of collateral to reduce and otherwise manage counterparty credit risks in derivatives trades.

88. **In order to mitigate these problems, an OTC registry can reduce operational risk and improve pricing.** By requiring market participants to report OTC transactions to a designated registry, it can improve operational risk by reducing post-trade uncertainty and other costs. As an example, the regulatory framework in Brazil has established such requirements, and the function of the registry is provided by two institutions, the BM&F exchange and the CETIP depository.³⁹ In the OTC market for corporate bonds and municipal bonds in the United States, participants are required to report within 15 minutes to a public access facility for posting

³⁹ The Brazilian Futures Exchange (BM&F) is one of the largest and most sophisticated derivatives exchanges in the world, and it also serves as a clearing house for bonds and a registry for OTC derivatives. CETIP is the central securities depository and a derivatives registry in Brazil.

prices.⁴⁰ A registry can provide greater market transparency for competitive pricing during normal times, and help to mark-to-market less liquid securities during tumultuous times. Accounting and reporting requirements also improve with the enhanced availability of market prices.

89. Korea's OTC markets for bonds already satisfy some of the recommendations.⁴¹

The bond market is regulated by the Korean Securities Dealers Association (KSDA), a self-regulatory organization. Trading in government bonds, corporate bonds and ABS are covered under the current KSDA rules, which require that all OTC bond and ABS transactions be reported within 15 minutes, to a central OTC registry and the information is then made available to the public. Korea's Bond Quotation System also improves pre-trade transparency in the bond market by offering a centralized quotation system. However it is not required of other OTC securities or derivatives transactions.

90. Korea's OTC securities and derivatives markets would be further improved by market-wide price reporting requirements, the use of a clearing house to reduce counterparty risk, and the establishment of minimum standards for the use of collateral in derivatives transactions. Korea's price reporting requirements, which already applies to corporate bond transactions, should be extended to dealers and other market participants in OTC derivatives and other OTC securities markets in order to strengthen the structure of those markets and help to ensure liquidity. The use of a clearing house and the establishment of collateral standards would also help maintain market liquidity by reducing counterparty risks. The clearing house would also enhance liquidity by allowing a larger number of firms to participate in the market. Towards this end, Korean authorities might be encouraged by recent successes by the NYFRB to convince major OTC derivatives dealers to undertake a voluntary commitment to meet similar requirements.⁴²

91. Alternatively, securities and derivatives are traded on the Korea Exchange (KRX) and this public market provides an even higher standard of transparency and trading liquidity for the price discovery process. The IFPO recognized that exchanges did not suffer the disruptions and trading illiquidity costs that befell many OTC markets. This is an important lesson to financial authorities, and the KRX offers a high standard for price transparency, efficient procedures for trade confirmation and clearing, and improved opportunities for market surveillance by financial system supervisors. Korean authorities have encouraged more

⁴⁰ The service is provided by the TRACE and the Municipal Securities Rulemaking Board, a self-regulatory organization for the municipal securities market.

⁴¹ The vast majority of bond trading in Korea is conducted OTC. The KSDA reports that 80.5 percent of bond trading volume was OTC in 2007, down from 99 percent in 2001.

⁴² See July 31, 2008 open letter to NYFRB President Geithner from 17 dealers, key buy-side asset management firms, and three related trade associations.

government securities trading to occur on the exchange, and such efforts could be expanded to include other securities and derivatives instruments.

92. **Korea lacks designated market makers in some OTC markets.** Although not explicitly spelled out as a recommendation, OTC markets sometimes need designated dealers to serve as market makers to maintain liquidity. The role of the market maker is more costly when volatility rises, and OTC market have recently experienced dealers withdrawing from markets. This is an important issue because of Korea's reliance on OTC trading for trading for bonds, structured securities and derivatives contracts. One potential policy measure to help prevent this is a requirement for dealers to maintain a liquid and orderly market by posting binding bid and offer prices throughout the trading day. Indeed, the KRX has designated dealers on the exchange, and the 20 designated primary dealers in government securities are also obliged to maintain price quotes on benchmark issuances. In a comparable manner, designated OTC foreign exchange dealers in Chile are required to act as market makers, Brazilian authorities have proposed market making requirements for OTC dealers, and primarily dealers in the OTC markets for U.S. Treasury securities are also required to act as market makers.

E. Dealing with Liquidity Risk

93. **The credit crunch in the interbank markets was one key way in which subprime mortgage problems grew into a financial crisis.** It resulted from heightened counterparty risk and a surge in the demand for interbank borrowing to fund assets being brought back onto banks' balance sheets. In this context, the following recommendations have been made by the IFPOs:

- Higher regulatory standards for liquidity risk management,⁴³
- Greater regulatory incentives to maintain an adequate liquidity cushion and other contingency provisions,
- Improved internal controls and risk management.

94. **The current international financial regulatory framework does not fully address the need to provision for funding liquidity.** Requirements for cash in hand and deposits with the central bank were designed to meet the threat of a loss of confidence by depositors. However, the liquidity problem that has recently emerged pertains to threats from disruption of wholesale funding markets. These include not only interbank markets, but also wholesale markets for money market instruments such as asset backed commercial paper and auction rate securities. Another source of recent liquidity problems stems from off-balance contingent obligations to provide liquidity to affiliated but often unconsolidated entities such as SIVs and conduits.

⁴³ See Chapter III of this Selected Issues Paper for a discussion of stress testing in regard to liquidity risk.

95. **Korean banks face liquidity funding risks by operating with a high loan-to-deposit ratio.** The prudential regulatory framework currently maintains higher than usual standards for bank liquidity, requiring minimum proportions of liquid assets over a specified short-term time horizons (7, 30 and 90 days). While the measures have proven adequate to address issues of depositor confidence, they may not be adequate to address risks from wholesale market disruptions that can strike at the roll-over dates of three month to one year maturities. This issue is accentuated by the increased reliance of funding from asset management companies who fund banks through certificate of deposit (CD) instruments and intermediate term notes.⁴⁴ Foreign currency borrowing from wholesale markets faces similar liquidity risks.⁴⁵

96. **Recent disruptions in foreign currency funding at Korean banks illustrated the vulnerability to liquidity risk.** In November-December 2007, major money center banks in the United States were faced with a serious credit crunch. As a result, Korean banks experienced difficulties in rolling over foreign currency loans in the wholesale interbank market and switched to the foreign exchange swap market for U.S. dollar credit. Korean banks were successful in using these derivatives instruments as a substitute to fund their dollar assets and derivatives, but the shift led to a reduction in transparency (financial statements became less representative of underlying activities) and it also reduced regulatory capital requirements for equivalent economic activity.⁴⁶

F. Complexity of Financial Products

97. **Although small compared to other OECD financial systems, Korea is already a regional leader in the issuance of ABS.** Korean ABS are issued on car loans, home equity loans, credit card receivables and student loans. They are also used for real estate project financing. Despite the subprime crisis in the United States, the issuance of ABS in Korea for the first quarter of 2008 was up sharply (by 42 percent) over the same period in 2007. Compared to the first quarter of 2006, however, it amounted to a small decrease due largely to a sharp decline in real estate project financing and the securitization of those assets. The growth of the ABS

⁴⁴ The use of longer maturity notes mitigates the wholesale funding risks as the frequency of the roll-over decreases and roll-over events are staggered over time.

⁴⁵ While a substantial share of this foreign currency borrowing is from parent or headquarter banks abroad, those banks may face their own liquidity risks during periods of global turmoil, and may not necessarily be capable of maintaining lines of credit to all areas of the global enterprise.

⁴⁶ The foreign exchange swap transaction is very much like a similarly dated foreign currency loan, but has different regulatory and accounting implications. The swap is booked through the bank's derivatives desk and is reported as an off-balance sheet item. The offsetting value of the exchange of currencies at the spot exchange rate in the start leg of the transaction means that there is no initial credit exposure on the transaction. If it were instead structured as a back-to-back loan, it would appear on the balance sheet as matching (won) asset and (dollar) liabilities.

market is expected to benefit from the implementation of the new deregulatory measures, as is the market for derivatives and other structured instruments

98. **The IFPO identified the complex nature of financial innovations such as CDO, credit derivatives indices and SIVs as one source of the financial crisis.** The following recommendations are especially relevant to Korean authorities:

- Higher standards for disclosure,
- Promote greater due diligence and sophistication,
- Suitability requirements for the full range of financial instruments,
- Better modeling—using more than one model and methodology,
- Reform of accounting and valuation methods.

99. **ABS issuance by mutual savings banks in Korea does not meet the highest standards of IFPO recommendations.** The underlying assets of mutual savings bank issued ABS are largely loans to construction projects, and the ABS carry credit enhancements in the form of a guarantee. The concern is that investors are not fully aware that the guarantees on the ABS are provided by the construction companies that are the recipients of the project loans that form the underlying assets. Unless investors are fully informed of the content of the underlying assets and the details of the structure of the securitization process, the asset will not be efficiently priced.

100. **As Korea's financial markets engage more and more in modern, complex market activities it may increasingly involve legal structures such as special purpose entities.**⁴⁷ The treatment of SPEs in the regulatory framework will need to be updated accordingly. The IFPO recommends strengthening capital requirements to properly reflect the risks involved with sponsoring and making funding commitments to such SPE.

101. **Suitability is another source for potential problems with complex financial instruments.** Financial sophistication is required in order to properly price complex financial transactions, in particular those that are not standardized and/or trade in illiquid markets. Financial firms that are sophisticated and trade regularly in these products face a conflict of interest in dealing with less sophisticated customers or clients and should be held accountable to “know thy customer” and suitability requirements.

102. **Certain financial structures are unsuitable for issuers.** One of the factors that led to the financial crisis in the U.S. municipal securities market and the student loan ABS market was the use of inappropriate financing structures. Auction rate securities, variable rate debt

⁴⁷ These entities are also known as QSPEs, special investment vehicles, special purpose vehicles, and conduits.

obligations and tender option bonds, which were putable debts, proved vulnerable to counterparty risk and liquidity risk. Auction rate securities were designed to add trading liquidity in order to attract money market investors. They depended upon dealers to assure liquidity, but there were no obligations for dealers to act as market makers. When troubles at the monoline insurers threatened the creditworthiness of these securities, investors tried to pull out, dealers abandoned their market making role and auctions failed to clear. The lesson is that these were not safe and sound innovations, and they proved unsuitable for investors as well as issuers.

103. Korean authorities will need to increasingly focus on suitability issues. Regulators will need to monitor innovations under the new negative list system and exercise appropriate authority in order to avoid similar problems in the modernization of Korea's financial system. While the CMCA includes new investor protection laws, suitability requirements should also apply to all clients, customers and counterparties even if they are selling or issuing securities. In fact, some suitability problems have recently emerged in Korea. Domestic banks have recently sold "knock-in knock-out" options to nonfinancial (largely small and medium-sized) firms that were seeking to hedge their foreign exchange risk. These types of options are less expensive than "vanilla" options because they are comprised of several partially offsetting long and short options transactions. Hedgers were likely attracted to their lower costs, however they proved inadequate as a hedging strategy because they left the hedger exposed to large changes in the exchange rate that would knock-out any gains otherwise captured from the transaction.

G. Addressing Regulatory Gaps

104. Several recommendations on regulatory gaps from the IFPO could prove useful for regulatory authorities in Korea:

- The regulatory framework should encompass the range of financial service firms and financial instruments in the marketplace and not leave regulatory gaps.
- Greater capital requirements are needed for complex assets as incentives to adequately provision for liquidity cushions.
- Special supervisory attention is needed for large, complex financial firms, especially when the firms play critical roles in several financial markets.

105. Korean regulatory reforms are moving from a "positive" list to a 'negative' list. While negative lists can speed the pace of innovation, they also risk the creation of gaps or regulatory arbitrage as new financial products are developed to circumvent existing regulations, accounting rules or tax provisions.

106. CMCA reforms will allow hedge funds to raise capital from domestic investors, and over time to accept funds from retail investors. The regulatory plan does not require reporting requirements for hedge funds, but instead plans to regulate them indirectly through the regulation of managers and investment advisors. While the fiduciary integrity and investment records of

these managers are important, so too is the ability to maintain market surveillance and if larger amounts of investments are being channeled through such nontransparent financial firms then the effective market monitoring will become more challenging.

107. Korean authorities also need to ensure that financial firms maintain capital commensurate with risk exposures from complex financial instruments and commitments for liquidity funding. Korea has already adopted Basel II capital requirements and should be ready to adopt efforts by the Basel Committee on Bank Supervision to update those financial policies according to the new recommendations. The areas of Korea's financial regulatory framework applying to nonbanks should be similarly updated, where appropriate, to better govern risk taking in light of the greater risks exposed by the financial crisis.

H. Policy Response Measures

108. The U.S. financial crisis illustrates the importance of a central bank's ability to exercise their authority to provide funding liquidity to the financial system. In response to the financial turmoil, the Federal Reserve expanded the range of assets that it allowed to be used as collateral for discount window borrowing and repurchase agreements. It also created a new asset swap facility in which general collateral U.S. Treasury securities could be obtained in a repo-like transaction in exchange for posting high quality but illiquid assets. Furthermore, the Federal Reserve expanded the range of financial institutions eligible for discount window lending by including all the designated primary dealers in U.S. Treasury securities. These measures succeeded in adding needed funding liquidity to the financial markets.

109. Korea's central bank has the capacity to add liquidity to the financial system through outright loans and repurchase agreements. The Bank of Korea has the emergency authority, for the purpose of assuring financial stability, to provide direct loans and credit through repurchase agreements to banks and nonbank financial firms. Normally, only government securities (national or municipal) can be used as collateral, but under emergency authority the central bank can accept other assets. Korean banks have pursued an aggressive loan growth policy in recent years, and as a result their balance sheets are proportionally less liquid. Korean authorities should take a careful look at the experience of the U.S. Federal Home Loan Banks in providing liquidity during the 2007 credit crunch by accepting home mortgages as collateral in exchange for making direct loans to banks and similar depository institutions.

110. Finally, it is important to point out that private repo markets in the United States and EU continued to function effectively throughout the credit crunch. This securitized credit market facilitated central bank actions, such as the Federal Reserve's security swap program, and augmented the provision of credit to financial and nonfinancial firms alike. Korea's repo market has remained underdeveloped, and reliance remains heavy on unsecured call loan transactions; such unsecured transactions proved to be the weak point in the credit crunch that hit the Eurodollar market in 2007 when counterparty risk jumped to critical levels. In light of this, the Korean authorities should complete their plans to deepen their repo market.

V. WHAT DETERMINES INVESTMENT IN KOREA?⁴⁸

A. Introduction

111. **Promoting investment is a central part of the government's strategy for increasing the potential growth rate of the Korean economy.** The government plans to reduce corporate tax rates, currently 13 and 25 percent to 10 and 20 percent by 2010, and introduce new tax incentives to spur investment. There are also plans to streamline business regulations and improve the functioning of the labor market.

112. **This chapter assesses the extent to which there is a role for public policy to stimulate investment in Korea, and what measures are most likely to be effective.** Using disaggregated data on listed companies covering the period 1989–2007, the paper attempts to shed light on the role of fundamentals—such as expected profitability, financing constraints, uncertainty, gearing ratios as well as tax parameters—in determining the investment patterns of Korean firms. The analysis allows for differences across both types of firms and over time, and the results are compared to those from other Emerging Asian economies.

113. **It finds that while a return to pre-crisis investment levels—which are difficult to justify on the basis of fundamentals—appears to be neither likely nor warranted, the government's strategy for promoting investment should focus on small firms.** Policies most likely to be effective include: developing capital markets to promote financing on risk-based terms and venture capital; supporting SME restructuring, including by reducing credit guarantees and reform of bankruptcy laws; and lowering uncertainty about government policies affecting risk perceptions, such as tax policy and regulations. While reducing tax rates could have some impact, it is likely to be more modest, while tax incentives would likely be less cost-effective and introduce new distortions into business decisions. At the same time, international surveys suggest that further improvements to Korea's business climate, notably through deregulation and enhanced labor market flexibility, would also help.

B. Investment in Korea: Stylized Facts

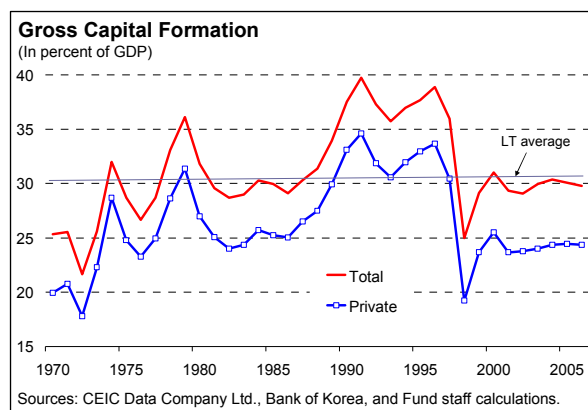
Aggregate Investment

114. **Korea has witnessed a sizeable decline in investment since the Asian crisis.** Comparing the period 2000–07 to 1990–97, aggregate investment has declined by 7½ percentage points, settling at around 30 percent of GDP. With public investment rising slightly, this decline reflects a sharp fall in private investment. In particular, a sustained slump in fixed investment—investment in machinery and equipment and factories—accounts for almost ⅔ of the overall decline. By contrast, FDI flows have been considerably less volatile and more modest over this period: outflows have remained broadly constant as a

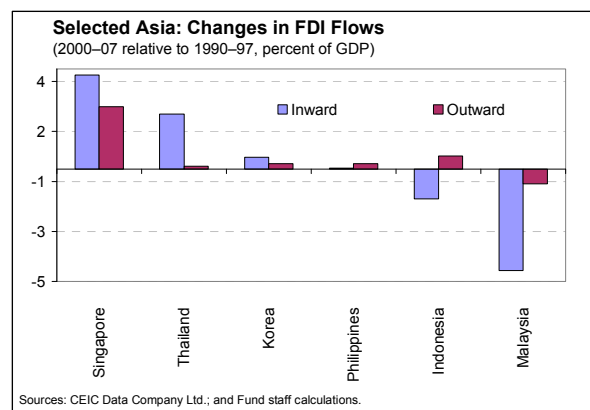
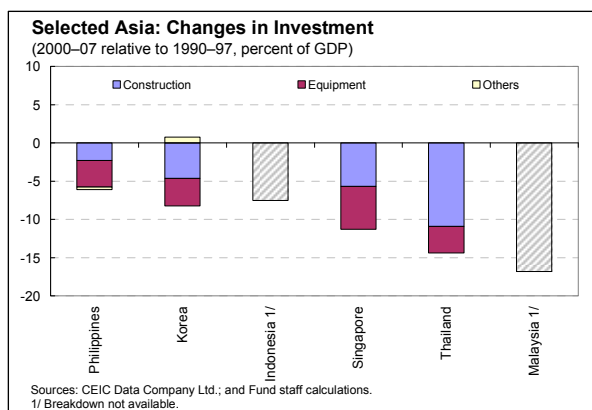
⁴⁸ Prepared by Murtaza Syed.

share of GDP while there has been a modest increase in inflows of around ½ a percentage point. While low inflows are potentially a matter of policy concern, FDI flows do not help explain the decline in aggregate investment in Korea since the crisis.

115. Taking a longer term view, however, current investment ratios in Korea are close to their historical average. While it is difficult to assess whether investment is now at the “optimal” level, it is in line with the historical average over the last three and a half decades, which includes Korea’s highly capital-intensive initial take-off phase. If anything, it is the rapid build-up in investment immediately preceding the crisis that appears anomalous and some subsequent pruning of overinvestment may have contributed to bringing investment to more sustainable levels. Despite the post-crisis decline, it is also notable that current investment levels are still on the high side for an economy of Korea’s level of economic development and by far the highest in the OECD area, where the average is around 22 percent of GDP.

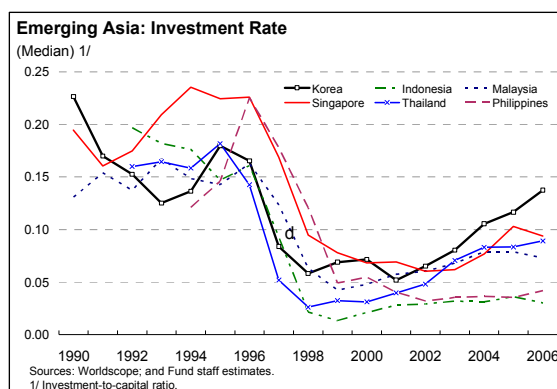


116. These broad trends have been mirrored in much of the rest of emerging Asia. Aggregate investment in the crisis economies (defined as Indonesia, Korea, Malaysia, Singapore, Thailand and the Philippines) has fallen by between 6 and 17 percentage points of GDP over the same period. Unlike Korea, however, in some countries, principally Malaysia and Thailand, excess investment in residential construction appears to have played a significant role in the pre-crisis boom and subsequent slump, while a fall in FDI inflows has been partly responsible for the decline in Indonesia and Malaysia.



Firm-Level Investment

117. **Similar patterns are reflected in the micro data.**⁴⁹ Both the peaks of the early/mid-1990s and the slump in the investment rate (the ratio of investment to the capital stock) associated with the crisis are replicated in the firm-level data. While investment rates remain below their previous highs, the subsequent recovery is also visible and has been more pronounced than in most of the other crisis economies.



The 6 percentage point fall in Korea's investment rate between 1990–97 and 2000–07, while sizeable, is only around half the average decline for these economies.

118. **Investment in Korea was high pre-crisis despite not very favorable conditions,** compared to other emerging markets or other Asian economies. Indeed, Korea was an outlier on the weak side based on a number of corporate indicators (Table V.1). Common measures of profitability—including operating margins and returns on equity or assets—were among the lowest in Emerging Asia during the pre-crisis period. Forward-looking fundamentals—such as expected profitability reflected by Tobin's Q—and liquidity indicators were also on the low side, while corporate leverage was by far the highest in the region. These findings suggest that many Korean firms may have been guilty of “irrational exuberance” in their investment decisions during the lead-up to the crisis.

119. **Corporate soundness indicators have improved since the crisis.** Most measures of profitability have improved, and the gap relative to the rest of the region has narrowed. At the same time, leverage has decreased markedly, although the composition of debt seems to have shifted toward shorter-term maturities. Moreover, liquidity indicators have improved, reflecting progress in financial restructuring, particularly for larger companies.

120. **While investment by large firms has tended to recover strongly, smaller firms have lagged behind,** reflecting weaker fundamentals since the crisis, notably lower profitability and liquidity and relatively greater reliance on short-term debt. Investment patterns also shows some interesting differences across sectors, falling especially sharply in IT and services.⁵⁰

⁴⁹ The Appendix describes the firm-level data and the main variables used in the analysis.

⁵⁰ For IT, this may, to some extent, reflect the relatively thin coverage of the sector in the pre-crisis period of our sample.

Table V.1. Emerging Asia: Corporate Soundness Indicators 1/

	Korea	Indonesia	Malaysia	Philippines	Singapore	Thailand
Investment rate						
1990-97	0.15	0.15	0.15	0.18	0.21	0.12
2000-07	0.09	0.03	0.07	0.04	0.08	0.07
Profitability						
Operating margins (in percent) 2/						
1990-97	6.8	13.7	12.7	10.9	7.3	8.4
2000-07	5.5	7.1	5.9	6.6	5.0	6.3
Return on equity (in percent)						
1990-97	3.9	9.8	10.8	8.8	6.1	8.7
2000-07	7.2	7.6	5.7	4.7	7.1	10.3
Return on assets (in percent)						
1990-97	4.9	7.4	7.2	5.2	3.9	5.9
2000-07	4.9	5.9	4.1	4.3	4.5	6.9
Valuation						
Tobin's Q						
1990-97	1.3	1.0	3.3	1.8	3.0	1.8
2000-07	1.3	0.8	1.6	1.1	1.7	1.4
Liquidity						
Current ratio 3/						
1990-97	1.0	1.5	1.2	1.3	1.5	1.1
2000-07	1.3	1.4	1.6	1.2	1.5	1.4
Quick ratio 4/						
1990-97	0.7	1.0	0.8	0.8	1.1	0.6
2000-07	0.9	0.8	1.1	0.8	1.0	0.8
Interest coverage ratio 5/						
1990-97	1.3	3.1	6.0	3.2	5.4	2.5
2000-07	3.2	2.4	3.8	2.0	5.8	5.5
Leverage and debt structure						
Debt to equity (in percent)						
1990-97	186.0	76.5	39.4	35.4	41.8	103.2
2000-07	54.6	63.5	37.1	37.2	33.0	42.6
Debt to assets (in percent)						
1990-97	48.7	35.9	20.0	20.9	22.4	43.5
2000-07	26.7	32.6	22.3	22.5	18.6	26.6
Short-term debt to total debt (in percent)						
1990-97	54.5	58.4	66.8	52.8	54.7	75.7
2000-07	64.8	50.0	69.9	50.9	63.5	63.9

Sources: Worldscope; and Fund staff calculations.

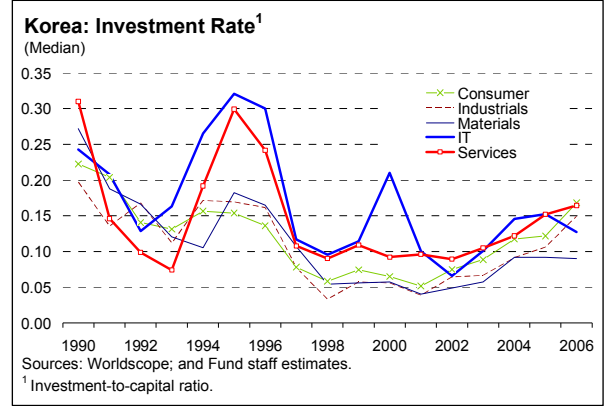
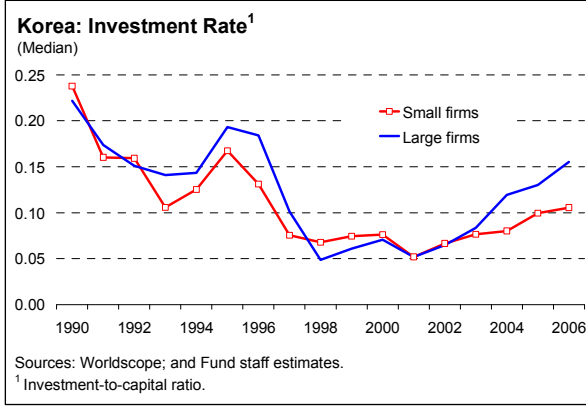
1/ Medians.

2/ Operating earnings (EBIT) in percent of sales.

3/ Current assets to current liabilities.

4/ Cash and receivables to current liabilities.

5/ Operating earnings (EBIT) to gross interest expenses.



C. Econometric Analysis

Model

121. **We use firm-level panel data on listed companies from the Worldscope database to estimate the standard neoclassical investment model**, which relates current investment to expectations of future profitability through the Tobin's Q ratio, augmented by additional factors. The model estimated can be expressed as follows:

$$\Delta \left(\frac{I}{K} \right)_{it} = c_t + b \Delta Q_{it} + c \Delta Z_{i,t} + \Delta \varepsilon_{it} \quad (1)$$

where I/K is the investment rate, Q is Tobin's Q ⁵¹, and Z is a vector of additional variables, including:

- *cash flow*, which measures the internal funds available to finance investment projects and is typically used in the literature as a proxy for financing constraints;
- *sales growth*, to reflect potential accelerator effects, whereby an increase in sales may trigger investment by signaling increased demand for a firm's output;
- *leverage*, measured by debt-to-asset and short-term debt-to-asset ratios, as a proxy for the effect of financial restructuring on investment; and
- the volatility of sales growth or stock market returns to capture the potential negative impact of *uncertainty* on investment, suggested by the "real options" literature.⁵²

⁵¹ Defined as the ratio of the stock market valuation of the firm to the replacement cost of its capital stock, incorporating standard adjustments for tax parameters.

⁵² Risk features prominently in more recent microeconomic theories, with greater uncertainty providing an incentive for agents to delay investment (Dixit and Pindyck, 1994).

122. **The model is estimated using a GMM approach**, to allow for endogeneity and measurement error in the dependent variables. Estimation is in first-differences and includes year dummies, to control for firm-and time-specific effects. This approach yields consistent parameter estimates, provided there is no higher order serial correlation in the residuals and the instruments are valid.⁵³ The instruments we report are lagged values of the dependent variable and our regressors, but the basic results were robust to using alternative instrument sets.

Results

123. **Estimating equation (1) on our full sample of Korean firms yields the following results** (Table V.2):

- Investment is positively associated with expectations of future profitability, as summarized by Tobin's Q. While the coefficient is marginally insignificant at typical significance levels, the implied elasticity (estimated at the means of the sample) is economically large, at around 0.26.
- The coefficient on cash flow is positive and highly significant, with an implied elasticity of around 0.23. While the interpretation of this coefficient is contentious, it may indicate that the average firm in Korea is financially constrained, and therefore forced to rely more on internal funds to finance its investment projects.
- Investment is negatively associated with both gearing—in particular short-term debt—and uncertainty, with large implied elasticities of -0.5 and -1.3, respectively.⁵⁴
- While tax parameters also affect investment through their effects on expected profitability, their impact is between 3 to 16 times smaller than the factors above: on average, a 1 percentage point decrease in the corporate tax rate is estimated to raise the investment rate by only 0.05 percent, and a 1 percentage point increase in depreciation allowances or investment tax credits, on average, by only 0.07 to 0.08 percent.
- Other variables appear to be less important. In particular, we did not find any significant effect of sales growth, suggesting that the accelerator channel is not very important in Korea, with investment determined by more forward-looking variables.

⁵³ We use diagnostic tests—namely m1 and m2 tests for serial correlation, and the Hansen test for instrument validity—to verify these conditions.

⁵⁴ The measure of uncertainty used in the reported results corresponds to sales growth volatility. Results using the alternative measure, based on stock market return volatility, were similar.

Table V.2. Korea: Investment Equation 1/, 2/, 3/

Sample	Tobin's Q	Cash flow	Short-term debt-to-assets	Uncertainty
Full	0.011 (1.49)	0.202** (3.92)	-0.319** (2.25)	-0.042** (5.91)
Pre-crisis	0.016 (0.84)	0.104 (0.45)	-0.234 (0.82)	0.023 (0.42)
Post-crisis	0.018* (1.91)	0.225** (3.46)	-0.218 (1.40)	-0.019** (2.62)
Small firms	0.022** (2.84)	0.135** (2.70)	-0.031 (0.30)	-0.010 (0.84)
Large firms	0.017** (2.38)	0.087* (1.79)	-0.09 (0.60)	-0.042** (5.22)
Domestically-oriented firms	0.015* (1.69)	0.202** (3.86)	-0.135 (0.86)	-0.029 (0.96)
Export-oriented firms	0.010* (1.69)	0.028 (0.71)	-0.125 (1.18)	-0.026** (3.12)

Sources: Worldscope; and Fund staff calculations.

1/ For readability, only selected variables—such as those referred to in the text—are shown.

2/ First-differenced GMM specifications, with a full set of year dummies included.
Instruments are (I/K), Q and CF/K dated t-3 and t-4. Time period for full sample is 1989-2007.

3/ Robust t-statistics in parentheses, with * indicating significance at 10 percent and ** at 5 percent level.
Diagnostic tests (not reported) did not reject validity of instruments or detect higher-order correlation in residuals.

124. **The determinants of investment have changed over time, with little role for fundamentals pre-crisis.** It is difficult to find any significant association between investment and our explanatory variables prior to the Asian crisis. While this may reflect large standard errors due to the smaller size of the sub sample, the magnitude of the coefficients on cash flow and uncertainty is also very different from that in the post-crisis period. This is consistent with our earlier hypothesis that the pre-crisis investment boom may not have been fully justified by economic factors. By contrast, the strong relationships we observe between investment and fundamentals in the full sample seem to be driven by the behavior of Korean companies during the more recent period.

125. **The effects of fundamentals differ significantly based on firm characteristics, notably size and trade exposure.** While almost all types of firms respond to profit expectations, smaller firms are much more sensitive to cash flow suggesting that financing constraints may be more binding, while larger firms are more affected by uncertainty, perhaps reflecting their exposure to a broader set of macro and microeconomic factors. A similar dichotomy exists between firms that are domestically-oriented versus those with foreign exposure through exports.⁵⁵ This cross-sectional variation of the coefficient on cash flow supports its interpretation as an indicator of financing constraints.

⁵⁵ This only partly reflects overlap between these classifications, with around 80 percent of small companies being domestically-oriented and nearly 50 percent of large companies having foreign exposure in our sample.

126. **Corporate investment behavior also varies across sectors** (Table V.3). While profit expectations matter strongly in the industrial and consumer sectors, financing constraints appear to be more broad-based. The only exception is the materials sector, which is characterized by low profitability due to competition from lower wage manufacturing economies so that demand for additional investment may itself be low. Despite post-crisis restructuring, short-term leverage continues to dampen investment across almost all sectors, but only significantly so in services, while uncertainty has a especially strong impact in the IT, consumer and materials sectors.

127. **Some of the determinants of investment in Korea differ from those affecting investment in the rest of the region** (Table V.4). As in Korea, gearing (although not specifically short-term) and uncertainty also tend to dampen investment in other parts of Emerging Asia. However, in most of the rest of the region, profit expectations are less important and firms appear to be less financially constrained, the latter perhaps partly reflecting the more dominant role played by small companies in Korea.⁵⁶ There is also stronger evidence of an accelerator mechanism in other parts of Asia, suggesting a tighter link between lagged economic growth and future investment, and hence a more prominent role for cyclical factors in determining investment patterns.

D. Policy Implications

128. **While a return to pre-crisis levels is unlikely to be sustainable, a strategy for promoting investment in Korea will need to focus on small firms.** Pre-crisis investment levels were at historic highs despite relatively subdued corporate indicators, and are difficult to rationalize based on economic fundamentals. While current aggregate investment levels in Korea are close to their long-term average and still-high by developed country standards, small firms have lagged behind, largely reflecting weaker fundamentals in the aftermath of the Asian crisis. Small firms also tend to dominate the services sector (representing around 85 percent of firms), where productivity growth has been lackluster. Looking ahead, a vibrant SME sector will be vital for accelerating Korea's shift to a knowledge-based economy and sustaining high rates of growth.

129. **Credit guarantees have held back restructuring and limited access to external finance for many small firms.** Significant progress has been made on corporate and financial restructuring since the crisis, but smaller companies have tended to fall behind. This partly reflects the still-sizeable credit guarantees for SMEs. With Korean banks tending to direct loans to those SMEs that have secured credit guarantees, since around 85 percent of the associated default risk is borne by the government, existing and well-established firms have an advantage. In turn, this limits their incentives for restructuring, makes it difficult for

⁵⁶ In Korea, SMEs account for almost 50 percent of manufacturing output and over 85 percent of total employment.

Table V.3. Korea: Investment Equation by Sector 1/

Sample	Tobin's Q	Cash flow	Short-term debt-to-assets	Uncertainty
Full	0.011 (1.49)	0.202** (3.92)	-0.319** (2.25)	-0.042** (5.91)
Consumer	0.029** (2.28)	0.199** (3.26)	-0.153 (1.15)	-0.028** (2.01)
Industrials	0.014* (1.95)	0.082* (1.76)	0.132 (1.22)	-0.014 (0.84)
Materials	-0.005 (0.53)	-0.002 (0.11)	-0.177 (1.05)	-0.049** (4.78)
IT	0.013 (1.07)	0.074* (1.78)	-0.129 (0.73)	-0.069** (2.00)
Services	0.010 (1.13)	0.094* (1.68)	-0.340* (1.73)	-0.002 (0.02)

Sources: Worldscope; and Fund staff calculations.

1/ See footnotes in Table V.2.

Table V.4. Emerging Asia: Investment Equation 1/

Sample	Tobin's Q	Cash flow	Gearing 2/	Uncertainty	Sales Growth
Korea	0.011 (1.49)	0.202** (3.92)	-0.319** (2.25)	-0.042** (5.91)	... ...
Indonesia	0.001 (0.08)	-0.019 (0.48)	-0.211** (2.67)	-0.021 (1.24)	... ...
Malaysia	0.006 (0.54)	0.072 (0.73)	-0.543** (2.27)	-0.069** (3.11)	0.078** (2.05)
Philippines	0.023** (2.31)	0.061 (1.45)	-0.342* (1.81)	-0.168** (3.00)	0.101** (3.42)
Singapore	0.004 (0.53)	0.072** (2.01)	-0.338 (1.44)	-0.046* (1.77)	0.047** (3.73)
Thailand	0.001 (0.08)	-0.019 (0.48)	-0.211** (2.67)	-0.021 (1.24)	... ...

Sources: Worldscope; and Fund staff calculations.

1/ See footnotes in Table V.2.

2/ For Korea, refers to short-term debt to assets ratio; for all others, refers to total debt-to-assets.

many newer firms to access bank credit and creates a barrier for new entrants.⁵⁷ While these guarantees have declined from 8 percent of GDP in 2001 to around 6 percent in 2005, they remain, for example, more than three times larger than in Taiwan Province of China and almost thirty times larger than in the United States.

130. Improving the incentives for SME restructuring and broadening access to market-based financing for small firms are key to boosting investment. Restructuring could be promoted by phasing out credit guarantees and assisting the exit of nonviable companies, through a reform of the onerous personal and corporate bankruptcy systems. In addition, the financial infrastructure for SMEs could be upgraded by promoting lending on risk-based terms by reforming collateral laws to allow for a wider range of securitization (beyond real estate and other fixed assets); and widening the pool of venture capital funding available for start-ups in technology sectors.

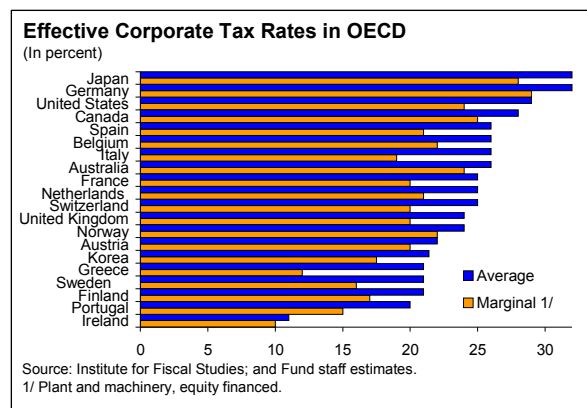
131. Reducing uncertainty through improvements in the business climate is also likely to lead to a positive investment response. While investment decisions of firms can be affected by uncertainty about many, potentially exogenous, elements of their operating environment—such as demand, prices, costs, and exchange rates—other risks stem directly from the policy environment, notably the tax code and other business legislation, government regulations, the legal system and administrative procedures. As suggested by most international surveys of investor perceptions, a less complex and more transparent tax system and regulatory framework, together with a more flexible labor market and more effective investor protection, could help reduce investor perceptions of risk in Korea as well as raise expected rates of return. Korea consistently ranks on the low side in these areas for a country of its level of development, both globally and among comparator economies in the region (Table V.5).

132. Lowering corporate tax rates is likely to have a modest impact on investment, while international experience suggests that tax incentives are unlikely to be cost-effective. The limited impacts of cuts in corporate tax rates on investment are consistent with the fact that effective tax rates in Korea are already relatively modest by OECD standards, as a result of generous tax exemptions.⁵⁸ They are also in line with literature suggesting that tax effects on investment may be secondary if other factors such as the quality of governance, regulatory framework, infrastructure, macro/political stability; labor market conditions; and

⁵⁷ For more details, see J. Kang (2006), K. Kang (2006), and Kang and Chung (2006).

⁵⁸ A wide range of incentives are currently provided under the special tax treatment and control law (STTCL) of 1999.

administrative certainty are problematic.⁵⁹ The general case against the use of tax incentives to encourage particular types of investment has been made both internationally and by many observers of the Korean tax system.⁶⁰ Their key weaknesses include costliness, scope for abuse by taxpayers, lack of transparency, introducing distortions into business decisions and



ineffectiveness, relative to other measures, in reaching intended goals. International evidence suggests that establishing a simple, transparent, credible, and broad-based tax regime would be a better strategy for creating a conducive environment for investment.

Table V.5. The Regional Business Environment: Selected Indicators
(Global rankings, unless otherwise indicated)

	Korea	Indonesia	Malaysia	Philippines	Singapore	Thailand
World Economic Forum						
Overall global competitiveness	11	54	21	71	7	28
Institutions	26	63	20	95	3	47
Efficiency of legal framework	28	75	18	94	10	44
Transparency of government policymaking	34	131	16	69	1	39
Labor market efficiency	24	31	16	100	2	11
Financial market sophistication	27	50	19	77	3	52
International Institute for Management Development						
Overall competitiveness	31	51	19	40	2	27
Government efficiency	37	38	19	41	1	22
Business legislation	50	51	30	44	1	29
Business efficiency	36	44	14	31	2	25
Labor market	32	14	7	15	1	3
Finance	40	47	4	33	7	31
World Bank						
Overall ease of doing business	30	123	24	133	1	15
Starting a business	110	168	74	144	9	36
Employing workers	131	153	43	122	1	49
Registering property	68	121	67	86	13	20
Getting credit	36	68	3	97	7	36
Protecting investors	64	51	4	141	2	33
Economist Intelligence Unit						
Overall business environment 1/	29 (8)	...	...	...	...	...
Policy toward foreign investment	41 (8)	...	...	...	...	...
Financing	45 (9)	...	...	...	...	...
Labor market	55 (13)	...	...	...	...	...

Sources: EIU: *Country Forecast* (July, 2008), covering 82 economies; World Economic Forum: *Global Competitiveness Report* (2005/06), covering 131 economies; IMD: *World Competitiveness Year Book* (2008), covering 55 economies; and World Bank: *Doing Business Survey* (2008), covering 178 economies.

1/ Numbers in parentheses indicate rank out of 17 regional economies: Australia, Bangladesh, China, Hong Kong SAR, India, Indonesia, Japan, Malaysia, Pakistan, Philippines, Singapore, Korea, Sri Lanka, Taiwan POC, Thailand, and Vietnam.

⁵⁹ See Norregaard and Khan (2007) for a review of this literature.

⁶⁰ Among others, see Zee and others (2002) for a survey of the evidence.

Appendix V.1: Description of the Data

The data used in the empirical analysis include all listed nonfinancial firms in Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand covered in the Worldscope database during the period 1989–2007. The Worldscope database is well-known for its standardized presentation of global investment portfolios and its good coverage of historical data. The database covers over 96 percent of the world's market value represented by it. One important advantage of using the database is that it provides standardized data for countries with different reporting practices, yielding relatively more reliable cross-country comparisons. Many of these firms entered the data set after 1995, implying somewhat shorter series for them. Outliers were excluded from the analysis based on standard criteria.

The company-specific variables included are those that potentially affect firm-level investment decisions, as suggested by the standard model of investment outlined in section D. These variables are obtained primarily from cash flow statements and include expected future profitability (Tobin's Q), cash flow, sales growth, leverage (defined as either total debt to total assets or short-term debt to total assets) and uncertainty (measured either as the coefficient of variation of sales growth or stock market returns). The capital stock measure was estimated using the standard perpetual inventory method, with the net book value of plant, property, and equipment was treated as the starting value, and subsequent values determined using data on investment, disposals, and acquisitions.

Incorporating the standard adjustments for debt, taxes and current assets, Tobin's Q is defined as:

$$Q_{it} = \frac{1}{1 - \tau_i} \left[\frac{V_{it} + B_{it} - A_{it} - C_{it}}{p_t(1 - \delta)K_{i,t-1}} - (1 - \Gamma_{it}) \right]$$

where τ is the marginal corporate tax rate; V is the firm's fundamental value or the expected present discounted value of future payments to shareholders; B is the book value of its outstanding debt; A is the present value of the depreciation allowances on investment made before period t ; C is current assets; K is the replacement value of the firm's tangible capital stock; p_t is the price of the investment good; and Γ is the present value of the tax benefit for each dollar of current investment spending. For example, with an investment tax credit at rate k , Γ is:

$$\Gamma_{it} = k_{it} + \sum_{s=t}^{\infty} (1 + r_s + \pi_s^e)^{s-t} \tau_s DEP_{is}(s-t),$$

where r is the default risk-free real interest rate (assumed to equal 3 percent), π^e is the expected inflation rate, and $DEP_{is}(a)$ is the depreciation allowance permitted for an asset of age a .

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