IMF Working Paper

Stress Testing Household Debt in Korea

Meral Karasulu

INTERNATIONAL MONETARY FUND

IMF Working Paper

Asia and Pacific Department

Stress Testing Household Debt in Korea[1]

Prepared by Meral Karasulu

Authorized for distribution by Jerald A. Schiff

November 2008

Abstract

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. This paper examines the sources of, and risks from, household debt by employing stress tests on household level panel data. Results suggest that a 100–300 bps increase in interest rates could increase distressed household debt 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 to amortizing mortgages in 2008−09 presents additional challenges as interest payments on debt are likely to increase further.

---

[1] An earlier version was presented at the IMF and the Korea Institute for International Economic Policy (KIEP) conference, *Ten Years after the Korean Crisis*, September 20−21, 2007, Seoul, Korea. The author would like to thank Dr. Chang Seok Oh and the participants of the conference for their useful comments, and Jongchan Lee for his able research assistance. All remaining errors are my own.
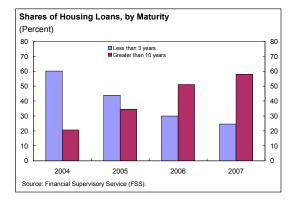
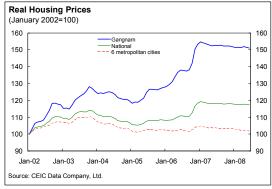<div align="center">Contents   Page</div>

I. INTRODUCTION

The recent increase in household debt has been flagged as a concern for macro-financial stability in Korea. The debt of the Korean households reached 82 percent of GDP in 2007 (Figure 1). This is still below levels of the U.S., 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.

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 level of indebtness would limit the extent domestic consumption growth can be sustained by further debt accumulation.

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 sector has strengthened considerably. Non-performing 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.

Shares of Housing Loans, by Maturity
(Percent)
Source: Financial Supervisory Service (FSS).

Real Housing Prices
(January 2002=100)
Source: CEIC Data Company, Ltd.

In contrast, the characteristics of household debt in Korea shift the risk to households. 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[2]. In the last several years, the mortgage market has changed significantly—with a rising share of longer maturity and amortizing loans[3]—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.

Figure 1. International Comparison of Household Debt

---

[2] In the United States (2005), EU (2004), and 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.

[3] 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.

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, for example with respect to net worth or propensities to consume, or more generally the vulnerability of their balance sheets to various shocks. These differences can be captured by the household level panel data used in this study and are important not only to understand the recent rise in household debt but also to assess the household sector's sensitivity to shocks. Section B discusses various factors that may have contributed to increasing household indebtedness. Section C provides a set of stress tests analyzing the impact of interest rate and real estate price shocks on household balance sheets. Section D concludes.

II. WHAT EXPLAINS KOREAN HOUSEHOLDS' DEBT LEVELS?

This section explores various alternative explanations of household indebtedness in Korea based both on the life-cycle model of consumption and on supply side factors in the financial sector that may affect available credit to households. The analysis relies both on KLIPS panel data set and aggregate data. A description of the KLIPS database is provided in the Appendix.

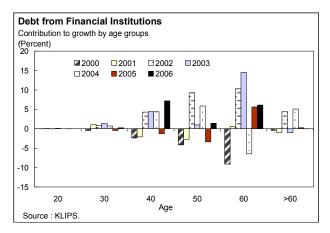**Life-Cycle Model of Consumption**

The life-cycle model of consumption links aggregate demand for borrowing in an open small economy to demographics, the expected income path and real interest rates. Specifically:

- A younger demographic profile would suggest a higher aggregate debt level, as people in their youth tend to finance current consumption with borrowing against expected future income. As incomes grow in later years, households accumulate assets and reduce debt. Once they retire, they begin dissaving, drawing down assets accumulated during their working lives. Hence a country with a younger demographic profile would tend to have higher debt levels (assuming no shift in debt preferences of household cohorts over time).

- Demographics does not seem to provide a good explanation for Korea's high household debt levels. Although Korea has a slightly younger population than the U.S., overall Korean households' age profile is very similar to those in the United States, with 55 percent of household heads above 45 years of age in both countries.

Debtors by Age: United States and Korea
(Percent of households with debt, 2004)   (Percent, age profile of households)
Sources: U.S. Survery of Consumer Finances; KLIPS for debt data U.S. Census (2006); NSO (2005) for age data.

However, contrary to the predictions of the life-cycle hypothesis, a lower percentage of younger households are indebted in

Korea than in the United States as compared to older cohorts, reflecting lower access to finance at younger age in Korea and to the traditional role of parents in fulfilling the role of the financier for the younger generations. Instead majority of debt in Korea is owed by older cohorts above 50 years of age and they account for ¾ of the increase in debt in 1990–2006.

- The effect of real interest rate changes on aggregate net household debt is ambiguous. According to the life-cycle hypothesis a decline in real interest rates would have opposing effects on different age cohorts (Muellbauer 1994). For young cohorts, a decline in interest rates would reduce debt servicing costs while increasing present value of future income, providing incentives for higher debt levels. However, for older cohorts this would mean lower

Debt from Financial Institutions
Contribution to growth by age groups
(Percent)

returns on accumulated assets and hence a desire to dissave less, leading to lower net aggregate debt levels. In 1999−2006 real interest rates on household credit in Korea declined from about 10.3 percent to 3 ½ percent on average while real debt grew by about 61 percent. However, only ⅓ of this increase is accounted by cohorts below 40 years of ago, the remainder being explained by older households. This suggests that in the overall sample the decline in interest rates was a key factor in driving the aggregate debt levels, but contrary to the predictions of the life-cycle hypothesis, the trend is driven by the behavior of older cohorts.

The Role of Housing

Another key factor affecting aggregate debt levels is the homeownership decision of households. If more consumers choose to own rather than rent, borrowing tends to be higher to enable smoothing of nonhousing related consumption. There is also a direct link between the cost of housing and debt levels. The higher are the house prices relative to household incomes, the higher will be the debt levels needed to buy a home. In addition, the lower is the supply elasticity of housing, the higher will be the effect of household borrowing on house prices, which in turn would require even higher debt levels.

- In Korea, these factors tend to work to increase household debt. Home ownership rates are relatively high—comparable to those in the United States and Japan—and the Chonsei

Home Ownership Rate
(In percent)

	2003	2004	2005	2006
Korea (KLIPS)	61.5	61.9	61.4	60.7
United States	68.3	69.0	68.9	68.8
Japan	60.9	...	...	...

Sources: CEIC Data Company, Ltd; KLIPS; and Japan Statistics Bureau.

system[4] implies that even those households that do not own their homes may still need to borrow for a Chonsei deposit or to smooth non-housing related consumption.

- 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 or equivalently longer periods of savings from income prior to homeownership increasing the average age of first time home-ownership. Also, real assets act as collateral enabling homeowners to access financing easier.

Homeownership by Age Groups
(Percent)

Source : KLIPS.

- 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.

Debt from Financial Institutions
Contribution to growth by homeownership
(Percent)

Source : KLIPS.

Supply Side Factors: Shifting Financial Sector Trends

Besides the demand for credit, the supply of funds to the household sector can have equally important effects on observed debt levels. If consumers face liquidity constraints and are not able to borrow to smooth consumption optimally over their life-cycles, then aggregate debt levels would be lower. The changes in the institutional features of lending market that relax such liquidity constraints could lead to higher debt levels.

Financial deregulation and deepening has been closely associated with increased borrowing by households in many industrial economies since the 1980s. The literature provides evidence that the relaxation of borrowing constraints through the process of financial development has been a leading cause of increased household borrowing. This reflects a move away from sub-optimal consumption closely tied to current period disposable incomes

---

[4] Consei system is a unique rental arrangement, whereby the renter pays an upfront deposit of 40 to 80 percent of the value of the property to the homeowner, with no additional monthly payments. The homeowner is obligated to pay back the nominal value of the deposit at the end of the contract, which tend to be mostly for 2 years.

to a situation in which consumers are better able to smooth their consumption based on their life-time earnings (Bayoumi, 1993). In effect, financial development allows behavior closer to that predicted by the life-cycle model to be observed. More recently, a similar trend can be observed for emerging market economies. Habibullah, and others (2006) present evidence of liquidity constraints in household consumption for 10 Asian economies from 1950 to 1994, but only in the case of South Korea, Sri Lanka and Taiwan Province of China do they report a significant relaxation of these constraints since the 1980s, reflecting financial deepening in these economies.
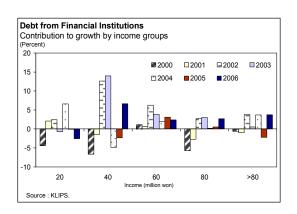
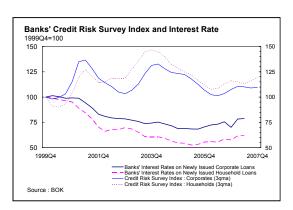In the last decade the evolution of Korean household' indebtedness has been closely linked to shifting trends in the financial sector. Lending to households increased from 38 percent of GDP in 1997 to 66 percent of GDP in 2007, coinciding with a retrenchment of credit from the corporate sector following 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.

Household[1/] and Corporate Loans
(In percent of GDP)

- Corporate loans by banks and major nonbanks [2/]
- Household loans by all financial institutions

Source : BOK.
1/ Includes general loans and loans for housing.
2/ Major nonbanks include KDB (until 2001), Merchant Banks, Trust account of banks, and life insurance companies.

However, financial deepening and improved access have played only a moderate role in recent build-up of household debt. 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

Debt from Financial Institutions
Contribution to growth by income groups
(Percent)

■ 2000 □ 2001 □ 2002 □ 2003
□ 2004 ■ 2005 ■ 2006

Income (million won)

Source : KLIPS.

Banks' Credit Risk Survey Index and Interest Rate
1999Q4=100

— Banks' Interest Rates on Newly Issued Corporate Loans
- - - Banks' Interest Rates on Newly Issued Household Loans
— Credit Risk Survey Index : Corporates (3qma)
···· Credit Risk Survey Index : Households (3qma)
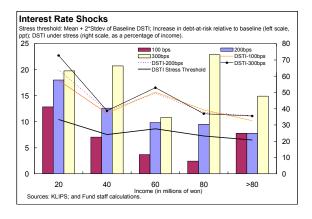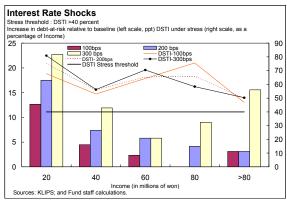
Source : BOK

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.

III. STRESS TESTS

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.

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 ratio (DSTI) 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 debt service-to-income 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 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.

Sources: KLIPS; and Fund staff calculations.

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.

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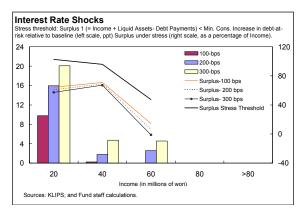
$$SR_{ti} = Y_{ti} - (r_{ti} D_{t-1,i}) \qquad (1)$$

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:

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

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 eq. 2 by income we define households under financial stress if :

$$SR_{ti}/Y_{ti} + \gamma_{ti} W_{ti}/Y_{ti} < (MC_{ti}^*/Y_i) \qquad (3)$$

Two alternative definitions of wealth, W^5 are considered in estimating the household surplus. The first definition (Surplus 1) includes only liquid assets, and excludes real estate deposits paid by renters in the form of chonsei or key money as these deposits tend to be locked over the life of rental agreements averaging around two years. For real estate owners that rent out, however, we include these real estate deposits as another liquid buffer for consumption smoothing or debt payments. The second definition of wealth (Surplus 2) also incorporates net real assets, where it is assumed that the pledgeable value of real estate is given by the difference of its market value and household's total debt from financial institutions[6]. 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.
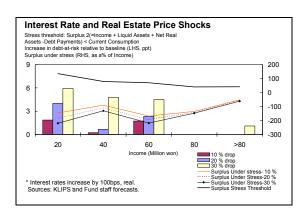

When household surplus is used to define financial stress, a 100–300 bps increase in interest rates could increase distressed household debt by 8–17 percentage points from the respective baseline. Allowing households to smooth income with their liquid assets reduces the impact of the shocks as compared 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

---

[5] 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.

[6] Pledging of real estate for additional debt would require net positive equity, which would depend on the loan-to-value ratio applied by the lenders, the age of the mortgage and the amount of equity in the real estate and the real estate prices. However, the KLIPS database does not specify pledged real estate assets for secured debt nor does it specify the amount of the secured debt separately. The assumption above 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 indebtness are closely linked, limiting the scope of underestimation.

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.

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 combi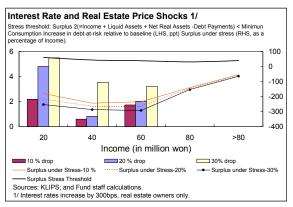ned shock of an interest rate increase and decline in real estate prices. Since the latter shock applies only to real estate owners, this stress test should be interpreted as analyzing the additional marginal impact of a real estate price shock on real estate owners, above and beyond the impact of an interest rate shock on all debtors, while allowing the real estate owners to smooth income with net real assets.

Interest Rate and Real Estate Price Shocks
Stress threshold: Surplus 2(=Income + Liquid Assets + Net Real Assets -Debt Payments) < Current Consumption
Increase in debt-at-risk relative to baseline (LHS, ppt)
Surplus under stress (RHS, as a% of Income)

10 % drop
20 % drop
30 % drop
Surplus Under stress- 10 %
Surplus Under Stress-20 %
Surplus Under Stress-30 %
Surplus Stress Threshold

* Interest rates increase by 100bps, real.
Sources: KLIPS and Fund staff forecasts.

Interest Rate and Real Estate Price Shocks
Stress threshold: Surplus 2(=Income + Liquid Assets + Net Real Assets -Debt Payments) < Mininum Consumption
Increase in debt-at-risk relative to baseline (LHS, ppt)
Surplus under stress (RHS, as a% of Income)

10 % drop
20 % drop
30 % drop
Surplus Under stress- 10 %
Surplus Under Stress-20 %
Surplus Under Stress-30 %
Surplus Stress Threshold

* Interest rates increase by 100bps, real estate owners only.
Sources: KLIPS and Fund staff forecasts.

Interest Rate and Real Estate Price Shocks 1/
Stress threshold: Surplus 2(=Income + Liquid Assets + Net Real Assets-Debt Payments) < Current Consumption Increase in debt-at-risk relative to baseline (left scale, ppt) Surplus under stress (right scale, as a percentage of Income).

10 % drop
20 % drop
30% drop
Surplus under Stress-10 %
Surplus under Stress-20%
Surplus under Stress-30%
Surplus Stress Threshold

Sources: KLIPS; and Fund staff calculations.
1/ Interest rates increase by 300 bps, real estate owners only.

Interest Rate and Real Estate Price Shocks 1/
Stress threshold: Surplus 2(=Income + Liquid Assets + Net Real Assets -Debt Payments) < Mininun Consumption Increase in debt-at-risk relative to baseline (LHS, ppt) Surplus under stress (RHS, as a percentage of Income).

10 % drop
20 % drop
30% drop
Surplus under Stress-10 %
Surplus under Stress-20%
Surplus under Stress-30%
Surplus Stress Threshold

Sources: KLIPS; and Fund staff calculations.
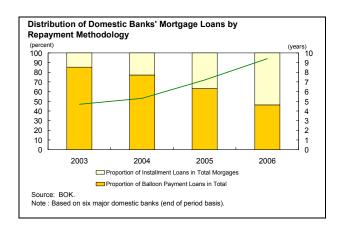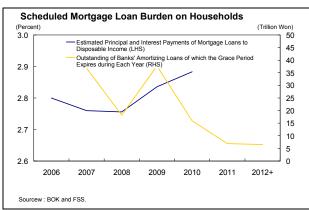1/ Interest rates increase by 300bps, real estate owners only.

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.

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 tr. 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 tr. or about 13 percent of estimated total outstanding mortgage loans as of end-2008.[7] This transition is expected to increase the aggregate principal and interest payment burden from W13.2 tr. in 2006 to W14.7 tr. in 2007 and W14.4 tr. 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.

Distribution of Domestic Banks' Mortgage Loans by Repayment Methodology

Source: BOK.
Note : Based on six major domestic banks (end of period basis).

Scheduled Mortgage Loan Burden on Households

Sourcew : BOK and FSS.

---

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

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 indebtness 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.

IV. CONCLUSIONS

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 indebtness 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.

A set of stress tests analyzing the impact of interest rate and real estate price shocks point to potentially large risks to households (Figure 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.
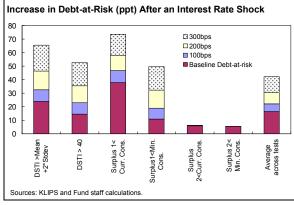
The jump in mortgage installment payments could also add to household strains as converted loans' grace periods end. Although the recent conversion of bullet type short term mortgages to longer term amortizing mortgages will reduce overall vulnerability of households in the longer term, the adjustment could be bumpy in the next two years adding another 2−2.5 percentage points of GDP to already high debt service payments.
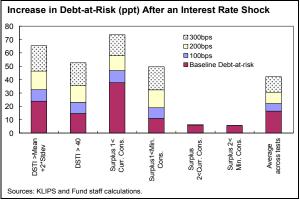
Low levels of nonperforming loans and high bank capitalization levels limit systemic financial risks, but potential risks to household balance sheets point to a need for vigilance and further strengthening of risk management capacities. Ensuring that the debt payment ability of households at the end of grace periods is taken into account when loans are
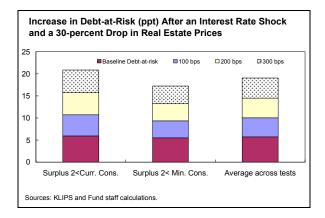
extended would help reduce future vulnerabilities. Financial institutions would also need to be more pro-active in monitoring potential credit problems before the end of the grace periods. Going forward, there may also be a need to reconsider tax incentives for loans with such grace periods to discourage 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 2. Comparison of Stress Tests

Increase in Debt-at-Risk (ppt) After an Interest Rate Shock

Sources: KLIPS and Fund staff calculations.

Increase in Debt-at-Risk (ppt) After an Interest Rate Shock

Sources: KLIPS and Fund staff calculations.

Increase in Debt-at-Risk (ppt) After an Interest Rate Shock and a 30-percent Drop in Real Estate Prices

Sources: KLIPS and Fund staff calculations.

Increase in DSTI (ppt) After an Interest Rate Shock and a 30-percent Drop in Real Estate Prices

Sources: KLIPS and Fund staff calculations.

The panel data used for the analyses are from 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 1. Table 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 data base 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 is the list of definitions were used in stress tests

Income

Financial Income : annual income from interest on financial asset + interest from private loans and non-financial 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 non-financial institutions (firms where household member is employed) + debt from private sources + debt related to chonsei + 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

Non-Financial 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 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 Expendicture Survey.

1/ Earnings include wage, financial income, income from real estate, transfer income, etc.

18

Table 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									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		
										(In millions of won)			
Income Group									Income Group	2003	2004	2005	2006
20	67.07	62.25	60.53	49.72	45.72	42.91	40.54	37.09	18	24.76	23.2	22.53	21.19
40	26.51	31.27	30.53	36.10	36.41	36.72	35.94	36.58	42	51.68	49.77	48.08	46.38
60	4.41	4.77	6.34	9.19	12.50	12.26	14.79	15.70	60	15.04	16.71	17.96	18.78
80	0.96	0.84	1.23	2.61	2.76	5.03	5.42	5.76	72	3.98	4.75	5.2	5.93
>80	1.05	0.86	1.38	2.38	2.62	3.08	3.30	4.88	>72	4.55	5.57	6.24	7.7

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

REFERENCES

Reserve Bank of Australia, 2003, "Household Debt: What the Data show," RBA Bulletin, March, pp. 1–22. (Sydney).

Bayoumi, Tamim, 1993, "Financial Deregulation and Consumption in the United Kingdom," *The Review of Economics and Statistics*, August, Vol. 75, No. 3, pp. 536−39.

Beaumont, Craig, 2003, "Household Credit in Korea – A Macroprudential Analysis," *in Republic of Korea: Selected Issues*, IMF Country Report No. 03/80 (Washington: International Monetary Fund).

Campbell, Jeffrey R., and Zvi Hercowitz, 2006, "Welfare Implications of the Transition to High Household Debt," Working Paper, WP-2006–27 (Chicago: Federal Reserve Bank of Chicago).

Canner, Glenn B., Arthur B. Kennickell, and Charles A. Luckett, 1995, "Household Sector Borrowing and the Burden of Debt," Federal Reserve Bulletin, April 1995, pp. 323−38, (Washington: Federal Reserve Board).

Coricelli, Fabrizio, Fabio Mucci, and Debora Revoltella, 2006, "Household Credit in the New Europe: Lending Boom or Sustainable Growth?" CEPR Discussion Paper, No. 5520, March 2006 (London: Centre for Economic Policy Research).

Cox, Donald, and Tullio Jappelli, 1993, "The Effect of Borrowing Constraints on Consumer Liabilities," *Journal of Money, Credit and Banking*, May, Vol. 25, No. 2, pp. 197–213.

Crook, Jonathan, 2003, "The Demand and Supply for Household Debt: A Cross Country Comparison," Credit Research Centre, Working Paper (Edinburgh, University of Edinburgh).

De Bondt, Gabe, 1999, "Credit Channels and Consumption in Europe: Empirical Evidence," BIS Working paper No. 69 (Basel: Bank for International Settlements).

Debelle, Guy, 2004, "Macroeconomic Implications of Rising Household Debt," BIS Working Paper No. 153 (Basel: Bank for International Settlements).

Del-Rio, Ana, and Garry Young, 2005, "The Impact of Unsecured Debt of Financial Distress among British Households," Working Paper No. 262 (London: Bank of England).

Frdly, Ed, 2007, "The Mortgage Market in Korea: Financial Risks and Development Needs," in IMF Country Report 07/345, pp. 47–56 (Washington: international Monetary Fund).

Habibullah, Muzafar Shah, Peter Smith, and W. N. W. Azman-Saini, 2006, "Testing Liquidity Constraints in 10 Asian Developing Countries: An Error-Correction Model Approach," *Applied Economics*, Vol. 38, pp. 2535–43.

Hayashi, Fumio, 1985, "The Effect of Liquidity Constraints on Consumption: A Cross-Sectional Analysis," The Quarterly Journal of Economics, February, Vol. 100, No.1, pp. 183–206.

Herrala, Risto, Karlo Kauko, 2007, "Household Loan Loss Risk in Finland – Estimations and Simulations with Micro Data," Research Discussion Paper 5/2007 (Helsinki: Bank of Finland).

Hilbers, Paul, Inci Otker-Robe, Ceyla Pazarbasioglu, and Gudrun Johnsen, 2005, "Assessing and Managing Rapid Credit Growth and the Role of Supervisory and Prudential Policies," IMF Working Paper, 05–151 (Washington: International Monetary Fund).

Korea Labor Institute, 2006, User's Guide – Korean Labor Income Panel Study Wave 1–7 (Seoul).

Kwon, Soon-Woo, 2007, "Does the Current Level of Household Debt Bode Ill for the Korean Economy?" Korea Economic Trends, April, pp. 10–13, (Seoul: Samsung Economic Research Institute).

Macfarlane, I. J., 2003, "Do Australian Households Borrow Too Much?" RBA Bulletin, April, pp. 7–16. (Sydney: Reserve Bank of Australia).

Maki, Dean M., 2000, "The Growth of Consumer Credit and the Household Debt Service Burden," FEDS Working Paper No. 2000–12 (Washington, Federal Reserve Board).

May, Orla, Merxe Tudela and Garry Young, 2004, "British Household Indebtedness and Financial Stress: A Household-Level Picture," Bank of England Quarterly Bulletin, Winter 2004, pp. 414–28.

Monacelli, Tommaso, 2006, "Optimal Monetary Policy with Collateralized Household Debt and Borrowing Constraints," NBER Working Paper, No. 12470 (Cambridge: National Bureau of Economic Research).

Murphy, Robert G., 2000, "Does Household Debt Help Forecast Consumer Spending?" Research Paper, Boston College.

Rinaldi, Laura, and Alicia Sanchis-Arellano, 2006, "Household Debt Sustainability: What Explains Household Non-performing Loans? An Empirical Analysis," ECB Working Paper No. 570 (Frankfurt: European Central Bank).