

ASSET PRICE BUBBLES AND CHALLENGES TO CENTRAL BANKS: THE CASE OF MONGOLIA **

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1. Introduction

Mongolian economy is bulleting highly from supply side shocks. Capital inflow and aggregate demand of Mongolian economy increased thanks to relatively stable economic environment through out last several years. The large capital inflows helped to promote economic growth and export performance, but on the other hand it led to rapid monetary expansion, accelerating inflation, and a loss of competitiveness and faster growth in securities and housing prices.

Meantime, initial conditions of asset price bubble have been formed in Mongolia and that conditions were fully consistent with Okina, Shirakawa, and Shiratsuka (2000)¹ defining ‘bubble period’ from the viewpoint of coexistence of three factors of the bubble economy, those are, a marked increase in asset prices, an expansion of monetary aggregates and credit, and an over-heating of economic activity.

But bubble burst started as turbulence in segments of US subprime mortgage market turned into a global financial crisis from the second half of 2008 and it caused complications in Mongolian financial sector. Due to the falling price of mining products in a short period of time, foreign trade deficit increased as same as the other economies around the world, which are dependent on this sector. Also it resulted in a decrease of foreign currency reserve and weakening of domestic currency against foreign currencies. Also domestic banking sector lacked financial source as a result of foreign institutions retracted its loans from banks and enterprises, delay in investment proposals, decrease in workers remittance from overseas. Thus, a lack of capital caused a shortage of sources within the banking sector, and it interrupted issuance of loan. As a result of those changes, asset price decreased dramatically in short run due to declined demand of all kind of assets such as house, equity and land.

All those actions have been carefully observed by the Bank of Mongolia. Due to negative impacts of possible asset price burst, response of monetary authority was at the center of attention.

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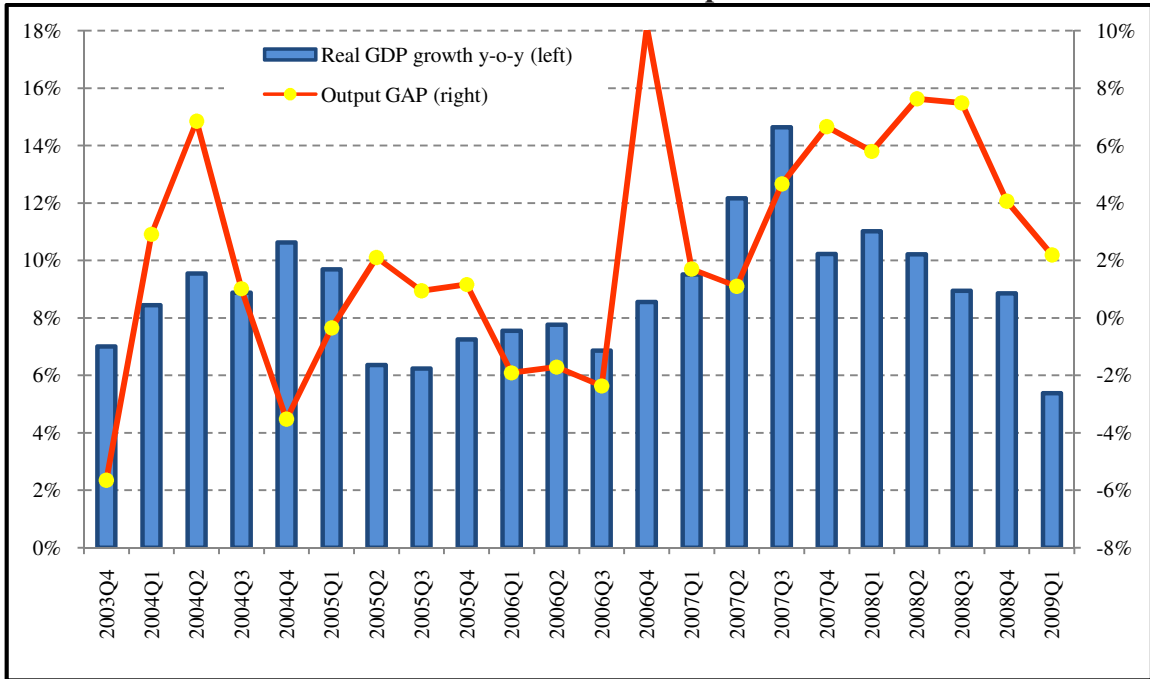
¹ Okina, Kunio, Masaaki Shirakawa, and Shigenori Shiratsuka, “*The Asset Price Bubble and Monetary Policy: Experience of Japan’s Economy in the Late 1980s and its Lessons*”.

This research is almost the first attempt in the field of evaluating the asset price bubble in Mongolia.

1.1 Trends in Asset Prices and Macroeconomic Variables

In recent years, Mongolian economic growth was provided by slump in global prices for copper and other export commodities. With improved current account and fiscal positions, both investment and consumptions of private and public sectors increased dramatically. Especially, mining and construction sectors saw boom in those periods.

Chart 1
Real GDP Growth and Output GAP



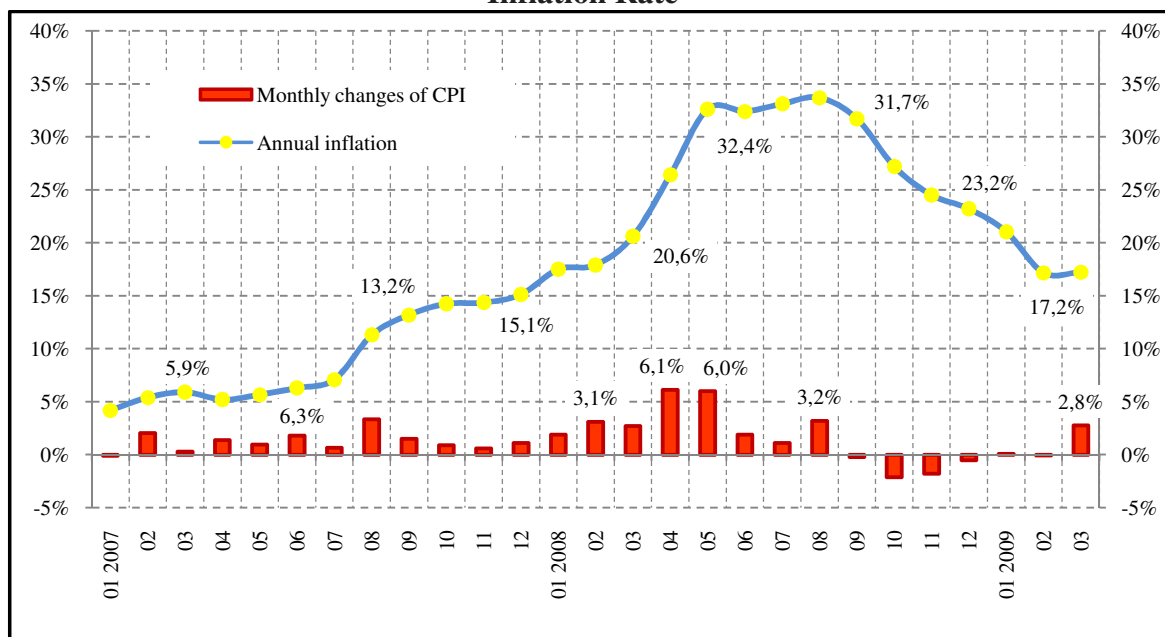
As shown in Chart 1, output gap increased progressively until the second quarter of 2008. It was one of the signs of economic overheating. Annual real GDP growth had averaged to 9.1 percent from 2003 to 2008 due to high copper and gold prices on international markets. But as those prices have been declining, Mongolian economy followed the fall and slowed down in last 3 quarters. However, the authorities expected that the economic growth would be 9.8%, close to two digits at the end of 2008, the real performance was 8.9%. Still it wasn't bad result and if we see contribution, agriculture sector grew by 5.0% aided by favorable weather and fiscal incentives to produce wheat; services increased by 15.9% and being the most important source of the GDP growth last year and industrial output fell by 1% to its lowest rate in a decade.

Rapid growth of monetary aggregates brought precondition for price increase in economy. In addition, sudden supply side shocks attributed to oil and food prices growth in 2007, adversely affected inflation in the last quarter of 2007 and first 3 quarters of 2008.

Inflation was 14.0% and 23.2% respectively in 2007 and 2008. Source of this rapid increase of inflation was both external and internal economic factors (Chart 2). For

example, supply side factors such as import goods, oil and food price increase, inefficient system of food supply and unstable exchange rate, demand side factors such as increase of both public and private sector salary and expenditure of social assistance and last 5 years' persistent increase of monetary aggregates and credits, and structural factors such as increase of administrative price and lack of competition in some sectors, food supply and oil etc.

**Chart 2
Inflation Rate**



**Table 1
Food, Fuel and Net Inflation**

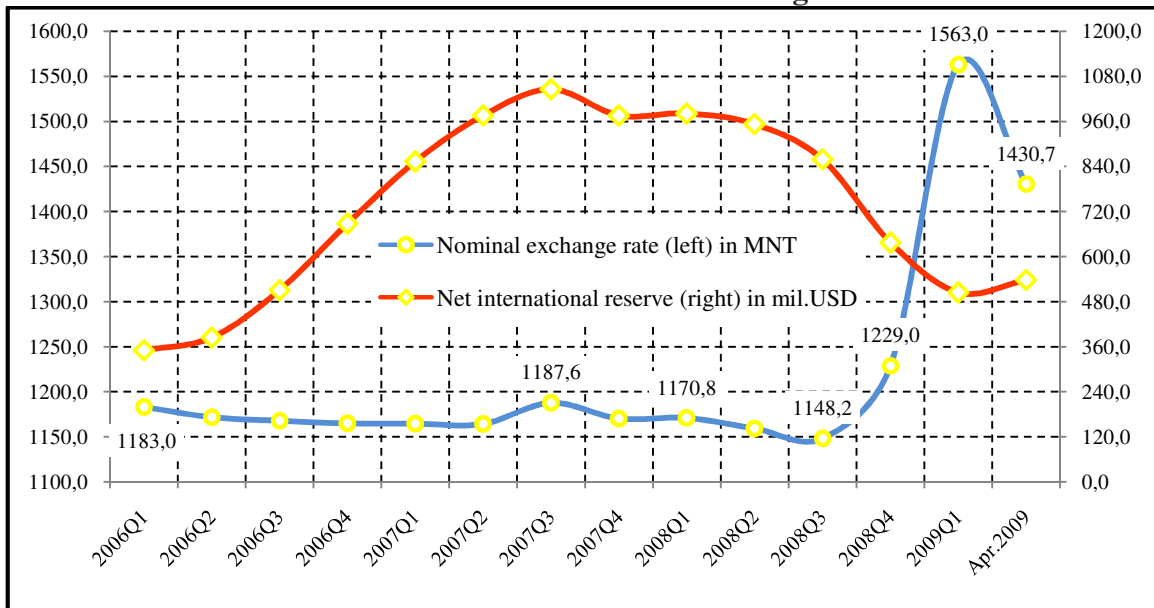
	Food inflation (y-o-y)	Fuel inflation (y-o-y)	Net inflation ² (y-o-y)	CPI inflation (y-o-y)	
2006Q1	7.3%	22.1%	2.8%	5.0%	2006Q1
2006Q2	3.4%	7.5%	1.0%	2.1%	2006Q2
2006Q3	3.9%	17.8%	4.3%	4.4%	2006Q3
2006Q4	2.2%	10.2%	6.4%	4.8%	2006Q4
2007Q1	6.9%	3.7%	4.2%	5.3%	2007Q1
2007Q2	8.6%	1.1%	3.4%	5.5%	2007Q2
2007Q3	22.1%	-1.0%	5.3%	12.1%	2007Q3
2007Q4	24.6%	23.2%	6.3%	14.0%	2007Q4
2008Q1	33.3%	44.6%	10.7%	20.6%	2008Q1
2008Q2	51.8%	40.3%	18.3%	32.4%	2008Q2
2008Q3	36.9%	79.3%	26.5%	31.7%	2008Q3
2008Q4	24.5%	13.2%	22.7%	23.2%	2008Q4
2009Q1	15.2%	-3.0%	19.5%	17.2%	2009Q1

² Net inflation is calculated by excluding food items and fuel prices from CPI basket.

Inflation, characterized by the shortage of food, began to soar from the second half of 2007 and continued throughout the first 3 quarters of 2008. That increase began from world oil price shock and continued with exchange rate movement and import price rise due to shortage of food. The first sign of annual inflation fall was observed in September 2008 when slight decrease of food price due to fuel price decline occurred (Table 1).

As mentioned before, one of the factors affecting inflation in Mongolia is the fact that our prices are heavily dependent on import prices. Thus, 30 percent of CPI basket constitutes import goods and exchange rate pass through coefficient is estimated to be around 50 percent in 2008. Therefore the exchange rate plays crucial role for the Mongolian economy.

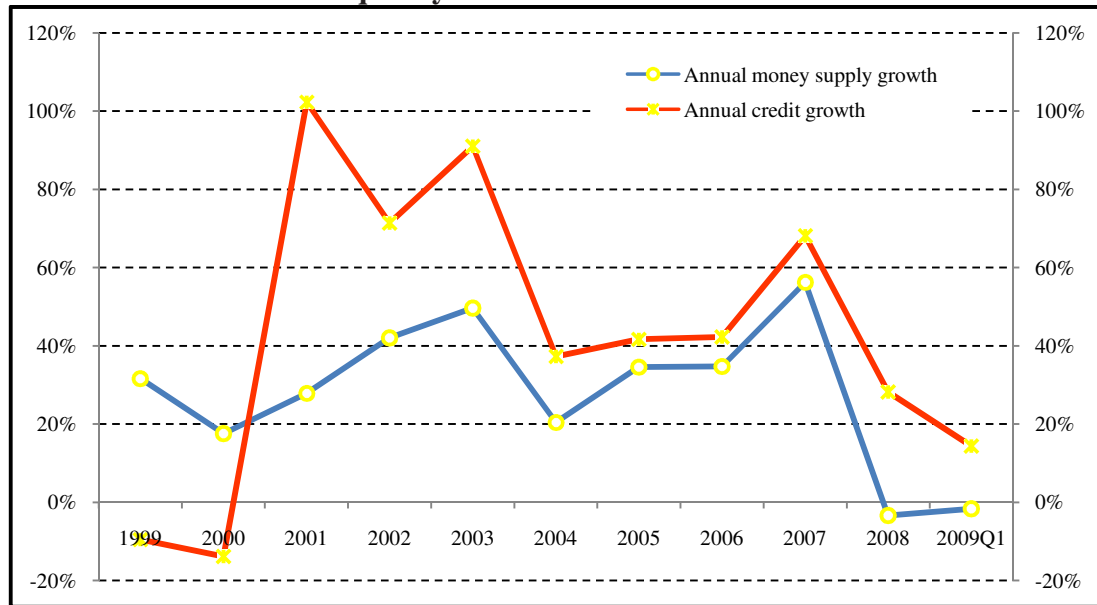
Chart 3
Net International Reserve and Exchange Rate



In August 2007, the first sharp depreciation of MNT against USD was observed for last 2 years. The reason was based on rumors that MNT will depreciate dramatically. It influenced public expectation significantly. Meantime, due to oil price increase, inflation upward pressure on domestic market was mounting up. At that time, the Bank of Mongolia aimed to decrease inflation pressure by stabilizing exchange rate fluctuation. As a result of the BOM supplied huge amount of USD to domestic market and could stabilize nominal exchange rate till the 3rd quarter of 2008.

But with the international financial crisis and rapid deterioration of terms of trade, current account ran in deficit. Consequently, it increased net demand of foreign currency on domestic market, and resulted in depreciation of the MNT against the USD (Chart 3). As shown in the Chart 3, sharp depreciation of nominal exchange rate took place from the 4th quarter of 2008 to the 1st quarter of 2009, by 33.5 percent compared with same period of the previous year. Weak domestic foreign exchange market infrastructure, limited information environment, domestic trade preference in USD and public expectation are motivated by rumors contributed to MNT rate depreciation.

Chart 4
Liquidity and Credit Measures



Monetary aggregates have increased significantly over last 8 years and averaged 32.7 percent between 2001 and 2008 (Chart 4). This significant increase was driven by not only capital inflow from other countries, but also by dramatic fiscal expansion. Increasing money supply heated up economic activities and increased inflation upward pressure. As a result, credit grew more than 60 percent, GDP gap reached 10 percent and inflation rate rose. Starting from the second half of 2007, supply side factors such as oil price shock and exchange rate depreciation began to aggregate inflationary pressure in economy at the end of 2007.

At this time, the Bank of Mongolia took steps to bring down inflation, caused by supply factors. The Bank of Mongolia intensified further tight monetary policy through a series of step-by-step measures taken against the rising inflation. A significant capital run due to the world economic crisis and shortage of resources within the banking system also contributed to the annual growth of M2 falling down to -3.4 percent for the first time ever.

Furthermore, banking sector also showed signs of stress. High inflation resulted in negative deposit real interest rates and combined with currency depreciation and a significant amount of capital run led to MNT deposits flight and a liquidity squeeze among the banks. The BOM imposed a conservatorship and appoint a conservator on solvency problematic Anod bank. In order to stabilize banking sector, the authorities issued a blanket guarantee.

- *Trends in asset prices*

As a result of increasing capital inflow and trade balance surplus, domestic investment and money supply in recent years, private wealth rose vast in some level of nation. In that time, main problem came from “Where should we store our wealth?” Most of them had chosen from several possibilities such as buying house, participating in equity or deposit markets.

Chart 5
Stock Market Indicators

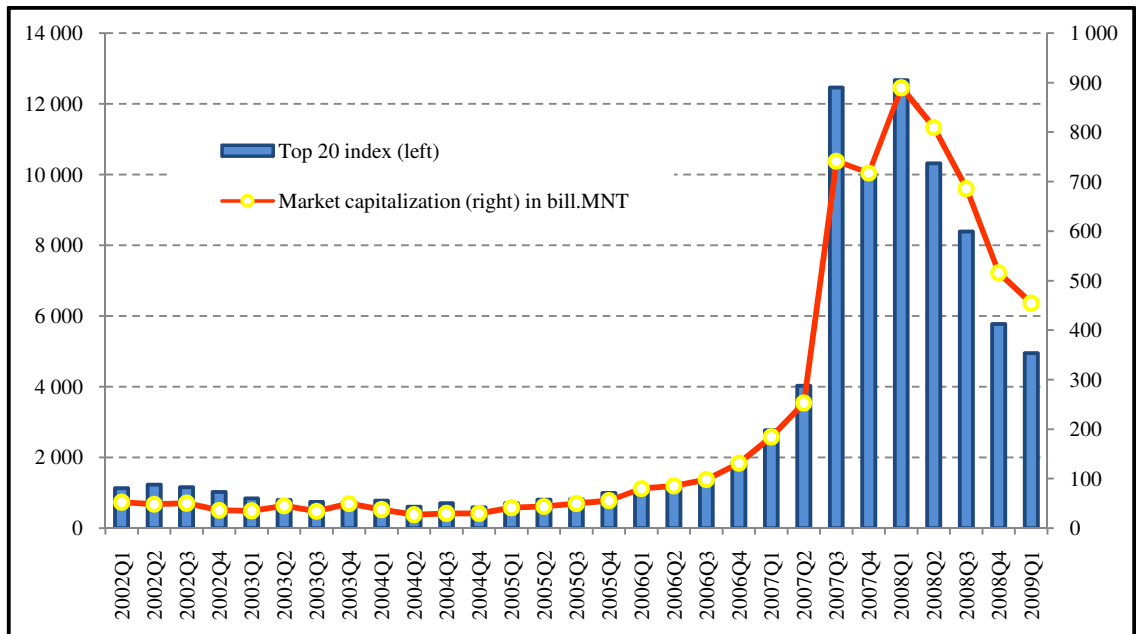
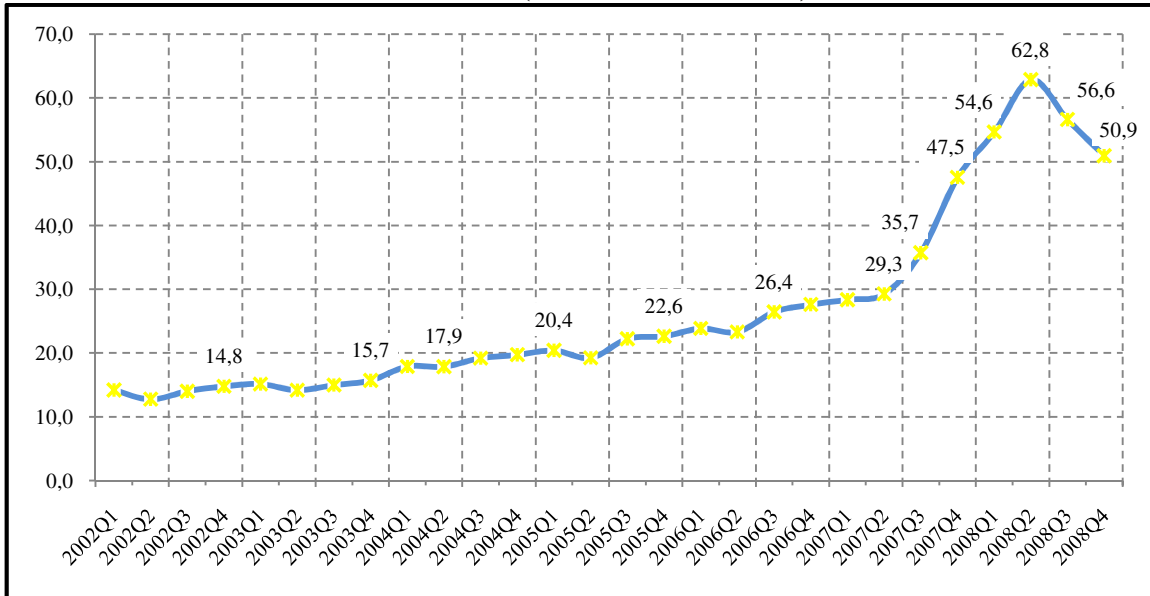


Chart 5 illustrates that stock market capitalization had increased 3.5 times in just one year (from 2007Q1 to 2008Q1) and declined 60 percent in next year (from 2008Q1 to 2009Q1). As mentioned before that raise was driven by increasing income of private sectors. Moreover, bigger portion of that raise is also explained by some big and medium sized banks interested and funded from stock market such as Anod and Zoos banks.

One of the biggest influenced asset markets was house and construction sector. In times of over heated economy, output of construction sector almost doubled and house price boom took place in last 3 years. Not only increasing both public and private sector income and remittance from migrants, but also increased migration from rural areas to urban areas influenced housing price and apartment demand sensationally. Responding to increasing demand, many big and medium sized enterprises invested a lot in construction sector.

As shown in Chart 6, house price had increased dramatically from second quarter 2007. In meantime, banks eased their mortgage loan criteria. Moreover, many people expecting further house price increasing put upward pressure on housing. Following house prices, raw material prices started to rise. But house price burst in the beginning of the third quarter of 2008 as banks found them in liquidity shortage, resulting delays in housing construction projects and slowed down mortgage loans. Hence, housing demand declined.

Chart 6
House Price (in thousand of US \$)



Now construction sector faced the lack of demand and loan supply. But construction companies continued to keep their prices at boom time high level, like waiting for miracle. With increasing non-performing construction and mortgage loans, banks faced liquidity problem. Banks trying to solve the problem started to force construction companies to decrease their prices and discounting those willing to buy from construction companies with bank loans.

Chart 7
Mortgage and Construction Loan (in billions of MNT)

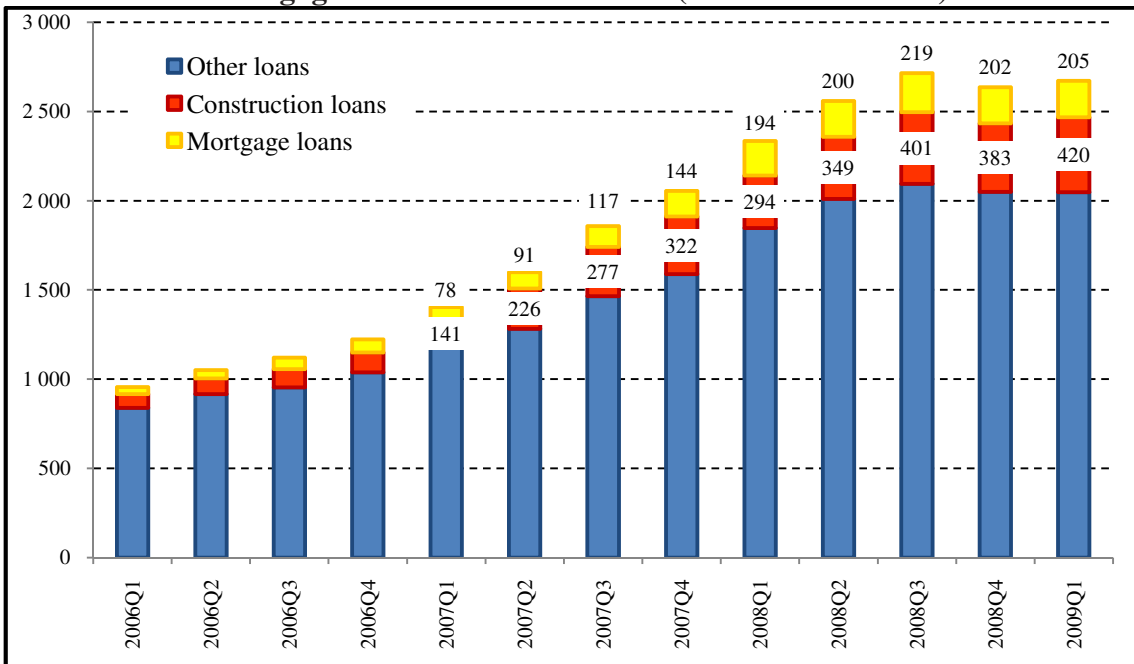


Chart 7 shows dynamic of mortgage and construction loan for the period of 2006Q1-2009Q1. As it can be seen, both construction and mortgage loans almost doubled and

even tripled during that time. But at the end of the period their growth decelerated from the third quarter of 2008.

1.2 Regulations and Policy Responses to Asset Price Fluctuations

“Many, perhaps most, economists believe in rules ... But when speculation threatens substantial rises in asset prices, with a possible collapses in asset markets later, and harm to the financial system ... monetary authorities confront a dilemma calling for judgment, not cookbook rules of the game. Such a conclusion may be uncomfortable. It is, I believe, realistic” Kindleberger (1995).

Monetary authorities face financial problem in economy where assets price fluctuations are observed. Unfortunately, there will be not only financial instability, but also some part of economic institutions will get harmed and lose their money.

In recent years, the BOM preferred to use non-direct instruments such as policy rate, reserve requirements and open market operation etc. So the BOM averted from using direct credit control on both volume and interest rate. Purpose of this was not to decrease effectiveness of the instruments arising from evasion as the financial market develops and economic agents learn how to circumvent them, to decrease inefficiency in resource allocation, and to avoid potential inequity during implementation.

As for regulation and law related to asset in Mongolia, there isn't any restriction or limit on purchasing and renting houses. The only restriction is that person who buys house, must pay 2 percent of tax from value of its house. A person can have any number of houses, which allows house demand to increase or speculate on this activity.

During dramatic increase in asset price, the BOM implemented a number of policy actions. But all these policy measures were not only direct response to asset price fluctuations, but also aimed to protect financial and economic stability. To mention some of them:

- Because of some clear signs of economic overheating such as high inflation, persistent increase in monetary aggregates, positive output gap and asset price rise, the BOM started to tighten monetary policy by increasing its policy rate several times from third quarter of 2007. Moreover, the BOM increased reserve requirement ratio and some of prudential ratios for the commercial banks. Those policy measures were to cool economy and prevent inflation expectation.
- The BOM also advised commercial banks about tightening their credit requirements, beware from dramatic growth of credit and abiding strictly regulation and ratios.
- The BOM produced minimum standard requirement for home mortgage loans. This regulation is must follow for banks and exemplary for other lending institutions. The regulation tightened lending not to ship over non-performing loan in construction into household debt among other benefits in terms of market regulation.
- At the time of decreasing asset prices, the BOM introduced new instrument for commercial banks. The Bank of Mongolia started to grant loans to construction companies through banks. These loans were aimed to complete constructions with

at least 80 percent done. In the reporting year, the BOM issued the construction loan refinancing worth MNT 55.7 billion to two banks. The BOM conducted a survey to ascertain how much refinancing was needed to complete ongoing apartment buildings. By the agreement between BOM and bank, the BOM provided up to 70 per cent of total required financing and bank provided the rest itself.

- The BOM worked out projects of “Law of Mongolia of Real estate collateral” etc for the mortgage market development. The legal framework provides healthy environment for mortgage loan market to prevent customers and banks from possible failure.

2. The Causes of Asset Price Fluctuations

2.1 Cross-Correlation Analysis

Cross correlation is a standard method of estimating the degree to which two series are correlated. By using that method we will check how asset prices are correlated with economic and financial indicators.

As shown in Table 2, signs of correlations are roughly consistent with theoretic matter. For example, only mortgage loan and GDP growth have positive and contemporaneous correlation with house price. Broad money, construction loan and remittance from abroad have positive correlation with housing price and lie behind one quarter (lag). This result shows that recent years’ house price rise has been driven by continuously increasing demand for house. Another interesting result is that house price has negative correlation with interest rates and lies ahead one quarter or explained by house price movement. It says that in the beginning of house price boom, banks tended to increase mortgage loan and support construction sector. In other words, banks supported construction sector boom by not only liquidity supply, but also loosing interest rate.

Table 2
Cross Correlation of House Price with Various Economic Indicators²

Economic Indicators	t-8	t-6	t-4	t-2	t	t+2	t+4	t+6	t+8
Mortgage Loan	-0.12	0.13	-0.18	-0.02	0.63	-0.06	-0.38	-0.01	0.09
Inflation	0.08	-0.11	-0.16	-0.34	-0.01	0.50	0.39	0.10	0.03
Stock Price	-0.02	-0.13	0.03	0.37	0.29	-0.06	-0.07	0.05	0.16
GDP Growth	-0.02	-0.21	-0.21	0.20	0.36	0.27	0.13	-0.08	0.00
Deposit Rate	-0.07	-0.06	0.19	0.34	0.24	-0.36	-0.34	-0.22	-0.01
GDP Gap	-0.17	-0.03	-0.01	-0.06	0.14	0.35	0.06	0.09	-0.10
Broad Money	-0.01	-0.07	-0.19	0.34	0.06	-0.25	-0.52	0.00	-0.21
Exchange Rate	-0.05	0.11	-0.04	0.03	0.17	0.34	-0.34	-0.29	-0.02
Loan Rate	0.08	0.11	0.06	-0.13	-0.18	-0.25	-0.26	-0.12	-0.01
Total Loan	-0.11	-0.01	-0.16	-0.03	0.09	-0.13	-0.21	0.02	0.02
Construction Loan	-0.26	-0.08	-0.16	0.20	-0.11	-0.10	-0.26	-0.05	-0.09
Remittance	0.05	0.07	-0.05	0.12	0.08	-0.09	-0.24	0.26	-0.05

² Numbers in bold correspond to the peak quarter.

Similar analysis for the stock price movement is illustrated in Table 3. The cross-correlogram shows that the highest correlation coefficients are those corresponding to GDP growth, inflation, loan interest rate and GDP gap and in all these cases the lead to coefficients appear to be the highest (except in the case of GDP growth, which appears concurrent to stock price). When we look individually, boost in broad money and real economy growth increase stock price simultaneously. But increasing stock price tends to affect inflation and GDP gap positively and loan interest rate negatively. Theoretically, since loan and stock are substituted, it is a reasonable result. This result is also proved by negative correlation of stock price movement and amount of total loan.

Table 3
Cross Correlation of Stock Price and Economic Indicators³

Economic Indicators	t-8	t-6	t-4	t-2	t	t+2	t+4	t+6	t+8
GDP Growth	-0.07	-0.19	-0.16	0.04	0.50	0.42	0.17	-0.06	-0.02
Inflation	0.20	0.06	-0.14	-0.28	-0.22	0.07	0.47	0.39	0.14
Loan Rate	0.26	0.22	0.08	-0.12	-0.23	-0.36	-0.41	-0.44	-0.21
GDP Gap	-0.15	-0.18	-0.33	-0.08	0.03	0.23	0.40	0.19	0.09
Housing Price	0.16	0.05	-0.07	-0.06	0.29	0.37	0.03	-0.13	-0.02
Broad Money	0.02	-0.20	-0.04	0.08	0.25	0.06	-0.17	-0.26	-0.12
Exchange Rate	-0.01	0.11	0.05	-0.01	0.15	0.24	0.05	-0.66	-0.26
Deposit Rate	0.01	-0.11	-0.04	0.24	0.24	-0.16	-0.49	-0.52	-0.18
Total Loan	-0.12	-0.16	-0.05	0.05	0.14	0.03	-0.16	-0.17	-0.03

³Numbers in bold correspond to the peak quarter.

2.2 Factor Analysis

Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. Factor analysis is often used in data reduction to identify a small number of factors that explain most of the variance observed in a much larger number of manifest variables. Principal component analysis (PCA) is most common form of the factor analysis. The end result of the principal components analysis will tell us which variables can be represented by which components, and which variables should be retained as individual variables because the factor solution does not adequately represent their information. In our case, we will analyze which macro economic variables can be in one component with house price or stock market price.

Table 4
Principle Component Analysis of House Price

Variables	F1	F2	F3	F4	F5	F6	F7	F8	F9	Communality
Inflation	-0.35	0.29	0.18	-0.11	0.26	0.24	0.26	0.24	0.48	1.00
Deposit rate	0.39	-0.10	-0.07	0.15	-0.12	-0.47	-0.44	0.16	0.40	0.65
Loan rate	0.13	-0.45	0.17	0.54	-0.01	0.04	0.50	0.01	-0.08	1.00
GDP gap	-0.17	0.46	0.15	0.51	-0.14	-0.11	-0.21	0.14	0.13	0.35
GDP growth	0.22	0.48	0.20	-0.29	0.07	-0.24	0.07	-0.14	-0.45	0.57
Broad money	0.36	-0.09	-0.26	-0.09	0.27	0.43	-0.19	-0.33	0.12	0.53
Mortgage loan	0.30	-0.08	0.37	-0.15	-0.30	0.44	-0.19	0.60	-0.22	0.83
Construction loan	0.29	0.09	-0.36	0.00	0.54	-0.21	0.25	0.56	-0.07	0.69
Total loan	0.38	0.27	0.08	0.07	0.00	0.33	0.05	-0.15	0.40	0.91
Remittance	0.03	0.36	-0.50	0.43	-0.19	0.30	0.01	0.02	-0.31	0.60
Exchange rate	0.23	0.10	0.53	0.31	0.44	-0.04	-0.07	-0.23	-0.14	1.00
Stock price	0.35	0.19	0.00	-0.15	-0.46	-0.18	0.55	-0.12	0.20	0.24

Factor	Value	Cum. Value	Difference	Proportion	Cum. Proportion
F1	4.74	4.74	2.20	0.39	39%
F2	2.54	7.27	0.95	0.21	61%
F3	1.58	8.86	0.62	0.13	74%
F4	0.97	9.82	0.12	0.08	82%
F5	0.85	10.68	0.20	0.07	89%
F6	0.65	11.32	0.32	0.05	94%
F7	0.33	11.65	0.07	0.03	97%
F8	0.25	11.90	0.20	0.02	99%
F9	0.05	11.95	-	0.00	100%
Total	11.95	88.20		1.00	-

- *F indicates factors corresponded*

Table 4 shows both the eigen value and the raw and cumulative percentage of variance explained by the extracted PCAs that account for 100 percent of the total variation. From this result, we can extract at least 2 possible factors. The first factor represents liquidity and the second factor represents real economic activities. But, we want to try third and fourth factors such as exchange rate and interest rate factors. In concordance with Table 4, the factors that we separate explain 82 percent of variation, and hence, we retained those four as explanatory variables for further analysis.

The key opportunity, and challenge, of PCA is determining dependant variable can be explained by factors and signs are theoretically consistent.

$$\Delta House_p = 0.82 * Factor_{GDP} + 0.08 * Factor_{liq} + 0.006 * Factor_{EX} - 0.08 * Factor_{IR}$$

(*P - Value*) (0.06) (0.54) (0.89) (0.70)

Adjusted R - square = 0.09

From the simple OLS estimation illustrated above, only real economic activity is significant at 10% and sign is theoretically consistent with. Other factors are not significant. From these analyses, we find that real economic activity is main factor that explaining housing price movement.

Table 5
Principle Component Analysis of Stock Price

Variables	F1	F2	F3	F4	F5	F6	F7	F8	F9	Communality
Inflation	-0.43	-0.11	0.15	0.05	0.23	-0.12	0.01	0.48	0.35	0.96
Construction loan	0.29	0.24	0.41	-0.28	0.18	-0.11	-0.05	-0.05	0.39	1.00
Broad money	0.31	0.25	-0.12	-0.45	-0.08	0.48	-0.04	0.36	0.29	0.90
Mortgage loan	-0.18	0.45	-0.30	-0.28	-0.13	0.03	0.38	-0.15	-0.28	0.42
Total loan	0.19	0.30	0.45	-0.03	0.15	-0.49	0.33	-0.04	-0.15	0.52
GDP gap	-0.36	0.14	0.25	0.31	0.05	0.42	0.30	-0.33	0.39	1.00
GDP growth	-0.27	0.41	0.01	-0.02	0.15	-0.11	-0.78	-0.12	-0.08	0.47
Loan rate	0.43	-0.21	-0.04	0.33	0.11	-0.03	-0.02	0.24	-0.06	1.00
Deposit rate	0.38	0.15	-0.22	0.35	-0.15	-0.07	-0.12	-0.43	0.38	0.23
Remittance	0.09	0.15	0.55	0.26	-0.36	0.41	-0.14	0.14	-0.40	0.72
Exchange rate	0.12	0.30	-0.20	0.31	0.73	0.27	0.10	0.12	-0.21	1.00
House price	-0.07	0.45	-0.20	0.39	-0.39	-0.27	0.08	0.46	0.18	0.36

Factor	Value	Cum. Value	Difference	Proportion	Cum. Proportion
F1	3.69	3.69	1.47	0.31	0.31
F2	2.22	5.91	0.45	0.19	0.49
F3	1.77	7.68	0.77	0.15	0.64
F4	1.00	8.68	0.07	0.08	0.72
F5	0.93	9.61	0.28	0.08	0.80
F6	0.65	10.26	0.13	0.05	0.85
F7	0.52	10.78	0.08	0.04	0.90
F8	0.43	11.21	0.10	0.04	0.93
F9	0.33	11.54	0.11	0.03	0.96
Total	11.54	79.37		1.00	-

- *F indicates factors corresponded*

As we can see from Table 5, we extracted five possible factors from principal component analysis of stock price, because they explained 80 % of total variance cumulatively. The first is interest rate factor, the second is liquidity factor, the third is real economic activity, the fourth is exchange rate and the fifth is house price independently.

But after making regression analysis by using those factors, we find that only two of them can be consistent in both theoretical and econometrical way. Estimated equation is showed below:

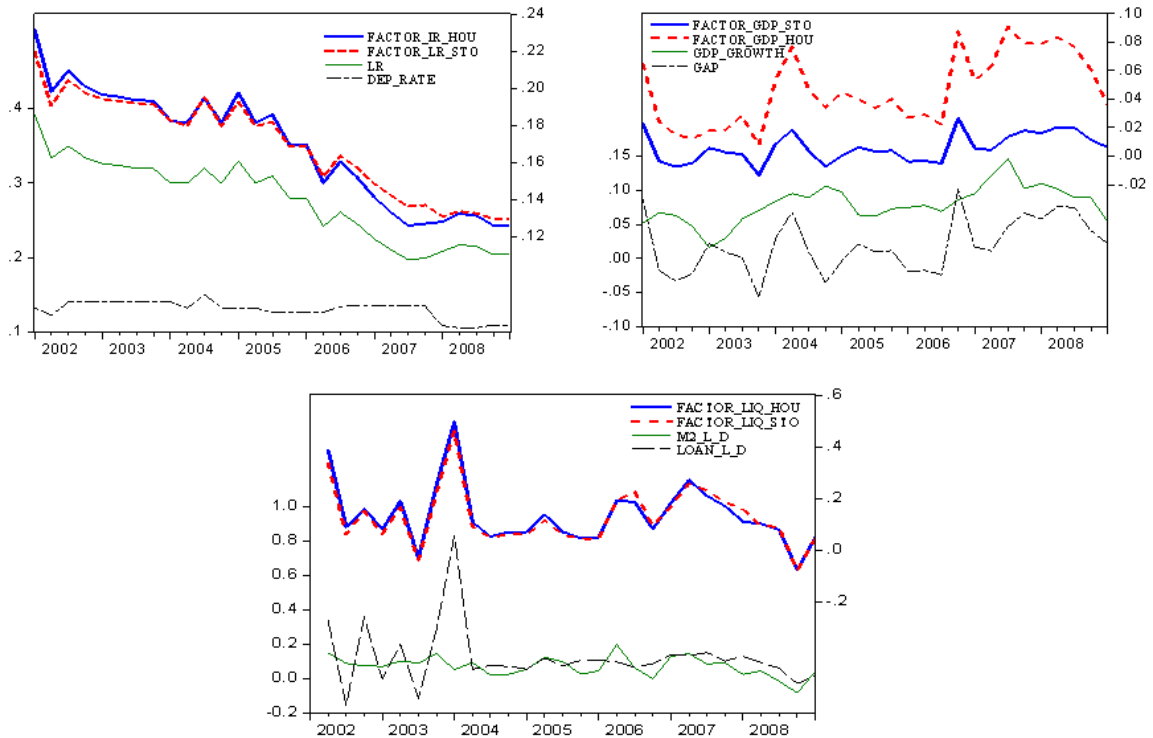
$$\Delta Stock_p = -0.49 * Factor_{loan\ rate} + 0.95 * Factor_{liq} + 0.06 * Factor_{ex} + 1.46 * Factor_{gdp}$$

(P - Value) (0.32) (0.05) (0.84) (0.79)

Adjusted R - square = 0.14

Regression result shows that recent stock price boom has mainly driven by market interest rate downturn and liquidity increase. Other factors couldn't approve statistically. So from this result, we can conclude that if liquidity in the market increases or market interest rate decreases, stock price may go up.

Chart 8
Factors



3. The Effects of Asset Price Fluctuations

3.1 How Do Asset Prices Amplify Business Cycle (Wealth Effect)?

This section will examine the effects of housing wealth on household spending as measuring wealth effect. We used simple method to estimate wealth effect as shown in Case and Quigley (2001). However this method has lot of weaknesses, we tried to determine linkage between stock market wealth, housing wealth and household consumption.

All the variables in the analysis are expressed per capita in real terms using GDP deflator and given quarterly time series from 1st quarter of 2002 to 1st quarter of 2009.

Table 8 shows simple correlation among variables of consumption, housing wealth and financial wealth. The result of analysis indicates that housing wealth is more correlated with household consumption than stock wealth. But correlation among all those variables is rather high.

Table 6
Ordinary correlation

	CONSUM_L	HOUWEA_L	STOWEA_L
CONSUM_L	1.000000		
HOUWEA_L	0.690018	1.000000	
STOWEA_L	0.566111	0.800183	1.000000

The estimation of wealth effect on household spending reported in Table 7. The table reports estimation of two different specification variables. The first part presents estimation result with log linear variables and the second part reports result with variables expressed as first differences. From the estimation we found a housing wealth effect that is substantially larger than the stock wealth effect on household spending.

Table 7
Simple Estimation of Wealth Effect

Dependent Variable: CONSUM_L Method: Least Squares Sample: 2002Q1 2009Q1 Included observations: 29			Dependent Variable: D_CONSUM Method: Least Squares Sample: 2002Q2 2009Q1 Included observations: 28 after adjustments		
	Coefficient	t-Statistic		Coefficient	t-Statistic
INCOME_L	0.572	3.612	D_INCOME	0.540	2.036
HOUWEA_L	0.421	3.263	D_HOUWEA	0.661	2.398
STOWEA_L	-0.086	-2.727	D_STOWEA	-0.057	-0.647
R-squared	0.490		R-squared	0.441	
Adjusted R-squared	0.451		Adjusted R-squared	0.396	
S.E. of regression	0.122		S.E. of regression	0.129	
Durbin-Watson stat	1.13		Durbin-Watson stat	2.403	

As table indicates, the estimated effect of housing wealth on consumption is significant and large in magnitude in log linear estimation. It says that elasticity of housing wealth is 0.42 and is higher than other country experience³. But elasticity of stock market wealth is rather small and sign is in opposite direction. It says that if stock market wealth increases, consumption will drop. For estimation with all variables in first difference, coefficient on housing market wealth is greater than previous estimation. But it is still greater than stock market wealth, while the elasticity of financial wealth is near to zero with negative sign. For the conclusion for this analysis, the evidence suggests that housing wealth is more important factor than stock market wealth on consumption of households in Mongolia.

3.2 What are the Effects of Asset Price Fluctuations on the Soundness of Financial System?

Recent Mongolia's economic downturn is caused not only by asset market boom and busts, but also other economic sectors. For example, wholesale, retail and manufacturing sectors dropped, which contributed to banking sector illiquidity problems. So we showed banking sector condition in last year below.

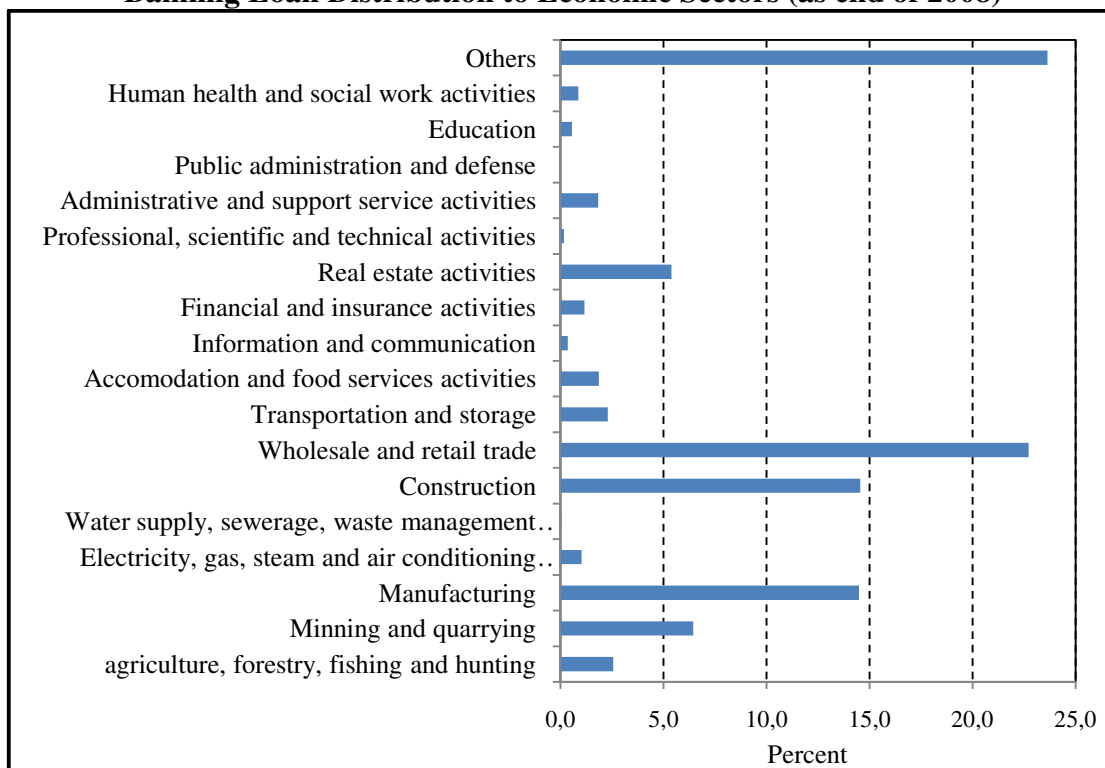
- *Diversification of banking sector*

As of the end of year 2008, 16 banks and 1 foreign representative office were operating their financial intermediation in Mongolia through 1080 branches. Currently, number of total customers including companies and individuals reached to 2.4 million, number of borrowers is 516.8 thousand, and depositor is 1.3 million in banking sector.

³ Compared with results showed in Case and Quigley (2001).

Diversification plays important role in banking sector even in economy. If bank could diversify its operation in many markets with many products, it can reduce bank's vulnerability and ensure better structure. That means, well diversified bank has a more power to pass the difficult times. Here we showed banking sector diversification in Mongolia.

Chart 9
Banking Loan Distribution to Economic Sectors (as end of 2008)



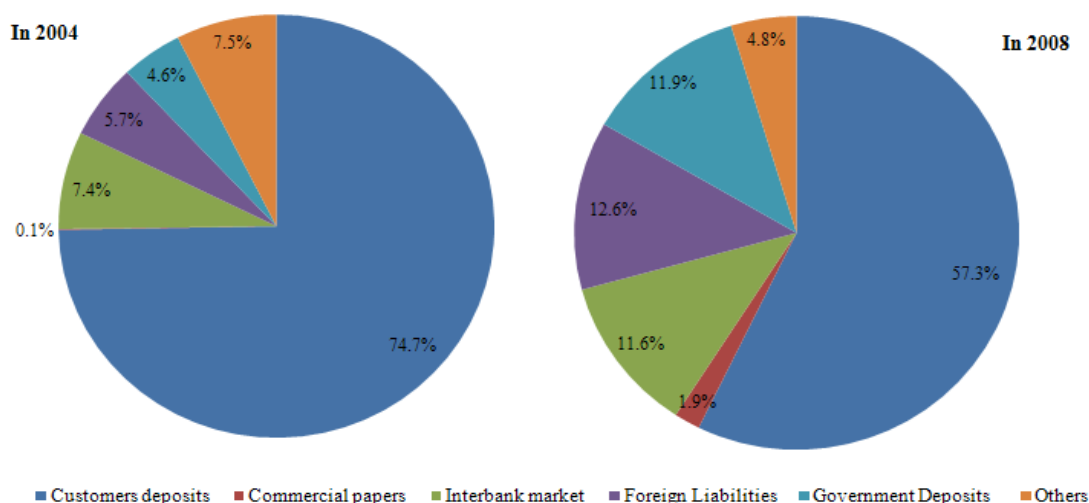
As shown in Chart 9, banking loans are highly concentrated on wholesale and retail trade, construction and manufacturing sectors. And newly developed mining and real estate activity follows. Nature of Mongolian economy is that much more concentrated on foreign trade. Export in Mongolian economy hasn't diversified a much thus concentrated on commodity goods including copper, gold and cashmere. Most wholesale and retailers mainly concentrated on import goods. Moreover, they are good customers who have long time loan history related with commercial banks.

Moreover in last 3 to 4 years, construction and mining (especially gold mining) sector became hot in economy, so loan to those sectors increased dramatically and almost every companies operated their activities in those sectors. Actually, banking loan follows economic activities and cycles. For example, economic sector that developed much in recent years has bigger loan demand and so on. So bank loan tends to go to that sector. But due to recent economic recession and banking sector liquidity, all economic activities are now frozen and commercial banks are facing big challenges.

Not only banks are facing challenges with loan supply and repayment, but also liquidity and liabilities. Banks liabilities mostly consist of customer deposits and both deposit rate and loan rate are still higher than developing countries. Seen in Table 10, 74.7 percent of

total funds of banks came only from customer deposits in 2004. But this scenario undergoes changes in recent years. As of 2008, foreign investment to banking sector and interbank transactions increased and share of customer deposit in bank funds decreased. It is good sign of diversification for the source of liquidity of banks and banks became more flexible for liquidity. But still lack of stock market development and confidence between commercial banks, there is still room to develop money market and increase diversification for funds.

**Chart 10
Funding Profile**



Last 2 years' global financial and economic crisis affected most of domestic market through decrease of our main export good prices, reversal of foreign direct investment and increase of main import good prices. Associated with the collapse of mineral prices in world market, the global financial downturn and slowdown of domestic economy, credit risk of the banking sector saw significant growth. During the past 5 years non-performing loan to total loan ratio had been constantly declining, however, the ratio shot up to 7.2 percent and the non-performing loans considerably doubled in 2008 compared to the previous year.

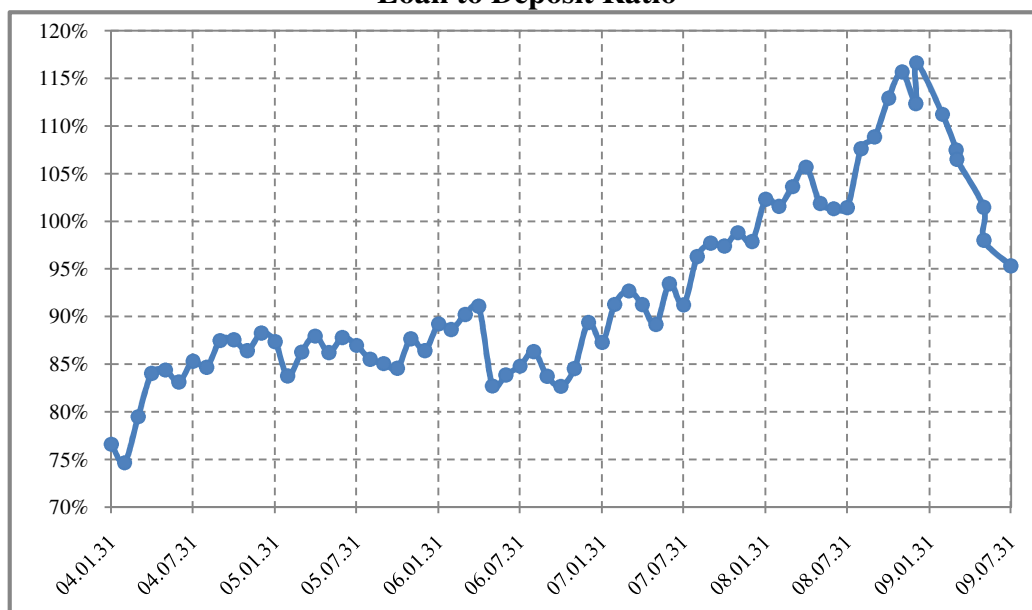
- *Financial stability measures*

Loan to Deposit Ratio: As economic growth intensifies, money demand increased dramatically in past years. Banks reacted to that. On average, annual loan growth between 2004 and 2007 was around 47.3 percent. Meantime average annual growth of broad money was 36.5 percent. As concluding from these numbers, we can clearly see that loan to deposit ratio constantly increased till 2007. We should notice here that during that years both broad money and loan growth were high, but loan increased more quickly than broad money and banks fed this gap from another financial source including foreign investment and government deposit.

As shown in Chart 11, loan to deposit ratio decreased from beginning of 2009, a reason of it was fewer new loans issued following after economics slow down. In the meantime, because of Anod bank problem, sudden deposit run from banking sector occurred and

confidence in banking sector fell in December 2008. But as response of these actions, the BOM implemented some kind of policy measures.

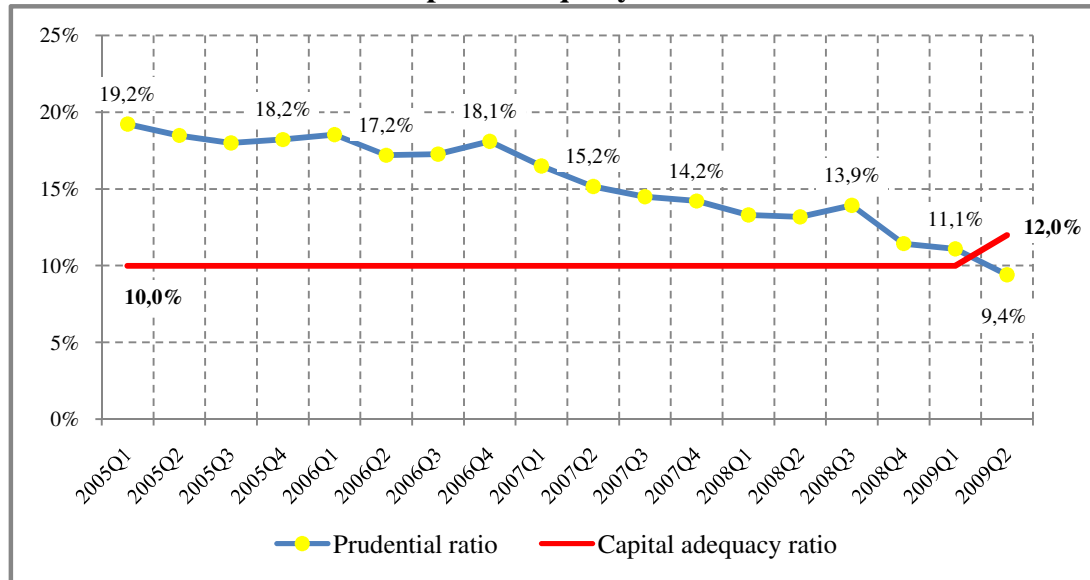
Chart 11
Loan to Deposit Ratio



Capital adequacy ratio (CAR): Unclearness of the economy in current situation is making the banks' decision making process stagnant and decreasing the supply of loan and accelerated inflation rate forced deposits and transactional accounts to decline. Capital adequacy ratio declined due to bank loses, which incurred because of raising non-performing loan, heighten market risk. Economic slow down in turn worsen bank loan repayments, hence loan outstanding fell largely by provisioning, which seriously erodes capital base of banks. Higher market risk causes fell in risk appetite of lending institutions. Therefore, capital adequacy ratio is still at the level above BIS 8%.

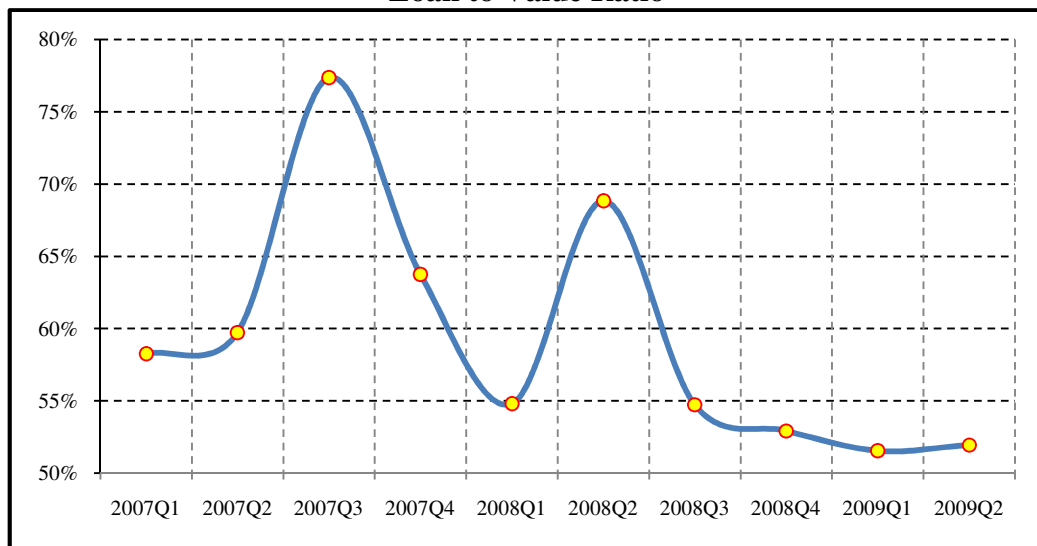
Moreover, in the time of decreasing capital adequacy ratio in banking sector, the BOM decided to revise its regulation of prudential ratio and increased CAR to 12%. The objective of this measure was that to help deal with pro-cyclicality in banking sector and to enhance resilience of both individual banks and the banking system as a whole. This kind of dynamic provision can be important prudential tool for emerging economies, where banks dominate financial intermediation.

Chart 12
Capital Adequacy Ratio



Loan to value ratio (LTV): Loan to value ratio is one of the key risk factors that lenders assess when qualifying borrowers for a loan. Loan to value ratio of a loan increases, the qualification guidelines for certain loan programs become much stricter. However, we don't have database to calculate whole sector LTV ratio, we calculated it only on mortgage market.

Chart 13
Loan to Value Ratio



As shown in Chart 13, loan to value ratio for mortgage loans steadily decreasing over last 2 years. This indicates that, because housing price decreased at the end of 2008, banks' LTV ratio sharply increased. So banks could decrease their LTV ratio by reducing their mortgage loans.

4. The Policy Response

4.1 Were the policy responses?

The Mongolian authorities didn't appropriately respond to the continuously increasing asset prices. In the momentum of high economic growth Government's support for construction and mining projects, perhaps, too generous social programs stimulated economy further. Bank lending fueled credit growth in combination of afore mentioned measures which generated platform for asset price increases at high pace.

For the monetary policy side, the Bank of Mongolia had carefully observed economic and monetary conditions. After accelerating inflation, money growth and economy over heating were observed, the BOM started to implement tight monetary policy. In this regard, the BOM took the policy measures such as rising its policy rate twice from 6.4% to 7.4% and 8.4% in October and November 2007 respectively and increased required reserve ratio by 0.5 percentage point. Moreover, The BOM increased capital adequacy ratio of some banks that faced liquidity problem at the beginning of 2008. All these policy actions against high inflation continued throughout 2008. As a result, monetary aggregates rapid growth slowed down during that time.

The only measure implemented by BOM directly to construction sector was the construction loan refinancing. The Bank of Mongolia granted loans to construction companies through banks', who lent to the construction sector in order to prevent failure of normal banking operation. These loans were given by banks to apartment building construction companies, which were at least at its 80 percent of construction works. But result of this measure wasn't good enough as expected. The reason was not only the financing was widely misused by companies, but also banks didn't monitor use of funds.

4.2 What is most appropriate monetary policy instrument in reacting to asset prices?

Most Central banks' main objective is to ensure stability of price and within this main objective they also aim to promote balanced and sustained development of the national economy, through maintaining the stability of financial markets. However, still researches haven't fully agreed on fact that whether the monetary authorities should respond to asset price fluctuations or not. Obviously it depends on how asset markets play considerable role in economy and how asset market effects to economy.

As we determined in analytical section, asset markets are, mainly stock market and housing sector, most emerging markets in Mongolia. So when economy is in boom path, stock market and housing sector followed economic movement. But after economy's boom burst, again those sectors faced problems. Hence only thing that we should consider is that, do asset prices contain reliable information about inflation and output and how does asset price fall affect banking sector. As we saw in cross correlation analysis housing market has a positive effect to inflation within 2 quarters. It means if house price goes up, inflation will increase within 2 months. But it is possibly explained by co-movement of inflation and house price which says that both inflation and house price movements are caused by excess demand.

Moreover, asset markets did influence banking sector (From section 3). Construction sector shutdown weakened banking sector loan quality. Some medium sized banks which financed to construction sector faced real problem. They have no liquid asset and financial prudential ratios getting worse quickly. In this case, monetary authorities should be aware of shifting construction sector problem to banking sector.

Another important aspect of responding to asset price bubble is that whether monetary authorities can distinguish between fundamental and asset price bubble behavior? If monetary authorities can not distinguish between fundamental and bubble, they should not respond against price fluctuation. But determining price boom is very difficult itself.

But no matter we could determine that should monetary authorities respond to asset prices or not, we should determine that which instrument will be the most appropriate? Current global economic conditions showed that conventional monetary instruments can't respond properly against asset price bubble and burst. Currently, major central banks have introduced "unconventional monetary policy measures" to deal with the economic and financial crisis that materialized in the aftermath of the bursting of the global credit bubble. The reasons of choosing that unconventional policies are:

- The risk taking capacity of various economic entities was severely damaged during crisis time, and, as a result, the effectiveness of conventional monetary policy was seriously hampered.
- It took time to recapitalize the banking system, which was most effective and vital in revitalizing the economy. The injection of public capital into weakened financial institutions was indispensable in stabilizing the financial system, but was politically unpopular.
- Uncertainty regarding the transmission mechanism of monetary policy is much larger than in normal times. Therefore, regardless of whether experimental types of monetary policy measures were introduced or not, explaining the intentions of monetary policy decisions to markets and to the public will be the key challenge.

Nowadays, the Central Bank is seeking some room to support asset markets by issuing its treasury bill to public in stock exchange. The Bank of Mongolia believes that policy measure can encourage stock market and bring back confidence of stock exchange.

5. Conclusion

Asset prices have increased significantly over recent years. Due to economic monetization process and capital inflow increase, economic agents tended to increase their demand for durable goods and were interested to store their wealth not only in deposit, but also in other high revenue assets.

The result of simple analysis indicates that housing price has been mainly driven by liquidity and real economic activity and another interesting result is a negative correlation between house price and domestic currency loan rate. Loan rate lies ahead one quarter or explained by a house price movement. The stock price movement is highly and positively correlated with broad money and real economy growth. But increasing stock price tends to affect inflation and GDP gap positively and loan interest rate negatively. From this result we can conclude that economic agents make decision to store their wealth

depending on their liquidity condition. Moreover, result shows that economic agents mostly are not interested in holding their wealth as foreign exchange, because of too volatile exchange rate. This relationship is also proved by principle component analysis.

From the indicators that show soundness of financial sector, banking sector vulnerability is weakening over time. But we can't say that it is just because of construction sector downturn due to sharp decrease of housing prices. However, construction company's loans are worsening related with reason mentioned above, banking sector faced liquidity problem due to exchange rate depreciation. In the time that exchange rate movement stabilized, banking problem still continued due to economy downturn.

The following policies could be recommended for implementation to avoid the adverse impact of asset price in banking sector.

- To enhance bank supervision and institutional improvements are the best responses to an asset price bubble episode.
- Implement dynamic provisioning measures to deal with pro-cyclicality in banking sector. Sometimes, it becomes the best way to avoid asset price bubble especially in the economy that a bank dominates in financial intermediation.
- To support demand side of construction sector is one way to avoid shift construction sector problem to banking sector soundness in the short run.
- In the long run, policy makers should consider inflation pressure after crisis and implement suitable policy.

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Appendix

Data summary:

	House price /Thous.US\$/	Stock market price /mil.MNT/	Mortgage loan /bil.MNT/	Construction loan /bil.MNT/	Total loan /bil.MNT/	Deposit rate	Output GAP
2002Q1	14.23	1 127.0	-	1.9	88.7	13.2%	0.087
2002Q2	12.76	1 226.5	-	4.2	124.0	12.2%	-0.018
2002Q3	14.03	1 154.1	-	6.1	105.9	14.0%	-0.033
2002Q4	14.80	1 025.8	-	6.7	151.3	14.0%	-0.022
2003Q1	15.15	839.6	-	8.1	151.0	14.0%	0.022
2003Q2	14.20	800.4	-	11.3	183.8	14.0%	0.009
2003Q3	15.00	737.9	-	10.1	163.8	14.1%	0.002
2003Q4	15.73	740.7	-	15.1	217.2	14.0%	-0.057
2004Q1	17.91	774.9	-	33.8	498.5	14.0%	0.029
2004Q2	17.90	609.2	-	41.6	525.5	13.2%	0.068
2004Q3	19.21	707.4	-	45.1	565.8	15.0%	0.010
2004Q4	19.73	590.7	-	51.9	606.2	13.2%	-0.035
2005Q1	20.42	706.0	-	58.6	640.3	13.2%	-0.004
2005Q2	19.26	802.3	-	71.5	719.7	13.2%	0.021
2005Q3	22.23	813.6	-	74.8	774.6	12.6%	0.009
2005Q4	22.63	995.3	-	76.8	859.4	12.6%	0.012
2006Q1	23.87	1 083.9	38.6	77.2	955.1	12.6%	-0.019
2006Q2	23.32	1 176.6	46.0	88.3	1 051.1	12.6%	-0.017
2006Q3	26.44	1 351.0	65.5	100.7	1 121.1	13.4%	-0.024
2006Q4	27.60	1 868.0	72.1	111.1	1 222.3	13.5%	0.101
2007Q1	28.37	2 770.7	78.2	141.4	1 403.8	13.5%	0.017
2007Q2	29.27	4 027.0	90.7	225.5	1 599.2	13.5%	0.011
2007Q3	35.72	12 461.7	116.6	276.8	1 858.4	13.4%	0.047
2007Q4	47.52	10 014.0	144.1	321.6	2 055.3	13.4%	0.067
2008Q1	54.65	12 668.9	194.4	294.1	2 335.6	10.8%	0.058
2008Q2	62.85	10 318.8	200.2	349.0	2 558.9	10.5%	0.076
2008Q3	56.56	8 393.6	219.2	400.9	2 714.6	10.5%	0.075
2008Q4	50.90	5 777.7	201.8	383.2	2 635.1	10.9%	0.041
2009Q1	45.00	4 953.7	205.0	419.6	2 671.7	10.9%	0.022

Continuous:

	Real GDP growth	Annual Inflation	Nominal Exchange Rate of US\$	M2 money /bil.MNT/	Domestic Loan rate	Net International reserve /mil.US\$/	Private Remittance /mil.US\$/
2002Q1	5.2%	-1.6%	1 104.0	345.9	39.3%	160.4	2.7
2002Q2	6.7%	-0.2%	1 104.0	401.0	33.4%	169.5	9.8
2002Q3	6.3%	3.4%	1 116.0	437.4	35.0%	199.4	15.3
2002Q4	4.7%	1.7%	1 124.0	470.1	33.4%	225.9	36.5
2003Q1	1.6%	4.9%	1 140.0	504.2	32.6%	213.0	16.7
2003Q2	3.0%	6.5%	1 134.0	557.7	32.4%	234.8	20.1
2003Q3	5.8%	5.4%	1 157.0	609.3	32.0%	259.8	31.6
2003Q4	7.0%	4.7%	1 170.0	703.3	32.0%	129.0	5.9
2004Q1	8.4%	6.2%	1 178.0	740.2	30.0%	149.8	36
2004Q2	9.5%	5.4%	1 167.0	812.2	30.0%	155.9	38.5
2004Q3	8.9%	12.5%	1 199.0	827.3	32.0%	154.0	42.4
2004Q4	10.6%	10.9%	1 212.0	847.0	30.0%	163.6	29.5
2005Q1	9.7%	12.5%	1 203.0	893.0	33.0%	186.5	35.1
2005Q2	6.4%	17.7%	1 191.0	1 009.6	30.0%	212.2	27.1
2005Q3	6.2%	11.5%	1 212.0	1 112.4	31.0%	255.0	41.3
2005Q4	7.3%	9.5%	1 227.0	1 140.1	28.0%	298.0	30.2
2006Q1	7.5%	5.0%	1 183.0	1 191.2	28.0%	350.1	33.9
2006Q2	7.8%	2.1%	1 171.5	1 449.5	24.2%	384.4	25.5
2006Q3	6.9%	4.4%	1 167.7	1 539.4	26.1%	510.5	4.6
2006Q4	8.6%	4.8%	1 164.8	1 536.5	24.5%	687.3	13.0
2007Q1	9.5%	5.3%	1 164.6	1 746.7	22.5%	852.8	14.0
2007Q2	12.2%	5.5%	1 164.1	2 016.1	21.0%	975.7	21.4
2007Q3	14.6%	12.1%	1 187.6	2 191.9	19.7%	1 045.5	24.1
2007Q4	10.2%	14.1%	1 170.2	2 401.1	19.9%	975.3	24.4
2008Q1	11.0%	20.6%	1 170.8	2 455.0	20.8%	981.0	23.1
2008Q2	10.2%	32.4%	1 159.2	2 564.5	21.7%	952.9	36.7
2008Q3	8.9%	31.7%	1 148.2	2 524.2	21.5%	859.2	31.8
2008Q4	8.9%	23.3%	1 229.0	2 318.9	20.4%	637.2	8.4
2009Q1	5.4%	17.3%	1 563.0	2 413.3	20.4%	504.1	22.5