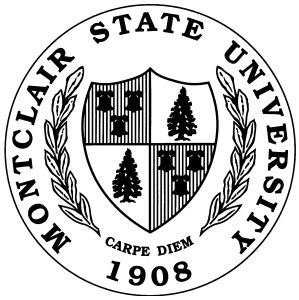

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Asset Bubbles and Moral Hazard: Evidence from Japan

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Abstract
(JEL Codes: 430, 120, 130)

In the presence of asymmetric information, asset bubbles may contribute to distortions in the allocation of investment. Using monthly data from Japan, we examine the role of stock and land prices on the commercial banking system's asset and liability accounts. We find supporting evidence that land and stock prices explain variations in the asset to liability ratio, and separately to the behavior of assets and liabilities. Within the Japanese banking system, asset bubbles contributed to an over-extension of lending for unproductive investments during the period of the 1980's and whose consequences extend well in the 1990's. We provide here co-integrated estimates of the influence of these variables on the behavior of the Japanese banking system.

Introduction

A central tenet of economics is that agents are rational, i.e., that they make decisions consistent with all available information.* While in the long run this must be true, in the short run, markets can fail to achieve a rational allocation of resources when there is limited information and when it is asymmetrically distributed. Nowhere is the proposition of rationality more put to the test than in the case of asset bubbles, whose episodes have been well documented, notably those covered by Chancellor (1999), Kindelberger (1996), Bernstein (1996), and Fischer (1996).[1] In this paper, we consider recent research on asset bubbles, and examine evidence from Japan in light of the experience in the early 1990s and the subsequent collapse of several East Asian financial markets beginning in July 1997. In so doing, we hope to shed light on the issue of transparency as discussed in Peterson (1999), Blinder (1999), Chote (1998), Feldstein (1998), Fisher (1998), Goldstein (1998), and Posen (1998), among others.[2]

It is reasonable to ask whether one should be concerned with the existence of asset bubbles, whether they are rational in some sense, and what, if any importance may derive the presence of asymmetric information in their generation. As Joseph Schumpeter argued long ago, innovation is an essential element in economic development, and with it comes a natural disturbance to the stability of the circular flow of goods.[3] As such, asymmetric information may be a necessary condition for innovation, even if it poses a risk to macroeconomic stability. While economic innovation may be essential to growth and development, it is when an economy experiences dis-equilibrium for reasons other than innovation and in which economic growth is foregone by the emergence of a crisis that asset bubbles become important. For this reason, Japan's experience in the early 1990s becomes all the more compelling, just as does the experience of other East Asian countries in the later 1990s and for the process of reform now taking place.

Rationality and Irrationality in Asset Bubbles

Market efficiency depends on a number of underlying assumptions. One is the notion of an optimal number of firms that takes into consideration all relevant economies of scale and scope to maximize the level of output at the lowest cost to consumers. If the level of technology is fixed, this also implies that there are zero steady-state economic profits.

Achievement of a zero steady-state level of economic profits depends not just on the level of technology and the number of firms, but also on the level and distribution of information. As long as there is quasi-perfect information that is symmetrically distributed within and across markets, market prices in both goods and factor markets will be efficient. As such, asset prices will evolve according to a random walk, i.e., that all relevant information has been incorporated into the supply and demand of assets.

If the above conditions were true, then, in the absence of technological change or market structure, asset bubbles should not arise. Because assets do appear to display

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pricing bubbles, we look for some measure that can shed light on why they arise. Asymmetric information affords one standard explanation for the existence of bubbles, and yet there are few direct measures that have been available to demonstrate its existence. We seek here to provide a proxy measure of asymmetric information and to test how the conduct of financial markets would have evolved in its absence.

There is an established literature built on the proposition that financial markets are generally efficient, and thus rational. Much of this literature originates with the random walk hypothesis, first put forth by Samuelson (1965), and made popular by Malkiel (1996, 1973).[4] The random walk hypothesis states simply that in the case of financial assets, the behavior of prices can be characterized essentially by a random walk process since market arbitrage tends to eliminate any advantage arising with the arrival of each new level of information. This proposition has been tested and largely upheld in any number of studies, notably those cited by Jensen (1972), Fama (1988), and Cochrane (1999).[5] These studies focus primarily on equity markets, though some address debt markets as well. They generally have excluded other assets such as land or primary commodities, though the underlying theory should apply equally well to any asset. Overall, studies of financial market efficiency may be considered as subsets of real business cycle theory, and thus contributing to the microeconomic foundations of macroeconomic stabilization policy.

With equity markets in mind, Santos and Woodford (1997) provide a useful re-statement of rationality, namely, that asset prices in an intertemporal equilibrium should equal the present value of the streams of future dividends to which each asset represents a claim.[6] When an asset's price does not equal the present value of the stream of dividends over an infinite future, the price of the asset is said to contain a bubble component. The question is how can one distinguish between fundamental market efficiency and trading that may distort the valuation of assets.

From the efficient markets framework have come a number of models to address the question of asset bubbles. Recent formulations have focused on the theory of rational asset bubbles, beginning with Garber (1990).[7] Garber's survey includes not just equities, but also historical episodes involving other assets, notably the Dutch tulip bubble of the early 17th century, and the Mississippi and South Sea bubbles of the early 18th century. Garber concludes that each episode should be considered as rational in light of the level and distribution available at the time, even though they resulted in considerable economic fluctuations.

Flood and Hodrick (1990) examine existing approaches to testing for asset bubbles and conclude that there is no direct test to validate whether they exist.[8] More recent formulations include those of Banarjee (1992); Bikhchandani, Hirshleifer, and Welch (1992); Wang (1993); Bulow and Klemperer, Devenow and Welch (1996); Santos and Woodford (1997); Kiyotaki and Moore (1997); Avery and Zemsky (1998); and Edison, Luangaram, and Miller (1998).[9] While some of these recent formulations extend the framework of rational asset bubbles to include asymmetric information, thus far the empirical models have not provided conclusive evidence on tests of asset bubbles, on the rationality of asset bubbles, or on the role of information asymmetry in asset bubbles. As

inconclusive as these studies may be, they do not stand in opposition to the efficient markets hypothesis in that over a sufficient period of time, all markets have sufficient feedback to generate an underlying level of equilibrium.

The Institutional Framework of Japanese Banks

Our focus is on the Japanese experience for the period from the early 1980's to the mid-1990s, during which time land and stock market asset bubbles arose and then collapsed, leading to the slowdown in economic growth that has continued up to the present.

This episode is instructive for a number of reasons. One is that the slowdown in economic growth in Japan may have been a contributory factor in the East Asian financial crisis that began in the summer of 1997. Several East Asian economies depended to some extent on capital flows from Japan for the economic liberalization in which they were engaged. When coupled with the likely presence of asymmetric information in those countries, such capital inflows were not accompanied by an efficient pricing of assets such that moral hazard problems arose.

A second reason for looking at the Japanese experience is that how Japan now proceeds with economic liberalization may carry important implications for the reform process undertaken in neighboring East Asian countries themselves. Finally, with rising concern that asset bubbles may still be a problem in such areas as the U.S. stock market, how well Japan resolves the consequences of the asset bubble crisis of the early 1990s may carry important lessons for the rest of the world.

We note first a number of key institutional considerations that have shaped Japan's asset bubble experience of the late 1980's and early 1990's.[10] First is the role of the Japanese *keiretsu* system. Building on the pre-war *zaibatsu*, a *keiretsu* represents an informal network that provides for extensive cross holding of assets across firms by a main lending bank. Under keiretsu practices, Japanese banks can own common stock in firms to whom they may issue loans, though a single bank's ownership of a stock is limited to 5 percent of a single firm's outstanding shares. Prior to 1993, Japanese banks could use the full value of their common stock as a basis to expand their lending, i.e., the original purchase price of their common stock and 100 percent of the stock's unrealized capital appreciation. Under such an arrangement, a bank had little incentive to restrict lending as long as one result would be the appreciation of a firm's equity.[11]

A second institutional consideration is the set of regulations that produced both high rates of saving and their channeling to the *keiretsu* financial institutions.[12] One is that Japanese banks had restrictions on the amount of interest, much as Regulation Q used to work for Savings and Loan banks in the United States. In turn, the Japanese government restricted the dividends that corporations could pay to investors and limited corporations from extensive use of corporate bonds for capital expansion. In addition, the Japanese government limited individual Japanese citizens from holding foreign-denominated financial assets. Beyond these considerations, Japanese banks also imposed high down-payment requirements on real estate loans to individuals. The net effect of these

regulations and practices was to foster a high rate of household saving that could be channeled into either the Japanese Postal Savings System or Japanese banks, and the concentration of firm finance within keiretsu institutions rather than through a diversified mix that includes both equity and corporate debt instruments.

Ordinarily, high rates of saving translate into high rates of economic growth. While Japan was able to enjoy exceptional economic growth when the yen was relatively inexpensive, once the yen began to appreciate in response to rising current account surpluses, the inefficiency of Japan's capital markets became more obvious. The collapse of land and equity market prices in the early 1990's signaled just how inefficient the *keiretsu* system had become and this prompted a series of changes that are still unfolding.

One reform is the adoption in Japan of the Basle Accords of 1988. The Basle Accords were designed to create uniform regulations for the evaluation of bank capital and the measurement of risk associated with different types of bank investment. Tier 1, or core capital, consists of private money invested based on the book value of the common stock issued by a bank. Tier II, or supplemental capital, consists of subordinated debt, loan loss reserves, preferred stock issued by a bank, and the book value and up to 45 percent of the unrealized appreciation of common stock owned by a bank. Tier I capital must be no less than 4 percent of the risk adjusted value of a bank's assets, while tier II capital must be at least 3 percent of the total value of all assets, including ownership of foreign assets such as U.S. government bonds. Tier I plus tier II capital must together be no less than 8 percent of the risk-adjusted value of a bank's assets. After much debate, these standards were adopted in Japan in 1990 on a phase-in basis, becoming fully effective in 1993.

A second change is an increase in tax rates beginning in 1988 and an interim tightening of monetary policy. Faced with rising deficits, the Japanese government imposed a 20 percent withholding tax on savings, a capital gains tax on equity sales, a security transfer tax, a 3 percent consumption tax, a 6 percent tax on new cars, and a 2.5 percent surtax on corporate profits. In 1990, the government increased the real estate capital gains tax from 17 percent to 57 percent.[13]

The effect of the Basle Accords on Japan has been dramatic. In essence, the 1988 Accords meant that many Japanese banks were undercapitalized and had to convert assets to tier I and tier II standards to be in compliance. Banks thus began to sell corporate stocks held in firms outside a bank's immediate *keiretsu*, as well as land holdings. These events helped to drive down the prices of equity and land assets which we will examine more formally below.

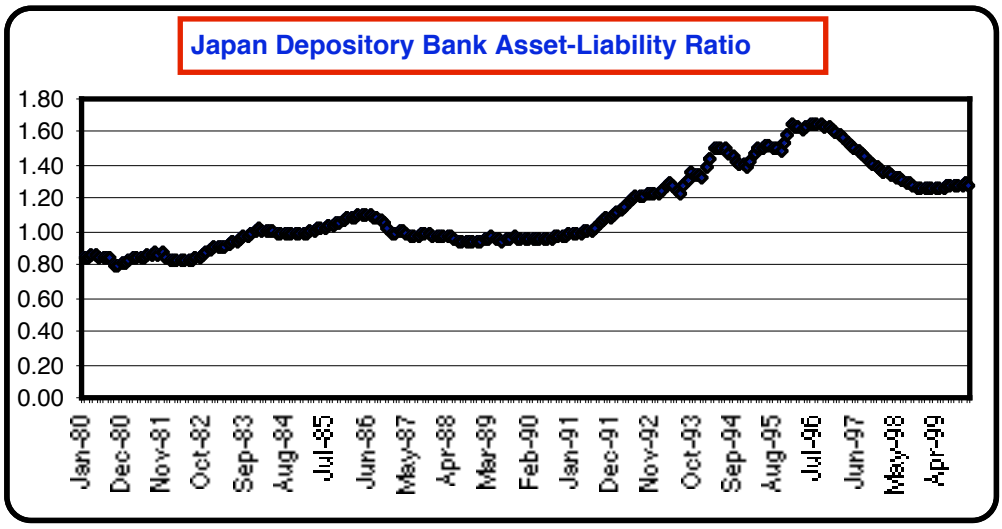
A third change was the "Big Bang" deregulation of the Japanese financial system.[14] This reform derived from the awareness brought about by the implementation of the Basle Accords that the Japanese financial system needed to become more competitive if economic growth were to resume. Under these reforms, Japanese citizens could now purchase foreign exchange, own accounts in foreign banks denominated in yen, and own foreign securities. Japanese banks were now permitted to sell equity mutual funds to individual Japanese households. Households could open cash-management accounts at

securities firms and use those accounts to pay credit card balances. In turn, Japanese corporations could pay employees with stock options, thus changing the incentive system away from the traditional lifetime employment security model to one based on economic efficiency. Additionally, securities firms, including foreign ones, could now manage tax-qualified pensions. Changes in the commercial code also make it easier for shareholders to sue management for malfeasance. As of April 1999, all brokers fees and commissions are to be determined competitively and derivatives and stock options may be traded over the counter and through stock exchanges.

Where does asymmetric information sit in this structure of events? Our focus is on the pre-1998 framework in which Japanese *keiretsu* institutions had little incentive to monitor the allocation of capital as long as the stream of savings was consistent with at least a modest rate of economic growth. The lack of transparency between banks and the firms to whom they made loans reflects this asymmetric information and for which we now look to some measure of its operation.

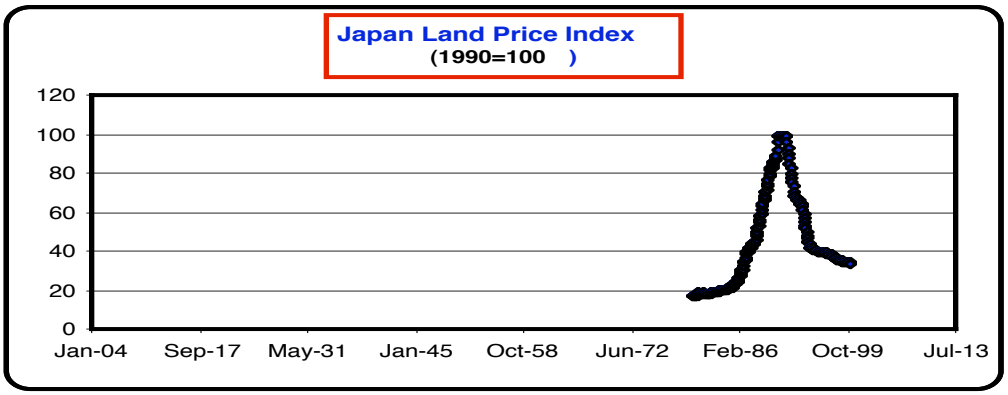
Figure 1 illustrates the Japan Depository Bank asset to liability ratio from the beginning of 1980 to the end of 1999. Except for a brief period in the mid-1980's, much of the decade was characterized by a ratio less than one. Following the collapse of land and stock market prices in 1990, bank loans slowed considerably as banks faced shortfalls in liquidity, thus bringing the asset to liability ratio well above unity.

Figure 1



As already noted, Japanese banks have relied extensively on land prices and stock market valuations to determine the level of lending activity. Figures 2 and 3 illustrate the presence of price bubbles for these assets, which we contend have played a determining role in shaping the bank asset to liability ratio.

Figure 2



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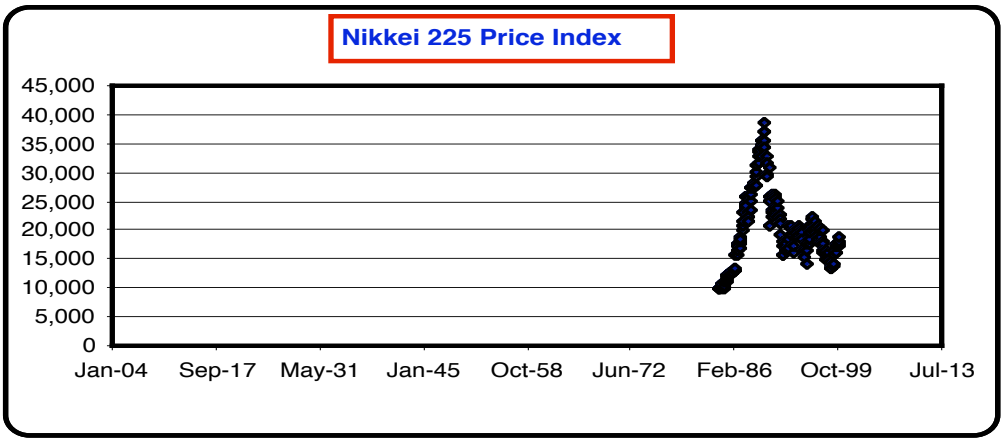


To round out this profile, we note the role of Japan's fiscal balance, and the real depository interest rate, as illustrated below.

Figure 4

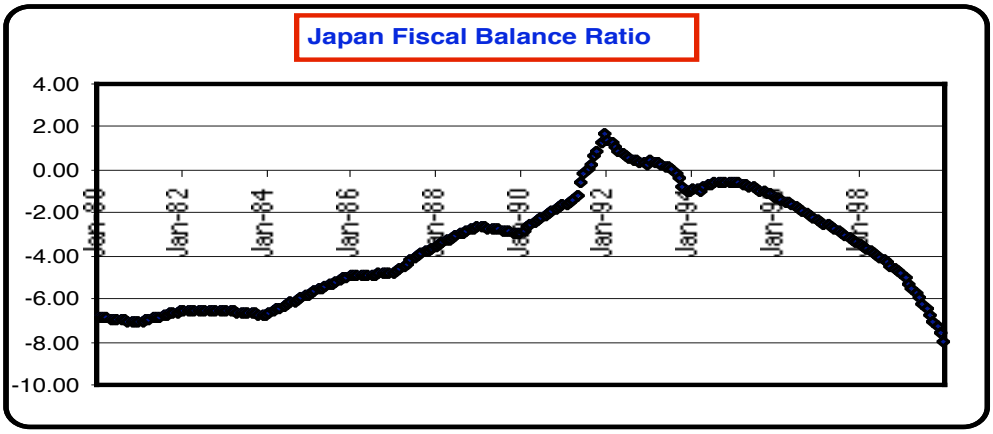
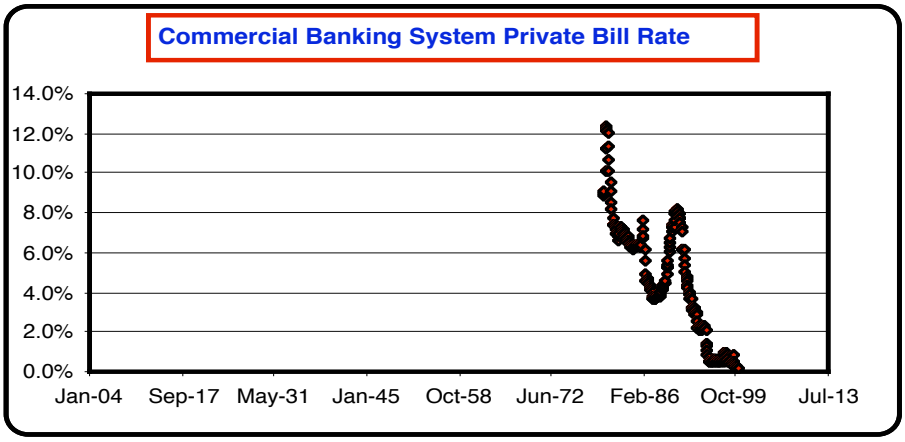


Figure 5



A Simple Model of Information Asymmetry

To model informational asymmetry, we link the role of collateral assets to the bank asset to liability ratio. Under informational symmetry, banks maintain approximate parity between assets and liabilities, thus suggesting a stable asset to lending ratio over time. Given symmetric information, bank lending should affect both assets and liabilities at approximately the same rate, and as a function of a standard set of determinants.

We can state these propositions in terms of a banking system's basic accounting identities. First, given that assets must be equal to liabilities plus capital, the asset to liability ratio is defined as:

$$(1.) \qquad \frac{Bank\ \ Assets}{Bank\ \ Liabilities} = 1 + \frac{Capital}{Bank\ \ Liabilities}.$$ Re-arranging, we have

$$(2.) \qquad \frac{Bank\ \ Assets - Capital}{Bank\ \ Liabilities} = 1$$

If bank assets relative to capital decline, the asset to liability ratio also will decline. If the banking system operates within a relatively closed environment and in which government provides implicit guarantees, banking lending can expand under conditions in which the capital-asset ratio can fall below zero.

From our basic identities, we now define the determinants of the bank asset to liability ratio. In addition to the rate of interest, we define bank lending as dependent on two types of collateral, namely, land prices and stock prices. Finally, we include the fiscal balance ratio of the public sector as the remaining principal determinant. We thus define our model as:

$$(3.) \qquad BKALRATIO = f(RLANDPR, RNK225PR, RFBRATIO, RPRBRATE)$$

where: BKALRATIO = the bank asset to lending ratio,

RLANDPR = the index of real land prices,
RNK225PR = the real stock market price index, in this case the Nikkei 225,
RFBRATIO = the aggregate real fiscal balance ratio
RPRBRATE = the real bank private lending rate

In long-run equilibrium, informational symmetry implies:

$$(4.)\quad \frac{\partial BKALRATIO}{\partial t} = a\,,$$

where a represents 1 plus the rate of return on capital, which is equivalent to the capital to liability ratio.

Bank lending varies inversely with the rate of interest, with the foreign exchange rate (or with the current ratio in the balance of payments), and with the public sector balance, other things equal. While these variables may play predictable roles in generating symmetric changes in the bank asset to lending ratio, where informational asymmetry exists, the bank asset to lending ratio may fall below unity as long as there are implicit guarantees of solvency provided by a higher agency such as government. Although there may be substantial private sector saving, expanded public sector intervention may eventually reduce the rate of economic growth, which in turn places pressure for financial sector reform to raise bank lending performance to internationally competitive rates of return.

In the case of Japan, we test for the role of collateral assets in explaining variations in the bank asset to lending ratio. As already noted, until recently, Japanese banks have been able to use land and stock market assets in setting the level of lending activity. Since Japan experienced asset bubbles for both land and stock market prices in the late 1980's, we test for the role of asset bubbles in determining changes in the bank asset to liability ratio.

Asset bubbles reflect abnormal valuations that in turn distort the pattern of bank lending. Initially, banks may use expected increases in asset values to allow the bank asset to liability to fall below one on the expectation that assets will grow at a rate sufficient to restore long-run unity to the bank asset to liability ratio. When these asset bubbles revert to levels more consistent with long-run behavior, as in the case of changes in tax rates, or bank capitalization rules, banks can no longer expand lending activity and must build up reserves to cover rising losses. This generates in turn bank asset to liability ratios above unity as banks must build up assets to cover a rising stream of losses. Thus, distortions in asset valuations reflect distorted perceptions of risks by banks, thus producing deviations in the bank asset to liability ratio.

Data for this study have been gathered from several sources. Monthly Data on depository commercial bank assets and liabilities have been compiled from IMF Financial Statistics and converted to 1995 constant dollars at official rates of exchange. Data on land prices have been compiled from the Japanese Land Planning Agency and converted to an index with 1990=100. Data on Japanese equity prices have been compiled from various banks and which we have used to construct a monthly time series index based on the Nikkei 225. We have further adjusted the Nikkei 225 index to a constant price index using

the 1995 Japanese price index, as well as for a real depository bank rate. Natural logarithm and first differences of these variables have been used in three estimating equations.

Ordinary Least Squares regressions were made in three separate estimating equations, one on the bank asset to liability ratio, the second on bank assets, and the third on bank liabilities. Results for these equations are reported in the Appendix in Table 1.

Unit root tests on the variables in the regressions in the Appendix indicate that except for the private banking rate (PRBRATE), all have some degree of non-stationarity, thus undermining the validity of the OLS estimates through spurious regression. To correct for non-stationarity, we develop co-integrating estimates for each equation. Long-run normalized equation results are given below in Table 1, while short-run error-correction estimates are given in Table 2, along with the associated significance levels of the model.

Table 1

Long-Run Equilibrium Co-Integrating Equations

	A. LNBKALRATIO	B. LNRBKASSETS	C. LNRBKLIAB
Number of Cointegrating Equations	1	1	1
LnRLANDPR $_{t-1}$	**-0.3463**	**0.4167**	**0.6212**
	(-36.9797)	(2.8312)	(3.2992)
LnNK225PR $_{t-1}$	**-0.0789**	**1.0757**	**1.3251**
	(-41.9654)	(21.5144)	(21.4493)
LnRFBRATIO $_{t-1}$	**0.4404**	**0.2083**	**-0.1833**
	(54.3675)	(1.7771)	(1.1988)
LnRPRBRATE $_{t-1}$		**-0.3740**	**-0.2825**
		(6.8088)	(-4.1508)
Constant	**0.0004**	**-2.6627**	**-7.3047**
Adj. R^2	0.5447	0.4470	0.6158
SER	0.0487	0.0191	0.0154
Log Likelihood	349.66	552.43	598.77
Johansen Log Likelihod Limit	787.51	1008.34	1056.20
n	215	215	215

Table 2

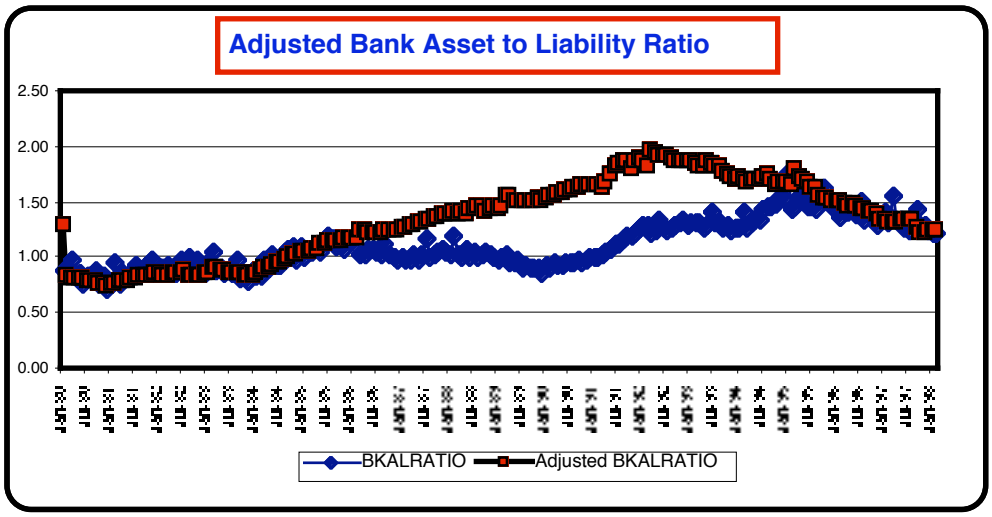
Short-Run Error-Correction Equations

	ΔLNBKALRATIO $_t$	ΔLNRBKASSETS $_t$	ΔLNRBKLIAB $_t$
Constant	**0.0004** (0.1224)	**0.0055** (3.5195)	**0.0035** (2.8239)
ΔLnBKALRFTIO $_{t-1}$	**-0.0539** (-0.5035)		
ΔLnBKALRFTIO $_{t-2}$	**0.0251** (0.3520)		
ΔLnBKASSETS $_{t-1}$		**0.7009** (10.0583)	
ΔLnBKASSETS $_{t-2}$		**-0.1569** (-2.3545)	
ΔLnBKLIAB $_{t-1}$			**0.8195** (11.6987)
ΔLnBKLIAB $_{t-2}$			**-0.1376** (-2.0747)
ΔLnRLANDPR $_{t-1}$	**-0.3509** (-2.1408)	**0.0568** (0.7942)	**0.0613** (1.0637)
ΔLnRLANDPR $_{t-2}$	**-0.3986** (-2.4024)	**-.07199** (-0.9920)	**-0.0939** (-1.6094)
ΔLnNK225PR $_{t-1}$	**0.0293** (0.4926)	**-0.0236** (-0.9809)	**-0.0263** (-1.3622)
ΔLnNK225PR $_{t-2}$	**0.0531** (0.9092)	**-0.0094** (-0.39212)	**0.0082** (0.4218)
ΔLnRFBRATIO $_{t-1}$	**0.2253** (0.7743)	**0.0341** (0.2998)	**-0.0190** (-0.2049)
ΔLnRFBRATIO $_{t-2}$	**0.0579** (0.2026)	**-0.0323** (-0.2864)	**-0.0094** (-0.1029)
ΔLnRPRBRATE $_{t-1}$		**-0.0314** (-1.5872)	**-0.0058** (-0.3642)
ΔLnRPRBRATE $_{t-2}$		**0.0034** (0.1683)	**-0.0022** (-0.1341)
Residual	**-1.0165** (-7.8969)	**-0.0157** (-2.7371)	**-0.0076** (-2.9289)
Number of Cointegrating Equations	1	1	1
Adj. R^2	0.5447	0.4469	0.6158
SER	0.0487	0.0191	0.0154
Log Likelihood	349.66	552.43	598.77
Johansen Log Likelihod Limit	787.51	1008.34	1056.20
n	215	215	215

The long-run bank asset to liability ratio depends significantly on the behavior of real land prices, the real Nikkei 225 price index, and on the fiscal balance ratio. When the real private bank lending rate is included, all of these variables become statistically insignificant, as does the real private bank lending rate itself. This is consistent with the long-run hypothesis that in the presence of asymmetric information, land prices, stock prices, and the fiscal balance determine variations in the asset to liability ratio, but that in a long-run equilibrium in which real interest rates are included, these variables are not important.

If rising land and stock prices lead to inefficient lending, how would the bank asset to liability ratio evolve were these assets priced more consistently? With the basic model, we repriced land and stock assets using the private bank lending rate. To do so, we used the reciprocal of the price-earnings ratio of the Nikkei225 stock index as a proxy measure of the implicit expected rate of return on equity. We then re-calculated the price-earnings ratio using the private bank lending rate, and then derived the corresponding value of the Nikkei225 index. Because there is a significant positive correlation between stock market and land prices over the period covered (0.65), we repriced land by multiplying the original index times the ratio of the repriced Nikkei225 to the actual Nikkei225 index. We then used these revalued assets in the long-run equilibrium cointegrating equation in Table 1 to derive the predicted bank asset to liability ratio. While there is an upward bias to this procedure, the adjusted bank asset to liability ratio shows that banks would have slowed the rate of lending, thus leading to a faster correction in the asset to liability ratio than actually occurred. The results of this exercise are shown in Figure 6.

Figure 6



Conclusion

Where does our model leave us in terms of the efficient market hypothesis and the implicit notion of economic rationality? A simple answer is that because information may be bounded in an asymmetric environment, at the individual level, economic rationality still holds. The question is whether this makes sense when one aggregates across markets to observe asset pricing bubbles that result in significant economic fluctuations for extended periods of time, as has been the case in Japan.

Although hindsight is always perfect, and Japanese policymakers have since implemented financial reforms that will address some of the problems of asymmetric information, the question is what could be done to forestall such an event from occurring again. Reducing the role of keiretsu institutions in allocating capital will undoubtedly foster a closer appreciation of competitive rates of return in financial markets. At the same time, it may also be useful to consider developing of additional financial products to provide more efficient feedback mechanisms when lending decisions are made. One such

measure would be to consider the use of additional derivatives such as real estate futures to provide more accurate information on the likely evolution of prices. Additionally, implementing greater transparency in accounting practices will permit a more accurate valuation of equity prices, and which in turn will improve the efficiency of land asset valuation. While there is no way to completely eliminate risk, as reforms in Japan proceed, they will undoubtedly result in a more efficient capital market than has been the case in the past.

Appendix

OLS Estimates of Japan Commercial Bank Dynamics

	LNBKALRATIO	LNRBKASSETS	LNRBKLIAB
LnRMLANDPRr(-3)	**-0.3190**	**1.1291**	**0.9741**
	(-23.08754)	(21.756O)	(21.6O17)
LnRNK225Pr(-1)	**-0.1572**	**0.4810**	**0.6267**
	(-12.348O)	(7.9O95)	(12.985O)
LNRFBRATIO(-1)	**0.4772**		
	(46.9749)		
LNRPRBRATE		**-0.5728**	**-0.3621**
		(36.8317)	(25.9556)
Constant	**0.7325**	**2.2721**	**2.9436**
Adj. R^2	0.9248	0.9587	0.9578
SER	0.0515	0.2008	0.1757
Log Likelihood	334.5592	42.3199	71.1364
DW	1.9935	1.1745	1.1637
F Ratio	877.77	1663.80	1627.69
n	215	216	216

t-statistics are in parentheses

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Notes

[1] There is a temptation to draw a parallel between Japan's bubble economy of the 1980's and the current stock market in the U.S. One important difference is that as the U.S. stock market has expanded, banks play a smaller role in U.S. financial markets than they have in Japan.

[2] Financial reforms in Japan, as well as in neighboring East Asian economies, place primary emphasis on greater transparency in accounting among banks as well as firms. As keiretsu organizations decline in importance, banks face increasing pressure to generate competitive rates of return on investment, thus generating a more rapid shift to transparent accounting practices.

[3] In Schumpeter's model, the individual entrepreneur is responsible for introducing economic innovation that disturbs the initial circular flow. Although Schumpeter did not utilize the term, one would contend today that the presence of asymmetric information is a necessary condition for such innovation to exist since no economic profit to reward such innovation would arise if all information were symmetrically distributed.

[4] Samuelson's 1965 paper drew on the 1900 doctoral thesis of Louis Bachelier, who put forth one of the first models of option pricing.

[5] Cochrane's position is that the CAPM model can have useful predictive power if one expands the number of variables used in the estimation of beta coefficients.

[6] Santos and Woodford state the case for rational bubbles on the basis of bounded rationality. It leaves open the question of rationality in asset pricing for the economy as a whole.

[7] Charles Mackay's 1841 account of the seventeenth century tulip bubble in Holland and the South Sea Bubble in 1720 is a reminder that asset bubbles have been a feature of financial markets for some time.

[8] Flood and Hodrick conclude that there is no efficient econometric test for asset bubbles, which leaves open the question of predicting the course of future asset bubbles.

[9] Most of these models still do not provide uniform rules for predicting the direction of change in asset bubbles.

[10] Under the keiretsu system, banks in Japan did not have to consider risk diversification as long as there were implicit guarantees of solvency.

[11] Kim and Moreno outline some of the characteristics used in developing the model put forth in this paper.

[12] As observed by Berglof and Perotti, cross-holdings across banks and firms shaped the evolution of governance in Japanese keiretsu, and which may have exacerbated the problem of transparency since no third party could effectively monitor and evaluate the performance of lending.

[13] The use of debentures in Japan is exceptional to the financing model of most developed countries.

[14] Japan's "big bang" financial deregulation echoes the financial liberalization in England in the 1980's. One difference is that Japan's financial system has been closed far more and longer than England's, and the adjustment is more prolonged and profound as a result.