Did Investors Regard Real Estate as "Safe" during the "Japanese Bubble" in the 1980s?

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August 25, 2003

Abstract

It is well known that Japanese banks increased their exposure to land assets and the real estate sector in the latter half of the 1980s, and that this became a primary factor in the non-performing loan problem that emerged in the 1990s. What is less clear, however, is whether this increased exposure was the result of active risk taking, and whether banks and other market participants regarded land and real estate assets as "risky" while real estate prices were increasing dramatically. To address this issue, we rely on the real estate data contained in corporate balance sheets to extract an estimate of the market sentiment toward land assets during the 1985-89 period. We find that the systemic risk of manufacturing companies increased with their real estate holdings but not with other balance sheet assets. This result indicates that market participants regarded real estate holdings as riskier than the main operations of manufacturing companies during the "bubble period", even if they may not have foreseen the subsequent crash in real estate prices.

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1 Introduction

The simultaneous rise in land and stock market prices during the second half of the 1980s in Japan has attracted considerable attention in both the popular press and the academic literature.[1] The decade long recession and the non-performing loan problem that followed the land price collapse have made it clear *ex post* that land was a highly risky asset. Policy discussions have focused on the factors that led investors and banks to increase their exposure to land during the 1980s. Yet, policy conclusions hinge on whether investors and banks were *ex ante* aware of the high risks involved in land investments, or were merely over-optimistic about future land price increases. In short, this paper addresses whether investors and bankers really knew about the high risks associated with land and real estate investment during the "bubble" period.

The economic environment in the 1980s was arguably conducive to the rise of moral hazard problems among bank and firm managers. Evidence suggests that the shareholding and regulatory environment in this period provided few sources of discipline to bank managers.[2] In addition, deregulation of the bond market meant banks faced real competition for the first time. Hoshi and Kashyap (1999) argue that the fall in the value of future profitability that came about with deregulation, and the inability of banks to properly asses investment risk, was a recipe for moral hazard problems.

During this period, banks greatly increased their exposure to land, directly through increased lending to the real estate sector and indirectly through loans that were made to other sectors but collateralized by land. In a banking environment characterized by excess capacity, this increased exposure to land may have reflected active risk taking behavior by bank managers. On the other hand, if the market participants in the 1980s regarded land as "safe", and if they failed to foresee the eventual collapse in land prices because of a

[1] Ogawa and Suzuki (1998, 2000), Ueda (2000), Hoshi and Kashyap (1999, 2001), Ito and Iwaisako (1995), and Stone and Ziemba (1993) are but a few in a large body of work on this topic.

[2] Government guarantees reduced the incentives for depositors, the major liability holders, to monitor bank managers. In addition, bank shareholders were often corporations that received loans from, and were partially owned by, the bank itself, and this cross-shareholding relationship potentially diluted the ability of these shareholders to discipline bank managers.

collective forecasting error, then claims of active risk taking behavior by banks cannot be substantiated. Thus, before investigation of corporate governance problems can meaningfully proceed, a necessary first step is to provide evidence that land was known to be "risky" during the asset appreciation period of the 1980s.

Couched in a simple synthesis of the CAPM and APT asset pricing models, we exploit the real estate asset data on corporate balance sheets to estimate indirectly the contribution of an unobserved real estate "factor" to systemic risk in the 1985-89 period. We find evidence that this unobserved real estate factor was a significant component of systemic risk, but do not find similar results for other asset "factors", including those that may have been alternative collateral choices. Our results imply that investors did recognize, at least to some extent, the riskiness of land during this period. In particular, we find that a one standard deviation increase in our land sensitivity proxies roughly translates into a 5% increase (from sample means) in a manufacturing firm's market beta.[3] Since this analysis rests on data that was readily available to market analysts during the late 1980s, it is somewhat difficult to explain why banks knowingly exposed themselves to land to such a high degree. The results hint at possible corporate governance failures in banks, and call for a more thorough analysis of lending and investment behavior.

The remainder of the paper proceeds as follows. Section 2 more thoroughly discusses the essential background information on the land exposure of both bank and non-bank entities in Japan. Section 3 describes the empirical methodology and data, while section 4 presents our primary empirical analysis. The robustness of our results is discussed in section 5, and the conclusion follows in section 6.

[3] We do not claim that land price appreciation caused stock market appreciation (or vice versa), or gave market participants any indication of *when* the land and asset price collapses might occur. Nor does this paper provide evidence for or against the bubble hypothesis. We show that land holdings increased the systemic risk of listed manufacturing companies, which implies that investors saw these holdings as riskier than the generic operations of these firms. The real estate beta we estimate may have been *too small*, indicating that market participants failed to recognize the *full* consequences of land exposure.

2 Background

Despite empirical evidence that links the non-performing loan problem of the 1990s to the lending practices of the 1980s (Tsuru (2001), Ueda (2000)), direct evidence of active risk taking by, and moral hazard problems in, financial institutions has been elusive.[4] The increased exposure to real estate assets is the most *likely* manifestation of moral hazard problems, but rests on the *1990s perspective* that land was risky. Ogawa and Suzuki (2000) provide evidence that land holdings in the 1980s by Japanese corporations "mitigated the probability of default, which enabled the banks to lend a large amount of loans to the firms" (p.2). In addition, simple balance sheet analysis shows the degree to which banks became exposed to real estate assets, both through lending to the real estate sector and through the increased use of land as collateral.

Yet, did these market participants view land as risky before 1991? With the exception of a *single six month decrease* following the first oil crisis, land prices rose throughout the entire post-war period through 1991. That land prices were exceptional is easily seen in figure 1, which presents the industrial land price index, the wholesale price index for building and construction materials, and the wholesale price index for general machinery from 1961 to 1997. While prices of other physical assets were relatively stable from 1980 on, the growth in land prices remained positive, and accelerated after 1985. An investor holding industrial land in 1980 realized a 60% nominal (38% real) return by 1989, while that on alternative physical assets was near 1% nominal. For the sample of manufacturing firms described below, the average annual growth in the market value of land stocks was around 6% in 1985-1986, but increased to 10% in 1987-88, and to 16% in 1988-89.

2.1 Bank Exposure to Real Estate

Banks' and other financial institutions' exposure to land assets grew on two margins. First, as shown in figure 2, direct lending to the real estate sector increased both absolutely, and

[4] Hoshi and Kashyap (1999) argue that the NPL problem is larger than that of the U.S. Savings and Loan crisis, and Corbett (2000) suggests it may be worse than the financial crisis faced by the Nordic countries.

relative to other loan categories. The first panel shows that real estate loans increased for all bank types. From 1982 to 1989, real estate loans (as a share of total loans) increased from approximately 5.5% to over 12% for city banks, and from 6% to to 11% for regional banks. The share of real estate related loans in the long term credit banks' total loans also increased, while trust banks, which had always lent more heavily, cut back on real estate lending starting in 1987 after warnings from the Ministry of Finance.[5] At the same time, the share of loans to the manufacturing sector decreased from an average of 26% in 1982 to 16% in 1989, while the share of loans to the construction sector remained relatively stable for all bank types. Consistent with the overall hypothesis that bond market deregulation forced the large city, long term credit, and trust banks to seek out new customers, the share of total loans going to small businesses increased for all three bank types over this period.

Concurrently, loans backed by real estate collateral increased for the major banks over the 1980s. Overall, approximately 44% of all *secured* loans were collateralized by land, while only 8% were collateralized by financial assets. Figure 3 displays the share of total loans backed by various collateral types. The share of loans collateralized by land had always been relatively high for regional banks, hovering around 33%. The share for city banks, however, rose from 17% in 1982 to over 24% in 1989; since city banks dominated the corporate loan market, this constitutes a significant shift in loan portfolios. Real estate backed loans by the long term credit and trust banks fell in the early 1980s, stabilized during the land price appreciation, and actually *increased* during the land price collapse of the 1990s, foreshadowing the collapse of the Nippon Credit Bank and the Long Term Credit Bank in later years.

In public statements, Japanese bankers seem to have been well-aware of the high risks involved in real estate loans relative to their other loans before the price reversal, even if they were unlikely to have foreseen the magnitude of the eventual crash. For example, in 1987,

[5] Tsuru (2001) finds a positive correlation between changes in the share of loans to the real estate sector and land price appreciation, but no correlation for other loan categories, and takes this as evidence that banks shifted their portfolios in response to rising land values. Dinc (2003) provides evidence that the presence of large shareholders (of banks), or those best able to monitor, *restrained* bank managers from real estate lending during the 1985-89 period, but that the ability of these shareholders to do so depended on the degree of bank ownership by other firms within the same Keiretsu group. Also see Horiuchi and Shimizu (2001) for the role of *Amakudari* in regulator monitoring of banks.

more than three years before real estate prices started their eventual decline, Kenichi Komiya, the then president of Mitsui Bank as well as the president of the Federation of Bankers Association of Japan, publicly stated that "the association recognized the importance of limiting the amount of money lent to finance land purchases. The association recommended its members [to] tighten up their lending procedures and...carefully investigate the uses to which the land in question is to be put."[6]

2.2 Corporate and Individual Exposure to Real Estate

Although the relationship between bank health, the non-performing loan problem, and banks' exposure to land has received considerable attention, the land price collapse had severe consequences for individual investors and corporations as well. Japanese tax law provides incentives for individual investors to hold real estate assets since inherited land is valued at well below market price, while other assets are valued at full market price. In addition, relative to the U.S., average property taxes were quite low, at .39%, and interest expenses deductible, making investment in land with borrowed money attractive to investors seeking to lower ordinary and estate taxes (Stone and Ziemba (1993)). Noguchi and Poterba (1994) report that the average house price to average annual income ratio is 7.4 for Japan, while only 3.2 for the U.S., implying that Japanese households spend about twice as much on owner occupied housing. Using individual level panel data from the Nikkei RADAR database, Iwaisako (2003) finds that over 60% of the sample population over the age of 40 owned real estate in 1987, and this share rises to over 80% for cohorts over the age of 60. In addition, real estate assets comprised roughly 50% of total individual wealth in 1987 for the sample as a whole, whereas equity ownership comprised less than 5% of total wealth. The share of real estate assets in total wealth reached 50% for those aged 35-39, and increased to over 70% for those in their mid 50s.

The Japanese corporate sector was also heavily exposed to real estate assets. Reflecting the boom in real estate prices, the number of listed real estate firms increased from 21 in 1980

[6]Kyodo News International, 27 October 1987.

to 39 in 1990, with the largest increase occurring between 1985 and 1989 when land price increases accelerated. In addition, the number of listed construction companies increased from 132 in 1980 to 160 in 1990. This increase, however, likely understates the effect of the real estate boom on business creation, as many of the real estate development and leasing companies that emerged were unlisted small and medium sized firms. To illustrate the extent to which corporations were exposed, Ziemba and Schwartz (1991) calculate the P/E ratios of large Japanese companies for the 1980s, and find a more substantial drop when land is factored out than when other asset types are removed. As an example, Nippon Steel had a P/E ratio of 101.5 in 1988, but only 83.3 once land is removed.

For listed firms as a whole, land exposure increased dramatically in the second half of the 1980s, both because of the rise in land prices, and because of large real estate investments. Corporations were already the major purchasers of real estate assets throughout the 1970s. Yet, corporate investment in land assets increased substantially during the land price appreciation of the 1980s; net land purchases by corporate entities between 1985-89 totaled 28 trillion yen, dwarfing their 3 trillion yen investment between 1980 and 1985 (Cutts (1990), Stone and Ziemba (1993)). These real estate purchases were often used to house employees at subsidized rental rates, although there is growing evidence that land intensive manufacturing firms may have enjoyed lower financing costs.[7] Land comprised roughly 30% of the market value of total assets for listed *manufacturing* firms in the 1980s, a much larger share than any other tangible asset.

The land price and stock market collapse in the early 1990s had a severe impact on the financial health of individuals, firms, and banks.[8] From 1991 to 2001, industrial land prices fell by 22%, commercial land prices by 54%, and residential land prices by 41%. Iwaisako

[7] Ogawa and Suzuki (1998, 2000).

[8] Using aggregate stock market measures (such as the Nikkei 225 or the Topix indices), it has been well documented that stock prices over the relevant period were more volatile than land prices, and that (a) there was little co-integration between stock indices and land prices (Hamao and Hoshi (1991), Stone and Ziemba (1992)), and (b) movements in stock prices tended to *lead* movements in land prices by at least one year (Canaway (1990), Ito and Iwaisako (1995)). For example, Ito and Iwaisako (1995) show that the simple correlation between current period excess land returns (over the call rate) and excess stock returns is only .05, but increases to .35 when $t-2$ period excess returns are used.

(2003) reports that total wealth of individuals decreased nearly 50% from 1990 to 1999, while financial wealth (wealth composed of stocks, mutual funds, and other financial assets) actually increased by 5 to 10%. He reports that the decline in total wealth is explained almost exclusively by the fall in real estate value over this period.

For corporate Japan, the fall in land prices led to a decrease in collateral value which increased the cost of capital for firms, and simultaneously halved the collateral value already on bank balance sheets. As a result, many banks were forced to call in loans that firms were often unable to repay. In addition, many real estate development companies and the *Jusen* lending institutions (many of which were affiliates of the large City banks) went bankrupt when land prices failed to recover quickly, leaving banks and individual investors with ties to these industries without recourse.

3 Methodology and Data

Our aim is to analyze the risks involved in real estate investments as perceived by the investors in the 1985-89 period. If real estate holdings were frequently traded in the market, or if there were Real Estate Investment Trusts (REITs), one could estimate the market beta for real estate directly. Unfortunately, no such security existed in Japan during the period of interest. Hence, we study securities whose return is likely to be partially affected by the return on real estate assets. Towards that aim, the analysis below focuses on listed manufacturing firms whose stock return is partially determined by their large land holdings. Since the market return to their land holdings is not observed nearly as frequently as their stock return, we first estimate the market beta of these securities and then study the effects of their land holdings on their beta.[9]

This analysis is couched in a simple synthesis of the APT and CAPM asset pricing models, and this is described in the appendix. This synthesis yields a decomposition of the market beta of a particular security into the weighted sum of factor "sensitivity" parameters,

[9]Using the same methodology, Saunders et al. (1990) study whether managerial shareholding is associated with higher risk taking by banks. See, also, Chen, Steiner, and Whyte (1998, 2001), Beason (1998), May (1995), and Lewis, Rogalski, and Seward (2002).

while offering no guidance on what the underlying factors actually are. The weights on these parameters are the unobserved betas of the factors, and can be estimated with appropriate measures of the factor sensitivities. Using listed firms as our universe of securities, our strategy is to proxy for the sensitivity parameters using variables from the firm's balance sheet. In particular, we assume that the real estate sensitivity parameters are well measured by the ratio of the value of land and real estate holdings to total firm value.

Whether this is a good assumption will depend on the asset composition of the firm. Firm value is the sum of the market value of all assets (both tangible and intangible, realized and unrealized). Construction and real estate development firms own relatively little land, but their business operations are strongly tied to the real estate market. In addition, their intangible assets (e.g. brand recognition, good will) are likely highly correlated with developments in the real estate market, and should also be reflected in the stock price. Thus, the ratio of physical land (owned by the firm) to the firm's market value is likely to underestimate the sensitivity of the firm's stock return to the real estate factor.

Manufacturing firms, on the other hand, own considerable tracts of land, and their operations are generally not directly tied to the real estate market. Thus, the sensitivity of their stock price to the real estate factor is likely well proxied by this ratio. It is still possible that manufacturing firms are exposed to real estate through cross-shareholding with firms tied to the construction or real estate markets, and the use of the land/firm value ratio as a proxy will not capture this additional sensitivity. However, the value of these cross-shareholdings is small relative to the stock of land.

In the first step, each firm's market beta is estimated separately for each year using

$$RI^f_{i,t} = \alpha_i + \beta^M_i RM^f_t + \epsilon_{i,t}, \tag{1}$$

where t indexes weeks, $RI^f_{i,t}$ is firm i's annualized excess return in week t, RM^f_t is the annualized excess market return in week t, and $\epsilon_{i,t}$ is a white noise error term.[10] This generates a yearly series for each firm of $\hat{\beta}^M_i$, the estimates of β^M_i, which are then stacked to

[10]We use the stock price *index* for each firm instead of the stock price itself in calculating excess firm returns because the former is adjusted for stock splits and inter-period dividend payments.

form the dependent variable in

$$\hat{\beta}^M_{i,t} = \alpha_i + \beta^C X_{i,t} + \beta^M_{RE} LAND_{i,t} + \epsilon^\star_{i,t} \tag{2}$$

where t indexes years, $X_{i,t}$ is a vector of firm and year control regressors, $LAND_{i,t}$ is our proxy for firm i's sensitivity to real estate, $\epsilon^\star_{i,t}$ is a white noise error term, and β^C and β^M_{RE} are to be estimated.[11]

The main variable of interest is $LAND_{i,t}$. A positive coefficient on this variable would indicate that the exposure to real estate is positively correlated with the systemic risk of the firm. To the extent that this correlation is stronger than that of other assets, such a result would be consistent with investors recognizing and pricing the riskiness of land. Note, however, that this says nothing about whether land risk was *accurately priced*. Investors may still have underestimated the riskiness of real estate, but a positive coefficient on the $LAND_{i,t}$ measure in equation 2 will imply that investors knew that real estate was on average riskier than investing in manufacturing companies. Different measures of $LAND_{i,t}$ are used for robustness, and further checks are provided by using (as dependent variables) the standard deviations of the regression residuals from equation 1 (an estimate of the firm's idiosyncratic risk), as well as the standard deviations of raw stock returns (an estimate of total firm risk).

The firm balance sheet data is taken from the financial database of the Japan Development Bank, which contains detailed accounting data for all non-financial listed firms. This balance sheet data is supplemented with weekly stock price data from Datastream. The annualized weekly yield on the three month Japanese government bond is used as the risk free rate, while the weekly Nikkei 225 index is used to calculate the market return. Requiring that all data be available for manufacturing firms over the 1985-96 time period, and that firms be continuously listed from 1983-1996, leaves a sample of 576 manufacturing firms.

The use of the book value of assets, as listed on Japanese corporate balance sheets, is likely to be problematic in this analysis. Japanese law permitted firms to record physical

[11] The constant term, α_i, contains a firm specific component, a result of the inclusion of the market portfolio as a factor in the APT equation (see appendix). Because our panel covers a very short time span, our estimates are driven by variation in the cross section of firm returns, which tend to be washed out in fixed effects models. As described below, a variety of firm specific controls as well as industry and year dummies are included in each regression.

assets at historical cost, which has led to a large discrepancy between their book and market values. Thus, to the extent possible, the book values of all assets have been converted to market value. For each firm, the market value of each physical asset is calculated using a perpetual inventory method similar to that in Hayashi and Inoue (1991), with asset specific price series and depreciation rates.[12] In particular, the construction of the market value of land involves a LIFO recursion using land prices from the Urban Land Price Institute, and is similar to the procedure used by Hoshi et al. (1990).[13] The market value of total assets, denoted TA, is the sum of the market values of all physical assets plus financial assets. For the latter, the book value is taken as the market value under the assumption that the rate of financial asset turnover is high.

Table 1 presents sample statistics for the variables used in the empirical analysis. Since many listed firms acquired their land in the pre-war era, there is an enormous discrepancy between the observed book value of land ($BLand$) and the unobserved market value ($Land$). The mean and median of $BLand/BTA$ are around 4% throughout the sample period, while those for $Land/TA$ are roughly five times larger, at 19%. The figures also contain evidence on the extraordinary growth in land prices *relative to other asset prices*. The last six rows of the table contain the ratio of the market value of land, buildings, and machinery to their corresponding book values. While the above accounting issues applied to all of these assets, the discrepancy between the book and market value of non-land physical assets is far smaller than that of land. The market value of land is roughly 7 times its book value on average, while the market values of machines and buildings are less than twice their book values.

[12]Non-land physical assets include buildings, structures, machines, transportation equipment, and tools.

[13]This land price index is the most common series used in econometric work on Japan. The institute generates indices for industrial, commercial, the highest priced lots, and for all land in the six largest cities and the country as a whole from 1955. The data is appraisal based, where simple averages of three sets of ten lots in each city covered in the survey are used to construct the index. Land is separated into high, medium, and low grades, reflecting location, yield, and other factors, and lots are randomly selected from these three classes. Ideally, one should use the land price index that corresponds to the actual geographic location of each *plant* in each firm. However, the firms in our sample are large, with multiple plants in numerous geographic areas. Even with data on the location of the headquarters of each firm, this correction could over-estimate the value of land, as many firms have their headquarters in Tokyo or Osaka, but base their operations elsewhere. Since we have no data on actual factory location, and because we restrict our sample to manufacturing firms, we follow the standard in the investment/Q literature on Japan and use the national industrial price index as our price series.

This is partially explained by the fact that land is not a depreciable asset.

4 Empirical Analysis

This section presents the primary results from the estimation of equation 2. The dependent variable, β_i^M, is calculated with *current* period weekly return data, whereas all independent variables are *beginning of period* values taken from the balance sheet data contained in the JDB database. Each OLS regression presented below contains a full set of industry and year dummies, and a dummy variable that equals one if the firm had a non-twelve month accounting period.[14] All reported t statistics and standard errors are heteroskedasticity consistent, and calculated with an estimated variance/covariance matrix adjusted for clustering by firm.[15]

Although the results are robust to a wide range of control variables, only those with control variables used elsewhere in the literature are presented. The log of gross sales, $ln(Sales)$, is a control for firm size, EBITDA over sales, $Prof/SL$, is a measure of profitability, and total debt over market capitalization plus total debt, $Leverage$, controls for leverage effects.[16]

Several measures are used as proxies for sensitivity to the unobserved real estate factor, $LAND_{i,t}$, in equation 2. Simply including the stock of land as a regressor is problematic because of the heterogeneity in firm size. *If* land is risky, larger firms can hold more land than smaller firms without adversely affecting their risk premium. Thus, we focus on measures of asset composition. $BLand/BTA$, defined as the book value of land over the book value of total assets, is an obvious choice, but may be problematic because of the large discrepancy between the market and book values.[17]

[14] Our results are robust to the exclusion of this variable.

[15] This relaxes the assumption that observations across years are independent within each firm.

[16] We also experimented with numerous corporate governance variables that have been the subject of other studies (e.g. ownership structure, corporate affiliation) to ensure that claims we make about our variables of interest are robust. For brevity, these have been excluded.

[17] Conceptually, if the measurement error in the book value of land and that in total assets has a common source, then the ratio may be an accurate measure of land intensity. However, because all fixed assets are carried at historical cost, book total assets contains measurement error beyond that introduced by the book value of land.

Table 2 presents the first set of empirical results based on estimation of equation 2. The first column contains only the control variables as regressors, and shows a positive and significant relationship between beta and the leverage and size regressors, but a negative relationship between beta and profitability. In other words, the systemic risk of manufacturing firms increases with their size and leverage but decreases with their profitability.

In the second column, $BLand/BTA$, the book value of land over the book value of total assets, is included as a proxy for the firm's sensitivity to the real estate factor. In the 1985-89 period, this enters *negatively* (but is insignificant), suggesting at most a weak, negative correlation between risk and land exposure. For the 1990-96 period (results not presented), $BLand/BTA$ is again negative, but now significant. This is somewhat counterintuitive, as land prices collapsed after 1990, and suggests not only that investors did *not* recognize the riskiness of land during the asset appreciation period, but that firms with more land during the *land price collapse* were viewed as less risky. Hence, the negative coefficient on the $BLand/BTA$ variable more likely illustrates the severe measurement error caused by using historical rather than market prices in valuing land held by these companies.

Consistent with this hypothesis, the pattern is reversed in the third column where $Land/TA$ is used in place of $BLand/BTA$. The coefficient on $Land/TA$ is positive and significant, while the signs of the coefficients on the control regressors are similar. Although interpretation of the size of the coefficient on $Land/TA$ is difficult because we do not have a corresponding model of investor risk aversion, the results suggest that a one standard deviation increase in $Land/TA$ leads to an increase in the firm's beta coefficient of $.3204 * .119 = .038$, or roughly a 5% increase from the sample mean. This is nearly *double* the effect of a marginal increase in the leverage ratio.

There are several potential measurement error issues to consider. In constructing the market value of total assets, it is assumed that the book and market value of *financial* assets are equal. This is not necessarily restrictive since, on average, 40% of financial assets are cash and short term securities and an additional 20% are other short term assets. However, if there is a large divergence between the market and book value because of the unmeasured market value of royalties, patents, brand name recognition, and research and development capital, then normalization by our measure of total assets may be problematic.

To investigate this possibility, the remaining columns of the table include alternative proxies for the sensitivity to the real estate factor. If capital markets are efficient, investors should capitalize all assets regardless of how they are recorded on the balance sheet. This implies that firm value perfectly reflects the these intangible assets, and is a potentially better normalization variable.[18] The third column presents the results using $Land/FV$ defined as the market value of land normalized by firm value (market capitalization plus gross debt). It enters significantly at the 10% level, but the coefficient has dropped from .32 to .11, and now implies that a one standard deviation increase in the land proxy translates into a 2.05% increase in beta (from sample mean). Whether this weaker result is because the original $Land/TA$ measure overstates the land-risk relationship, or because $Land/FV$ introduces *more* measurement error is difficult to sort out.

In support of the previous results, however, the remaining columns repeat these regressions using alternative sensitivity proxies (defined below) for $LAND_{i,t}$ in equation 2. Financial assets were used as collateral in only 8% of secured loans during the relevant period. However, firms with a substantial stock of reserve cash and other liquid assets may be considered better able to weather adverse shocks, implying a negative correlation between financial assets and firm risk (confirmed below). This variation in financial assets across firms could generate a positive coefficient on the real estate sensitivity proxy when total assets (which includes financial assets) is the normalization variable. Thus, a better measure may be $Land/FA$, defined as the market value of land over the market value of *fixed* assets. As shown in the fifth column, the coefficient on $Land/FA$ is roughly double that on $Land/FV$ in the preceding regression, and is significant at the 1% level. As with $Land/TA$, a one

[18]This is the fundamental assumption behind the estimation of R&D capital, the benefits of IT technology, and other "intangibles" using U.S. data. See Hall (1993), Hall (2001), and Brynjolfsson and Yang (1999) for discussion and applications. Note, however, that the possible existence of an asset price "bubble" in Japan in the second half of the 1980s may mean that normalization by firm value will introduce non-fundamental components into the regressor. We cannot address this issue directly, making it unclear as to whether this is a better measure.

standard deviation increase in $Land/FA$ is correlated with roughly a 5% increase in beta.

Similarly, because of the problems with all these asset measures, gross sales is often used as a proxy for firm size (total assets) in empirical work based on Japanese data. Land normalized by gross sales, $Land/SL$, enters positively and is highly significant in the sixth column, and has a slightly larger effect on the dependent variable; a one standard deviation increase leads to a 5.5% increase in beta.

It is possible that land is highly correlated with *other* real estate assets that may be risky, while land itself is not. The last column contains the results where $Real/TA$, defined as the market value of land *plus* the market value of buildings and structures over the market value of total assets, is used as the sensitivity proxy. The coefficient on $Real/TA$ is *smaller* and (slightly) less significant than that on the original $Land/TA$ regressor, suggesting a negative correlation between buildings and structures and the firm's market beta. This is consistent with the use of physical structures as collateral assets, and suggests that the earlier estimates were not driven by correlation between land and other real estate assets. We address this issue thoroughly in the next section.[19]

Taken together, the results from table 2 are consistent with the hypothesis that market participants *knew* land to be risky in the 1985-89 period. Our real estate sensitivity proxies are always positive and significant, implying that the beta on the real estate factor is positive and significant. The next section further establishes this primary result by incorporating other asset "factors" into the empirical framework.

[19]The denominator of *Leverage* also contains the firm's market capitalization, thus possibly introducing measurement error through the leverage ratio. All regressions presented in table 2 were run using the coverage ratio in place of $Prof/SL$ and *Leverage*, where $ln(Cov\ Rat)$ is defined as the log of one plus the ratio of interest expenses over EBITDA. Like *Leverage*, firms with higher debt (and thus higher interest payments) and lower cash flow should be viewed as more risky, and the coefficient on $ln(Cov\ Rat)$ is expected to be positive. In all cases, this regressor enters positively, and is generally significant, although the size of the regressor is smaller than when the leverage ratio is used. The measures of land intensity are virtually unchanged, and these results have been omitted for brevity.

5 Robustness

This section explores several alternative specifications to ensure that the results presented above are robust. We first consider exposure to alternative assets, including those that could have been used as collateral assets. Second, cross-shareholding relationships in Japan may imply that investors cannot diversify away idiosyncratic risk. Thus, we examine the correlation between measures of idiosyncratic (and total) risk and our various proxies for sensitivity to the real estate portfolio. Third, we test our results using market beta's calculated from a multi-factor CAPM equation. Fourth, we consider alternative time periods. Finally, a well known problem in the estimation of market betas is the "non-synchronous trading bias"; a discussion of this issue, as well as results based on corrected risk measures, is presented in appendix 7.2.

5.1 Alternative Assets

It is possible that the proxy for real estate sensitivity is correlated with components of systemic risk which result from exposure to other, uncontrolled for factors. In particular, land holdings may proxy for new investment, as land was typically used as collateral in obtaining loans from banks. If new investments increase the systemic risk of a firm, the results presented in the previous section may be capturing the riskiness of new investment, and not the risk associated with land per se. To address this issue, we study the factors related to non-land real estate assets, assets tied to the operation of the firm, and financial assets, and then proxy for the sensitivity to these factors using ratios similar to those used for land. As reported in table 1, land comprised about 40% of the market value of fixed assets, machines and tools about 35%, and buildings and structures about 24%, implying that exposure to these latter asset types was considerable.

The results of these experiments are presented in tables 3-5. In the first column of table 3, systemic risk is regressed on the control variables and on a proxy for the sensitivity to the return on non-land real estate assets, $Bldg/TA$, defined as the market value of buildings and structures over the market value of total assets. This regressor enters negatively, but with standard errors roughly 40 times larger than the estimated coefficient. In the third column where buildings and structures are normalized by firm value, the coefficient is positive, but even more imprecisely estimated. Similar results follow in regressions where fixed assets or sales are used to normalize the numerator. For each of these regressions, we also include the corresponding $LAND_{i,t}$ proxy, which is the market value of land over the corresponding denominator. In all cases, these regressors enters positively and significantly, and, in addition, the coefficients on the non-land real estate regressors are everywhere insignificant when the land regressor is included.

This experiment is repeated using machines and tools in table 4, and using financial assets in table 5. The results for machines and tools are similar to those for buildings and structures discussed above, but those for financial assets deserve comment. In the first column of table 5, Fin/TA, defined as financial assets (assumed equal to book value) over the market value of total assets, enters negatively and significantly; evidence that those firms with a larger share of financial assets have lower systemic risk. This proxy becomes insignificant when $Land/TA$ is included as a regressor, implying a negative correlation between Fin/TA and $Land/TA$. Since both land and financial assets are relatively large shares of total assets, the inclusion of both regressors may introduce multicolinearity. However, these regressions were repeated in the remaining columns of the table after normalizing all assets by firm value, fixed assets, and gross sales, and similar results are obtained.[20]

5.2 Idiosyncratic and Total Risk

The above analysis rested on the decomposition of beta that falls out of a synthesis of the CAPM and APT models. However, it is often of interest to examine the components of idiosyncratic and total risk, particularly if agents cannot easily diversify their portfolios. Idiosyncratic risk should be irrelevant if investors maintain a well diversified portfolio. However,

[20] Transportation equipment is a small fraction of fixed assets for manufacturing firms. We experimented with this individually, and included this with machines and tools, but with no quantitative or qualitative effect on the results.

unlike in the U.S., a significant portion of shares in Japan are held by financial institutions and other corporations. In particular, banks hold shares in many large companies as part of their main bank relationships. Because these banks cannot adjust their portfolio easily without affecting these relationships, they will be exposed to idiosyncratic risk as well.[21]

Similarly, many large manufacturing firms in Japan maintain close ties with supplier firms as part of a *vertical* Keiretsu chain (e.g. Toyota, Matsushita). It is argued that the cross-shareholding in these vertical chains helps to mitigate holdup problems inherent in subcontracting relationships. These shareholder connections may imply that the value to the firm (or bank) of holding shares may extend beyond that asset's contribution to the firm's portfolio. These agents may choose *not* to diversify away idiosyncratic risk because the information/stability benefits of maintaining the shareholding tie outweigh the financial costs of holding volatile shares. Thus, idiosyncratic risk measures are potentially important in our analysis.

The summary statistics for both the idiosyncratic and total risk measures are presented in table 6, while table 7 presents the results from regressions where these measures are regressed on the independent variables discussed in the main text. All the land measures have positive and, with the exception of the value of land normalized by firm value ($Land/FV$), statistically significant coefficients. These results indicate that that real estate exposure is also a significant component of idiosyncratic and total risk.

5.3 Multi-Factor Risk Measures

The systemic risk measure from the single-factor CAPM theoretically contains all risk priced by the market. It is possible that the correlation between the real estate sensitivity proxies and systemic risk are driven by the interest rate component of the dependent variable. The

[21] It is often argued that large banks give implicit guarantees to help firms that enter financial distress, and that the shareholding tie helps reduce problems of asymmetric information. Alternatively, bank shareholding may be a vehicle by which banks extract rents from client firms. Either of these imply that banks may *choose* not to divest shares of risky firms as part of a portfolio management strategy in the way a neutral investor would. See Aoki and Patrick (1994) and Hoshi and Kashyap (2001) for descriptions of relationship banking in Japan.

systemic risk measures used in this section are based on the multi-factor market model that includes the long term interest rate and the yen/dollar exchange rate as factors (as well as the market return), and the resulting beta is a measure of systemic risk which is *independent* of interest or exchange rate exposure.

Table 8 presents the results using this alternative measure and our four proxies for sensitivity to the real estate portfolio. Relative to the results in table 2, the coefficients on our proxies are all larger, and generally *more* significant. Based on these estimates, the effect of a marginal increase in land intensity on systemic risk is roughly equivalent to the effect of a marginal increase in the leverage ratio, a smaller effect in relative terms than that documented above, but arguably more precisely estimated. The real estate sensitivity proxies perform less consistently in the idiosyncratic and total risk regressions; they are less often significant and relatively volatile across model specifications. These have been omitted for brevity.

5.4 Alternative Time Periods

A positive correlation between systemic risk and the real estate factor was documented above for the 1985-89 period. Ideally, these results should be compared with estimates from the period prior to the acceleration in land price increases (i.e. 1980-85). Unfortunately, the weekly risk free rate is unavailable before 1985, thus preventing the calculation of our primary dependent variables. A second best robustness check, however, is a comparison with the 1990s, when it was clear that exposure to real estate was risky. This comparison serves as a robustness check on the overall appropriateness of the regression model and the choice of control variables.

Table 9 presents the results where the dependent variables are systemic risk, idiosyncratic risk, and total risk. The first column of each section of the table lists the results for the entire 1985-96 period, and the second column lists those for the 1990-96 period. For the 1990s, as well as for the 1985-96 period overall, our main proxy for sensitivity to the real estate portfolio, $Land/TA$, is everywhere positive and significant, with coefficients slightly larger than those documented for the 1985-89 period. Results using the other proxies are similar to those presented earlier, and are omitted.

6 Conclusion

This paper has documented a strong positive correlation between land intensity in manufacturing firms and measures of systemic firm risk during the 1985-89 period. Couched in theory that synthesizes the CAPM and the APT models, our results can be interpreted as estimates of the beta coefficient on an unobserved real estate factor. The consistently positive and significant coefficients on our real estate sensitivity proxies suggest that real estate was a significant contributor to systemic market risk during the asset appreciation period. Moreover, we are unable to establish similar results for other asset types. To the extent that shareholders of manufacturing firms were a diverse group of market participants, our results imply that investors did appreciate, at least to some extent, the riskiness of land prior to the asset market collapse, and call into question claims made by bank and firm managers during the 1990s that it was impossible to know that land was risky.

Our results do not imply that the investors had foreseen the subsequent crash in land prices, but they do indicate that investors were aware of higher risks of land investments relative to the equity of manufacturing companies. Our results also have implications for studies of the U.S. stock market during the most recent business cycle. For whatever reasons market participants invested in U.S. equities during that period, it is unlikely they were unaware of higher risks. Our results have especially strong implications for studies of the Japanese financial environment in the 1980s and after. The non-performing loan problem that surfaced in the 1990s was a direct result of the financial sector's excessive exposure to real estate in the late 1980s. Whether this exposure was the result of bad judgement on the part of bank managers, or symptomatic of much larger corporate governance failures that arose when banks moved into competitive markets, is an open, but important, question.

We are exploring this broader issue in a series of separate papers. As discussed above, Dinc (2003) has shown that the share of real estate lending by banks is positively correlated with weak bank ownership structures. This paper, the second part of this ongoing project, is a critical element because of the lack of evidence to date on how investors viewed land. Without evidence of a "risky asset", claims that bank managers *knowingly* engaged in risky lending behavior are much less convincing.

The third part of our analysis, and the subject of future research, is the most critical. We plan to address the question of whether those banks that faced the *largest increase* in competitive pressures in the late 1980s were also more likely to lend on land collateral, or directly to the real estate industry. Our hypothesis is that *if* land was "known" to be risky by market participants, then a higher exposure to real estate loans and land collateral by banks that faced the harshest competitive pressures would be evidence of risk taking behavior by bank managers, and indicative of corporate governance failures in banks during this period. In addition, we may expect that firms that were closely tied to such banks to have invested more heavily in land, particularly if banks had market power over these firms through shareholding ties.

Table 1: **Sample Statistics for Risk Regressions**

Table presents sample statistics for 576 manufacturing firms that were continuously listed from 1983 to 1996. β_i^M is the firm beta coefficient, $ln(Sales)$ is the log of real sales, $Prof/SL$ is operating profit over gross sales, $Leverage$ is total debt over total debt plus market capitalization, $Land/FA$, $Land/TA$, $Land/FV$, and $Land/SL$ are the market value of land divided by the market value of physical assets, the market value of total assets, the market capitalization plus total debt, and gross sales, respectively. $Bldg/FA$, $Mach/FA$, $Bldg/TA$, $Mach/TA$, Fin/FV, and Fin/TA are corresponding variables with the market value of buildings and structures, machines and tools, and financial assets in the numerator. $BLand/BTA$ is the book value of land over the book value of total assets. $MLand/BLand$ is the ratio of the market value of land to the book value of land, $MBldg/BBldg$ is the ratio of the market to the book value of buildings and structures, and $MMach/BMach$ is the ratio of the market value to the book value of machines and tools. See the data appendix for details on the construction of the market value of all assets.

Variable	**Period**	**Mean**	**Std Dev**	10th Pctile	Median	90th Pctile
β_i^M	85-89	0.750	0.527	0.078	0.774	1.361
	90-96	0.948	0.377	0.472	0.947	1.424
$ln(Sales)$	85-89	18.206	1.181	16.803	18.039	19.845
	90-96	18.442	1.202	17.040	18.317	20.083
$Prof/SL$	85-89	0.051	0.051	0.007	0.045	0.104
	90-96	0.039	0.053	0.005	0.035	0.088
$Leverage$	85-89	0.151	0.112	0.029	0.127	0.304
	90-96	0.197	0.127	0.044	0.178	0.374
$BLand/BTA$	85-89	0.047	0.033	0.013	0.041	0.084
	90-96	0.057	0.041	0.016	0.049	0.105
$Land/TA$	85-89	0.193	0.119	0.065	0.170	0.350
	90-96	0.199	0.123	0.068	0.175	0.367
$Land/FV$	85-89	0.140	0.139	0.034	0.103	0.276
	90-96	0.188	0.175	0.049	0.144	0.377
$Land/FA$	85-89	0.412	0.174	0.195	0.401	0.643
	90-96	0.412	0.171	0.200	0.396	0.644
$Land/SL$	85-90	0.273	0.282	0.069	0.199	0.538
	90-96	0.331	0.440	0.084	0.233	0.661
$Real/TA$	85-89	0.293	0.126	0.147	0.277	0.462
	90-96	0.309	0.130	0.159	0.292	0.492
Fin/TA	85-89	0.549	0.141	0.366	0.552	0.730
	90-96	0.534	0.144	0.347	0.537	0.718
Fin/FV	85-89	0.351	0.113	0.218	0.343	0.491
	90-96	0.444	0.123	0.299	0.436	0.603
$Bldg/TA$	85-89	0.100	0.038	0.057	0.096	0.146
	90-96	0.109	0.043	0.062	0.104	0.157
$Bldg/FV$	85-89	0.067	0.036	0.029	0.061	0.113
	90-96	0.096	0.048	0.043	0.088	0.153
$Mach/TA$	85-89	0.156	0.083	0.056	0.148	0.267
	90-96	0.156	0.083	0.055	0.145	0.272
$Mach/FV$	85-89	0.067	0.036	0.029	0.061	0.113
	90-96	0.096	0.048	0.043	0.088	0.153
$MLand/BLand$	85-89	7.292	8.443	1.835	5.225	13.145
	90-96	6.335	8.142	1.750	4.416	11.347
$MBldg/BBldg$	85-89	1.692	0.358	1.331	1.641	2.108
	90-96	1.529	0.282	1.261	1.496	1.822
$MMach/BMach$	85-89	1.985	0.586	1.420	1.894	2.653
	90-96	2.095	0.766	1.423	1.937	2.885

Table 2: **Systemic Risk and Land Sensitivity**

Table presents results for OLS regressions on 576 manufacturing firms that were continuously listed from 1983 to 1996. The dependent variable is β_i^M, the market beta from the single-factor CAPM model estimated with weekly stock price data. $ln(Sales)$ is the log of real sales, $Prof/SL$ is operating profit over gross sales, $Leverage$ is total debt over total debt plus market capitalization. $BLand/BTA$ is the book value of land over the book value of total assets. $Land/TA$, $Land/FA$, $Land/FV$ and $Land/SL$ are defined as the market value of land over the market value of total assets, the market value of fixed assets, market capitalization plus gross debt, and gross sales, respectively. $Real/TA$ is the market value of land plus buildings and structures over the market value of total assets. All regressors are end of period $t-1$ values. All regressions include unreported year and industry dummies, and a dummy that equals one if the firm has a change in its accounting period. The heteroskedasticity consistent standard errors (in parentheses) have been adjusted for clustering by firm.

Period 1985-89 **Dependent Variable: Systemic Risk** β_i^M							
Constant	-.6708	-.6565	-.8317	-.7148	-.8509	-.8155	-.8522
	(.1663)^a	(.1677)^a	(.1686)^a	(.1689)^a	(.1689)^a	(.1721)^a	(.1707)^a
$ln(Sales)$	.0689	.0687	.073	.0699	.0733	.0752	.0722
	(.0084)^a	(.0085)^a	(.0084)^a	(.0085)^a	(.0083)^a	(.0086)^a	(.0083)^a
Leverage	.1964	.1968	.1774	.1761	.1831	.1504	.1795
	(.0902)^b	(.0902)^b	(.0904)^b	(.0904)^c	(.0905)^b	(.0929)	(.0899)^b
$Prof/SL$	-.2173	-.2137	-.0677	-.1667	-.1261	-.1563	-.078
	(.2086)	(.2093)	(.2144)	(.2141)	(.2168)	(.2142)	(.2132)
$BLand/BTA$		-.1694					
		(.284)					
$Land/TA$			.3204				
			(.0873)^a				
$Land/FV$				.1107			
				(.0597)^c			
$Land/FA$					.2053		
					(.061)^a		
$Land/SL$						.1466	
						(.0472)^a	
$Real/TA$							.3031
							(.0842)^a
R^2	.17	.17	.174	.171	.174	.175	.174
Ob. Num.	2970	2970	2970	2970	2970	2970	2970
Ind Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Table 3: **Systemic Risk and Buildings/Structures**

Table presents results for OLS regressions on 576 manufacturing firms that were continuously listed from 1983 to 1996. The dependent variable is β_i^M, the market beta from the single-factor CAPM model. $ln(Sales)$ is the log of real sales, $Prof/SL$ is operating profit over gross sales, $Leverage$ is total debt over total debt plus market capitalization, $Bldg/TA$, $Bldg/FV$, $Bldg/FA$, and $Bldg/SL$ is the market value of buildings and structures over the market value of total assets, over market capitalization plus gross debt, over the market value of fixed assets, and over gross sales, respectively. $LAND$ is the *corresponding* ratio of the market value of land over each of the above. All regressors are end of period $t-1$ values, and all regressions include unreported year and industry dummies, and a dummy that equals one if the firm changes its accounting period. The heteroskedasticity consistent standard errors (in parentheses) have been adjusted for clustering by firm.

Period: 1985-89 Dependent Variable: Systemic Risk β_i^M								
$Constant$	-.6701	-.8407	-.6709	-.7121	-.597	-.7953	-.7429	-.8362
	$(.1673)^a$	$(.1705)^a$	(.1669)	$(.1687)^a$	$(.1668)^a$	$(.1755)^a$	$(.1682)^a$	$(.1719)^a$
$ln(Sales)$	.0689	.0729	.0689	.0705	.0686	.0726	.0714	.0758
	$(.0085)^a$	$(.0084)^a$	(.0085)	$(.0085)^a$	$(.0083)^a$	$(.0083)^a$	$(.0085)^a$	$(.0086)^a$
$Leverage$	.1963	.1776	.1962	.1839	.184	.1799	.1517	.1329
	$(.0901)^b$	$(.0902)^b$	$(.0916)^b$	$(.092)^b$	$(.0901)^b$	$(.0903)^b$	(.0937)	(.0953)
$Prof/SL$	-.2173	-.0671	-.2171	-.174	-.1298	-.1031	-.2952	-.2016
	(.2087)	(.2143)	(.2116)	(.2156)	(.2117)	(.2178)	(.2132)	(.2185)
$Bldg/TA$	-.0069	.0808						
	(.2719)	(.2764)						
$Bldg/FV$			.0026	-.1515				
			(.2567)	(.2731)				
$Bldg/FA$					-.2836	-.1161		
					$(.1171)^b$	(.1282)		
$Bldg/SL$							.3368	.1679
							$(.1396)^b$	(.1475)
$LAND$		.323		.1224		.1764		.1312
		$(.0873)^a$		$(.063)^c$		$(.0668)^a$		$(.0482)^a$
R^2	.17	.174	.17	.171	.172	.174	.172	.175
Ob. Num.	2970	2970	2970	2970	2970	2970	2970	2970
Ind Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Table 4: **Systemic Risk and Machines/Tools**

Table presents results for OLS regressions on 576 manufacturing firms that were continuously listed from 1983 to 1996. The dependent variable is β_i^M, the market beta from the single-factor CAPM model. $ln(Sales)$ is the log of real sales, $Prof/SL$ is operating profit over gross sales, *Leverage* is total debt over total debt plus market capitalization, $Mach/TA$, $Mach/FV$, $Mach/FA$, and $Mach/SL$ is the market value of machines and tools over the market value of total assets, over market capitalization plus gross debt, over the market value of fixed assets, and over gross sales, respectively. $LAND$ is the /it corresponding ratio of the market value of land over each of the above. All regressors are end of period $t-1$ values, and all regressions include unreported year and industry dummies, and a dummy that equals one if the firm changes its accounting period. The heteroskedasticity consistent standard errors (in parentheses) have been adjusted for clustering by firm.

Period: 1985-89 — Dependent Variable: Systemic Risk β_i^M								
Constant	-.6763	-.8311	-.684	-.7361	-.6976	-.9109	-.6684	-.8062
	(.166)[a]	(.1686)[a]	(.166)[a]	(.1687)[a]	(.1641)[a]	(.1838)[a]	(.1663)[a]	(.1719)[a]
ln(Sales)	.0696	.0725	.0704	.0719	.0728	.0724	.0683	.0744
	(.0085)[a]	(.0084)[a]	(.0085)[a]	(.0086)[a]	(.0084)[a]	(.0083)[a]	(.0084)[a]	(.0086)[a]
Leverage	.1973	.1763	.2106	.1918	.1935	.1794	.1551	.1227
	(.0902)[b]	(.0901)[b]	(.0904)[b]	(.0907)[b]	(.0903)[b]	(.0903)[b]	(.0933)[c]	(.0948)
Prof/SL	-.2223	-.0602	-.2377	-.187	-.1952	-.1018	-.2523	-.185
	(.2097)	(.2144)	(.2114)	(.2163)	(.2138)	(.2176)	(.2065)	(.213)
Mach/TA	-.0591	.046						
	(.1227)	(.1211)						
Mach/FV			-.1264	-.159				
			(.1293)	(.1296)				
Mach/FA					-.1679	.1207		
					(.0659)[b]	(.1259)		
Mach/SL							.1574	.1147
							(.0832)[c]	(.083)
LAND		.3279		.1225		.2957		.139
		(.0869)[a]		(.0621)[b]		(.1167)[b]		(.0469)[a]
R^2	.17	.174	.17	.171	.172	.174	.171	.175
Ob. Num.	2970	2970	2970	2970	2970	2970	2970	2970
Ind Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Table 5: **Systemic Risk and Financial Assets**

Table presents results for OLS regressions on 576 manufacturing firms that were continuously listed from 1983 to 1996. The dependent variable is β_i^M, the market beta from the single-factor CAPM model. $ln(Sales)$ is the log of real sales, $Prof/SL$ is operating profit over gross sales, *Leverage* is total debt over total debt plus market capitalization, Fin/TA, Fin/FV, Fin/FA, and Fin/SL is the market value of buildings and structures over the market value of total assets, over market capitalization plus gross debt, over the market value of fixed assets, and over gross sales, respectively. $LAND$ is the *corresponding* ratio of the market value of land over each of the above. All regressors are end of period $t-1$ values, and all regressions include unreported year and industry dummies, and a dummy that equals one if the firm changes its accounting period. The heteroskedasticity consistent standard errors (in parentheses) have been adjusted for clustering by firm.

Period: 1985-89 **Dependent Variable: Systemic Risk β_i^M**								
$Constant$	-.5664	-.7917	-.6136	-.6552	-.6202	-.7898	-.6804	-.8103
	$(.1679)^a$	$(.1927)^a$	$(.1658)^a$	$(.1696)^a$	$(.1652)^a$	$(.1688)^a$	$(.1699)^a$	$(.1747)^a$
$ln(Sales)$	.0686	.0725	.0709	.0718	.0675	.0717	.0693	.075
	$(.0084)^a$	$(.0085)^a$	$(.0082)^a$	$(.0083)^a$	$(.0084)^a$	$(.0083)^a$	$(.0086)^a$	$(.0087)^a$
$Leverage$	.1814	.1764	.2635	.2432	.1906	.1792	.1926	.1524
	$(.0894)^b$	$(.0902)^b$	$(.091)^a$	$(.0918)^a$	$(.0892)^b$	$(.0898)^b$	$(.0918)^b$	(.0942)
$Prof/SL$	-.1001	-.06	-.284	-.2361	-.093	-.0249	-.2311	-.1476
	(.2107)	(.2141)	(.2157)	(.2222)	(.2075)	(.2123)	(.2163)	(.22)
Fin/TA	-.2144	-.0449						
	$(.0694)^a$	(.1027)						
Fin/FV			-.2556	-.2485				
			$(.0961)^a$	$(.0968)^a$				
Fin/FA					-.0286	-.0252		
					$(.009)^a$	$(.0089)^a$		
Fin/SL							.0074	-.0045
							(.0216)	(.0211)
$LAND$		.2843		.1008		.1865		.1474
		$(.127)^b$		$(.0595)^c$		$(.0612)^a$		$(.0476)^a$
R^2	.173	.174	.173	.173	.173	.176	.17	.175
Ob. Num.	2970	2970	2970	2970	2970	2970	2970	2970
Ind Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Table 6: **Risk Measure Sample Statistics**

Each risk measure is calculated separately by year for each of 576 manufacturing firms using the firm-specific listing dates, and roughly 52 weekly market observations. The yield on the three month Japanese government bond is used as the risk free rate, the weekly Nikkei 225 index is used to calculate market returns. In the multi-factor regression model, the yield on the 10 year Japanese government bond is used as the long term interest rate, and the weekly yen/dollar exchange rate is used to calculate the exchange rate index. δ_i^{tot} is the standard deviation of raw excess returns, δ_i^0 is the standard deviation of the residuals from the single-factor CAPM model, β_i^{MF} is the market beta from the multi-factor CAPM model, and δ_i^{MF} is the standard deviation of the residuals from the multi-factor CAPM model.

Risk	**Period**	**Mean**	**Std. Dev.**	**10th Pctile**	**Med.**	**90th Pctile**
δ_i^{tot}	85-89	2.576	0.831	1.723	2.419	3.607
	90-96	2.652	0.979	1.616	2.451	3.919
δ_i^0	85-89	2.395	0.828	1.558	2.226	3.452
	90-96	2.108	0.831	1.280	1.935	3.130
β_i^{MF}	85-89	0.758	0.567	0.071	0.768	1.425
	90-96	0.956	0.398	0.458	0.950	1.465
δ_i^{MF}	85-89	2.333	0.803	1.522	2.173	3.357
	90-96	2.066	0.817	1.254	1.896	3.071

Table 7: **Idiosyncratic/Total Risk and Real Estate**

Table presents results for IV regressions on 576 manufacturing firms that were continuously listed from 1983 to 1996. The dependent variables are β_i^M, the market beta from the single-factor CAPM model estimated with weekly stock price data, δ_i^0, the annual standard deviation of the residuals from this model, and δ_i^{tot}, the annual standard deviation of the raw excess returns. $ln(Sales)$ is the log of real sales, $Prof/SL$ is operating profit over gross sales, $Leverage$ is total debt over total debt plus market capitalization, $Land/FV$ is the market value of land over firm value (market capitalization plus gross debt), $Land/FA$ is the market value of land over the market value of fixed assets, and $Land/SL$ is the market value of land over gross sales, $Real/TA$ is the market value of real estate (land plus buildings and structures) over the market value of total assets. All regressors are end of period $t-1$ values, and all regressions include unreported year and industry dummies, and a dummy that equals one if the firm changes its accounting period. The heteroskedasticity consistent standard errors (in parentheses) have been adjusted for clustering by firm.

Period: 1985-89								
	Idiosyncratic: δ_i^0				**Total: δ_i^{tot}**			
Constant	6.331	6.4617	6.2904	6.3031	5.7223	5.8999	5.6845	5.6896
	$(.3032)^a$	$(.3016)^a$	$(.3107)^a$	$(.3054)^a$	$(.3011)^a$	$(.3003)^a$	$(.3067)^a$	$(.3049)^a$
$ln(Sales)$	-.2235	-.2268	-.2226	-.224	-.188	-.1926	-.1873	-.1888
	$(.0154)^a$	$(.0154)^a$	$(.0154)^a$	$(.0153)^a$	$(.0151)^a$	$(.0152)^a$	$(.0151)^a$	$(.0151)^a$
Leverage	.3678	.3783	.3712	.3687	.3903	.4032	.3964	.3922
	$(.1548)^b$	$(.1569)^b$	$(.1549)^b$	$(.1549)^b$	$(.1539)^b$	$(.1564)^a$	$(.1543)^a$	$(.1537)^b$
$Prof/SL$	-1.2737	-1.3921	-1.3145	-1.2758	-1.1776	-1.3377	-1.2436	-1.1851
	$(.4446)^a$	$(.4473)^a$	$(.4364)^a$	$(.4445)^a$	$(.431)^a$	$(.436)^a$	$(.4202)^a$	$(.4327)^a$
$Land/TA$	.2886				.4002			
	$(.1477)^c$				$(.1488)^a$			
$Land/FV$		.0358				.0588		
		(.102)				(.1048)		
$Land/FA$			.2114				.2722	
			$(.1123)^c$				$(.1116)^b$	
$Real/TA$				.2887				.3905
				$(.1493)^c$				$(.1489)^a$
R^2	.2	.199	.2	.2	.182	.179	.182	.182
Ob. Num.	2970	2970	2970	2970	2970	2970	2970	2970
Ind Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Table 8: **Firm Risk and Real Estate, Multi-Factor Model**

Table presents results for IV regressions on 576 manufacturing firms that were continuously listed from 1983 to 1996. The dependent variables are β_i^{MF}, the market beta from the multi-factor CAPM model estimated with weekly stock price data, and δ_i^{MF}, the annual standard deviation of the residuals from this model. $ln(Sales)$ is the log of real sales, $Prof/SL$ is operating profit over gross sales, *Leverage* is total debt over total debt plus market capitalization, $Land/FV$ is the market value of land over market capitalization plus gross debt, $Land/FA$ is the market value of land over the market value of fixed assets, and $Land/SL$ is the market value of land over gross sales, $Real/TA$ is the market value of real estate (land plus buildings and structures) over the market value of total assets. All regressors are end of period $t-1$ values, and all regressions include unreported year and industry dummies, and a dummy that equals one if the firm changes its accounting period. The heteroskedasticity consistent standard errors (in parentheses) have been adjusted for clustering by firm.

Period: 1985-89								
	Systemic: β_i^{MF}				**Idiosyncratic: δ_i^{MF}**			
Constant	-.839	-.7093	-.8651	-.8557	6.2467	6.3779	6.2	6.217
	$(.194)^a$	$(.1935)^a$	$(.1941)^a$	$(.1976)^a$	$(.2902)^a$	$(.2895)^a$	$(.297)^a$	$(.2924)^a$
$ln(Sales)$	.0711	.0677	.0716	.0701	-.2213	-.2247	-.2203	-.2218
	$(.0097)^a$	$(.0098)^a$	$(.0097)^a$	$(.0097)^a$	$(.0147)^a$	$(.0148)^a$	$(.0147)^a$	$(.0146)^a$
Leverage	.2732	.2674	.2797	.2763	.3505	.3595	.3537	.3515
	$(.1008)^a$	$(.1015)^a$	$(.1009)^a$	$(.1005)^a$	$(.1497)^b$	$(.1517)^a$	$(.1498)^b$	$(.1497)^b$
$Prof/SL$	.0699	-.0373	.0021	.0517	-1.2272	-1.3452	-1.2671	-1.2288
	(.2201)	(.2208)	(.2229)	(.2192)	$(.4313)^a$	$(.4335)^a$	$(.4226)^a$	$(.4313)^a$
$Land/TA$	.3806				.2986			
	$(.1007)^a$				$(.1445)^b$			
$Land/FV$		.1545				.0471		
		$(.0699)^b$				(.0988)		
$Land/FA$			.2475				.2241	
			$(.0698)^a$				$(.1091)^b$	
$Real/TA$				.3472				.3001
				$(.0958)^a$				$(.146)^b$
R^2	.162	.159	.162	.161	.201	.199	.201	.201
Ob. Num.	2970	2970	2970	2970	2970	2970	2970	2970
Ind Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Table 9: **Firm Risk and Real Estate, Alternate Periods**

Table presents results for OLS regressions on 576 manufacturing firms that were continuously listed from 1983 to 1996. The dependent variables are β_i^M, the market beta from the single-factor CAPM model estimated with weekly stock price data, δ_i^0, the annual standard deviation of the residuals from this model, and δ_i^{tot}, the annual standard deviation of the raw excess returns. $ln(Sales)$ is the log of real sales, $Prof/SL$ is operating profit over gross sales, $Leverage$ is total debt over total debt plus market capitalization, and $Land/TA$ is the market value of land over the market value of total assets. All regressors are end of period $t-1$ values, and all regressions include unreported year and industry dummies, and a dummy that equals one if the firm changes its accounting period. The heteroskedasticity consistent standard errors (in parentheses) have been adjusted for clustering by firm.

Risk Type:	**Systemic** β_i^M		**Idiosyncratic** δ_i^0		**Total** δ_i^{tot}	
Period	1985-96	1990-96	1985-96	1990-96	1985-96	1990-96
$Constant$	.1592	1.5037	7.0163	7.9823	6.541	8.595
	(.1206)	$(.1423)^a$	$(.2223)^a$	$(.2413)^a$	$(.2057)^a$	$(.2391)^a$
$ln(Sales)$	.0161	-.0258	-.267	-.2969	-.2415	-.2775
	$(.0059)^a$	$(.0072)^a$	$(.0114)^a$	$(.0125)^a$	$(.0104)^a$	$(.0121)^a$
$Leverage$	.3701	.5211	.5075	.5983	.7161	.9479
	$(.0673)^a$	$(.0826)^a$	$(.1476)^a$	$(.2142)^a$	$(.1414)^a$	$(.2017)^a$
$Prof/SL$	-.8438	-1.2372	-1.8343	-2.1966	-2.2236	-2.8846
	$(.14)^a$	$(.1914)^a$	$(.3472)^a$	$(.413)^a$	$(.3451)^a$	$(.4338)^a$
$Land/TA$	.3325	.3389	.3914	.4578	.6073	.7489
	$(.0663)^a$	$(.0867)^a$	$(.1151)^a$	$(.1366)^a$	$(.1058)^a$	$(.1267)^a$
R^2	.193	.211	.352	.45	.427	.577
Ob. Num.	7015	4045	7015	4045	7015	4045
Ind Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year Dum	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Figure 1: **Price Index**

Figure displays the industrial land price index from the Japan Real Estate Institute, the wholesale price index for building and construction materials, and the wholesale price index for general machinery from 1961 to 1997. 1995=baseyear.

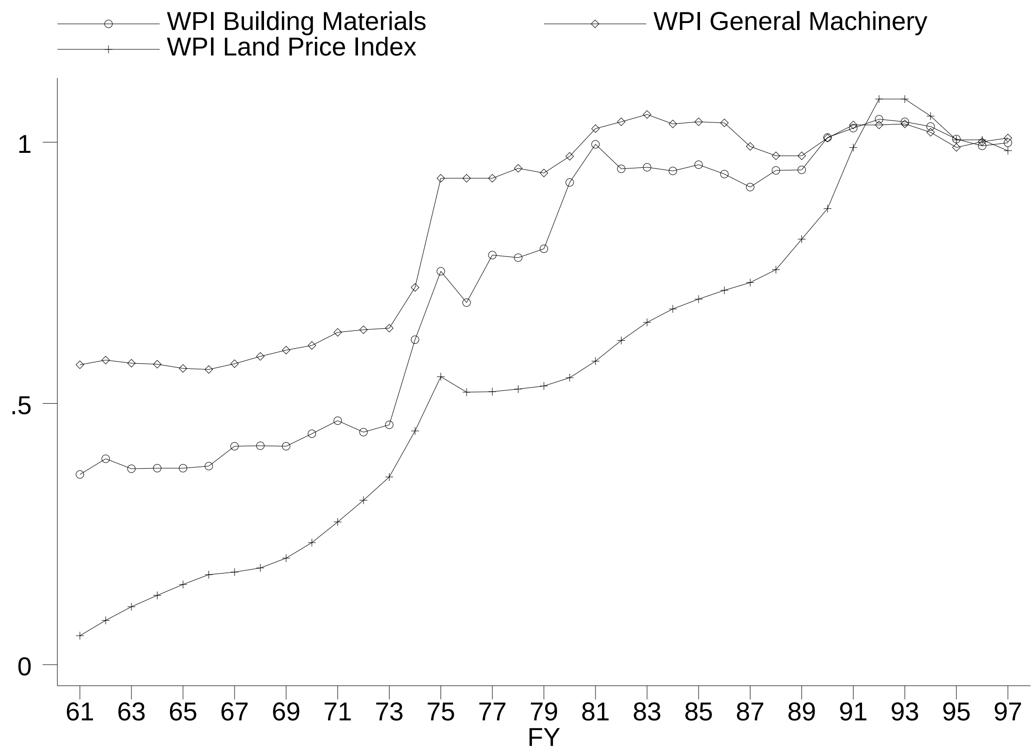


Figure 2: **Sectoral Loan Breakdown by Bank Type**

Figure displays the ratio of loans to various sectors to total loans by bank type. "City" represents the 13 City banks, "Trust" the 6 trust banks, "LTCB" the 3 long term credit banks, and "Reg" the 63 regional banks. The sample is restricted to publicly traded banks. The mean for each bank type is presented for each loan category, and is calculated using balance sheet data contained in the NIKKEI Zaimu database.

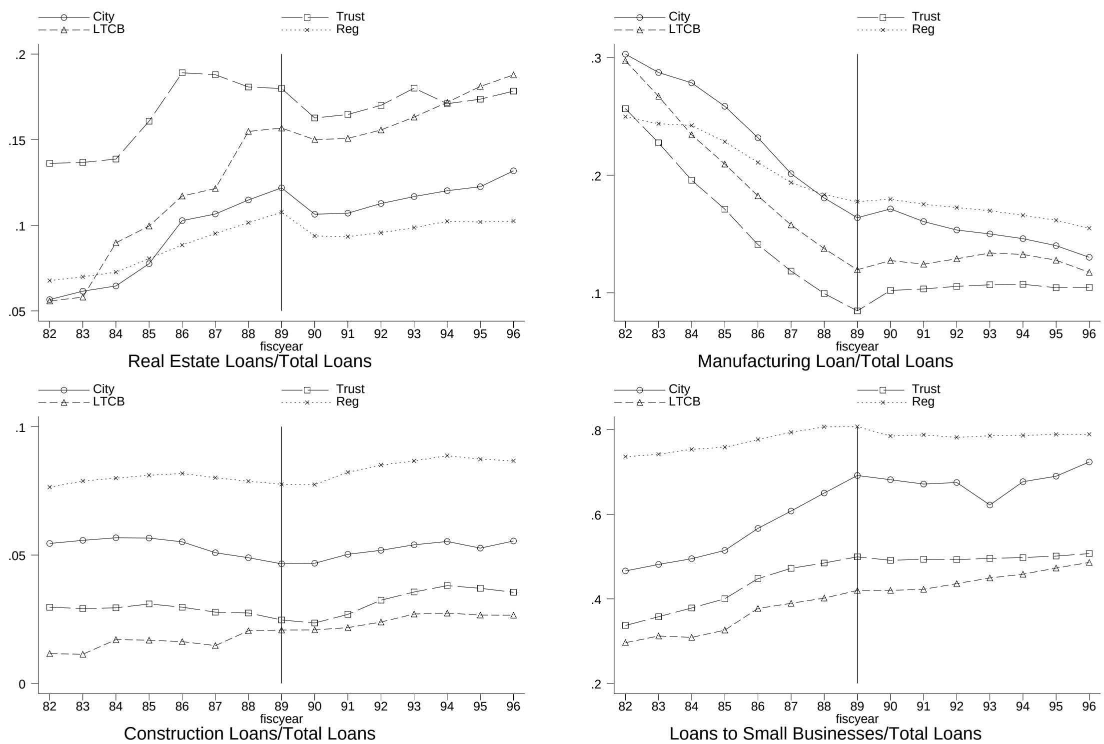
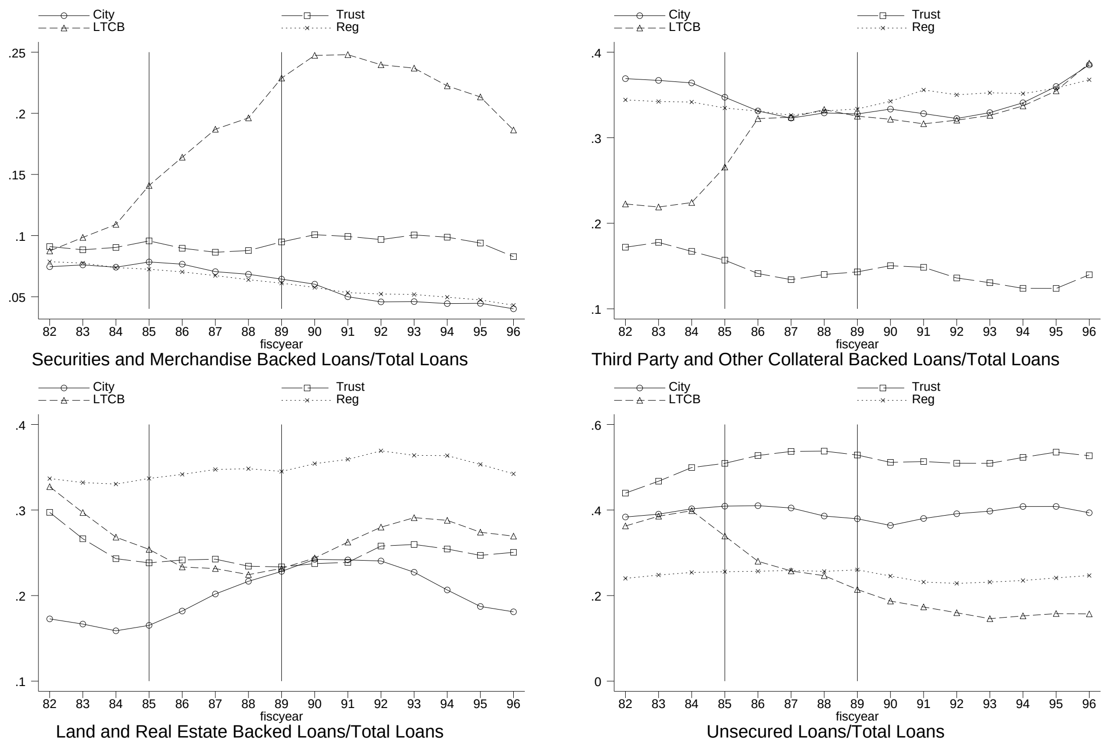


Figure 3: **Share of Collateralized Loans by Collateral Type**

Figure displays the ratio of collateral backed loans to total loans by collateral and bank type. “City” represents the 13 City banks, “Trust” the 6 trust banks, “LTCB” the 3 long term credit banks, and “Reg” the 63 regional banks. The sample is restricted to publicly traded banks. The mean for each bank type is presented for each loan category, and is calculated using balance sheet data contained in the NIKKEI Zaimu database.



7 Appendix

7.1 Synthesis of the APT and CAPM Models

Below we describe a simple synthesis of the APT and CAPM asset pricing models based on well-established work.[22] Investors will require a higher return to hold securities that are highly correlated with the market portfolio, but be willing to accept a lower return for those securities that pay off when the return on the market portfolio is low. Thus, a security's beta coefficient (β_i^M) can be interpreted as a measure of its *systemic* risk which cannot be eliminated through portfolio diversification. If the standard, single-factor CAPM model holds, the following equation describes the state of the world

$$E[r_i] = r^f + (r^M - r^f)\beta_i^M \tag{3}$$

where $E[r_i]$ is the expected return on security i, r^f is the risk free return, r^M is the market return, and β_i^M is security i's market beta. Time subscripts have been dropped for ease of exposition. Unlike the CAPM, the APT model postulates that expected security returns are a linear function of k (unspecified) factors, and is described by

$$E[r_i] = b_{i,0} + \sum_{j=1}^{k} b_{i,j} F_j$$

where the $b_{i,j}$'s are the sensitivity of security i to factor F_j. Ross (1976) showed that given enough securities, investors will eliminate arbitrage opportunities, and the expected return of security i will be approximately equal to a linear function of the sensitivity parameters,

$$E[r_i] \approx \lambda_0 + \sum_{j=1}^{k} \lambda_j b_{i,j}$$

where the λ_j's are constants common across all securities.[23] In general, the λ's are unknown, but values can be assigned using reasonable assumptions on the size and scope of the asset

[22] See Sharpe (1984), Jarrow and Rudd (1985), Shanken (1985), and Wei (1988) for discussion of the synthesis of the APT and CAPM models. For less technical treatment, see Sharpe, Alexander, and Bailey (1999).

[23] The relationship holds with strict equality in the limit as the number of securities available increases. It is assumed that the deviation from equality for the case of Japan is negligible.

market. First, by definition, the risk free security will be insensitive to the factors, implying that $\lambda_0 = r^f$. Second, a large asset market will contain a sufficient number of securities such that at least one security (or portfolio) will exist with unit sensitivity to factor j, and zero sensitivity to all other factors (the so called "pure j factor security"). If the return on the pure security for factor j is d_j, then $\lambda_j = d_j - r^f$, and the above can be written as

$$E[r_i] = r^f + \sum_{j=1}^{k} (d_j - r^f) b_{i,j} \tag{4}$$

Note that the CAPM model is not inconsistent with the APT model; equations 3 and 4 can simultaneously describe the state of the world if the assumptions underlying both models are satisfied. When both hold, simple manipulation of covariance formulas implies that

$$\beta_i^M = \sum_{j=1}^{k} b_{i,j} \frac{Cov(F_j, r^M)}{\sigma_M^2} + \frac{Cov(\epsilon_i, r^M)}{\sigma_M^2}$$

where σ_M^2 is the variance of the return on the market portfolio, and ϵ_i is an expectations error from the APT equation. Each security's market beta is a linear function of the covariance between each factor and the return on the market portfolio, and the covariance between the error term from the APT equation and the return on the market portfolio. Note that $\frac{Cov(F_j, r^M)}{\sigma_M^2}$ is simply the beta of a portfolio of factor j, is constant across securities, and is, by definition, the contribution of factor j to systemic risk. Since it is assumed that the APT model is well specified, the covariance between the market return, r^M, and ϵ_i is zero, and the above can be written as

$$\beta_i^M = \sum_{j=1}^{k} b_{i,j} \beta_{F_j}^M \tag{5}$$

The APT theory provides no guidance on what the factors should actually be. It merely says that given some important factors, and given that the CAPM holds, the above decomposition of each security's market beta is possible. We assume that the APT equation contains (at least) two primary factors: the market portfolio and an unobservable "real estate factor" (other factors are included in the empirical analysis for robustness).[24] Further, we assume

[24]The inclusion of the market portfolio in the APT equation has a different interpretation than when included in the CAPM model. It is an equilibrium condition in the CAPM, but merely a factor in the APT.

that the relationship between the true sensitivity to the real estate factor and the observed proxy can be described by

$$b_{i,RE} = a + c * RE_i + \nu_i \tag{6}$$

where a and c are constant across securities, RE_i is the real estate proxy, and ν_i is a white noise error term which is uncorrelated with ϵ_i.[25] Combining equations 5 and 6 and simplifying yields

$$\beta_i^M = \alpha_i + \beta^{\mathbf{C}} \mathbf{X_i} + \widetilde{\beta}_{RE}^M RE_i + \epsilon_i^\star \tag{7}$$

$$\begin{aligned}
\alpha_i &= \frac{b_{i,M}}{\sigma_M^2} + a\beta_{RE}^M \\
\widetilde{\beta}_{RE}^M &= c\beta_{RE}^M \\
\epsilon_i^\star &= \epsilon_i + \nu_i \beta_{RE}^M
\end{aligned}$$

where X_i is a matrix of control regressors (additional factors in the APT), β^C is the coefficient vector for these controls, $b_{i,M}$ is the sensitivity of security i to the market portfolio from the APT equation, and RE_i is our proxy for security i's sensitivity to the real estate portfolio. The constant c, which cannot be separately identified, can be thought of as simply a re-normalization of our proxy variables. Since the error term and the proxy are correlated, the estimate of $\widetilde{\beta}_{RE}^M$ will be biased. However, the resulting attenuation inconsistency will bias this coefficient toward zero, and away from finding that real estate was priced in systemic risk.

7.2 The "Thin Trading" Bias Problem

A well known empirical problem in calculating systemic risk is "nonsynchronous trading bias", or the "thin trading problem". If some stocks are traded infrequently, then the actual return from $t-1$ to t will differ from the measured return (based on the last closing price). In this case, the observed return, $RI_{i,t}$, *actually* measures the return from $t - s_{i,t-1} - 1$ to $t - s_{i,t}$ where $s_{i,t}$ is the time from the posting of the last trade of security i until the measurement

[25] The constant c is assumed greater than zero.

date t (i.e. security i's "non-trading" time). Theoretically, the measurement error in $RI_{i,t}$ is correlated with the market index, RM_t, which is simply the weighted average of returns across all securities. Thus, when $RI_{i,t}^{rf}$ is used as a regressor in the standard OLS estimation of β_i^M, the measurement error leads to an additional source of correlation between the error term and the regressor, and further biases the coefficients.

Assuming that the *true* instantaneous returns on securities are normally distributed, Scholes and Williams (1977) identify the direction of the thin trading bias, and propose computationally convenient, yet consistent, estimators that require only that the $s_{i,t}$'s be identically and independently distributed across both firms and time. Their consistent estimate of the market beta is defined as

$$\beta_i^{SW} = \frac{b_i^- + b_i + b_i^+}{(1+2\rho)}$$

and is composed of coefficients from *three separate* OLS regressions and a correlation coefficient. First, b_i is the coefficient on RM_t^{rf} in equation 1. b_i^- and b_i^+ are the same, except RM_{t-1}^{rf} and RM_{t+1}^{rf} are used in place of RM_t^{rf}. The correlation coefficient ρ is calculated as the sample equivalent of

$$\rho = \frac{COV(RM_t^{rf}, RM_{t-1}^{rf})}{std(RM_t^{rf})std(RM_{t-1}^{rf})}.$$

Another widely used correction procedure was proposed by Dimson (1979), and involves estimating the following equation:

$$RI_{i,t}^{rf} = \beta_i^-(RM_{t-1}^{rf}) + \beta_i^0(RM_t^{rf}) + \beta_i^+(RM_{t+1}^{rf}) + \epsilon_t$$

The consistent estimate of the firm's market beta is calculated as

$$\beta_i^D = \beta_i^- + \beta_i^0 + \beta_i^+.$$

The magnitude of the bias problem depends on the data used. Because the size of the individual $s_{i,t}$'s grows relative to the length of the measurement period as measurement occurs more frequently, estimates based on corrected betas are typically provided for robustness in studies where daily return data is used.[26] Scholes and Williams (1977) note that the problem is much less severe in monthly return data. This paper uses *weekly* return data, possibly implying that thin trading is not a problem. Unfortunately, this cannot be tested since transaction specific data (or even data on weekly trading volume) is unavailable. However, Japanese stock markets have been described as "inactive" (relative to U.S. markets) because of extensive cross-shareholding, particularly before the period of deregulation. For this reason, these corrections in the calculation of the market beta may be important.

Table 10 presents the sample statistics for these corrected market beta measures for the two periods of interest, and table 11 presents the correlation matrices of all eight risk measures used in this study. The main regressions are re-estimated in 12 using these corrected measures. Despite a seemingly low correlation between the CAPM beta and these corrected measures, our primary proxies of ($Land/FA$ and $Land/FV$) remain positive and significant in these alternative specifications.

[26]These correction procedures have received mixed reviews. Using U.S. stock market data, Scholes and Williams (1977) find that their consistent estimate of beta is larger than the OLS estimate for infrequently traded portfolios, and smaller for frequently traded portfolios. However, Fowler, Rorke and Jog (1980) and McInish and Wood (1984) offer evidence that neither the Dimson nor the Scholes-Williams estimators are adequate. The problem is in finding a benchmark to which estimates of the market beta can be compared. The thin trading bias might exist, but absent data on the exact trading dates for each security, it is difficult to determine whether or not these correction techniques are important. Bartholdy and Riding (1994) get around this by calculating beta using *synchronous* price data for New Zealand securities (argued to be relatively infrequently traded). Other correction procedures have been proposed by Fowler and Rorke (1983), Cohen et al. (1983), and Marsh (1979), but are not pursued here because of data limitations.

Table 10: **Adjusted Market Betas Sample Statistics**

β_i^{SW} is the market beta calculated using the Scholles-Williams correction, and β_i^D is that using the Dimson correction procedures. Each risk measure is calculated separately by year for each of 576 manufacturing firms using the firm-specific listing dates, and roughly 52 weekly market observations. The yield on the three month Japanese government bond is used as the risk free rate, and the weekly Nikkei 225 index is used to calculate market returns.

Risk	**Period**	**Mean**	**Std. Dev.**	**10th Pctile**	**Med.**	**90th Pctile**
β_i^{SW}	85-89	0.788	0.881	0.191	0.797	1.708
	90-96	1.104	0.564	0.465	1.068	1.782
β_i^D	85-89	0.764	0.743	0.154	0.798	1.612
	90-96	1.080	0.481	0.501	1.063	1.687

Table 11: **Risk Measure Correlation Matrices**

Entry (i, j) of the table displays the correlation coefficient between the risk measures in row i and column j for 576 manufacturing firms. Each risk measure is calculated separately for each firm in each year using the firm-specific listing dates, and roughly 52 weekly market observations. The yield on the three month Japanese government bond is used as the risk free rate, the weekly Nikkei 225 index is used to calculate market returns. In the multi-factor regression model, the yield on the 10 year Japanese government bond is used as the long term interest rate, and the weekly yen/dollar exchange rate is used to calculate the exchange rate index.

1985-89							
	β_i^M	β_i^{SW}	β_i^D	β_i^{MF}	δ_i^0	δ_i^{MF}	δ_i^{tot}
β_i^M	1.00						
β_i^{SW}	0.49	1.00					
β_i^D	0.6	0.94	1.00				
β_i^{MF}	0.94	0.38	0.47	1.00			
δ_i^0	0.01	-0.03	-0.02	0.02	1.00		
δ_i^{MF}	0.01	-0.02	-0.02	0.02	0.99	1.00	
δ_i^{tot}	0.17	0.05	0.07	0.17	0.98	0.97	1.00

1990-96							
	β_i^M	β_i^{SW}	β_i^D	β_i^{MF}	δ_i^0	δ_i^{MF}	δ_i^{tot}
β_i^M	1.00						
β_i^{SW}	0.54	1.00					
β_i^D	0.68	0.95	1.00				
β_i^{MF}	0.98	0.49	0.64	1.00			
δ_i^0	0.22	0.32	0.35	0.22	1.00		
δ_i^{MF}	0.22	0.32	0.35	0.22	0.99	1.00	
δ_i^{tot}	0.53	0.43	0.51	0.52	0.91	0.91	1.00

Table 12: **Adjusted Systemic Risk and Real Estate**

Table presents results for OLS regressions on 576 manufacturing firms that were continuously listed from 1983 to 1996. The dependent variables are the market betas corrected for thin-trading bias using the Scholes-Williams (1977) and Dimson (1979) procedures described in the appendix. $ln(Sales)$ is the log of real sales, $Prof/SL$ is operating profit over gross sales, $Leverage$ is total debt over total debt plus market capitalization, $BLand/BTA$ is the book value of land over the book value of total assets, $Land/TA$ is the market value of land over the market value of total assets, $Land/FV$ is the market value of land over market capitalization plus total debt, and $Real/TA$ is the market value of buildings plus land over the market value of total assets. All regressors are end of period $t-1$ values. All regressions include unreported year and industry dummies, and a dummy that equals one if the firm changes its accounting period. The heteroskedasticity consistent standard errors (in parentheses) have been adjusted for clustering by firm.

Period: 1985-89						
Systemic Risk:	**Scholes/Williams** β_i^{SW}			**Dimson** β_i^{D}		
$Constant$	.3257	.4028	.3404	.0882	.237	.0834
	(.2746)	(.277)	(.2805)	(.2681)	(.2701)	(.2767)
$ln(Sales)$	.0181	.016	.0168	.0285	.0245	.0268
	(.014)	(.0141)	(.014)	$(.0135)^b$	$(.0137)^c$	$(.0137)^b$
$Leverage$	.2465	.2319	.2514	.3009	.282	.3067
	$(.1338)^c$	$(.1338)^c$	$(.1345)^c$	$(.1419)^b$	$(.1454)^c$	$(.1423)^b$
$Prof/SL$	-1.3322	-1.3889	-1.3671	-1.1158	-1.231	-1.1535
	$(.3988)^a$	$(.3924)^a$	$(.3967)^a$	$(.3691)^a$	$(.3623)^a$	$(.3684)^a$
$Land/TA$	.2907			.5077		
	$(.1407)^b$			$(.1557)^a$		
$Land/FV$		.1732			.2671	
		$(.0879)^b$			$(.1297)^b$	
$Real/TA$			.2195			.4341
			(.1445)			$(.1519)^a$
R^2	.145	.144	.144	.135	.133	.134
$Ob.\ Num.$	2970	2970	2970	2970	2970	2970
Ind Dum	Yes	Yes	Yes	Yes	Yes	Yes
Year Dum	Yes	Yes	Yes	Yes	Yes	Yes

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