

The Rising Long-Term Trend of Single-Family Mortgage Foreclosure Rates*

Peter J. Elmer

and

Steven A. Seelig

Federal Deposit Insurance Corporation
Division of Research and Statistics
550 17th St., N.W.
Washington, D.C. 20429
Phone: 202-898-7366
Fax: 202-898-7222
e-mail: pelmer@fdic.gov

FDIC Working Paper 98-2

Abstract

This paper identifies and analyzes the long-term rising trend in single-family mortgage foreclosure rates. Traditional measures of mortgage risk, such as house appreciation rates and loan-to-value ratios (LTVs), appear to explain some, but not all, of the long-term trend. In an effort to explain the remaining part of the trend, several non-traditional hypotheses are explored. One is the notion that the incidence of shocks to individual lifestyles or “trigger events,” such as divorce, have increased, thereby increasing the likelihood of mortgage default. The second is that the risk posture of individuals has increased, especially as individuals increasingly leverage their homes as part of a broader strategy of managing their overall wealth portfolio. The third is the possibility that structural changes in servicing, arising from the trend toward securitization, have increased foreclosure rates. While evidence exists supporting these hypotheses, the risk posture hypothesis appears more consistent with a variety of disparate incentives and trends relating to household financial management.

* The authors would like to thank Anton Haidorfer, David Olson, Bob Schafer, Isaac Megbolugbe, and George Nahmi for helpful comments. The views expressed are those of the authors and not necessarily those of the Federal Deposit Insurance Corporation.

The Rising Long-Term Trend of Single-Family Mortgage Foreclosure Rates

The long-term trend in single-family mortgage foreclosure rates is rising. As shown in Figure 1, industry statistics produced by the Mortgage Bankers Association (MBA) and other sources suggest that foreclosure rates over the past decade are noticeably higher than rates experienced at any time in the past 50 years.¹ Moreover, the long-term trend, although rising gradually, translates into a dramatic increase in foreclosures over the course of a generation. The long-term trend is reflected in foreclosure rates both on mortgages insured by the Federal Housing Authority (FHA) and on conventional mortgages, i.e., those not insured by either the FHA or the Veterans Administration (VA).

During the 1950s foreclosure rates on conventional mortgages fluctuated within a narrow band, ranging from a low of 0.04 percent in 1953 to a high of 0.12 in 1959. These rates rose in the early 1960s, peaked at 0.78 percent in 1966, then declined in the late 1960s to the relatively low levels experienced throughout the 1970s. But between the early 1980s and the present, rates increased more than 300 percent, rising from 0.31 percent in 1980 to 1.04 percent in 1997. This represents an approximately ninefold increase since the early 1950s, with a threefold increase occurring after 1980. FHA foreclosure rates reflect a similar pattern, although these rates are currently approximately 11 times higher than the rates of the early 1950s.

The long-term foreclosure rate trend is surprising in the light of strong aggregate economic conditions experienced throughout most of the 1980s and 1990s. Although individuals who default commonly cite unemployment as the reason for their default, the rising trend has continued throughout extended economic expansion during the 1980s and the 1990s.² The experience of the 1990s is even

¹ Construction of the long-term foreclosure rate series is described in the appendix.

² Gardner and Mills (1989) and Ambrose and Capone (1996) provide panel data on borrower motivations for default. Business cycle data from the National Bureau of Economic Research (NBER) record the 1980s expansion as lasting 91 months and the 1990s expansion as 86 months as of May 1998. These expansions rank as the second and third longest since NBER records began in 1921.

more remarkable, given that declining unemployment and continuing economic prosperity have been accompanied by relatively stable prices.³

This study examines the rising aggregate trend of mortgage foreclosure rates with an eye toward exploring the roles of traditional determinants of mortgage default alongside nontraditional measures relating to household risk. Section I reviews several of the most widely recognized determinants of mortgage default and examines their relationships to the aggregate trend. Section II describes aggregate movements of individual financial shocks, or “trigger events,” that might correlate with the long-term trend. Section III extends the discussion to variables relating to household risk posture and their relationship to the trend. Section IV examines the growth in third-party servicing that has accompanied the trend toward securitization. Section V tests the empirical content of traditional versus nontraditional variables for explaining the long-term trend. Section VI summarizes the results and concludes.

I. Traditional Measures of Mortgage Risk

Determinants of mortgage default have been studied for many years and have been widely tested with respect to their ability to explain default at the level of the individual loan, city, state, and region.⁴ The interesting question is, do previously identified determinants of default explain the rising long-term aggregate trend?

³ As is discussed below, house appreciation rates have remained in the 2–6 percent range for most indexes and in most years following 1982.

⁴ All studies confirm the importance of homeowner equity, with most also finding a role for shocks to borrower income, such as loss of employment or divorce. Recent academic work along these lines includes Quigley and Van Order (1995), Phillips, Rosenblatt and Vanderhoff (1996), Case and Shiller (1996), Deng (1997), and Capozza, Kazarian, and Thompson (1997). Rating agency and other practitioner research, such as Wilson (1995), Jones et al. (1995), and Monsen (1996), tend to take a broader perspective that includes mortgage type, credit, or other effects alongside those emphasized by academic research.

As noted above, it is natural to expect unemployment rates to explain the foreclosure rate trend. However, the opposite is actually observed. As can be seen in Figure 2, unemployment rates exhibit the anticipated upward “spike” at each of the eight recessions, over the past 50 years, and decline during the nine expansions. Nevertheless, the long-term trend in unemployment rates bears at best a weak relation to that of foreclosure rates. While unemployment rates tended to be higher between the mid-1970s and the mid-1980s, they began declining in 1984 and, by 1995, had returned to levels found in the early 1970s and other previous periods. Moreover, foreclosure rates only occasionally contain the recession “spike” regularly observed in unemployment rates.

A second seemingly unrelated variable is nominal interest rates. Academic models emphasizing the option-like characteristics of mortgage default often stress that declining (rising) interest rates should provide a strong incentive to default (not default), especially in areas characterized by weak or declining (rising) house prices.⁵ Unfortunately, interest rate movements over the past 35 years fail to reflect a consistent inverse or negative relationship between changes in interest rates and mortgage foreclosure rates (see Figure 2). Indeed, prior to the early 1980s the relationship appears to be positive, with almost no relationship observed during the “hump” in foreclosure rates in the mid-1960s. More recently, two periods of sharply declining rates, 1985–86 and 1991–93, are closely associated with record mortgage prepayments, but are not closely related to spikes in foreclosure rates (e.g., foreclosure rates increased slightly in the 1986–87 period and declined in 1992–93).

All theories of mortgage default stress a key role for homeowner equity, and empirical analysis supports this emphasis. Since the most direct measure of equity is the loan-to-value ratio (LTV), we expect to observe a strong positive relationship between LTVs and foreclosure rates, although the

⁵ A sample of literature relating to treatment of mortgage default as an option can be found in Hendershott and Van Order (1987), Kau and Keenan (1995), and Vandell (1995). Several recent

relationship may not surface until several years after mortgage origination. As Figure 3 illustrates, rising LTVs explain several, but not all, aspects of the foreclosure rate trend. In the early 1950s mortgage lending was remarkably conservative, as witnessed by an average LTV of only 58 percent in 1952. Rising LTVs throughout the 1950s suggest a transition to modern-era lending practices, when LTVs have averaged over 70 percent. This transition explains the exceptionally low default rates of the 1950s as well as rising rates in the early 1960s. Unfortunately, LTV trends fail to track foreclosure rates for the two decades after the mid-1960s. A possible relation reappears in the late 1980s and 1990s, as slowly rising LTVs again follow rising foreclosure rates. However, this most recent relationship is questionable because of the close relationship between conventional and FHA rate trends, as noted in Figure 1. That is, since FHA mortgages have had high LTVs for many years, and the FHA patterns in Figure 1 are very similar to conventional patterns, it seems unlikely that rising LTVs are solely responsible for the rising long-term trend in mortgage foreclosure rates.

A second variable that affects homeowner equity is the rate of appreciation in house prices. High home appreciation expedites the buildup of equity by reducing the current LTV, i.e., loan to current value. Other variables being equal, high home appreciation is expected to reduce defaults as current LTVs decline and wealth increases.⁶ As shown in Figure 4, two indexes of house appreciation increased in the late 1960s, remained high until the early 1980s, then dropped to much lower levels until the present time.⁷ These trends suggest that house appreciation is especially useful in explaining the

alternatives to the option model include Elmer (1997), Archer, Ling, and McGill (1996), or Yang, Buist, and Megbolugbe (1998).

⁶ The caveat “other variables being equal” is significant. Homeowners may consume an appreciation-induced increase in real LTV through second mortgages, home equity lines, or other types of borrowings. Such a move would leave the individual’s risk of insolvency unchanged in spite of the fact that LTV, based solely on the first mortgage, is higher.

⁷ The two indexes shown in Figure 4 were chosen because they are among the longest time series of house prices available. A more appealing “repeat sales” index is published by the Office of Federal

relatively low rates in the 1970s and some rise in rates in the early 1980s. However, the relative stability of appreciation rates through most of the 1980s and 1990s is difficult to reconcile with the continued rising trend in foreclosure rates as well as with the plateau apparent in the mid-1990s.

In summary, several traditional determinants of mortgage default appear to explain some, but not all, of the long-term foreclosure rate trend. Rising LTVs associated with the transition to modern mortgage finance explain exceptionally low rates in the 1950s along with rising rates in the early 1960s. Increasing home appreciation explains falling rates in the late 1960s as well as modest rates throughout the 1970s. However, these variables stop short of explaining the secular rise during the 1980s and 1990s.

II. Trigger Events

Over the past several years it has become common to consider unexpected catastrophic events in an individual's life as "triggering" mortgage default. Elmer (1997) defines these "trigger events" as shocks that cause an "unanticipated shortfall in income such that income is no longer sufficient to meet periodic debt obligations."⁸ Per this definition, a wide variety of income- or expense-related shocks, such as unemployment or divorce, may lead to insolvency and mortgage default. Is it possible that the incidence of trigger events could have increased sufficiently to explain the rising foreclosure rate trend?

Housing Enterprise Oversight (OFHEO), but it does not begin until 1980. As a check, we compared the OFHEO index to the two series in Figure 4 and found it had a comparable long-term trend. For example, the average OFHEO appreciation rate during the 1980–97 period was 4.26 percent, whereas the CPI rate was 4.68 percent and the NAR rate was 4.15 percent.

⁸ This approach suggests that trigger events imply that solvency can be maintained only by an individual's borrowing against future income or wealth. Insolvency occurs if it is not possible to borrow sufficient funds to support current contractual debt obligations. Thus the incidence of trigger events relates to the accumulation of household debt, which is discussed in the next section.

Although Figure 2 eliminated unemployment rates as an explanation of the rising foreclosure rate trend, portions of the business sector have continued to experience problems even as unemployment rates have fallen. In this regard, Figure 5 points out that business failure rates rose dramatically in the early 1980s and have since remained at surprisingly high levels. Although the household effect of business failures should be reflected in unemployment rates, persistently high failure rates coincident with low unemployment add another dimension to the issue. As households increasingly rely on income from self-employment, they become more susceptible to the success or failure of these ventures. Since 1970 the number of workers classifying themselves as proprietors has more than doubled to over 25 million, and the proportion of the labor force composed of proprietors rose from 13.9 percent in 1975 to 16.4 percent in 1995. Since the bulk of business failures typically occur among small firms, the growth in the number of such firms in the 1980s helps explain the persistence of high business failure rates. More to the point, a rise in business failure rates coincident with an increase in household dependency on small business success suggests more than a casual linkage between business failures and residential mortgage foreclosure rates.

Divorce can motivate a variety of financial problems that last for many years, especially when alimony or child support payments are involved. Shelter, living, and other expenses typically increase dramatically without any increase in income. Ownership of the home may be contested or simply not resolved for years as the legal terms of the divorce are ironed out. Thus it is reasonable to expect a host of financial problems to develop from a rising trend in the divorce rate. As can be seen in Figure 6, divorce rates approximately doubled during the 1970s and have since remained high. This increase in rates almost certainly helped to ratchet foreclosure rates to higher levels in the 1980s. However, the gradual drop in divorce rates from the early 1980s onward makes it difficult to closely associate recent divorce rate trends with foreclosure rate trends.

A rarely cited source of problems is gambling, yet this activity, when practiced in excess, can easily lead to insolvency. Over the past twenty years facilities for casino gambling have come within driving distance of most major population centers. This has been the result of actions to legalize casino gambling on riverboats and Indian reservations as well as in specific geographic areas, such as Atlantic City. Thus it is not surprising that Figure 7 suggests a geometric growth rate for gambling as a percentage of consumption. Before 1975, casino gambling represented less than one-tenth of 1 percent of disposable income, yet by 1996 this percentage had increased by a factor of five to over 0.5 percent. Moreover, this increase does not include wagers placed in state lotteries or through illegal outlets. However, although gambling has increased sharply and appears to follow the general trend in foreclosures, it does not mirror periodic fluctuations in the foreclosure rate.

In fairness, although some trends appear to support the trigger event hypothesis, others seem to work against it. For example, death rates in the key earning ages 20–50 have declined steadily, and other developments have reduced the likelihood of unexpected births as well as the birthrate in general. Real disposable income has increased, so that at least a portion of the financial strains that plagued prior generations has been reduced. These factors suggest that one should at least consider additional perspectives before concluding the list of factors that might explain the foreclosure rate trend.

III. Household Risk Posture

A topic closely related to trigger events, but nevertheless distinct, is the financial risk posture of households. Individuals choose, of their own volition, their preferred levels of leverage, savings, insurance, and other variables that affect the extent to which they can absorb unexpected shocks. Of course, trigger events can be sufficiently severe so as to overwhelm even conservative individuals. However, the likelihood of a given event's causing problems increases as individuals increase leverage

and/or reduce their insurance against catastrophe. The financial risk profile of a borrower also affects the way lenders react to delinquency. For example, traditionally lenders might forbear foreclosure if they believed a recently unemployed borrower would return to work. However, if borrowers have taken on too much debt or do not have readily available savings, lenders will be less likely to grant forbearance.

Savings represent a way for households to protect themselves against unforeseen financial shocks. Financial planners often counsel families to avoid high levels of debt and to “save for a rainy day,” but Figure 8 shows that American families have not followed this advice. Consumer debt as a percentage of disposable income has reached historical highs and, on average, has been high since the early 1980s. Perhaps more pronounced is the drop in the personal savings rate. This rate fluctuated between a low of 6.6 percent and a high of 9.5 percent during the period 1950–81. However, it began a relatively steady secular decline in 1981 and had dropped to 3.8 percent by 1997.

Compounding the problem of lower savings rates is the fact that an increasing proportion of savings are being held in relatively illiquid forms, such as 401(k) and IRA types of retirement savings plans. Although one can make “hardship” withdrawals from a 401(k) plan to protect a home from foreclosure, the penalties are severe. The IRS requires the plan sponsor, or trustee, to withhold the estimated income tax on the withdrawn amount plus a penalty equal to 10 percent of the withdrawn amount. Thus, for example, a borrower who needs \$1,000 to meet a mortgage obligation, and pays a 20 percent tax rate, would have to withdraw \$1,428.57 to receive the amount needed. Hence, this type of tax-sheltered saving, while ideal for retirement, is not effective as a safety net for adverse shocks to income.

Rising household financial risk is also reflected in the debt-to-assets ratios found in Figure 9. These data show a secular increase in household leverage going back to the early 1950s, with interim

fluctuations consistent with the foreclosure rate trend. Through 1966 the ratio rose from 7.3 percent to 12.2 percent, a high point coinciding with the peaking of the foreclosure rate in 1966. The ratio then remained relatively stable until 1972, whereas the foreclosure rate declined significantly. The remainder of the 1970s saw the beginning of a secular upward trend in both foreclosure rates and the leverage ratio. Only in the past several years, when the extraordinary rise in equity market prices led to large increases in household assets, did assets grow faster than debt, thus yielding a decline in the leverage ratio while the foreclosure rate rose.⁹

Not surprisingly, the vast majority (approximately 65 percent) of the increase in debt has been in the form of mortgage debt, which comports with the rising LTVs noted in Figure 3. Of course, the tax deductibility of mortgage interest stimulates individuals to rely on mortgage debt as a primary form of leverage. But how can tax incentives be motivating higher leverage if they have been in place for many years? Engen and Gale (1997) suggest a fresh perspective on this issue that provides an economic rationale for recent trends in increased mortgage borrowings. That is, their study finds that increased savings in 401(k) plans are associated with increased mortgage debt and a reduction in home equity. In essence, the financial advantages of 401(k) plans may be causing individuals to substitute savings in 401(k) plans for savings in home equity, thereby causing both mortgage leverage and the likelihood of default to increase.

In addition to savings, insurance provides individuals with a financial tool for guarding against the ill effects of unexpected problems. In this regard, Figure 10 emphasizes that a significant portion of the population is not covered by health insurance and that this percentage has increased by more than

⁹ The ratio declined from 15.89 percent in 1994 to 14.87 percent in 1997. Between 1996 and 1997 household total assets grew by 11.48 percent while liabilities grew by 7.50 percent. Within the asset category, household holdings of corporate equities and mutual funds grew by 23.87 percent. See *Flow of Funds Accounts of the United States*.

one-third since the data were first reported for 1978. Moreover, this statistic understates the magnitude of the problem by including population segments that are covered by health insurance in their entirety, such as the military and senior citizens covered by Medicare. Thus, the increase in the portion of the population without health insurance constitutes a significant increase in the overall risk profile of households.

One can perform an intuitive test of the financial risk theme by comparing personal bankruptcy rates with foreclosure rates. Bankruptcy occurs when an individual's liabilities exceed his or her assets or when there is insufficient income to service debt obligations. Although there are many legal issues at the nexus between mortgage default and personal bankruptcy,¹⁰ the two events nevertheless share a close association with financial distress. That is, both events can be motivated by shocks to income and/or by excessive leverage. Households faced with the burden of excessive debt or unanticipated financial hardship (illness, accident with no insurance, etc.) may try to resolve their problems by choosing personal bankruptcy and/or mortgage default.

If increasing household risk is causing an increase in the likelihood of financial distress, then personal bankruptcy rates should mimic increasing foreclosure rates. In fact, that is exactly what is observed. As Figure 11 shows, personal bankruptcy and mortgage foreclosure rates have tended upward for most of the past 25 years. With the exception of 1997, when personal bankruptcy rates spiked up, and the early 1980s when they trended downward, personal bankruptcy and mortgage foreclosure rates have moved in a comparable manner.

¹⁰ Mortgages are treated differently from other types of debt in personal bankruptcy because the lender has a security interest in the real estate collateral. Moreover, most states have homestead exemptions that allow homeowners who declare bankruptcy to keep at least a portion of the equity in their principal residence subject to the first mortgage lien. In these instances, individuals experiencing financial hardship might find it advantageous to default on all obligations except their mortgage, and declare bankruptcy. Therefore, although mortgage foreclosure and personal bankruptcy are both distress-related events, they are not necessarily coterminous events.

The coincident rise in mortgage default and personal bankruptcy rates is also intriguing from the standpoint of society's attitudes toward leverage and financial risk. That is, the trends are consistent with the notion that households have increased their risk posture by opting for greater leverage and lower net savings. Of course, these trends also reflect the willingness of lenders to take on greater risk by increasing the availability of credit to highly leveraged households. Lenders and borrowers must both embrace these changing attitudes toward risk before an increase in risk can be contracted at market prices.

IV. Structural Change in Servicing Relationships

During the 1950s and 1960s most single-family mortgages were originated by "traditional" lenders, primarily savings and loan associations and mutual savings banks. In addition, mortgage bankers served as correspondents for insurance companies that invested in mortgages and for thrifts in capital-surplus areas, such as some cities in the Northeast. These "traditional" lenders performed all or most of the mortgage lending functions, including mortgage origination, servicing, portfolio management, and investment in the mortgages.¹¹ They were headquartered in the local markets, where they originated loans and typically had other business relationships with the mortgage borrowers.

The advent of mortgage securitization in the 1970s changed the borrower/lender relationship by breaking apart the various functions that had been performed by banks and thrifts. In particular, it became much less common for the same organization to both originate a mortgage and retain it as a portfolio investment. Lenders with traditional ties to the borrowers were replaced by national servicing

¹¹ Traditional banks and thrifts were the primary, but not the only, mortgage market participants before securitization. Mortgage bankers commonly originated FHA/VA products, and life insurance companies invested in whole loans. Figure 12 suggests that prior to the late 1970s these non-lender-serviced mortgages held a relatively stable 25 percent share of the mortgage market.

organizations with no tie to the borrower apart from the mortgage and with servicing policies based on national rather than local standards.

The “breakup” of the mortgage management function resulting from the shift toward mortgage securitization may have contributed to the rising trend in foreclosure rates by decreasing the likelihood that servicers would forbear foreclosing on delinquent borrowers. That is, the close relationship between borrower and lender found in the “traditional” local origination/servicing relationship may have been associated with a higher likelihood of forbearance (a lower likelihood of foreclosure) compared with modern relationships. Traditional lenders, with their greater knowledge of local economic conditions and better information about a borrower’s financial problems, might have been more likely to forbear and/or restructure a mortgage.

At first impression, the servicing structure change hypothesis is easily supported by the well-known fact that securitization activity exploded during the past two decades and led to a significant change in mortgage management relationships. As shown in Figure 12, the portion of the mortgage market serviced by third parties rose dramatically during the 1980s and 1990s, a rise that corresponds to the most recent increase in mortgage foreclosure rates. The growth in third-party servicing is directly attributable to the growth in securitization, as the portion of the mortgage market funded through government-sponsored enterprises and federally sponsored pools rose from less than 2 percent in 1980 to about 50 percent in the mid-1990s.

The servicer structural change hypothesis is explored further in Figure 13, which compares the relationship between foreclosures and mortgages delinquent 90 or more days. If the hypothesis is valid, the rising trend in Figure 12 should be accompanied by an increased likelihood that delinquent loans are foreclosed on as soon as possible, and the ratio of foreclosures to delinquencies should rise.

Unfortunately, the foreclosure/delinquency ratios shown in Figure 13 do not consistently support the

hypothesis. For example, while the ratio for conventional loans jumped after 1988, it was relatively stable until the mid-1980s. Also, the trend in the conventional ratio does not comport with that of the FHA ratio despite the close relationship between FHA and conventional foreclosure rates presented in Figure 1. Indeed, the FHA foreclosure/delinquency ratio is highest in the early 1970s, a period of relatively low foreclosure rates. Therefore, only limited evidence supports the view that securitization-induced structural changes in mortgage servicing account for the rising long-term trend in foreclosure rates.

V. Empirical Results

The discussion to this point suggests that the mortgage foreclosure rate trend could be related to a number of factors. Although several traditional determinants of default, notably house appreciation and LTV, appear to explain portions of the long-term trend, they fall short of explaining the more recent, and unsettling, rising trend. Turning to other explanations, one sees that a noticeable increase has occurred in the incidence of several trigger events, such as gambling and the percentage of households without health insurance. Moreover, the risk posture of households appears to have increased along with their financial exposure to unexpected problems.

Consistent with the discussion found in sections I–III, we consider the effect of three sets of variables. First, traditional determinants of default, such as LTV, unemployment rate, and house appreciation, reflect the roles of variables that are widely known to affect default at the loan level. Second, variables associated with trigger events, such as business failure and divorce rates, capture the role of unexpected financial shocks. The third group of variables gauges consumers' risk posture, such as consumer debt burden, and the last measures structural changes in mortgage servicing policies. That is, the regressions take the following general form:

**foreclosure rate = f (traditional determinants, trigger events,
risk posture, servicing structural change).**

This general specification can be used to test for the relative contribution of various economic forces on aggregate default patterns.¹²

The four economic themes can be examined with regression analysis that explains mortgage foreclosure rates (FOR) during the 1951–97 period. The first equation explains these rates with a traditional model containing four variables: unemployment (UN), current and lagged loan-to-value ratio (LTV and LTV1, respectively), and the personal savings rate (PSAV).¹³

$$\text{FOR} = 0.05 \text{ UN} + 0.30 \text{ LTV} + 0.23 \text{ LTV1} - 0.04 \text{ PSAV} \quad (1)$$

(2.64)* (3.04)* (2.52)** (-2.15)**

$$\text{Reg. } R^2 = 0.74, \text{ Total } R^2 = 0.96, \text{ D-W} = 0.86, \text{ df} = 41$$

This model suppresses the intercept because the foreclosure rate approaches zero in the 1950s. Also, since autocorrelation is common in these types of time series, the regressions were estimated with Yule-Walker equations to correct for autoregressive characteristics.¹⁴ Several other traditional variables were attempted, such as house appreciation and long-term interest rates, but none was consistently found significant.

Equation 1 suggests that traditional variables explain at least a portion of the foreclosure rate time series but fail to provide a robust explanation of the global trend. While all of the variables are

¹² For a full discussion of various empirical specifications and theoretical constructs, as well as a more detailed set of empirical results, see Elmer and Seelig (1998).

¹³ A single asterisk (“*”) signifies significance at the 1 percent level, whereas “**” signifies significance at the 5 percent level.

¹⁴ See Judge et.al. (1985) for a discussion of this technique for dealing with autocorrelation.

significant and have their expected signs, several do not hold up during the past two decades. As shown in Figure 2, the unemployment rate has fallen dramatically during the past several years, yet the foreclosure rate has continued to rise. Similarly, LTVs rose modestly in the 1990s but remained at approximately the same level throughout most of the 1970s and 1980s. Therefore, although traditional variables can be shown to appear significant in regression-based tests, this finding does not necessarily imply that they adequately explain the long-term trend.

Adding the liabilities-to-assets ratio (LI/AS) to equation (1) enables us to test the marginal effect of a broader measure of household leverage while sensitizing the results from equation 1 for the inclusion of an additional variable.

$$\text{FOR} = 0.02 \text{ UN} - 0.03 \text{ LTV} - 0.11 \text{ LTV1} - 0.03 \text{ PSAV} + 6.23 \text{ LI/AS} \quad (2)$$

$$\begin{matrix} (1.25) & (-0.27) & (-1.15) & (-2.35)** & (4.54)* \end{matrix}$$

$$\text{Reg. } R^2 = .81, \text{ Total } R^2 = .97, \text{ D-W} = 1.24, \text{ df} = 40$$

In this case, the newly added liability variable is significant at the highest level, while the traditional unemployment and LTV variables become insignificant. Personal savings remains significant, thereby providing support to the household risk theme.

A third equation adds several trigger events, the business failure rate (BFAIL) and the divorce rate (DIV), to the liabilities-to-assets and personal savings variables found significant in equation 2.

$$\text{FOR} = -0.03 \text{ PSAV} + 5.28 \text{ LI/AS} + 0.01 \text{ BFAIL} - 0.01 \text{ DIV} \quad (3)$$

$$\begin{matrix} (-3.18)* & (3.27)* & (3.92)* & (-1.13) \end{matrix}$$

$$\text{Reg. } R^2 = .87, \text{ Total } R^2 = .98, \text{ D-W} = 1.48, \text{ df} = 41$$

The results confirm the significance of the household risk variables from equation 2 and add at least one significant trigger event, the business failure rate. The divorce rate variable is not significant, although this result is not surprising in light of the 1970s run-up, and the subsequent slight downward trend, noted in Figure 6.

The inclusion of the share of mortgages serviced by someone other than the owner (SHSERV) to equation 3 allows us to test the hypothesis that a structural change in servicing relationships, caused by the growth in mortgage securitization, is responsible for the rising trend in foreclosure rates.

$$\text{FOR} = -0.04 \text{ PSAV} + 5.01 \text{ LI/AS} + 0.003 \text{ BFAIL} - 0.01 \text{ DIV} + 0.004 \text{ SHSERV} \quad (4)$$

$$\begin{matrix} (-2.75)^* & (2.72)^* & (2.62)^{**} & (-1.49) & (1.04) \end{matrix}$$

$$\text{Reg. } R^2 = .90, \text{ Total } R^2 = .98, \text{ D-W} = 1.16, \text{ df} = 39$$

The SHSERV variable was not statistically significant. This, therefore, further supports the view that one should reject the hypothesis that a structural change in servicing relationships explains the rising long-term trend in foreclosure rates.

As regards the long-term trend, the regression results are generally consistent with the notion that household risk is rising and that the rising risk is contributing to the rising long-term trend. Broader measures of household debt and savings tend to be more significant than narrower or traditional measures of risk, such as unemployment and LTV. Also, substituting the broader household risk variables for the more traditional variables tends to improve the explanatory power of the regressions. Some significance appears to accrue to trigger events, although the regression results offer only limited support in this area. Alternative specifications containing a broader range of variables are presented in Elmer and Seelig (1998).

Although the results in equation 3 are encouraging and support the notion that household risk may help to explain the foreclosure rate trend, they are nevertheless limited in several respects. Figures 1–13 clearly illustrate the fact that many of the long-term time series are severely autocorrelated.¹⁵ Although the Yule-Walker equations are used to correct for this problem, it would be naïve to think that the problem has been entirely eliminated. A second problem is that a number of seemingly relevant variables discussed in previous sections, such as health insurance coverage and gambling, do not extend throughout the 1950–97 period. The tests are necessarily limited by their inability to include the full range of variables that might influence foreclosure rates. Finally, the availability of some variables is somewhat misleading because they do not accurately measure the intended effects. Most notably, although the shelter component of the CPI serves as an approximate index of house prices and extends back to the early 1950s, other house price indexes are generally preferred. Unfortunately, two preferred indexes, the NAR median sales price and OFHEO repeat sales indexes, extend back only to the late 1960s and early 1980s, respectively. Thus the value of a longer sample must be weighed against the cost of using less-appealing inputs.

VI. Conclusion

The advantage of examining economic trends over very long periods is that one can identify elements of trends that can be lost in shorter-term or cross-sectional analyses. Such is the case with the rising long-term trend in single-family mortgage foreclosures. This trend clearly suggests a secular rise in mortgage default risk that is not discussed in the myriad previous studies and bears almost no relation to very basic explanatory forces, such as the rate of interest. The consistency of the trend over the past two decades points to a need to examine its causes.

¹⁵ While problems of nonstationarity in some of the data series make interpretation of the results

The rising long-term trend in foreclosure rates is at least partially explained by a variety of variables. Although several traditional determinants of default, notably house appreciation and LTV, explain some portion of the long-term trend, they appear to stop short of explaining the more recent, and unsettling, rising trend. In an effort to explain the remaining portion of the trend, we have explored the notion that the incidence of shocks to individual lifestyles or “trigger events,” such as divorce, have increased. A related, but distinct, hypothesis is that the risk posture of individuals has increased, especially as individuals increasingly leverage their homes as part of a broader strategy of managing their overall wealth portfolio. Although evidence exists supporting both hypotheses, the risk posture hypothesis appears more consistent with a variety of disparate incentives and trends relating to household financial management.

Appendix

Extension of MBA FHA and Conventional Foreclosure Rates

The foreclosure rate series presented in Table A comes from several sources. Approximately half of the data are annualized rates of foreclosures started each quarter as published by Mortgage Bankers Association beginning in 1972 for loans insured by the FHA, loans insured by the VA, and conventional

difficult, first difference estimates support the role of broader risk measures.

(non-FHA/VA) mortgages. The MBA data provide an excellent starting point for constructing a continuous time series because they constitute one of the longest time series of aggregate mortgage foreclosure rates.¹⁶

The post-1972 MBA data are extended to the earlier 1950–71 period with a two-step procedure. The first step involves extending MBA FHA foreclosure rates, found in column 1 of Table A, using aggregate FHA foreclosure rates published by the Department of Housing and Urban Development (HUD), found in column 2. The HUD FHA rates cannot be used directly before 1972, because they are reported on an “annual loans foreclosed” basis, which differs from the “foreclosures started” basis of MBA data. Since many more foreclosures are started than are consummated, the MBA FHA rates tend to be higher than the HUD FHA foreclosure rates, suggesting that the HUD rates must be adjusted upward to make them comparable to MBA rates. One makes this adjustment by finding the average MBA FHA foreclosure rate ratio during a period in which the two series overlapped. The period 1972–79 represents such a period, and the ratio during this period is 1.49. The MBA FHA data are thereby extended to 1950–71 as follows:

$$1950\text{--}71 \text{ Extended MBA FHA} = 1.49 (1950\text{--}71 \text{ HUD FHA}), \quad \text{A-1}$$

with the entire series shown in column 3.

In the second step, post-1972 MBA conventional foreclosure rates, shown in column 4 of Table A, are extended to the 1950–71 period on the basis of the pre-1972 MBA FHA rates calculated in step 1.

¹⁶ The MBA series is calculated from a very large sample (currently over 20 million) of mortgages serviced by members of the MBA. A longer time series is available from the American Council of Life Insurance (ACLI). Although the ACLI series begins in 1965, in more recent years it is problematic because the underlying database of mortgages, from which the series is constructed, has dwindled as life insurance companies have moved out of single-family mortgages. For example, in 1970 these mortgages represented about one-third (about \$75 billion) of ACLI sample respondent holdings, but in 1997 they had dropped to only 3 percent (about \$4 billion). While the ACLI series exhibits the same long-term rising trend observed in the MBA data (see Figure 1), its declining sample reduces its reliability as an aggregate index.

This is accomplished with the assistance of conventional foreclosure rates published by the Federal Home Loan Bank Board (FHLBB) beginning in 1963 and shown in column 5. The FHLBB rates are convenient because they have often been reported with, and compared to, the HUD FHA rates in column 2.¹⁷ The ratio of these two series thereby provides a basis for estimating pre-1972 conventional foreclosure rates. Specifically, one estimates 1963–71 MBA-consistent conventional foreclosure rates by multiplying pre-1972 extended MBA FHA foreclosure rates from column 3 by the ratio of the 1963–71 yearly FHLBB conventional and HUD FHA rates:

$$1963-71 \text{ Extended MBA Conventional} = 1963-71 \text{ Extended MBA FHA (1963-71 FHLBB Conventional / HUD FHA)}. \quad \text{A-2}$$

Before 1963, the pre-1972 MBA FHA series is multiplied by the average long-term ratio of MBA conventional and FHA foreclosure rates for the 1963–97 period, which equals 0.41:

$$1950-62 \text{ Extended MBA Conventional} = 0.41 (1950-62 \text{ Extended MBA FHA}). \quad \text{A-3}$$

This approach ensures that conventional foreclosure rates lie below FHA rates while following the same aggregate trend. The final extended MBA conventional series is shown in column 6.

¹⁷ For example, see 1964, 1966, and 1970 FHLBB *Annual Reports* for early data, and the *FHLBB Journal* throughout the 1970s for later data. The FHLBB data also have an intuitive appeal because their FHA and conventional rates follow the same general trends, but with the FHA rates considerably higher than the conventional rates in every period reported.

Table A

Extended MBA FHA and Conventional Foreclosure Rates: 1950-97

Year	MBA FHA Rate (1)	HUD FHA Rate (2)	Extended MBA FHA Rate (3)	MBA Convent. Rate (4)	FHLBB Convent. Rate (5)	Extended MBA Convent. Rate (6)
1950	N/A	0.20	0.00	N/A	N/A	0.00
1951	N/A	0.10	0.15	N/A	N/A	0.06
1952	N/A	0.09	0.13	N/A	N/A	0.05
1953	N/A	0.06	0.09	N/A	N/A	0.04
1954	N/A	0.18	0.26	N/A	N/A	0.11
1955	N/A	0.20	0.30	N/A	N/A	0.12
1956	N/A	0.25	0.37	N/A	N/A	0.15
1957	N/A	0.15	0.23	N/A	N/A	0.09
1958	N/A	0.13	0.20	N/A	N/A	0.08
1959	N/A	0.20	0.30	N/A	N/A	0.12
1960	N/A	0.33	0.49	N/A	N/A	0.20
1961	N/A	0.67	1.00	N/A	N/A	0.41
1962	N/A	0.97	1.44	N/A	N/A	0.59
1963	N/A	1.09	1.63	N/A	0.43	0.63
1964	N/A	1.18	1.76	N/A	0.46	0.69
1965	N/A	1.21	1.80	N/A	0.51	0.76
1966	N/A	1.20	1.79	N/A	0.52	0.78
1967	N/A	0.99	1.48	N/A	0.45	0.67
1968	N/A	0.76	1.13	N/A	0.29	0.43
1969	N/A	0.57	0.86	N/A	0.17	0.26
1970	N/A	0.60	0.90	N/A	0.14	0.21
1971	N/A	0.77	1.15	N/A	0.12	0.18
1972	1.29	0.95	1.29	0.16	0.10	0.16
1973	1.64	1.16	1.64	0.23	0.10	0.23
1974	1.50	1.15	1.50	0.31	0.11	0.31
1975	1.24	0.94	1.24	0.38	0.14	0.38
1976	0.89	0.64	0.89	0.32	0.14	0.32
1977	0.89	0.58	0.89	0.30	0.11	0.30
1978	0.86	0.52	0.86	0.25	0.09	0.25
1979	0.78	0.40	0.78	0.25	0.09	0.25
1980	0.73	N/A	0.73	0.31	0.12	0.31
1981	0.82	N/A	0.82	0.40	0.18	0.40
1982	1.06	N/A	1.06	0.52	0.33	0.52
1983	1.05	N/A	1.05	0.62	0.39	0.62
1984	1.03	N/A	1.03	0.62	N/A	0.62
1985	1.13	N/A	1.13	0.68	N/A	0.68

1986	1.26	N/A	1.26	0.75	N/A	0.75
1987	1.35	N/A	1.35	0.70	N/A	0.70
1988	1.47	N/A	1.47	0.69	N/A	0.69
1989	1.84	N/A	1.84	0.82	N/A	0.82
1990	1.73	N/A	1.73	0.83	N/A	0.83
1991	1.72	N/A	1.72	1.07	N/A	1.07
1992	1.79	N/A	1.79	1.03	N/A	1.03
1993	1.90	N/A	1.90	0.94	N/A	0.94
1994	2.22	N/A	2.22	0.90	N/A	0.90
1995	2.12	N/A	2.12	0.90	N/A	0.90
1996	2.31	N/A	2.31	0.99	N/A	0.99
1997	2.47	N/A	2.47	1.04	N/A	1.04

References

- Ambrose, Brent W., and Charles A. Capone. 1996. Resolution of Single-Family Borrower Default: Modeling the Conditional Probability of Foreclosure. Paper presented at the Mid-Year AREUEA Meetings, Washington, D.C.
- Archer, Wayne R., David C. Ling, and Gary A. McGill. 1996. The Effect of Income and Collateral Constraints on Residential Mortgage Terminations. *Regional Science and Urban Economics* 26:235–61.
- Capozza, Dennis R., Dick Kazarian, and Thomas A. Thompson. 1997. Mortgage Default in Local Markets. *Real Estate Economics* 24(4):631–55.
- Case, Karl E., and Robert J. Shiller. 1996. Mortgage Default Risk and Real Estate Prices: The Use of Index-Based Futures and Options in Real Estate. *Journal of Housing Research* 7(2): 243–58.
- Deng, Yongheng. 1997. Mortgage Termination: An Empirical Hazard Model with a Stochastic Term Structure. *The Journal of Real Estate Finance and Economics* 14(3):309–31.
- Elmer, Peter J. 1997. A Choice-Theoretic Model of Single-Family Mortgage Default. FDIC Working Paper 97-1.
- Elmer, Peter J., and Steven A. Seelig. 1998. Insolvency and Trigger Events in the Theory of Single-Family Mortgage Default. FDIC Working Paper 98-3.
- Engen, Eric M., and William G. Gale. 1997. Debt, Taxes, and the Effects of 401(k) Plans on Household Wealth Accumulation. Mimeo, Federal Reserve Board and The Brookings Institution.
- Gardner, Mona J., and Dixie L. Mills. 1989. Evaluating the Likelihood of Default on Delinquent Loans. *Financial Management* 18(4):55–63.
- Hendershott, Patric H., and Robert Van Order. 1987. Pricing Mortgages: An interpretation of the Models and Results. *Journal of Financial Services Research* 1(1):19–55.
- Jones, Andrew B., Henry W. Hayssen, and Jennifer E. Schneider. 1995. Rating of Residential Mortgage-Backed Securities. *The Journal of Fixed Income* 4(4):12–36.
- Judge, George G., W. E. Griffiths, R. Carter Hill, Helmu Lutkepohl, and Tsong-Chao Lee. 1985. *The Theory and Practice of Econometrics*. 2d ed. John Wiley and Sons.
- Kau, James B., and Donald C. Keenan. 1995. An Overview of the Option-Theoretic Pricing of Mortgages. *Journal of Housing Research* 6(2):217–44.
- Monsen, Gordon. 1996. A Poor Performance. *Mortgage Banking* 56(9):14–22.

Phillips, Richard A., Eric Rosenblatt, and James H. Vanderhoff. 1996. The Probability of Fixed and Adjustable-Rate Mortgage Termination. *The Journal of Real Estate Finance and Economics* 13(2):95–104.

Quigley, John M., and Robert Van Order. 1995. Explicit Tests of Contingent Claims Models of Mortgage Default. *The Journal of Real Estate Finance and Economics* 1(2):99–117.

Vandell, Kerry D. 1995. How Ruthless is Mortgage Default? A Review and Synthesis of the Evidence. *Journal of Housing Research* 6(2):245–64.

Wilson, Donald G. 1995. Residential Loss Severity in California: 1992-1995. *The Journal of Fixed Income* 5(3):35–48.

Yang, Tyler T., Henry Buist, and Isaac F. Megbolugbe. 1998. An Analysis of the Ex-Ante Probabilities of Mortgage Prepayment and Default. *Real Estate Economics* (forthcoming).

Figure 1
Long-Term Trends for Conventional and FHA Foreclosure Rates Are Rising

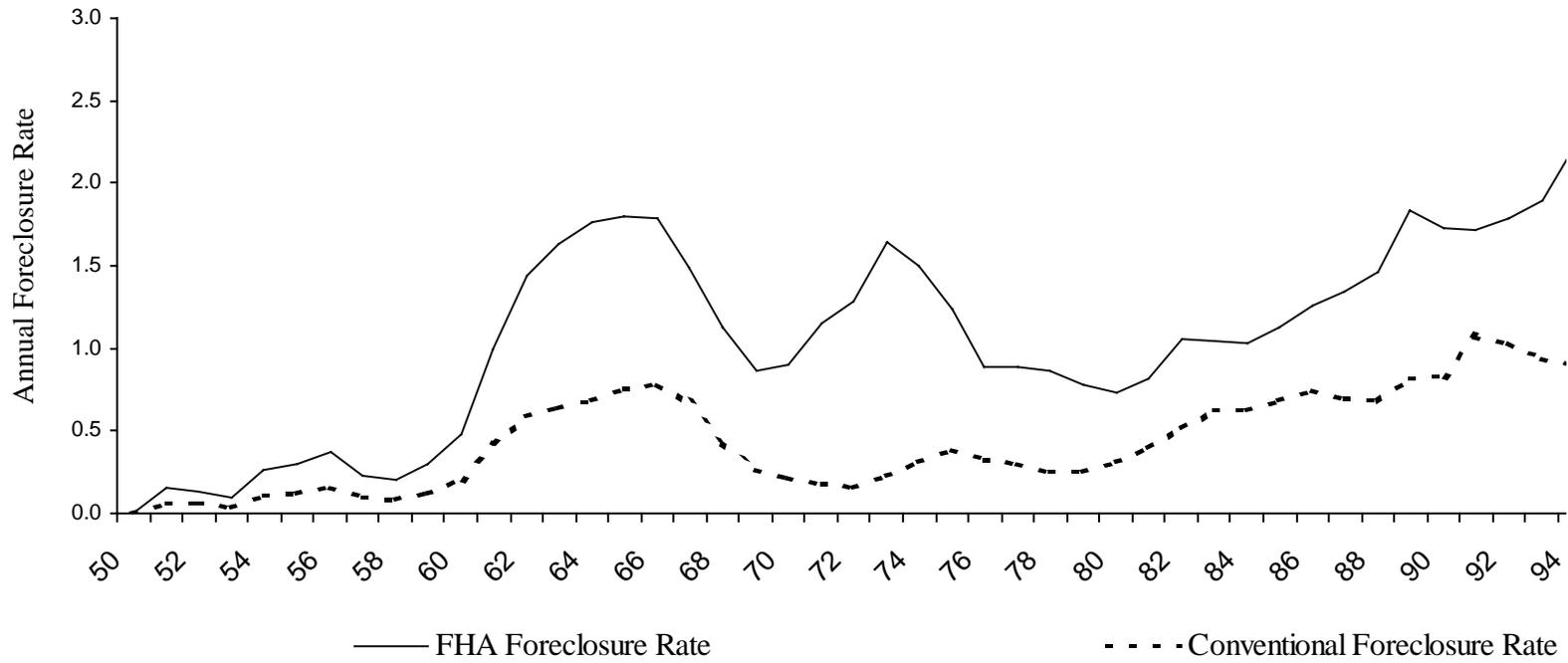
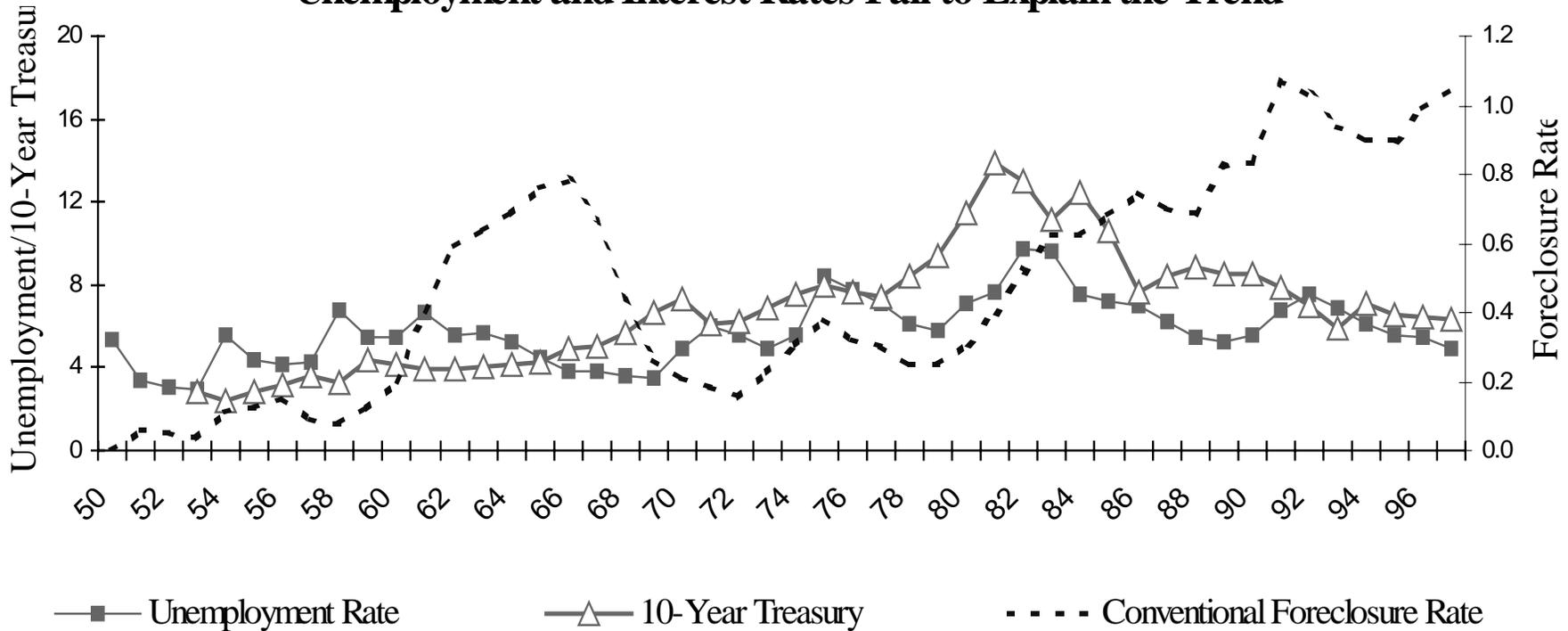


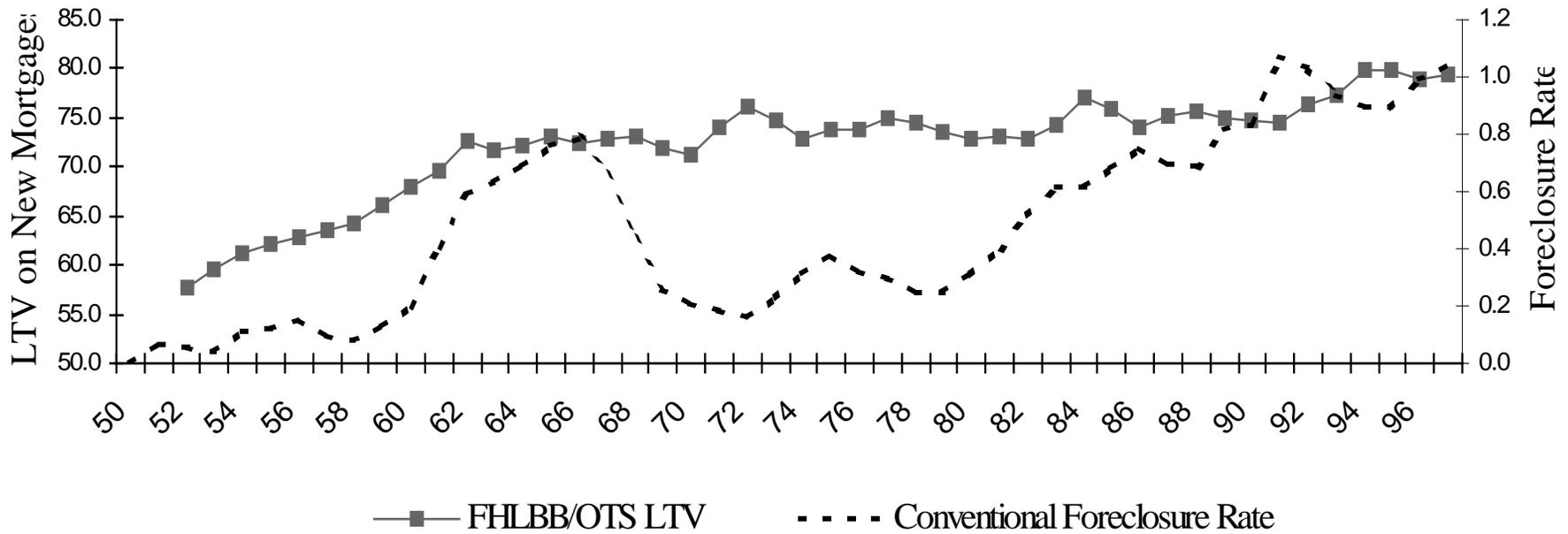
Figure 2

Unemployment and Interest Rates Fail to Explain the Trend



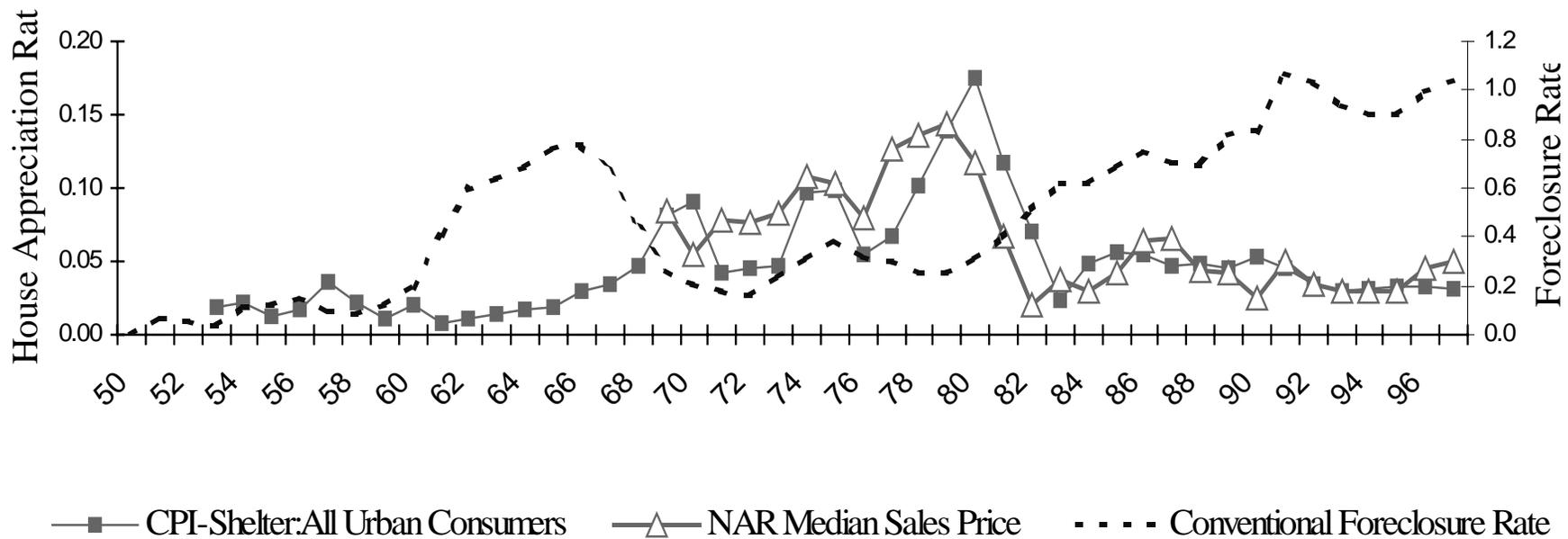
Source: MBA/FHLBB/HUD, Federal Reserve, Conference Board, NBER.

Figure 3
LTV Explains Some, But Not All, of the Trend



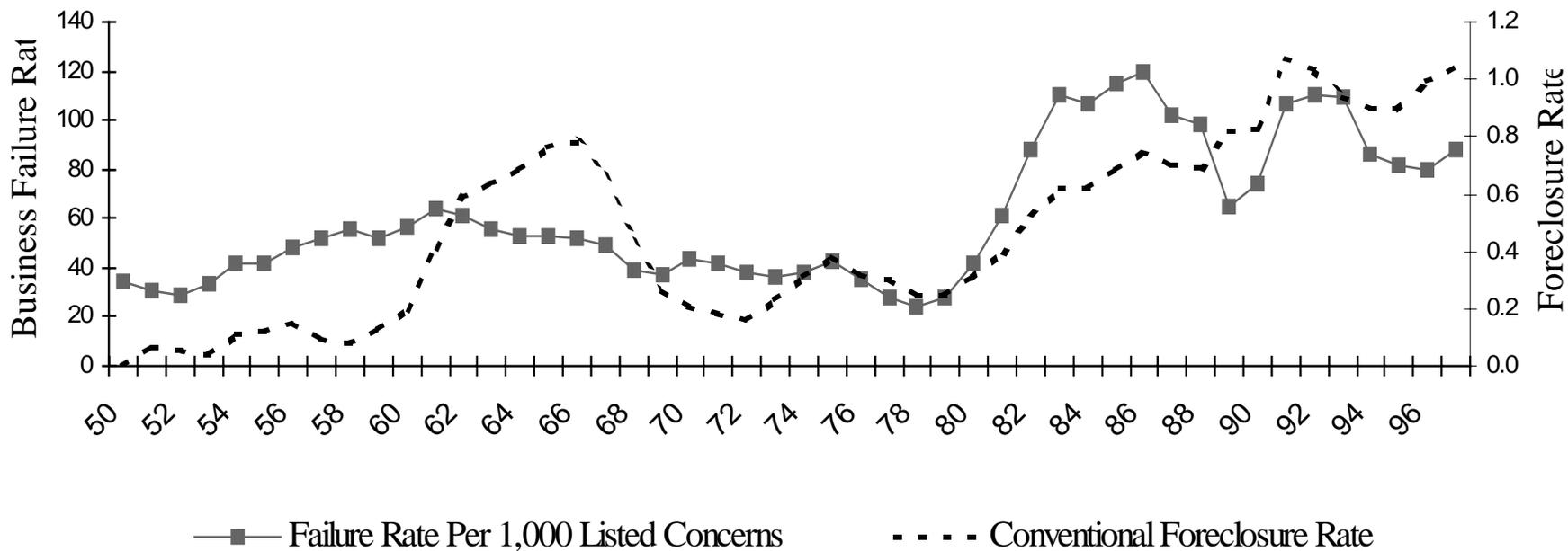
Source: MBA/FHLBB/HUD, FHLBB/Office of Thrift Supervision (OTS).

Figure 4
House Appreciation Rate Explains Some, But Not All, of the Trend



Source : MBA/FHLBB/HUD, BLS, National Association of Realtors (NAR).

Figure 5
Business Failure Rates Remain High Despite Good Economic Health



Source : MBA/FHLBB/HUD, Dunn and Bradstreet.

Figure 6
Divorce Rates Doubled in the 1970s and Have Remained High Since

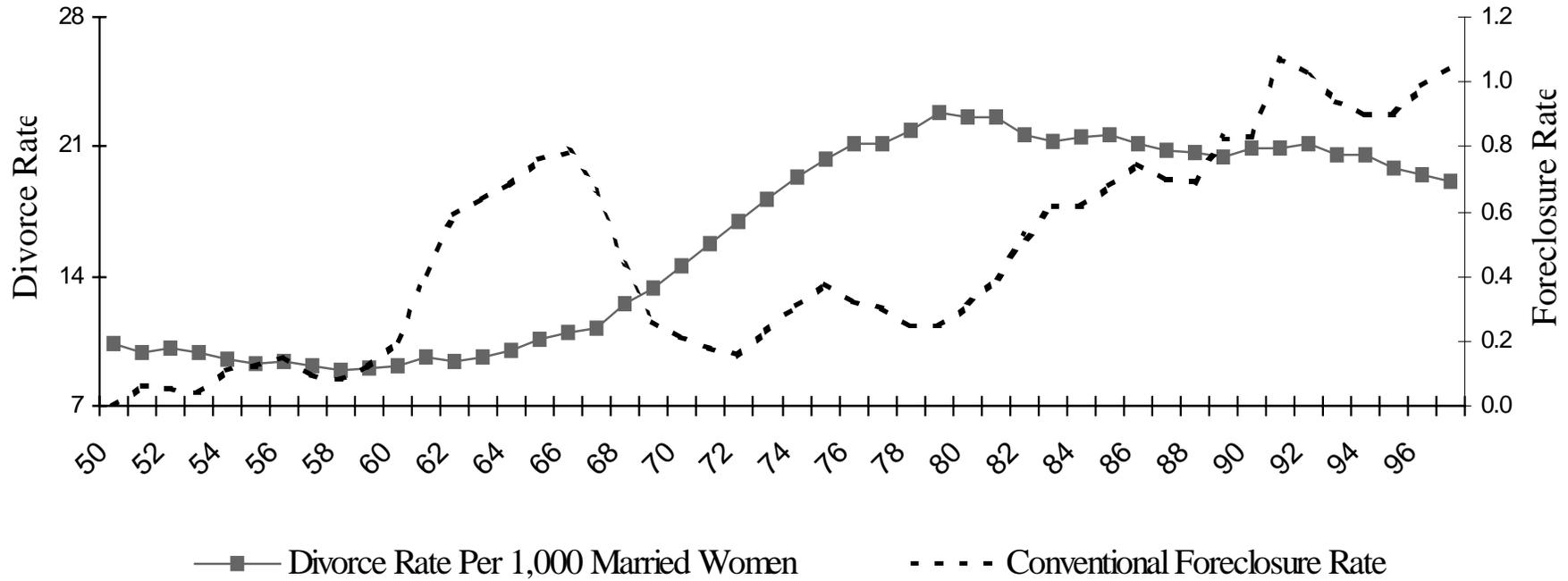
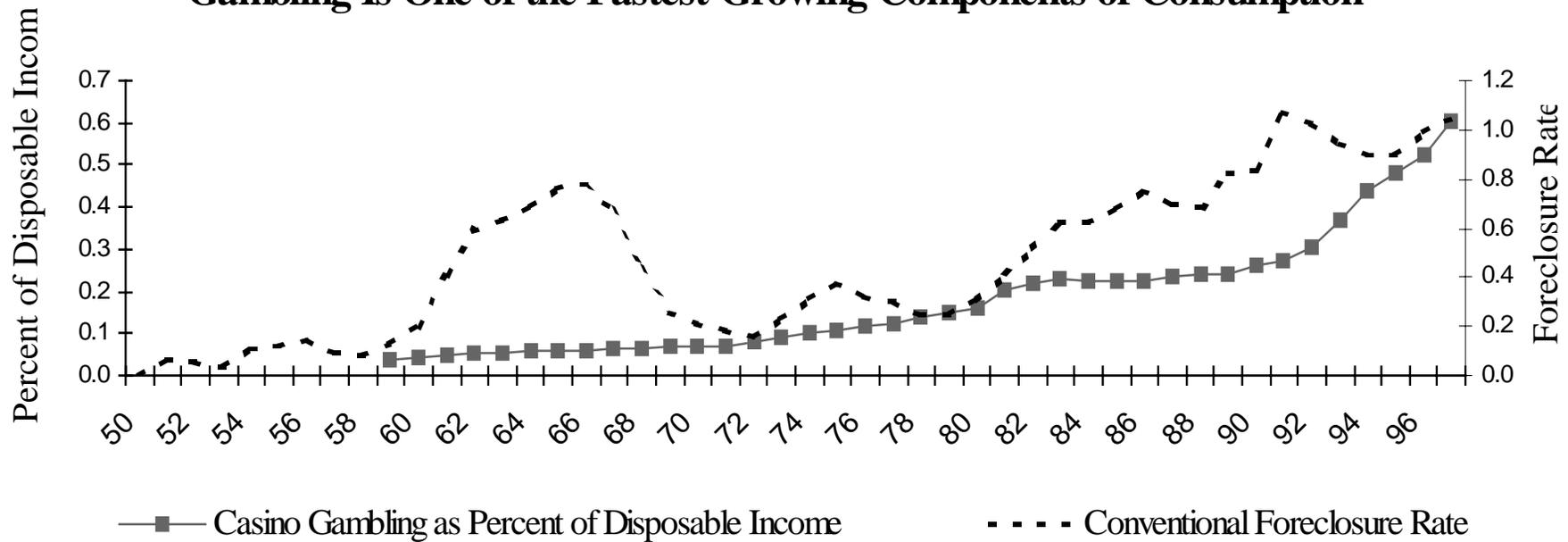


Figure 7
Gambling Is One of the Fastest-Growing Components of Consumption



Source: MBA/FHLBB/HUD, Bureau of Economic Analysis (BEA).

Figure 8
Consumer Debt Is at Historic Highs,
While Savings Rates Are at Historic Lows

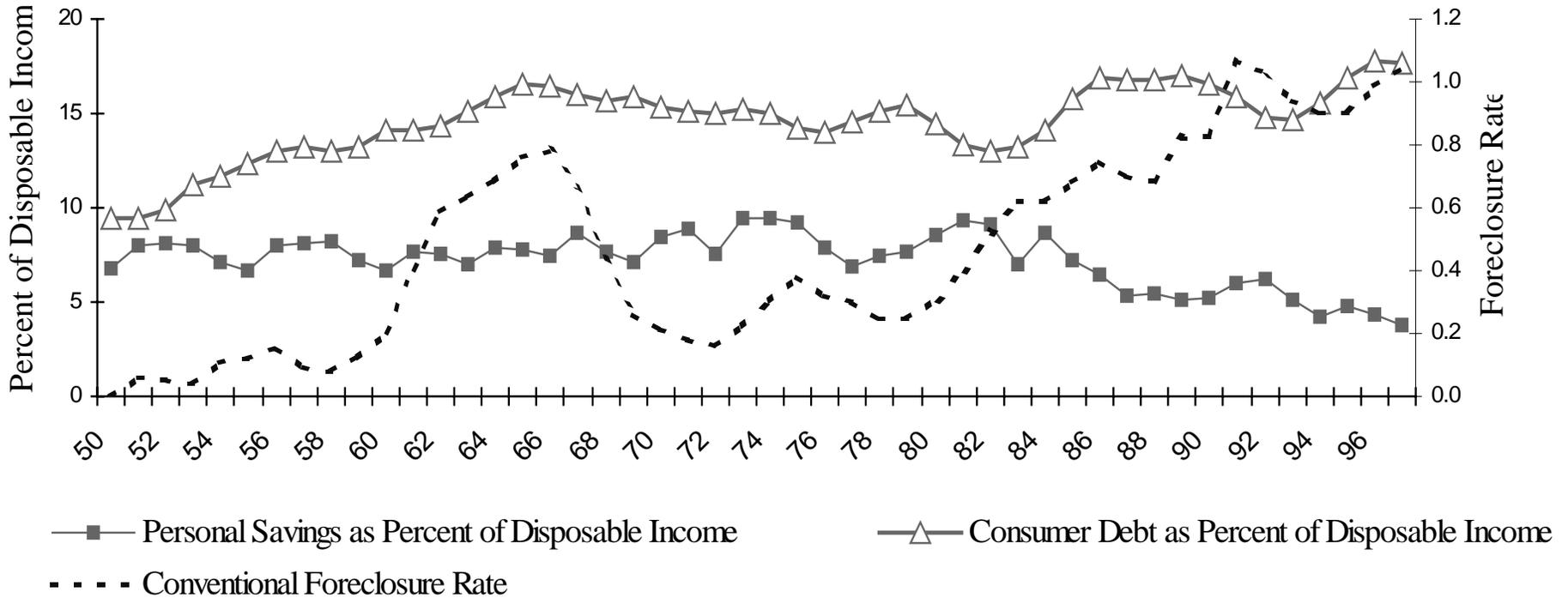


Figure 9
Total Personal Liabilities Steadily
Increased Vis-a-Vis Total Assets

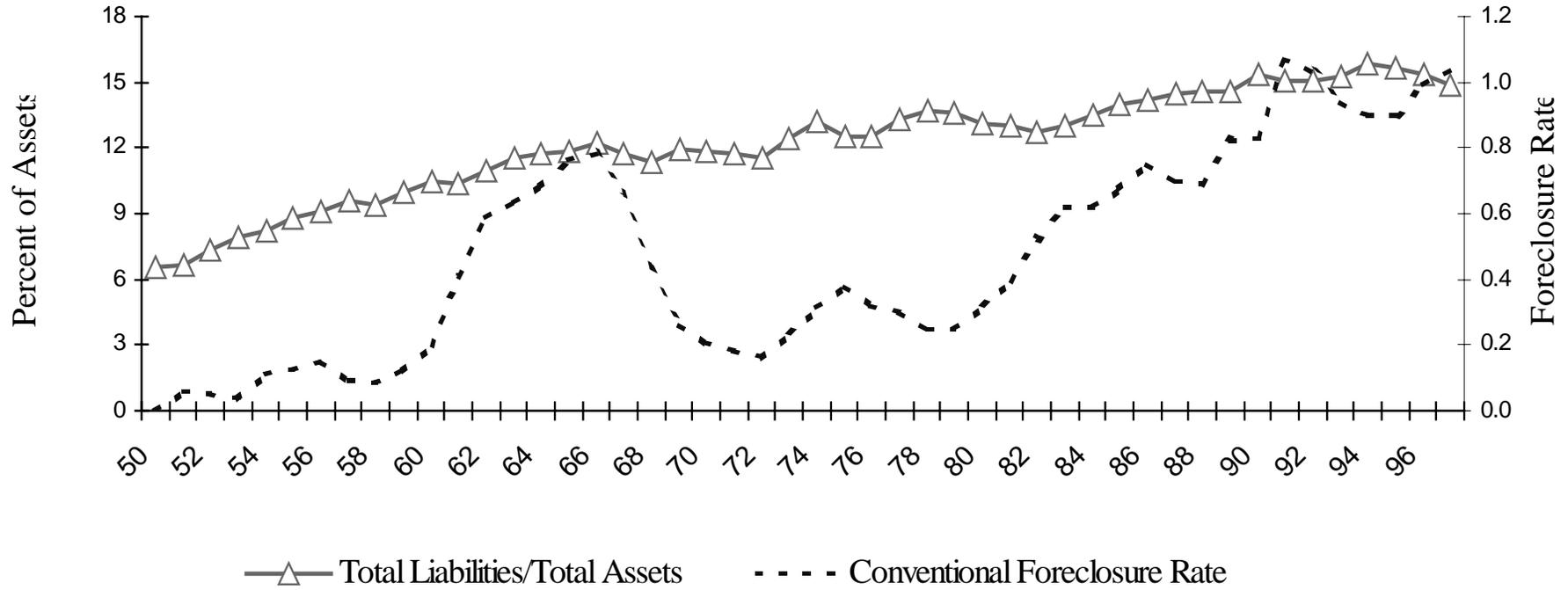


Figure 10
Percentage of Population Not Covered by Health Insurance
Rose Throughout the 1980s

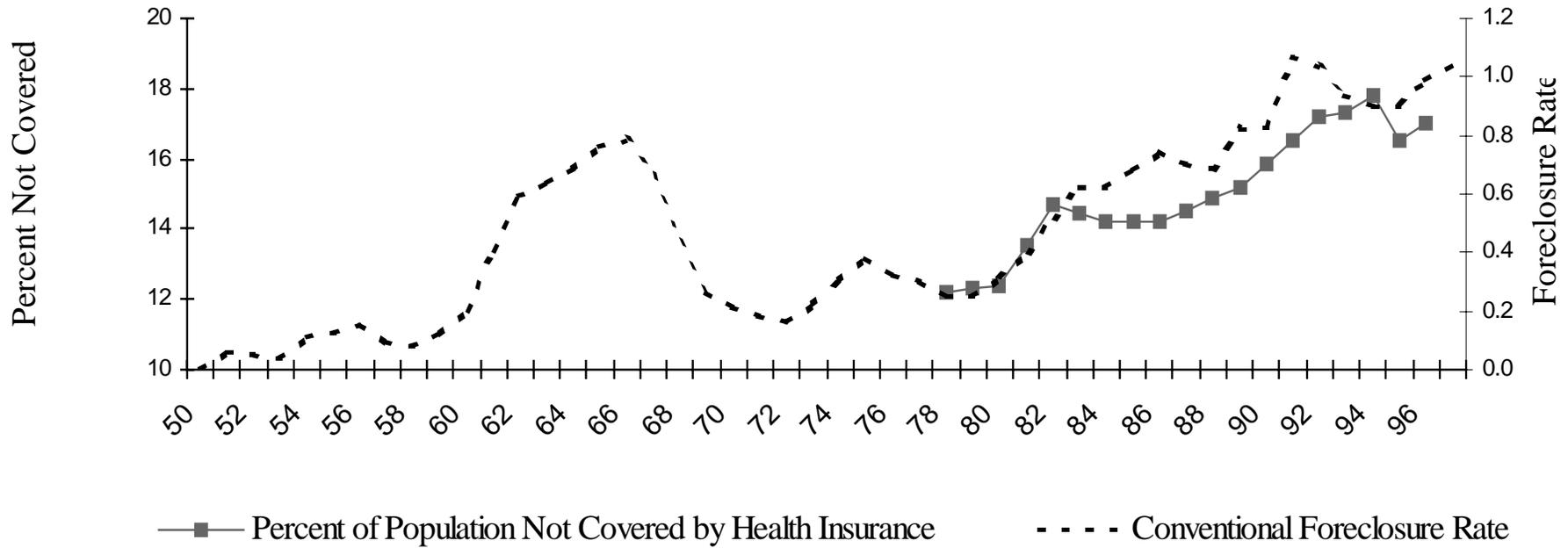


Figure 11
Personal Bankruptcy and Mortgage Foreclosure
Rates Are Surprisingly Similar

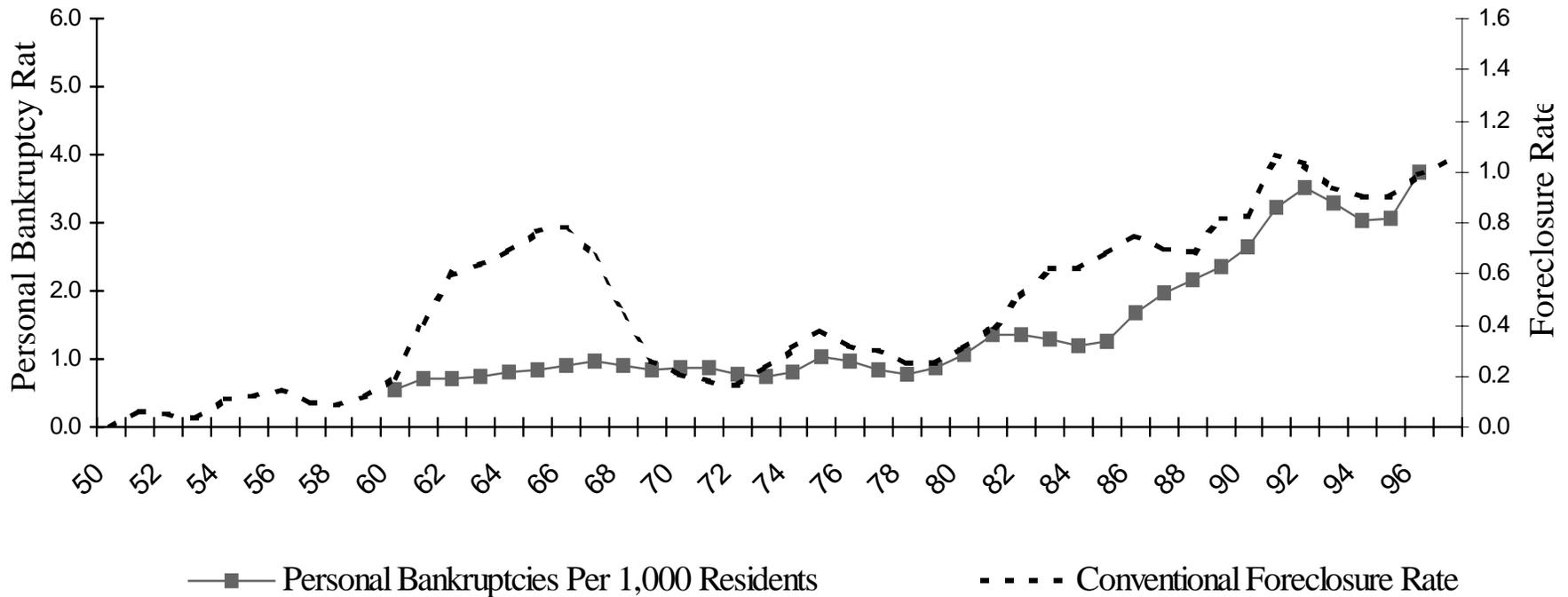
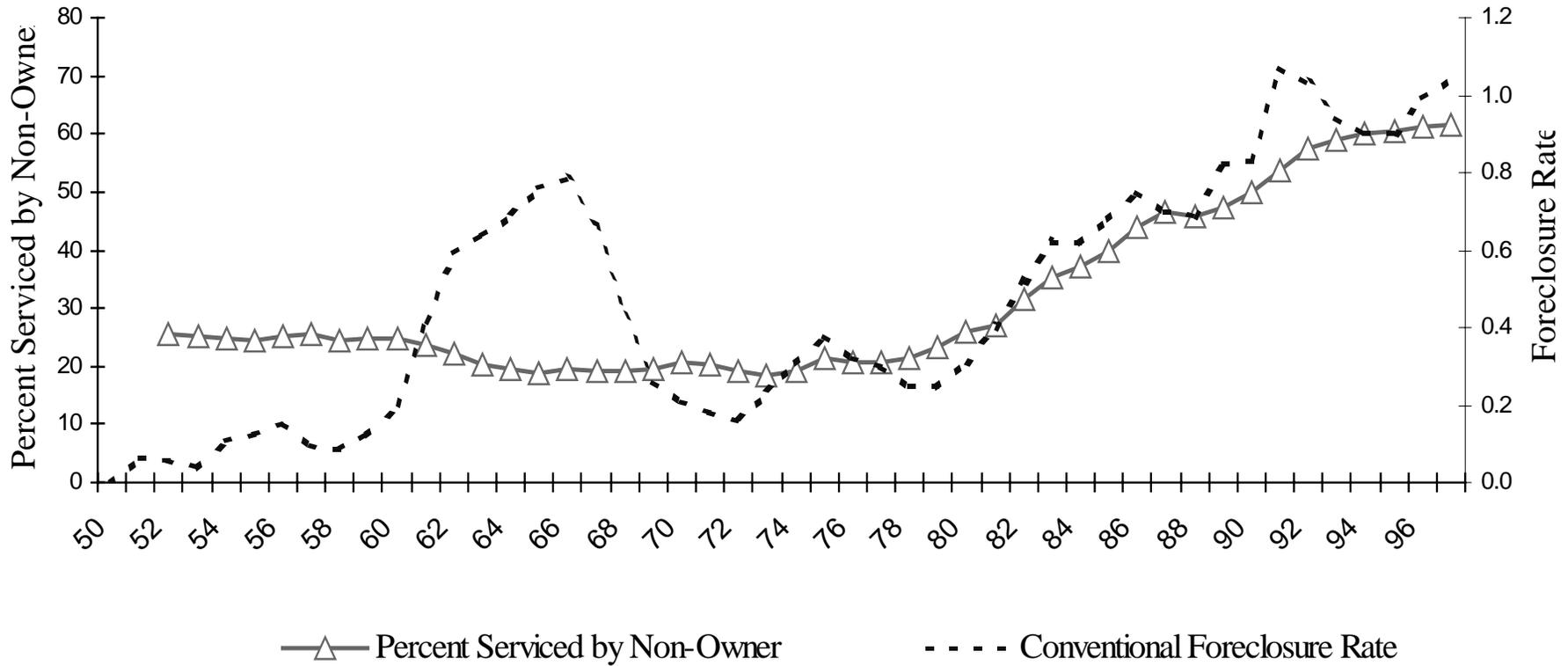
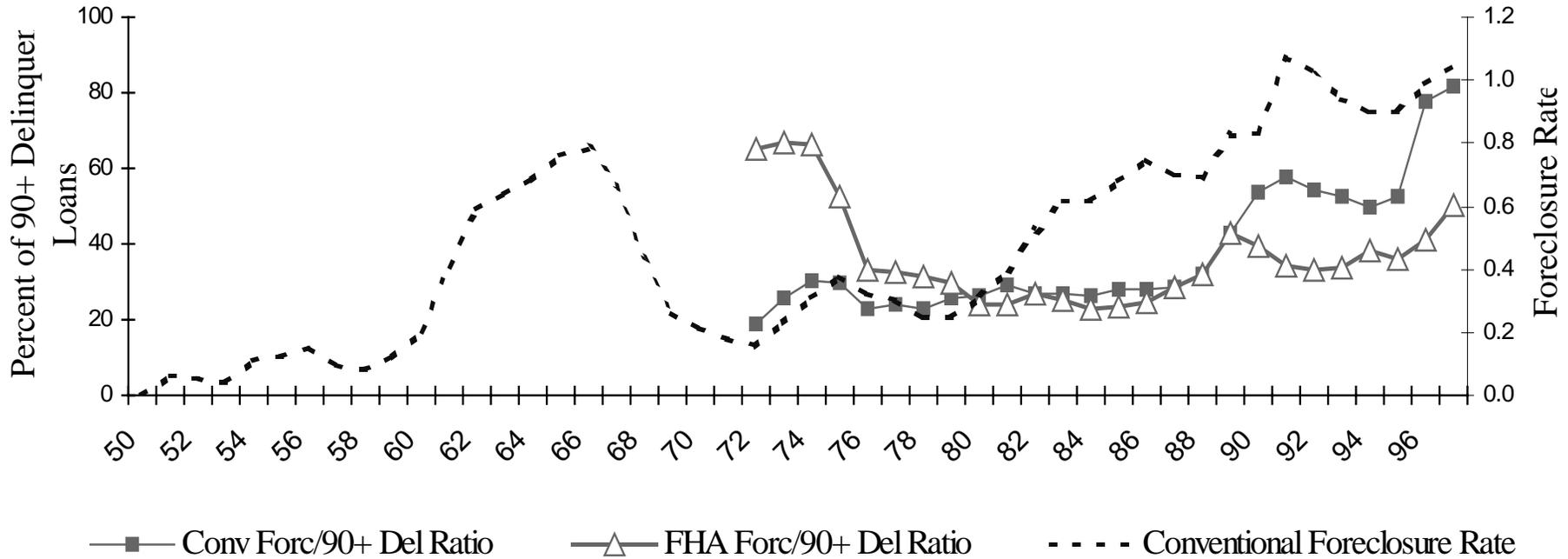


Figure 12
Share of Mortgages Not Serviced by Owner Rose Steadily After 1980



Source: MBA/FHLBB/HUD, FRB.

Figure 13
Inconsistent Behavior for Conventional and FHA Foreclosure Rates
Relative to Delinquencies Over 90 Days in the 1980s



Source : MBA/FHLBB/HUD.