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Securitization and the Efficacy of Monetary Policy

I. Introduction

While there is no single prevailing view of the monetary policy transmission mechanism, the credit markets are important in practically every mainstream view. The central bank is seen to influence the economy by affecting the pricing or the volume of credit instruments, or of financial assets more generally. At the same time, the credit markets are significantly influenced by securitization, particularly since a boom in mortgage securitizations took hold of the markets in the 1970s. The pace of that boom has since moderated, but the growth of securitization in other credit markets has been at least as vigorous in the past five years as it was in the mortgage markets two decades ago.

This paper investigates whether the cyclical effects of monetary policy have been influenced by the secular growth in securitization in recent decades. In particular, when the central bank makes a specific monetary policy move—such as increasing the overnight interbank rate by 50 basis points—is the ultimate effect on GDP different from what it would have been in the 1960s, when securitization was virtually nonexistent?

This question is considered from several angles. In Section II, we consider why, in principle, securitization may affect the results of a policy move. The analysis suggests that securitization has likely weakened the impact of any policy move. Alternatively, for policy to achieve a given intended result in terms of inflation or output, it may be necessary to make a larger policy move than was required earlier.

Section III describes the markets in which securitization has grown the most in recent years. The analysis suggests that the more prominently these markets feature in the monetary transmission mechanism, the more likely it is that they have contributed to a reduction in the efficacy of policy moves. We then construct in Section IV some simple empirical macroeconomic models with an explicit role for the level of securitization in the mortgage markets. These markets present the best opportunity to identify empirically the conjectured theoretical effects of securitization because they provide the longest-running time series of data in any securitized market. In the final section, we summarize the lessons derived from the various strands of the analysis.

II. Securitization and the Transmission Mechanism: Why Should Securitization Matter?

Casual reasoning suggests that if monetary policy operates through the credit markets, and if securitization has transformed the credit markets over the past few decades, securitization may have had important effects on the

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transmission mechanism. In this section, we consider how those effects may have manifested themselves. In this discussion, we focus on two types of theories of the importance of these effects, which we classify as pertaining to the *liquidity channel* or the *credit channel*.

Liquidity channel theories emphasize the deepening of credit markets as a result of securitization, and draw conclusions about how the functioning of those markets may improve with this deepening and the associated additional liquidity. A classic paper in this literature is Black, Garbade, and Silber (1981). The authors present a model in which the "marketability" of Government National Mortgage Association (GNMA) securities increases as the GNMA market grows.[1] This additional marketability influences the demand for both GNMA securities and directly held Federal Housing Administration (FHA) mortgages, which are gross substitutes. The conclusion they highlight is that these changes tend to lead to lower interest rates in both the GNMA and the FHA markets.

More generally, however, this deepening and increased marketability suggest that the markets would be more efficient in the allocation of credit, and the additional liquidity would reduce undesirable distortions in these markets. Some of these distortions could be simple short-term fluctuations in pricing and credit availability owing to illiquidity. Beyond the short term, the additional liquidity would produce a market less susceptible to external forces such as the monetary policy operations of a central bank.

Kolari, Fraser, and Anari (1998) provide a recent review of the literature in this area. As is the case in most of this literature, the purpose of that paper is to show that mortgage interest rates have declined with the growth of securitization in the mortgage markets. This negative correlation between rates and the growth of securitization is almost always found in the empirical data.

Heuson, Passmore, and Sparks (2000) have a different take on this negative correlation. Their theoretical model is consistent with the earlier arguments under certain conditions, but under others the model has causality going in the reverse direction. Specifically, the paper shows that lower mortgage rates can lead to more securitization, rather than the other way around. Since both sets of conditions are plausible a priori, it is quite possible that causality runs both ways.

Moreover, endogenizing the level of securitization makes the implications for the transmission mechanism more complex. On the one hand, market deepening owing to increased securitization could make it more difficult for the central bank to affect rates, as in the earlier models. On the other hand, if the central bank can still affect mortgage rates, it could produce fluctuations in liquidity whose potency could vary over the cycle. In a period of easing, securitization would tend to rise, making it more difficult for monetary policy to affect rates. In a period of tightening, the opposite would be true and policy would have more bite.

Several researchers have used cross-sectional empirical evidence to examine the pattern of securitization activity in periods of weakness. For instance, James (1988) and Stanton (1998) conclude that securitization by banks increases in periods of aggregate weakness or individual firm weakness. Minton, Opler, and Stanton (1999) reach a similar conclusion with regard to industrial firms. However, these cross-sectional patterns may not be obvious in the aggregate data. We shall see later that securitization of multi-family home mortgages, as a proportion of outstanding mortgages, tends to decline during recessions.

Katz (1997) provides a different view of the increased efficiency of the mortgage markets as a result of securitization. Her article argues that securitization has not only deepened, but also broadened the mortgage markets. Katz examines cross-sectional dispersion in mortgage rates in United States and finds that dispersion is negatively related to the extent of securitization. Thus, securitization has not only created deeper markets, but has contributed to the development of a single deep market.

Credit channel theories focus on the effects that monetary policy can have through changes in the demand for or the supply of credit, rather than through pure effects at the interest rate level. Bernanke and Gertler (1995) identify a balance-sheet channel, based on cyclical fluctuations in the financial condition of borrowers, and a bank-lending channel, based on cyclical changes in the ability of banks to intermediate credit. We focus here on the latter, which has the more obvious and direct connection to securitization.

In the bank-lending-channel approach, banks specialize in the intermediation of credit by overcoming informational problems between lenders and borrowers in the credit markets. In a period of monetary tightening, these problems become more acute and it is more difficult for the bank to fund itself and, therefore, to provide loans.

A key assumption of most of these models is that "banks cannot easily replace lost (retail) deposits with other sources of funds, such as certificates of deposit (CDs) or new equity issues."[2] Asset securitization can change this picture, since securitization provides an effective means for banks to deal with their funding problems. Although it is at times hard for banks to issue mortgages and hold them on their books because that requires continuous funding, banks could generate mortgages and securitize them immediately, obviating the need to fund those assets on an ongoing basis. Once again, the implication is that the effect of a given monetary policy move may be more subdued in the presence of greater securitization.

Securitization can also affect the volume of bank credit extended because of the need to standardize contracts and procedures. For instance, if lending criteria are tightened, the tightening is likely to be applied uniformly to all borrowers whose loans are intended for securitization. Thus, stricter criteria may affect a large population of borrowers and may thus have a larger aggregate supply effect.

Now that we have suggested that securitization can affect the transmission mechanism, the logical follow-up question is, does securitization matter in practice? Kuttner (2000) looks at this issue by comparing the relative growth of asset-backed securities and bank loans over the business cycle. He argues that if banks use securitization to buffer the effects of a monetary policy move, the volume of asset-backed securities and bank loans should move in opposite directions in response to monetary policy. He presents evidence that home mortgages since 1980 tend to show that type of behavior. In Section IV, we return to the empirical evidence on the direct question of securitization, after first reviewing the present extent of securitization.

III. The Growth and Reach of Securitization

The general idea behind a typical securitized issue is as follows. First, a bank originates credit market assets of some sort, for instance, home mortgages, credit card receivables, or boat loans. For various reasons, such as to reduce regulatory requirements on capital or improve liquidity, the bank may wish to take the assets off its books. However, it may still be interested in originating the asset, for reasons such as obtaining fee income or maintaining client relationships. The second step is to create a security by pooling together many similar assets whose aggregate income will provide the returns on the security. Finally, the security is sold to outside investors, in many cases institutional investors, and the corresponding assets and liabilities are taken off the bank's books.

The phenomenon of securitization took hold initially in the home mortgage markets. By the late 1970s, a visible proportion of home mortgages was securitized, and the trend intensified in the 1980s. To this day, the proportion of home mortgages securitized continues to grow. At the end of second-quarter 2000, 46 percent of all home mortgages were securitized. Since 1980, we have seen substantial growth in new entrants to the securitization market, including more private sector participants, a greater variety of assets being securitized, and the extension of the trends internationally.

A catalyst for the development of mortgage securitization in the United States was the federal government's sponsorship of a few financial agencies, namely, the Federal National Mortgage Association (FNMA), the Federal Home Loan Mortgage Corporation (FHLMC), and GNMA. These agencies issue securities whose income is derived from pools of home mortgages originated by banks and other financial intermediaries. In order to qualify for inclusion in these pools, mortgages must meet various requirements in terms of structure and amount.

As of September 2000, these three agencies had outstanding mortgage-backed security (MBS) debt of $996 billion, $769 billion, and $575 billion, respectively, representing 37 percent, 29 percent, and 22 percent of the market. Since the creation of these agencies, private sector issuers have entered the market, issuing securities that in many cases deviate from the conforming structure of the federally sponsored pools. Overall, residential mortgage-backed securities constitute 30 percent of the securitized sector.

Many variants of the original MBSs have appeared over the years. Other types of loans may be used as the basis for the securities, such as multi-family home mortgages and commercial mortgages. Commercial mortgage-backed securities (CMBSs) are frequently considered a different type of instrument altogether, because the risk characteristics and the degree of conformity are different from those associated with home mortgages.

Collateralized mortgage obligations (CMOs) are a variation on the MBS approach that differs not in the nature of the underlying instrument, but in the temporal structure of expected payments. With a CMO, payments are divided into tranches, with the first one receiving the first set of payments that come in and later ones taking their turn in the receipt of payments. This structure makes the duration of the securities different and potentially easier to use for asset-liability management purposes.

The top two panels of Chart 1 show the growth of the MBS market from 1980 to September 2000; the bottom two panels provide similar information for the growth of CMOs from 1987 to September 2000. Note that the growth of the MBS market has been fairly steady since 1980, whereas the CMO market grew dramatically from 1988 to 1992 and then leveled off.

The first two panels of Chart 2 offer another look at the growth of securitization of residential mortgages. The top panel shows the ratio of securitized mortgages to all mortgages for the government agencies combined. The ratio is also shown for components corresponding to single- and multi-family homes, respectively. The middle panel shows the same proportions for private sector mortgage-backed securities (sometimes called asset-backed securities, or ABSs). In both panels, the starting points are determined by data availability. The total ratio is dominated by single-family mortgages and exhibits a trend-like pattern. However, note that multi-family mortgages in the federally sponsored pools appear to be more cyclical, slowing down or declining in the 1981-82 and 1990-91 recessions.

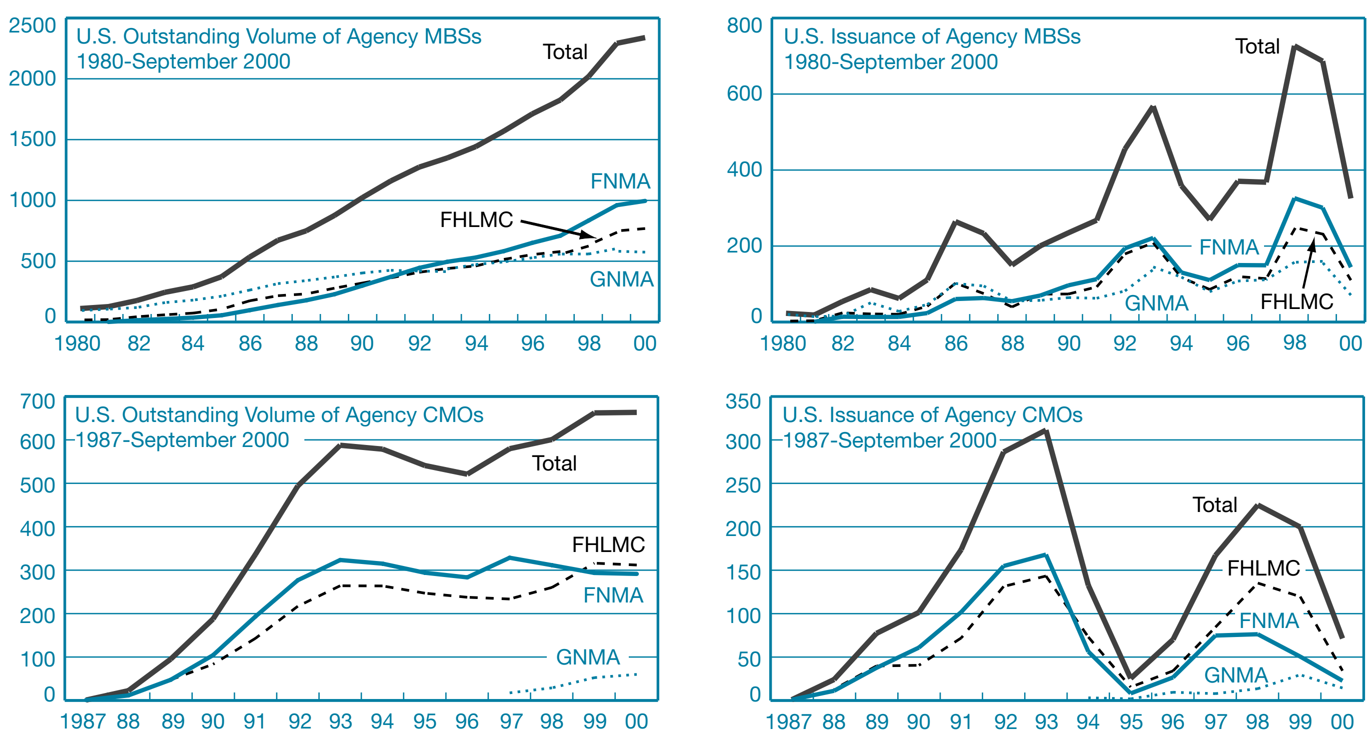
Another related instrument is securitized home equity loans. These are essentially based on second mortgages and thus have characteristics that are similar to the first-mortgage MBSs. Of course, the access to collateral on the home equity loans is of lower quality than that on first mortgages, and the risk characteristics of these securities are different.

Asset-backed securities is a term that applies to instruments based on a much broader array of assets than MBSs. This denomination may be applied to CMBSs and to securitized home equity loans, but it also includes other underlying instruments such as credit card receivables, auto loans, student loans, commercial bonds, commercial loans, and leasing receivables. Since 1996, securitization growth has increased yet further with the development of collateralized bond obligations and collateralized loan obligations, collectively known as collateralized debt obligations (CDOs).

Chart 1

Growth of the Mortgage-Backed Securities Market

Billions of Dollars



Sources: Government National Mortgage Association (GNMA); Federal National Mortgage Association (FNMA); Federal Home Loan Mortgage Corporation (FHLMC).

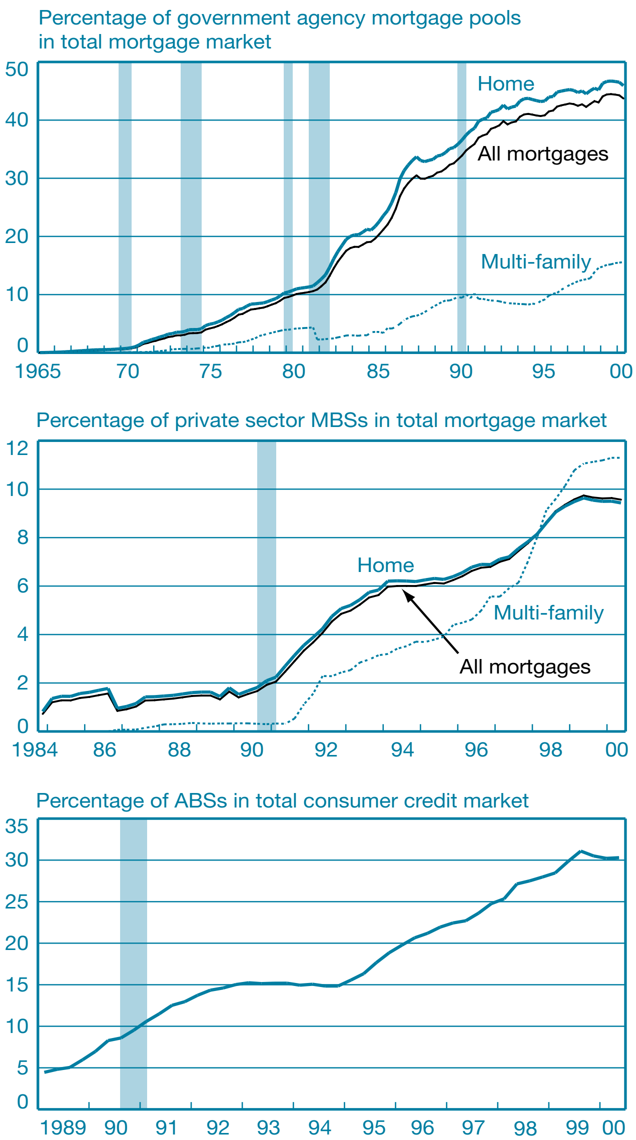
Note: MBSs are mortgage-backed securities; CMOs are collateralized mortgage obligations.

To give a flavor for the growth of these ABS markets, the bottom panel of Chart 2 presents the securitization ratio for consumer credit since 1989 (earlier data are not available). Chart 3 shows the growth of various ABS markets since 1995; Chart 4 depicts the development of the CDO markets over the same period.

At the short end of the maturity spectrum, commercial paper backed by corporate receivables had grown to more than $500 billion by the end of 1999. This figure represents about 25 percent of the U.S. commercial paper market.

Mortgage- and asset-backed securities have also developed outside the United States. For instance, in the first half of 2000, MBS issuance in Europe was $18 billion, while ABS issuance accounted for another $11 billion. The CDO market is also active in Europe.

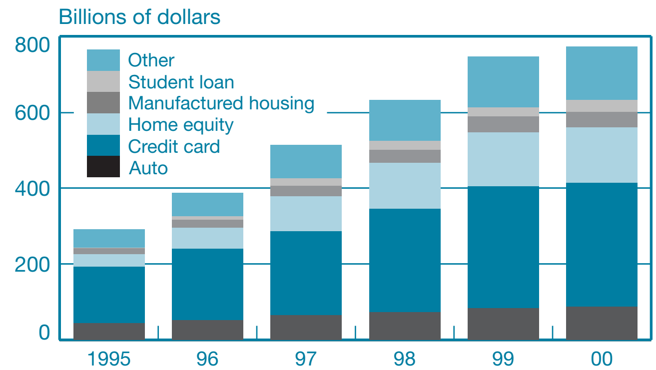
Chart 2
Securitized Proportion of Mortgage and Consumer Credit Markets



Source: Board of Governors of the Federal Reserve System, Flow of Funds database.

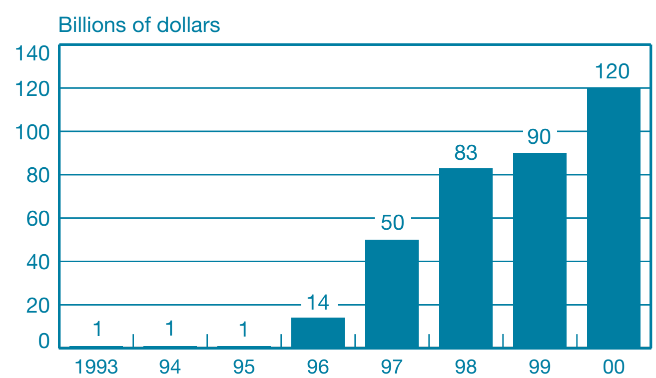
Notes: The shaded areas indicate periods designated national recessions by the National Bureau of Economic Research. MBSs are mortgage-backed securities; ABSs are asset-backed securities.

Chart 3
U.S. Asset-Backed Securities Markets by Major Types of Credit



Sources: Bond Market Association; Board of Governors of the Federal Reserve System.

Chart 4
New Issuances of Collateralized Debt Obligations



Source: Moody's Investors Service.

IV. Statistical Evidence of the Influence of Securitization

This section uses data corresponding to securitization in the U.S. mortgage markets to test the hypothesis that more securitization may reduce the efficacy of monetary policy to produce real economic effects. As noted earlier, this issue differs from those addressed in earlier research, which have focused on securitization's effect on the level or the dispersion of mortgage interest rates. In essence, we turn our attention from constant terms in equations to "slope coefficients" that correspond to the average effect of policy on output or on interest rates.

A Simple Dynamic IS Curve

Our first model is an extension of an IS equation constructed by Rudebusch and Svensson (1999). This equation models the effect of a change in the real interest rate on the output gap—the proportional (or, more accurately, logarithmic) difference between real U.S. GDP and potential GDP as computed by the Congressional Budget Office. The Rudebush-Svensson IS equation is:

$$(1) \quad y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_3(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \eta_t ,$$

where y_t is the quarterly output gap, $\bar{i}_t$ is a four-quarter average of current and lagging federal funds rates, $\bar{\pi}_t$ is average inflation over the same four quarters, and η_t is a random disturbance term. Note that since an increase in the interest rate is contractionary, we expect that $\beta_3 < 0$.

To test for the effects of mortgage securitization on the reaction to monetary policy moves, we allow the coefficient of the real rate, β_3, and the intercept term, β_0, to vary with the extent of securitization. Securitization is represented by the ratio S_t of the value of securitized home mortgages to the value of all home mortgages, both obtained from the Federal Reserve's Flow of Funds database.

The time-profile of this ratio is different for single-family and multi-family home mortgages, as shown in the top panel of Chart 2. Both series have a strong upward-trend component. However, variations in the multi-family ratio have a much stronger business-cycle component. This ratio rises during expansions, but falls or slows down during the twin recessions in the early 1980s and the recession of 1990-91. For this reason, we examine the effects of the single- and multi-family ratios separately. The combined ratio is dominated by the much larger single-family figures, and thus its effects are very similar to those of the single-family ratio.

After we augment it with the securitization ratio, equation 1 becomes

$$(2) \quad y_t = \beta_{00} + \beta_{01} S_t + \beta_1 y_{t-1} + \beta_2 y_{t-2} + (\beta_{30} + \beta_{31} S_t)(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \eta_t .$$

Table 1 presents the results for estimates of this equation, using data for single-family home mortgages from first-quarter 1966 to second-quarter 2000. These results are consistent with the view that securitization has reduced the efficacy of monetary policy moves. The first column presents estimates for the base case equation 1, which is identical to that in Rudebusch and Svensson (1999), except for the estimation period, which includes more recent data. The estimates are very similar to those of the earlier paper, and the negative sign of the interest elasticity is confirmed.

Table 1

Estimates of IS Equation, Allowing Interest Elasticity to Vary Linearly with Securitization of Single-Family Home Mortgages

First-Quarter 1966 to Second-Quarter 2000

$$y_t = \beta_{00} + \beta_{01} S_t + \beta_1 y_{t-1} + \beta_2 y_{t-2} + (\beta_{30} + \beta_{31} S_t + \beta_{32} t)(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \eta_t$$

	Base Case	Intercept Varying with Securitization	Elasticity Varying with Securitization	Varying Elasticity and Intercept Term	Elasticity Varying with Trend
β_{00}	0.13 (.223)	0.05 (.703)	0.10 (.356)	0.21 (.158)	0.12 (.263)
β_{01}	—	0.62 (.161)	—	-1.00 (.276)	—
β_1	1.20 (.000)	1.19 (.000)	1.17 (.000)	1.16 (.000)	1.17 (.000)
β_2	-0.29 (.001)	-0.27 (.002)	-0.25 (.003)	-0.25 (.002)	-0.25 (.003)
β_{30}	-0.06 (.045)	-0.08 (.018)	-0.14 (.003)	-0.18 (.003)	-0.18 (.006)
β_{31}	—	—	0.34 (.029)	0.64 (.046)	—
β_{32}	—	—	—	—	0.001 (.043)
R^2	0.912	0.913	0.915	0.916	0.914

Note: *p*-values are in parentheses.

Columns 2-4 of Table 1 contain estimates of equation 2 in which only the intercept term, only the interest elasticity, or both terms are allowed to vary with the securitization variable. We see from the table that when only the intercept is allowed to vary, the additional parameter is not significantly different from zero.

When the elasticity is allowed to vary, its value tends to be negative but its absolute value generally varies inversely with the extent of securitization. Thus, with no securitization, the elasticity is -.14. With the current securitization ratio level of 46 percent, however, the elasticity is estimated to be a small positive number, about .015. This value is not significantly different from zero but it seems to suggest that the direct policy effect of interest rates on output has virtually disappeared.

In a way, this result is not inconsistent with much of the earlier literature, which has found it difficult to establish empirically a negative elasticity of output with respect to interest rates. In fact, the literature on the credit channel of monetary policy arose largely because estimates of this elasticity were too close to zero to be considered satisfactory in light of the prevalent theory (see Bernanke and Gertler [1995]).

A look at the almost monotonic rise of the level of securitization in Chart 1 suggests that it is almost like a time trend. Is it possible that the level of securitization in equation 2 may be indistinguishable from a time trend, and thus a proxy for any variable highly correlated with a time trend?[3] The last column of Table 1 reports the estimates for an equation that uses a time trend, instead of the level of securitization, in equation 2.[4]

The trend variable is significant at the 5 percent level, so that the effect of securitization in the second column is similar to that of a time trend. However, there is some evidence that the securitization-based estimate dominates the result obtained with a simple trend. A straightforward test of the relative strength of the two models is Davidson and MacKinnon's (1993, Section 11.3) *J*-test, which is applied to equation 2 with a constant intercept. The equation is first estimated with a trend in place of S_t, and the fitted values $\hat{y}_t$ are then included in an equation of the form

$$(3) \quad y_t = (1-\alpha)[right\text{-}hand\ side\ of\ (2)] + \alpha \hat{y}_t + residual\,.$$

If $\alpha = 0$, the model with the trend adds nothing to the estimate and the equation collapses to the one with the securitization ratio. If $\alpha = 1$, the equation reduces to the trend model. Thus, a statistical test of $\alpha = 0$ can be helpful in selecting the preferred model. Using the data and sample period corresponding to Table 1, we see that the point estimate is $\alpha =$ -.21 with a standard error of 1.76. Clearly, $\alpha = 0$ cannot be rejected, but the estimate is very imprecise.

The roles of the securitization ratio and the trend may be reversed in the *J*-test to ask whether the securitization ratio adds information beyond that contained in the trend. The point estimate in that case is $\alpha = 1.19$, but the standard error is also high (1.69) and the hypothesis of $\alpha = 0$ cannot be rejected. However, the point estimates are more consistent with a preference for the securitization model. A *J*-test in a nonlinear variant of the model, to which we now turn, seems to be more powerful and leads to a clearer statistical rejection of the trend model in favor of the securitization model.

One drawback of the varying-coefficient model discussed is that there is nothing to prevent the interest elasticity of output from being positive, which is counterintuitive and contrary to economic theory. Some theoretical discussions argue that the absolute size of the coefficient is small, but they stop short of suggesting that it would be positive. To deal with this issue, a nonlinear functional form may be used for the varying coefficient, which is then constrained to have the same sign throughout the sample period (although it is not constrained to be non-negative).

Table 2 contains estimates analogous to Table 1, but with a model of the form

$$(4) \qquad y_t = \beta_{00} + \beta_{01} S_t + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_{30} exp(\beta_{31} S_t + \beta_{32} t)(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \eta_t\,.$$

The sign of the interest elasticity is determined by β_{30}, whereas dependence on securitization and the trend are determined by β_{31} and β_{32}, respectively. The first column of Table 2 shows that the elasticity is negative, as expected, and that its absolute value decreases with securitization. The latter result, however, is significant only at the 10 percent level.

The estimates from the first column of Table 2 indicate that the interest elasticity has fluctuated from -.21 with no securitization, to -.013 with the current securitization ratio of .46. Chart 5 shows the range of values of this elasticity since 1966, together with 95 percent confidence bands.[5] The chart indicates that, even though the magnitude of the elasticity is currently fairly small, the estimate is statistically different from zero. The statistical significance of the negative sign of the elasticity is confirmed by the estimate of β_{30}, which determines the sign and has a *p*-value of .025.

The model with the trend (the last column of Table 2) performs worse compared with the securitization model. First, the effect of the trend is insignificant, even at the 10 percent level. Second, a *J*-type test rejects the trend model strongly in favor of the securitization model. Because of the nonlinear form of this model, the parameter in the J-test may be estimated simultaneously with the competing parameters in an equation of the form

$$(5)\quad y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_{30}[(1-\alpha)exp(\beta_{31}S_t) + \alpha\, exp(\beta_{32}t)](\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \eta_t\ .$$

In this equation, the point estimate is $\alpha = -5.6\text{e-}14$ with a standard error of 2.5e-12 and a t-statistic of -.02, which has a p-value of .982.

Single-family home mortgages constitute the largest piece of the MBS business. However, securitization of multi-family homes is also quite extensive. In Tables 3 and 4, we perform an exercise similar to the one in Table 2, but using the ratio of securitized multi-family mortgages to all multi-family mortgages. As in Table 2, the nonlinear form of the interest elasticity is used. The results in Table 3 suggest that the level of the securitization ratio for multi-family mortgages does not

Chart 5

Interest Elasticity of Output in Nonlinear IS Equation

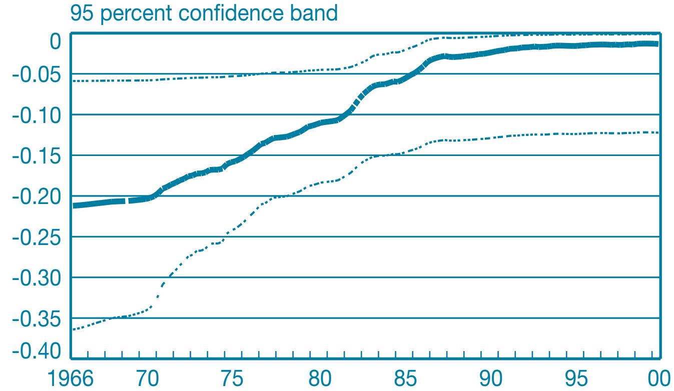


Table 2

Estimates of IS Equation, Allowing Interest Elasticity to Vary Nonlinearly with Securitization of Single-Family Home Mortgages

First-Quarter 1966 to Second-Quarter 2000

$$y_t = \beta_{00} + \beta_{01}S_t + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_{30}exp(\beta_{31}S_t + \beta_{32}t)(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \eta_t$$

	Elasticity Varying with Securitization	Varying Elasticity and Intercept Term	Elasticity Varying with Trend
β_{00}	0.14 (.135)	0.18 (.208)	0.16 (.124)
β_{01}	—	-0.18 (.715)	—
β_1	1.16 (.000)	1.16 (.000)	1.18 (.000)
β_2	-0.23 (.007)	-0.23 (.008)	-0.26 (.003)
β_{30}	-0.21 (.025)	-0.23 (.054)	-0.22 (.139)
β_{31}	-6.02 (.096)	-6.62 (.123)	—
β_{32}	—	—	-0.01 (.166)
R^2	0.915	0.915	0.914

Note: p-values are in parentheses.

Table 3

Estimates of IS Equation, Allowing Interest Elasticity to Vary with Securitization of Multi-Family Home Mortgages

First-Quarter 1966 to Second-Quarter 2000

$$y_t = \beta_{00} + \beta_{01}S_t + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_{30}exp(\beta_{31}S_t)(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \eta_t$$

	Intercept Varying with Securitization	Elasticity Varying with Securitization	Varying Elasticity and Intercept Term
β_{00}	0.05 (.659)	0.11 (.233)	0.13 (.353)
β_{01}	2.40 (.134)	—	-0.26 (.894)
β_1	1.19 (.000)	1.18 (.000)	1.18 (.000)
β_2	-0.27 (.001)	-0.26 (.002)	-0.26 (.002)
β_{30}	-0.08 (.018)	-0.15 (.050)	-0.15 (.012)
β_{31}	—	-21.21 (.278)	-23.54 (.175)
R^2	0.913	0.914	0.914

Note: p-values are in parentheses.

have a significant effect on the interest elasticity, although the estimated signs are consistent with those obtained with the single-family ratio.

The estimates in Tables 1-3 assume that the securitization ratios are exogenous, which raises an econometric issue. The Rudebusch-Svensson (1999) IS equation is constructed in such a way that the regressors are all predetermined, but the securitization ratio enters contemporaneously. The results of specification tests suggest that endogeneity is not a problem for any of the ratios. For instance, we apply an omitted-variables version of the Hausman test to equation 2, with a constant intercept, using a time trend as an instrument for S_t. The residual from a regression of S_t on the trend and the other predetermined variables is included in equation 2 and is tested for significance.[6] Its p-value is .700, even though the instrumental-variables estimate of the β_{31} coefficient is significant at the .042 level. Similarly, a Hansen (1982) test of the overidentifying restriction imposed by using the time trend as an instrument produces a p-value of .703.[7]

Hausman and Hansen tests also fail to reject the exogeneity of the securitization ratios based on multi-family and private sector securities. When the change in the proportion of multi-family housing is used, the p-values of the two tests are .166 and .174, even though the variable exhibits some cyclical properties. Private sector securities are bound to be less insulated from cyclical fluctuations than federally sponsored agency securities. However, when the securitization ratio is based on the level of private sector mortgage-backed securities, the p-values of the tests are .539 and .573, respectively. Thus, the exogeneity assumptions employed in estimation seem reasonable.

The foregoing analysis has focused on aggregate economic activity, as represented by the output gap, because monetary policy tends to focus on aggregates, rather than on individual sectors. However, if there is evidence that home mortgage securitization has affected the efficacy of monetary policy, it seems likely that the changes would be most noticeable in the housing sector. Thus, we conclude this section by estimating a model analogous to the IS equation, but focusing on housing investment. Although in principle a model of housing investment might include variables not included in the IS curve, we retain the form of the latter and view housing investment as an interest-sensitive component of aggregate output.

The housing investment model has the same form as equation 4:

$$(6)\qquad h_t = \beta_{00} + \beta_{01} S_t + \beta_1 h_{t-1} + \beta_2 h_{t-2} + \beta_{30} exp(\beta_{31} S_t)(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \eta_t ,$$

where h_t is the detrended log-level of housing investment, using a linear trend from first-quarter 1965 to second-quarter 2000. The results appear in Table 4. The point estimates of the elasticity are larger than they are in the aggregate output equation, confirming that housing investment is more sensitive than output to changes in the real interest rate (Chart 6). In addition, both β_{30} and β_{31} are much more significant than they are in the output equations.

As a final note, the results of this section are based on ratios of mortgages securitized by federally sponsored pools to all mortgages. In principle, pools issued by private sector firms have different risk characteristics that could have other implications for the analysis. For instance, the path of the interest elasticities could be different, or the ratios might be endogenous. Empirically, however, results based on private sector pools are qualitatively identical to those obtained with data from federally sponsored pools. In particular, the time patterns of the elasticities are the same and the exogeneity of the variables cannot be rejected.

Table 4

Estimates of Housing Investment Equation, Allowing Interest Elasticity to Vary with Securitization of Single-Family Home Mortgages

First-Quarter 1966 to Second-Quarter 2000

$$h_t = \beta_{00} + \beta_{01} S_t + \beta_1 h_{t-1} + \beta_2 h_{t-2} + \beta_{30} exp(\beta_{31} S_t)(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \eta_t$$

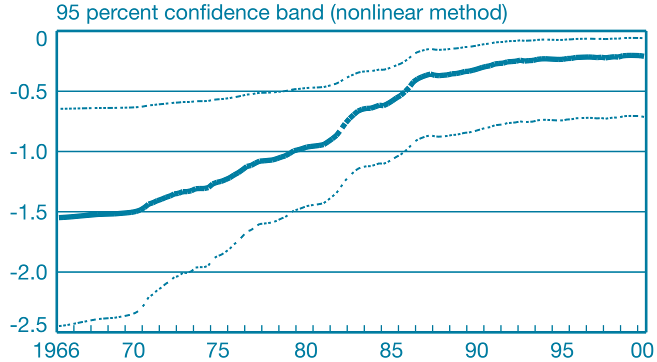
	Base Case	Intercept Varying with Securitization	Elasticity Varying with Securitization	Varying Elasticity and Intercept Term
β_{00}	1.25 (.087)	0.81 (.303)	1.56 (.019)	2.17 (.024)
β_{01}	—	4.22 (.137)	—	-2.78 (.387)
β_1	1.54 (.000)	1.52 (.000)	1.48 (.000)	1.47 (.000)
β_2	-0.67 (.000)	-0.66 (.000)	-0.64 (.000)	-0.63 (.000)
β_{30}	-0.48 (.030)	-0.64 (.009)	-1.72 (.002)	-2.05 (.005)
β_{31}	—	—	-5.05 (.011)	-6.14 (.012)
R^2	0.938	0.939	0.941	0.942

Note: p-values are in parentheses.

Chart 6

Interest Elasticity of Housing Investment

95 percent confidence band (nonlinear method)



Policy Influence on Mortgage Rates

The results in the preceding subsection suggest that the interest elasticity of aggregate demand has declined with the rise of securitization. We now ask if this decline took place because the effect of monetary policy on the level of mortgage interest rates has declined as well. We address this question by constructing an empirical model of the relationship between the federal funds rate—a direct instrument of monetary policy—and a mortgage interest rate.

The model is derived from a structural vector autoregression (SVAR) model involving the mortgage rate, other interest rates, and variables representing real activity and inflation.[8] Let X_t represent a vector containing the variables in the SVAR, namely, commodity price inflation, consumer price inflation, the output gap, the federal funds rate, the three-month Treasury rate, the ten-year Treasury rate, and the mortgage rate. The first step is to estimate a VAR of the form

$$A(L)X_t = \eta_t, \tag{7}$$

where, as usual, L is the lag operator and A contains only non-negative powers of L. Tests of successive lags suggest that $A(L)$ represents the data well with two lags.

Let $\Omega = V(\eta_t) = CC'$, where C is a lower triangular matrix representing the Choleski decomposition of Ω, with the variables ordered as they were listed above. Then

$$C^{-1}\eta_t = \varepsilon_t \tag{8}$$

is a triangular structural model of the innovations in each of the included variables. In particular, the last row of equation 8 is a structural representation of the relationship of the mortgage rate to the other variables, which may be expressed in the form

$$\eta_t^M = \gamma_1\eta_t^{c\pi} + \gamma_2\eta_t^{\pi} + \gamma_3\eta_t^{y} + \gamma_4\eta_t^{ff} + \gamma_5\eta_t^{3m} + \gamma_6\eta_t^{10y} + \varepsilon_t. \tag{9}$$

By analogy to the analysis of the IS equation earlier, the principal question is whether the coefficient of the federal funds rate innovation, γ_4, has been affected by the extent of securitization.

A simple way to obtain the coefficients of equation 9 using ordinary least squares is to run an equation of the form

$$r_t^M = \gamma_0 + \gamma_1\pi_t^c + \gamma_2\pi + \gamma_3 y_t + \gamma_4 r_t^{ff} + \gamma_5 r_t^{3m} + \gamma_6 r_t^{10y} + \ldots + \varepsilon_t, \tag{10}$$

where the ellipsis represents two additional lags of each of the included variables, including the mortgage rate. The variable r_t^M is the yield on FHA-insured mortgages (secondary-market), r_t^{3m} is the three-month Treasury bill rate, r_t^{10y} is the ten-year Treasury bond rate, and r_t^{ff} is the federal funds rate. We use a secondary-market mortgage yield rather than a contractual mortgage rate because reported values of the contractual rates are slow to reflect new information. The estimates of the γ_i coefficients in equations 9 and 10 are identical.

To allow the constant term and the influence of the federal funds rate to vary with the level of securitization, we expand equation 10 to become

$$r_t^M = \gamma_{00} + \gamma_{01}S_t + \gamma_1\pi_t^c + \gamma_2\pi + \gamma_3 y_t + (\gamma_{40} + \gamma_{41}S_t)r_t^{ff} + \gamma_5 r_t^{3m} + \gamma_6 r_t^{10y} + \ldots + \varepsilon_t. \tag{11}$$

As before, the equation includes two lags of all variables, including the terms involving S_t. Estimates of equation 11 are presented in Table 5. The first column constrains the terms in to be zero, whereas the next two columns allow the constant and slope terms to be nonzero, respectively.

The results indicate that the most important marginal relationship of the mortgage rate is to the ten-year Treasury rate, as might be expected because of the similar maturities of these two rates. The federal funds rate and the level of consumer inflation are also significant. The level of securitization does not significantly affect the constant term, but there is evidence that it does affect the influence of the federal funds rate on the mortgage rate. The effect is relatively large and is significant at the 5 percent level. For instance, in the third column, a one-percentage-point move in the federal funds rate increases the mortgage rate by 15 basis points when there is no securitization. However, when the securitization ratio is at its current level of 46 percent, the same change in the federal funds rate implies an increase of 40 basis points in the mortgage rate.

These results stand in sharp contrast to the results obtained for the IS equation earlier. Why would the federal funds rate, which has become less efficacious in producing changes in real activity, become more influential on mortgage rates? One possible answer is that the growth of securitization, coupled with deregulation and other financial innovations, has made the mortgage markets more efficient in the informational sense. A change in basic credit pricing, represented by a change in the federal funds rate, translates more quickly and fully into a change in mortgage rates. This argument is supported by results in Hendershott and Van Order (1989), who show that the mortgage rate has become more representative of a "perfect market" rate.

The combined results of Section IV suggest that although the influence of monetary policy on the real economy seems to have declined with securitization, the decline does not seem to be associated with a direct pricing effect through mortgage interest rates. In fact, the results in this subsection suggest that the effects of changes in the federal funds rate are transmitted more directly to the mortgage rate in the presence of higher levels of securitization. Thus, the decline in the influence of policy is more likely to be related to its influence on the volume of liquidity or on the supply of credit (the liquidity and credit channels, as discussed earlier), rather than to direct interest rate effects.

Table 5

Estimates of Mortgage Rate Equation, Allowing Elasticity with Respect to the Federal Funds Rate to Vary with Securitization of Single-Family Home Mortgages

First-Quarter 1966 to Second-Quarter 2000

$$r_t^M = \gamma_{00} + \gamma_{01} S_t + \gamma_1 \pi_t^c + \gamma_2 \pi + \gamma_3 y_t + (\gamma_{40} + \gamma_{41} S_t) r_t^{ff} + \gamma_5 r_t^{3m} + \gamma_6 r_t^{10y} + \ldots + \varepsilon_t$$

	Base Case	Intercept Varying with Securitization	Elasticity Varying with Securitization	Varying Elasticity and Intercept Term
γ_{01}	—	-0.68 (.919)	—	-5.30 (.480)
γ_1	-2.10 (.458)	-2.19 (.451)	-2.50 (.376)	-2.66 (.353)
γ_2	-19.14 (.032)	-20.01 (.034)	-20.68 (.024)	-18.95 (.041)
γ_3	-0.003 (.918)	-0.01 (.857)	-0.01 (.839)	0.003 (.929)
γ_{40}	0.19 (.002)	0.19 (.002)	0.15 (.019)	0.13 (.047)
γ_{41}	—	—	0.54 (.051)	0.63 (.048)
γ_5	-0.11 (.160)	-0.10 (.183)	-0.11 (.150)	-0.10 (.184)
γ_6	0.91 (.000)	0.91 (.000)	0.90 (.000)	0.88 (.000)
R^2	0.991	0.991	0.992	0.992

Notes: *p*-values are in parentheses. The ellipsis in the equation represents two lags each of all the variables, including the mortgage rate.

V. Conclusion

The empirical analysis of this paper indicates that securitization may have had a significant effect on the degree to which a given change in monetary policy can influence real output. In fact, the interest elasticity of output as calculated in one of the models is currently very close to zero. However, the reaction of mortgage rates to changes in the federal funds rate is, if anything, stronger with the increasing extent of securitization. Thus, the change in the efficacy of policy seems to derive not from a loss of control over mortgage rates, but from noninterest rate effects, such as the liquidity and credit channels.

These results stress the importance of research on these channels of monetary policy for at least two reasons. First, the results suggest that an important part of the transmission of policy through the mortgage markets occurs via liquidity and credit volumes, as opposed to interest rate effects. Second, if the measurable effects of policy on output, as proxied here by the simple IS curve, are currently close to zero, it is important to understand alternative explanations of policy that do not rely exclusively on the effects of changing interest rates.

We have also seen evidence that the development of new forms of securitization is still booming in many sectors and countries. The question is, to what extent will these new types of securitization affect the transmission of monetary policy, as mortgage securitization seems to have done? Perhaps the key is to ask whether the new forms of securitization will provide banks with additional flexibility to face changes in market conditions associated with monetary policy. Monetary policy acts most directly through the banking system, and changes in the structure of that system are likely to affect policy as well. Thus, the effects of securitization seen in the mortgage markets may be expected to extend to other markets as well, as new forms of securitization allow banks to take assets off their balance sheets, provide banks with greater funding flexibility, and open a door to investors to markets traditionally intermediated by banks.

Endnotes

1. Mortgage pass-through securities issued by GNMA are discussed in Section III.

2. Bernanke and Gertler (1995).

3. One potential problem is that y may not be stationary. However, a Dickey-Fullter t-test (with two lags) rejects a unit root with a p-value of .02.

4. Hirtle and Kelleher (1990) also use a time trend to examine variations in the interest sensitivity of output.

5. The confidence bands are asymmetrical, since they are computed using a nonlinear technique, rather than the standard delta method. The coefficients of the nonlinear elasticity function are assumed to be jointly normally distributed, and the extrema of the function over a 95 percent confidence ellipse are plotted.

6. See Godfrey (1988, p. 194). Intuitively, if S_t is not exogenous, it is generally correlated with the disturbance in equation 2. The additional term, based on the residual from the first-stage regression of S_t on the exogenous variables, represents the component of the disturbance that is correlated with S_t, which should therefore be significant.

7. The Hansen test determines whether redundant orthogonality conditions can be rejected. In this application, both S_t and the trend are included as instruments. Since the trend is clearly exogenous, if the test were to reject the joint exogeneity of S_t and the trend, it would have to be because S_t is not orthogonal to the disturbance.

8. SVARs were first proposed by Bernanke (1986) and Sims (1986).

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