CREDIT AVAILABILITY, BANK CONSUMER LENDING, AND CONSUMER DURABLES

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Abstract

This study tests the empirical implications of a modified screening model of lending [Stiglitz and Weiss (1981, Part IV)] using a proxy for nonrate credit conditions based on Federal Reserve survey data. Consistent with screening models, this proxy (1) significantly affects bank consumer lending, (2) is significantly affected by the real federal funds rate and ex ante default risk measures, and (3) substantially affects consumer durables. Other results indicate that deposit rate deregulation has reduced the impact of monetary policy on consumer credit availability and consumer durable spending.

JEL Classification Codes: E51, G21, D12

1. Introduction

Empirical studies of household liquidity or credit constraints generally fall into two groups. The first tests whether the time series properties of consumer spending accord with the life-cycle (LCH) or permanent income (PIH) hypotheses (e.g., Hall (1978), Flavin (1981), and Wilcox (1989)). As Wilcox (1989) notes, such studies finding violations of the LCH/PIH cannot determine whether the violations owe to myopia, borrowing constraints, or transactions costs. Partly to avoid this problem, the second strand of research tests the LCH/PIH using cross-sectional data on consumption (e.g., Hall and Mishkin (1982) and Zeldes (1989)) or on whether credit constraints affect debt [e.g., Duca and Rosenthal (1993), Jappelli (1990) and Cox and Jappelli (1992)].

However, there have been few time series tests of borrowing constraints on consumer debt. One exception is Fissel and Jappelli (1990) who estimate the share of credit constrained U.S. households across time using parameter estimates from Jappelli's (1990) cross-section study. Fissel and Jappelli (1990) note that most of the time series variation that they estimate reflects changes in household demographics and balance sheets because they assume that credit standards prevailing in Jappelli's (1990) prevailed throughout their sample. Accordingly, they qualify their results by mentioning why credit standards may vary over time in ways that they may not have measured.

This gap in the literature is significant for three reasons. First, it is important to know how much changes in lending policies affect household borrowing for monitoring the economy and assessing the empirical relevance of lending policy changes. Second, in evaluating the transmission channels of macro policies, it is important to determine the impact of policy on nonrate credit conditions. Third, in assessing the relevance of theoretical models of credit constraints, it is important to test whether lenders actually react to changes in the economic environment in ways that are consistent with theory.

This study addresses each of these issues. Section 2 draws out testable implications of a modified Stiglitz and Weiss (1981, Part IV) screening model of lending. Section 3 tests implications for what determines the availability of consumer loans from banks, while section 4 tests implications for consumer loan growth at banks. Section 5 assesses the impact of nonrate credit conditions on consumer durables and the conclusion interprets our findings.

2. A Stylized Theoretical Model of Bank Consumer Lending

This section develops a stylized model of bank consumer lending similar to the "redlining"/screening model of Stiglitz and Weiss (1981, part IV). This model is used to draw out testable implications about what determines the nonrate terms of bank consumer credit and the volume of bank consumer lending.

Assume that banks are risk neutral and that household j is approved for a loan of fixed size (\$1) if expected loan revenue ($E^j \equiv q^j R$) for some interest rate (r) at least covers the bank's cost of insured deposits (ϕ), i.e.,:

$$\text{if } E^j \equiv q^j R \geq \phi \text{ for some R, then household j can qualify for a loan,} \quad (1)$$

where $R \equiv (1+r)$, $q \equiv$ expected loan quality $\equiv (1-x)$, $x \equiv$ expected default rate, $\phi \equiv (1+i)$, and $i \equiv$ riskless real rate. Further assume that the expected default rate is inversely related to household j's expected income (βy^j):

$$x^j = gR/\beta y^j, \quad (2)$$

where $g \equiv$ a positive scaler reflecting the degree of moral hazard effects for a given level of $(R/\beta y^j)$, $y^j \equiv$ the household specific component of household j's expected income, $\beta \equiv$ a positive index of expected macroeconomic conditions that affect each household's expected income, and y^j is distributed uniformly over the interval $[y^{min}, y^{max}]$. For tractability, also assume that the probability of applying for a loan is constant across income types.

Under these assumptions, a household j qualifies for a loan if $E^j = q^j R \geq \phi$ for some R, and competition ensures that each qualifying income type faces a different minimum loan rate. Since loan revenue is quadratic in R, two conditions must hold for households having the lowest level of income prospects (y^c) that can qualify them for a loan at some loan rate factor (R^c):

$$q^c R^c = \phi, \qquad \text{and,} \tag{3a}$$

$$\partial(q^c R^c)/\partial R^c = 0. \tag{3b}$$

Eq. (3a) ensures zero expected profits, while eq. (3b) reflects that the expected loan revenue curve of marginally qualified households peaks at R^c. The second condition implies a maximum ratio of debt-payments-to-income:

$$R^c/(\beta y^i) \geq 1/2g, \tag{4}$$

which is qualitatively consistent with typical lending practices.

Substitution yields expressions for the minimum level of qualifying income and the share of households that qualify (δ) for a loan, respectively:

$$y^c = 4g\phi/\beta, \quad \text{and} \tag{5}$$

$$\delta = [y^{max} - (4g\phi/\beta)]/[y^{max} - y^{min}], \tag{6}$$

where $\delta_\phi < 0$, $\delta_\beta > 0$, and $\delta_g < 0$. The first two derivatives reflect that the "bindingness" of a given maximum debt-payments-to-income ratio endogenously depends on real rates and general macroeconomic conditions. δ_g reflects the extent to which a change in other factors not reflected in real market interest rates or in income affects credit standards and availability.

The degree to which credit availability affects bank consumer lending also depends on loan demand. If the probability of applying for a loan by household i can be expressed by $f(\phi,\alpha)$, where $f_\phi<0$ and $f_\beta>0$, then the volume of lending reflects the demand of households who are not credit constrained:

$$L^u = \delta[y^{max}-y^{min}]f(\beta,\phi), \tag{7}$$

$$\partial L^u/\partial\phi = -[4gf/\beta] + f_\phi\delta[y^{max}-y^{min}] < 0, \tag{8}$$

$$\partial L^u/\partial\beta = [4g\phi f/\beta^2] + f_\beta\delta[y^{max}-y^{min}] > 0, \text{ and} \tag{9}$$

$$\partial L^u/\partial g = -[4\phi gf/\beta] < 0, \tag{10}$$

since $f_\phi < 0$ and $f_\beta > 0$. $L^u_g < 0$ because a rise in g induces a tightening of credit standards. Changes in the macroeconomic outlook (β) and real interest rates (ϕ) have similarly signed supply and demand effects on loan volume. For example, the second term of (8) is negative reflecting that loan demand falls as loan rates rise and the first term is negative since fewer households could qualify for a loan as real rates rise. In equation (9), the first term is positive because more households could qualify for a loan and the second term is positive since loan demand rises as the macroeconomic outlook improves. Thus, macroeconomic variables typically included in consumer loan regressions will also pick up at least some of the effects of changed credit availability.

It follows that the marginal information in a credit availability proxy (CR) for explaining bank consumer loans depends critically on how much changes in CR (1) reflect changes in moral hazard problems in lending (Δg), and (2) respond differently to changes in interest rates or cyclical conditions than do changes in the demand for durables. In practice, the first category could reflect changes in bankruptcy laws or the perceived moral hazard posed by lending to households, and the second could include changes in credit availability stemming from the bindingness of Reg Q ceilings whose correlation with interest rates has changed dramatically since deposit deregulation.

In terms of testable empirical hypotheses, eqs. (7), (9), and (10) imply that a variable which is positively related to nonrate terms of bank consumer loans should have a positive correlation with the volume of bank consumer lending. In addition, eq. (5) implies that such an increasing measure of bank credit availability should increase (i.e., y^c falls) as the real interest rate (ϕ) falls and as the macroeconomic outlook (β) improves. Alternatively, the standard portrayal of the money multiplier process also suggests that real M2 growth at banks could be a major determinant of credit standards at banks.[1]

3. An Empirical Model of Nonrate Credit Conditions at Banks

This section presents a proxy for nonrate credit conditions at banks, and then discusses its potential determinants. Next, data used in modeling this proxy are presented, and then regression results are reviewed.

3.A. A Proxy for Nonrate Credit Conditions at Banks

To measure nonrate credit conditions, an index of the change in bank willingness to make consumer installment loans is created based on the Federal Reserve's Quarterly Survey of Bank Lending Terms, which asked since 1966:Q3:

> "How has your bank's willingness to make consumer installment loans changed relative to 3-months ago?"
>
> (a) much more, (b) somewhat more, (c) about unchanged,
> (d) somewhat less, or (e) much less.

A diffusion index (CR) of the average response was constructed by weighing responses of "much more" by 2, "somewhat more" by 1, "unchanged" by 0, "somewhat less" by -1, and "much less" by -2. Positive values indicate

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[1] Portfolio balance theories imply a role for relative ex ante returns to banks. However, good data on ex ante returns are unavailable.

expanded credit availability and negative values, the converse. In general, the willingness-to-lend index declines prior to recessions (Figure 1).

Because CR tracks the *relative change* in willingness to make loans, it is appropriate to use an equation for the *relative change* in bank credit standards to derive a testable empirical model of the variable CR. In (5), the term y^c can be loosely interpreted as a credit standard where a higher level of y^c corresponds to a *tougher* credit standard. Thus, eq. (5) implies:

$$\Delta\log(y^c) = \Delta\log(g) + \Delta\log(\phi) - \Delta\log(\beta), \quad \text{and} \tag{11}$$

$$CR = h[\Delta\log(g), \Delta\log(\phi), \Delta\log(\beta)], \tag{12}$$

where $h_{\Delta\log(g)}$ and $h_{\Delta\log(\phi)} < 0$, and $h_{\Delta\log(\beta)} > 0$. Since CR is *inversely* related to $\Delta\log(y^c)$, (11) implies that CR declines with an increase in the real riskless rate ($\Delta\log(\phi)>0$ or a tight*ening* of monetary policy), but rises on signs of a better economic outlook ($\Delta\log(\beta)>0$, implying less macroeconomic default risk).

One problem is the ambiguity of the survey question used to construct CR. If banks are more willing to lend, (i) have they have eased credit standards, (ii) do more households meet a fixed credit standard, or (iii) are banks accommodating an increase in loan demand? Possibility (iii) is inconsistent with two facts. First, less ambiguous questions about business lending suggest that the index measures changes in consumer credit standards.[2] Second, Granger test results below favor explanations (i) and (ii).

3.B. Model Specification and Data

Several regressions were run. Paralleling (12), each includes a measure of monetary policy and default risk, along with three variables controlling

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[2] Until 1979, banks were asked about how their willingness to make and their credit standards on business loans had changed. Indexes from these questions have a significant correlation of -.88 [Schreft and Owen (1991)].

Figure 1
Relative Change in Consumer Credit Availability (CR)

for Reg Q [Jaffee and Rosen (1978)] and other regulatory effects.

Real Rates and Monetary Policy Indicators

Four monetary policy indicators were tried. One proxies the change in real bank funding costs with the change in the real federal funds rate (ΔRFF), which outperformed the change in the real 1-year T-bill rate. Another is the two-quarter growth rate of real M2 balances at banks (GM22).[3] Both variables measure inflation expectations using the annualized two-quarter percentage change in the implicit consumption price deflator. Two other indicators of the *change* in monetary policy that we use are the *change* in the spread between the six-month prime commercial paper and Treasury bill rates (ΔPAPERBILL) [Bernanke (1990) and Friedman and Kuttner (1992)] and the *change* in the slope of the yield curve, defined as the spread between the 10-year and 3-month Treasury rates (ΔYCURVE) [Stock and Watson (1989)]. ΔFF and ΔPAPERBILL should be negatively correlated with the change in bank willingness to make consumer loans, while GM2 and ΔYCURVE should be positively correlated with the index.

Default Risk

Default risk is measured by the percentage change in the quarterly average level of the index of leading economic indicators (GLI). Because this index leads the business cycle, GLI should be positively correlated with the future ability of households to service new debts and therefore, with CR.[4]

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[3] The two-quarter growth rate outperformed the one-quarter growth rate. The first difference of GM22 also proved inferior to GM22.

[4] An alternative credit risk measure, the change in the spread between A- and AAA-rated corporate bond yields, was insignificant in other runs, likely because it reflects the risk of firms more than that of households. The changes in the unemployment and the consumer loan delinquency rate were also tried. Although these variables are more specific to households than GLI, they lag the business cycle and are not be good indicators of ex ante default risk. This likely explains why GLI proved superior to these alternatives.

Regulatory Factors

To control for Reg Q induced disintermediation, a variable (REGQ) was included that equaled the spread of a market rate over a deposit rate ceiling. Measuring these effects raises the issues of which deposit rate to use and how to handle market-rate based deposits introduced before the lifting of most deposit rate ceilings in 1983. REGQ was based on regulations on small time-like deposits, because their maturity is closer to that of auto loans than that of demand or passbook savings deposits, and because most market-rate based instruments were designed to substitute for small time deposits. REGQ equals the maximum of zero or the spread between the 3-year Treasury yield and the ceiling on 3-year small time rates up through 1978:Q2. From 1978:Q3-81:Q3, rate ceilings on small saver certificates were used [see Mahoney, et al. (1987) and Duca (1995a, 1995b)], and REGQ equaled 0 after 1981:Q3.[5]

Another deregulatory action was the introduction of MMDAs in late-1982, which enabled banks to offer a close substitute for money market mutual funds (MMMFs). As a result, households shifted funds into MMDAs partly from MMMFs,

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[5] This measure outperformed others based on either 6-month small time deposit or money market certificate (MMC) bank regulations. [Qualitative results were similar using MMC regulations.] Over 1979:Q3-Q4, bank SSC ceilings equaled the 2-1/2 year Treasury yield minus 25 basis points. In January and February 1980, this spread was widened to 75 basis points. From March to April 1980, SSC ceilings equaled the 2-1/2 year Treasury yield minus 25 basis points up to 12 percent. From June 1980 to July 1981, SSC ceilings equaled the 2-1/2 year Treasury yield minus 50 basis points when this yield was between 9.5 and 12.0 percent, 9.5 percent when this yield was below 9.5 percent, and 12.0 percent when this yield exceeded 12.0 percent.

The lifting of ceilings on uninsured large time deposits in 1973 was of limited help in alleviating Reg Q effects for two reasons. First, back in the 1970s, it was difficult for smaller, less well-known banks and thrifts to issue uninsured deposits. Second, when rate ceilings were binding on insured deposits, banks flooded the market with uninsured CDs in periods when monetary tightening boosted default risk. As a result, the risk premium that investors demanded on large CDs typically soared above the then normal premium of 50 basis points above Treasury rates. For example, when the funds rate peaked in July 1974, six-month CD-T-bill rate spread was 402 basis points.

the supply of funds to banks rose, and banks increased their willingness to make consumer loans (Senior Loan Officer Opinion Survey, May 1983). A dummy (MMDA) equal to 1 in 1982:Q4 was included to control for this reintermediation effect. Another dummy (CONTROL) was included for the imposition and lifting of credit controls in 1980:Q2 (= 1) and 1980:Q3(= -1), respectively, which caused a temporary plunge followed by a temporary jump in CR.

3.C. Granger Test Results

Granger tests were done to assess whether bankers were confusing loan demand with loan supply in responding to the survey. If banks confused loan demand with supply, then CR should move with or lag behind changes in the growth of real credit extensions and real consumer durable spending. However, Granger tests indicate that CR leads both variables (table 1). Granger tests also show that CR leads changes in the real federal funds rate and the growth rate of real M2, but suggest that CR moves contemporaneously with the paper-bill spread and changes in the index of leading economic indicators. The results for M2 may reflect that M2 responds with a lagged response to changes in its opportunity cost, consistent with evidence that ΔRFF leads GM22 [and Δlog(M2)]. Tests also indicate that changes in the slope of the yield curve lead CR. On balance, Granger tests imply that changes in the willingness-to-lend index reflect changes in loan policy (supply) more than loan demand.

3.D. Results From Modeling the Willingness-To-Lend Index

Models 1-4 in table 2 include all three regulatory terms, the ex ante default risk proxy, and one real rate or monetary policy variable. Models 5 and 6 include ΔRFF and either ΔYCURVE or ΔPAPERBILL. Each model has an R^2 of around .80 and several patterns emerged. The default risk and regulatory variables were significant with the expected signs, with a large coefficient on CONTROL. The REGQ results imply that the lifting of Reg Q has reduced, but not eliminated, the impact of monetary policy on nonrate credit terms.

Each monetary policy variable was significant with the expected sign. Of the models using one monetary variable, that using ΔYCURVE had the highest R^2, followed in order by ΔRFF, ΔPAPERBILL, and GM22. ΔRFF is significant in the presence of ΔPAPERBILL and ΔYCURVE. However, model 4, which uses ΔYCURVE, does not track the lending index well in the early-1990s.

Moreover, unlike ΔRFF and GM22, ΔYCURVE and ΔPAPERBILL have statistically different effects after the 1970s as shown by variables interacting them with a dummy equal to 1 after 1978 (table 3) whether or not REGQ is present. This likely reflects a shift in the indicator properties of the spread variables.[6] By contrast, only when REGQ is omitted does ΔRFF have a significantly smaller effect after the 1970s, implying that interest rates affect consumer credit availability less after deposit deregulation.

In the late 1980s and early 1990s the willingness-to-lend index turned down after a long period of positive readings (Figure 2), but did not fall as much as it had in previous periods that have been described as credit crunches (1974-75 and 1979-82).[7] Regression results using the real federal funds rate imply that the absence of Reg Q effects likely accounts for this difference.

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[6] These findings are consistent with evidence of shifts in the relationship between the yield curve and inflation [Balke and Emery (1994b)], the yield curve and output [Balke and Emery (1994a, footnote 7)], and the paper-bill spread and output [Hafer and Kutan (1992) and Emery (forthcoming)].
The effect of GM22 is not different after the 1970s, reflecting that implicitly by construction, M2 growth picks up Reg Q effects.

[7] The surveys also showed that many banks tightened their credit standards on C&I and commercial real estate loans over 1990-91, perhaps owing to over-borrowing by firms and overbuilding, with surveys showing that C&I loan standards were tightened less than during the 1974-75 and 1979-82 episodes.

4. Modeling Consumer Loan Growth at Banks

This section tests whether a noninterest rate proxy for credit availability affects bank consumer lending. First, an empirical model is presented. Next, the data are described, and then results are presented.

Before proceeding, it is important to note that several factors make it is easier to assess the impact of credit constraints on bank consumer loans than on other loans. First, one can directly adjust bank consumer loans for securitizations, which remove loans from bank balance sheets (see Duca and Garrett (1992)); by contrast, it is more difficult to adjust bank commercial and industrial (C&I) or real estate loans for loan sales. Second, tax reform effects on consumer loans are more transparent and easier to model than those affecting business or real estate finance. Third, data on auto loan rates at banks and finance companies provide a good measure of nonbank competition that is not plagued by term structure problems posed, for example, by substitution across C&I loans, commercial paper, and bonds. Fourth, consumer lending were not affected by special factors such as those affecting C&I loans (mergers in the 1980's) or real estate lending (the thrift crisis). Finally, surveys can be used to construct a continuous credit availability series that goes back to the late 1960s for consumer loans, but not for C&I or real estate loans.

4.A. Empirical Specification

This sub-section lays out a simple model of bank consumer loans which can control for nonbank competition, nonrate credit terms, and the demand for all consumer loans. The stock of real bank consumer loans (L^b) is given by:

$$L^b = \alpha^b QNL^t, \tag{13}$$

where $\alpha^b \equiv$ bank share of consumer loans, Q $\equiv$ population share qualifying for a loan large enough that households borrow, N ≡ population, and L^t ≡ real notional consumer loan demand per capita. Superscripts b and t denote bank and all lender variables, respectively. A rise in CR implies that more households can borrow against their permanent income or that Q is higher. CR, which proxies for the percent change in credit standards, can be seen as a determinant of how quickly the overall stock of loans adjusts towards the level desired by households based on permanent income and interest rates. Under this interpretation, eq. (13) implies the error correction model:

$$\Delta l^b = [\alpha_0 + \Sigma_{i=1}^{x} \alpha_i CR_{t-i}]EC_{t-1} + \Delta\alpha^b{}_t + \Delta q_t + \Delta n_t + \Delta(\text{proxy for } l^t{}_t), \qquad (14)$$

where lower case letters denote logs, Δ is the first difference operator, and EC $\equiv(l^b - l^{b*})$ is an error correction term reflecting the long-run relationship between l^b and factors affecting loan market share (α^b) and demand (l^t).[8]

The interactive variable [CR*EC}, tests to see whether relative changes in credit availability can affect the speed of adjustment. Recall that the error correction term is based on the long-run relationship between the logs of loans and income, along with the gap between bank and finance company auto loan rates. Thus, the error correction term equals the log of the ratio of the actual to the log of the long-run equilibrium level of loans. As a result, a term interacting CR and the error-correction term can be interpreted as reflecting how short-run changes in credit availability can lead to short-run changes in how much households are using leverage.

4.B. Data and Variables

The dependent variable is the growth rate of real bank consumer loans, adjusted for securitizations (Federal Reserve data) and deflated by the PCE

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[8] Population was excluded because changes in it occur too gradually.

deflator. Independent variables are of five types: user cost of capital, tax, spending and labor, nonbank competition, and nonrate credit conditions.

Real User Cost of Capital

The real user cost of bank consumer loans (r) can be measured by:

$$r = R(1-t\Omega) - \pi^e, \tag{15}$$

where $R \equiv$ nominal interest rate, $t \equiv$ marginal income tax rate, $\Omega \equiv$ percent of consumer loan interest that is deductible, and $\pi^e \equiv$ expected inflation. The four-quarter percent change in the PCE deflator is used to proxy π^e.[9] The most common 48-month rate on bank loans for new autos (Fed data) is used because (a) auto loans comprise 40% of consumer borrowing, (b) credit card debt appears to be very interest insensitive and credit card rates are very sticky (Ausubel (1991)), and (c) much credit card debt is float (i.e., convenience card use).[10] The auto loan rate is adjusted for a break in 1983 when the loan maturity changed from 3 to 4 years by assuming that each year of loan maturity adds roughly one percentage point based on anecdotal evidence. The tax rate used was the U.S. Treasury's series on the marginal income tax rate for a family of four earning the median level of income (Lerman (1991)). The share of deductible consumer loan interest (Ω) equaled 1 up through 1986:Q4, and since then, the four-year ahead expectation of the average pre-announced share of interest that is deductible, adjusted for amortization.[11]

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[9] This deflator yielded better results than the CPI or core CPI.

[10] Despite high real loan rates, credit card debt grew rapidly in the 1980s. Other runs using the most common credit card rate and the one-year T-bill rate yielded much worse R^2s and did not affect the qualitative results.

[11] The percent of consumer loan interest that could be deducted was 65% for 1987, 40% for 1988, 20% for 1989, 10% for 1990, and 0 thereafter. The four-year horizon matches the maturity of the bank auto loan rate series.

Variables Controlling for Other Tax Effects on Bank Consumer Loans

Aside from changing the after-tax real rate via altering interest deductibility, the Tax Reform Act of 1986 also changed relative cost of consumer loans versus other finance, inducing many to pay off consumer debt with interest-deductible home equity lines of credit (HELCs). To control for this substitution effect, several dummy variables were tested including a dummy equal to 1 since 1986 (REFDUM), a dummy equal to 1 in the transitional quarters of 1986:4 and 1987:1, and a dummy equal to 1 in the transitional quarter of 1987:1. All of these tax reform dummies were insignificant and did not affect the qualitative results in the error-correction models tested, and are not in any of the models that are reported in the tables or charts.[12]

Consumer Spending and Unemployment

Several other variables were included that are typically associated with loan demand. Because loans reflect a derived demand for durable purchases, the Federal Reserve Board model's proxy for permanent income (CON) was included to control for the underlying demand for durables. Other demand effects were controlled for with the change in the unemployment rate (ΔU).[13]

Controlling for Substitution Between Bank and NonBank Consumer Loans

Auto loan rates at banks greatly exceeded those at finance companies until the late-1970s. Following the introduction of market-rate based deposit instruments in the early-1980s, this spread narrowed as banks passed on the

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[12] Some of these dummies were significant in other models that did not include long-run relationships. Most households with HELCs initially used them to retire consumer debt [see Canner, Luckett, and Durkin (1989), p. 337].

[13] CON ≡ consumption of services and nondurables plus the imputed service flow from the stock of durables. CON avoids much of the simultaneity between durable spending and loans. Loan supply effects of CON are likely picked up by CR, implying that any marginal information in CON reflects loan demand.

higher deposit rates and banks lost auto loan market share [Duca (1991)]. Since then, the captive finance companies have irregularly offered incentives which induced shifts toward auto finance company loans [Duca (1991)]. To parsimoniously control for these effects, we use the spread between finance and bank auto loan rates for new cars (SPREAD). A bigger spread should raise bank loan market share (α^b) and bank consumer loan growth, (Δl^b).[14]

Non-Rate Credit Conditions/Availability Variables

Two variables were used to control for the effects of variation in non-rate credit conditions/availability. The first is CR. This index, however, is more tightly linked to the growth rate of real consumer loan extensions than to the growth of consumer loan outstandings. Owing to amortization, principal payments are back-loaded over a loan's life, and loan outstanding growth tends to lag loan extension growth by about one year. Unfortunately, extensions data end in 1982:Q4, necessitating the use of outstandings.

We tested the one-quarter lag of CR as a separate r.h.s. variable and in the form of an interactive variable that equaled the one-quarter lag of CR multiplied by the error-correction term. The CR variables control for two effects. First, they reflect credit standards at banks and perhaps at nonbanks. For this reason, an increase in CR will likely accompany faster loan growth [higher Δl^b in eq. (2)] because the share of households that can qualify for a loan rises (Δq is higher). Second, a rise in CR may lead to banks gaining market share from finance companies [see Duca (1991)]. One reason for this is that banks had tightened credit standards when binding Reg

[14] The finance company rate is an average on all loans, while the bank rate is for a fixed maturity (3 years before 1983 and 4 years afterward).(Fed data). SPREAD was adjusted for maturity differences by assuming that each extra year of loan maturity boosts loan rates by one percentage point.

Q ceilings caused deposit outflows while finance companies continued raising funds by issuing commercial paper.

Another reason a rise in CR boosts bank market share is related to the lender of last resort role of captive finance companies, where loan delinquency rates tend to be higher. Captives lend to some who are denied credit at banks because part of the profit earned on a car sale exceeds the negative expected return from lending to a poor credit risk. When banks tighten their credit standards, they improve the average loan quality of people denied bank loans, thereby inducing finance companies to tighten their credit standards less than banks do. As a result, a fall in CR may also be correlated with falls in $\Delta\alpha^b$ and Δl^b as banks lose market share to finance companies.

The second credit availability variable accounts for the consumer credit controls of 1980:Q2 and their lingering effect in 1980:Q3. These controls induced banks to tighten their credit standards on credit cards. Although the controls exempted auto credit, they lowered banks' auto loan market share for two reasons [see Duca (1991)]. First, many consumers believed that it was illegal to borrow and may not have borrowed until they met dealers who could originate loans. Second, many consumers may not have applied for bank loans fearing that they would be rejected. To distinguish this effect from other factors affecting credit availability, a dummy variable (DUM802) was included that equals 1 in 1980:Q2 and that is expected to have a negative sign.

4.C. Results

A two-step error-correction model of consumer loans was developed. In the first step, a cointegrating vector was estimated (with a trend) using the Johansen and Juselius procedure to find a long-run relationship between the log of real consumer loans, the log of permanent income (CON), and the gap between finance company and bank loan rates (SPREAD).[15] The resulting vector shows that l^b is positively related to log(CON) and SPREAD over the long-run.

From this cointegrating vector, an error correction term (EC) was defined and used to estimate second stage model versions of equation (14):

$$\Delta l^b_t = [\alpha_0 + \alpha_1 CR_{t-1}]EC_{t-1} + \beta\Delta z_{t-j} + \lambda_1\Delta l^b_{t-1} + \lambda_2\Delta l^b_{t-2}, \tag{16}$$

where z ≡ a vector of short-run variables, including $\Delta\log(CON)_{t-1}$, $\Delta(SPREAD)_{t-1}$, r_{t-1}, $DUM802_t$, and $\Delta(U)_{t-1}$, where U = the unemployment rate. [Other lags of these variables were insignificant.] Except for models 1, 3 and 5, which exclude DUM802, the models in table 4 include the same z and EC terms, but differ in whether CR is added as separate r.h.s. term or is interacted with the EC term to see if credit availability is positively correlated with the speed of error-correction. Since loan data start in 1973:Q1 and 2 lags of Δl^b are included as regressors, the sample was 1973:3-94:4.

EC_{t-1} and $\Delta(U)_{t-1}$ are significant in every model with the anticipated signs, while the rate term r was insignificant.[16] Note that while the short-run terms $\Delta(SPREAD)_{t-1}$ and $\Delta(\log(CON))_{t-1}$ are insignificant, the significance of

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[15] The real after-tax loan rate is stationary and is thus not included. Only when SPREAD was included could a significant cointegrating vector be found, reflecting the decline in bank's auto loan market share in the late-1970s and early-1980s when bank loan rates rose toward finance company rates.

[16] EC should have a negative sign as EC≡ l^b - l^b's equilibrium level. In other runs, r was replaced with log(r) and Δr. These alternatives were also insignificant and did not affect the qualitative results. r was significant in one-stage error correction models that, in place of the EC term in the two-stage models, included the one-quarter lags of log(L), log(CON), SPREAD, and r. In some one-stage models, CR was added as a separate r.h.s. variable or was interacted with log(L). Since the qualitative results with respect to CR were similar to those in the tables, the more elegant two-stage results are presented. In other runs, the percent change in consumer confidence (CONFID) was insignificant, implying that confidence did not add information in the presence of other demand-related variables.

$\log(CON)_{t-1}$ and $SPREAD_{t-1}$ in the cointegrating vector implies that income and the degree of nonbank competition are significant long-run determinants of bank lending. DUM802 is significant when included, and its absence in models 3 and 5 has little effect on the significance of CR. The terms interacting EC with lags of CR in models 3 and 4 are jointly significant. Because the EC term is expected to have a negative sign, the negative signs of CR*EC in those models imply that greater credit availability speeds up the adjustment of bank loans to their long-run equilibrium and encourages people to lever up in the short-run. Furthermore, in models that include the significant credit control dummy (models 2, 4, and 6,), there is autocorrelation in the residuals of the nonCR model (2) but not in models 4 and 6 that include the interactive CR term and CR, respectively. On balance, these findings imply that the growth rate of bank consumer loans reflects both nonprice and price terms.[17]

Using an insample period of 1973:3-87:4, ex post forecasts from the table 4 models were done over 1988:Q1-94:Q4 (the most recent interest rate cycle) using an insample period of 1973:Q2-87:Q4. Comparing across models with or without the credit control dummy, the S.S.E. of the forecasts from the nonCR models (models 1 and 2, respectively) were 28 percent higher than those from the models with the interactive CR term (models 3 and 4, respectively) and 29 percent higher than those from the models with CR (models 5 and 6).

5. Consumer Spending Effects

To assess the impact of nonrate credit terms on consumer spending, the credit availability index (CR) is added to several equations in the Federal

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[17] Findings are consistent with results shown later and two studies. Duca (1991) finds that auto lending shifted from banks toward finance companies when banks became less willing to make consumer loans. Lam (1991) finds cross-section evidence that liquidity constraints affect auto sales.

Reserve Board's (FRB) econometric model. Two are error-correction models of auto and nonauto durable spending and the third models consumer spending on services and nondurables plus the service flow from the stock of durables.

Effects on Consumer Durables

The FRB durable equations are of the form:

$$i_t/k_{t-1} = \alpha EC_{t-1} + \beta \Delta x_t, \tag{17}$$

where i ≡ durable purchases and leases minus depreciation, EC_{t-1} ≡ the error-correction term, and X ≡ a vector of variables having short-run dynamic effects. The dependent variable in the auto model is household purchases and leases of autos divided by the lagged stock minus a constant (.17493) and a time trend (10.398/time). The dependent variable in the nonautos model equals purchases of nonautos divided by the lagged stock (there is no time trend). In the EC terms below, the first term controls for permanent income (con), the second for the user cost of capital, and the third for relative prices:

$$EC^a = \{[1*CON]-[.686*r^a]-[.328*\log[P^{gas}/(P^{con}*MPG)]]\} - k^a, \quad \text{and} \tag{18}$$

$$EC^o = \{[1*CON]-[.182*r^o]-[.664*\log(P^o/P^{con})]\} - k^o, \tag{19}$$

where "a" ("o") superscripts denote auto (nonauto) variables, CON ≡ consumer purchases of services and nondurables plus the imputed service flow from the stock of durables, r^a ≡ real after-tax interest rate for autos adjusted for relative prices, r^o ≡ real after-tax interest rate for nonauto durables, P^{gas} ≡ price of gasoline, P^{con} ≡ consumption price deflator, MPG ≡ fuel efficiency of the existing auto stock, and P^o ≡ price deflator for nonauto durables.

For autos and nonautos, x includes Δr_t and the one-quarter lags of disposable income growth (Δy^d) and the dependent variable. For autos, x also includes the percent change in the real price of gas per mile driven [$P^{gas}/P^{con}*MPG$], and the two-quarter lag of the dependent variable.

Of the models including CR, the most successful in terms of fit and performance[18] of the EC specification were of the form:

$$i_t/k_{t-1} = [\alpha_0 + \alpha_1 CR]EC_{t-1} + \beta\Delta x_t, \tag{20}$$

where α_0 is a constant and α_1 is hypothesized to be positive because increases in credit availability (CR>0) theoretically could increase the responsiveness of purchases to the gap between desired and actual durable stocks. Since the speed of error correction is more a function of the level rather than the percent change in credit availability (CR), other runs also included lags of CR interacted with EC_{t-1}. Given the big spikes in CR around the credit control episode, some models also include the credit control dummy, CONTROL, interacted with the EC term to see if the credit control episode can bias the normal dynamic effect of CR on the speed of error-correction.

CR has significant, positive effects on the speed of adjustment whether contemporaneous or lagged CR is interacted with the EC term (table 5). For both durables, the one-quarter lag of CR has the largest effect, and more so when the significant credit control dummy is present. Consistent with these results, both FRB models fit better when CR is included as a determinant of the speed of correction. In addition, including CR in the nonauto durable model allows one to not reject the null hypothesis that the residuals are well-behaved. Based on fit and t-statistics, models 3 and 6 are the preferred specifications for auto and nonauto durables, respectively.

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[18]In other runs, separate lags of CR were very significant, but the estimated EC coefficients were insignificant and R^2's were lower.

Ex post forecasts of the levels of auto and nonauto durables from the FRB models have S.S.E.'s which are 408% and 144% higher than those derived from models 3 and 6, respectively, over the post-Reg Q era (1983:4-94:4).[19] Unlike the FRB auto model, model 3 did not incorrectly predict a sharp decline in auto purchases over the 1988-90 period of rising interest rates, did not incorrectly forecast a sharp recovery during the subsequent period of declining interest rates over 1990-93 (Figure 2),[20] and does a respectable job of simulating auto spending out-of-sample over a 12-year period. One plausible explanation is that the FRB model is affected by bias from omitting the credit availability index that lead it to overestimate the effect of higher interest rates on autos in the post-Reg Q era. In particular, credit availability, as measured by CR, declined much less during 1988-90 run-up in interest rates than in preceding periods of Fed tightening. Additionally, CR did not surge as much as in prior periods of Fed easing during the 1990-92 fall-off in interest rates because prior increases in the federal funds rate in the late-1980s did not lead to Reg-Q induced disintermediation that was later unwound by the subsequent rate cuts in the early-1990s.

Credit Availability Effects on "CON"

The variable "CON" plays a critical role in the FRB model of the U.S. economy because it proxies for permanent income and measures consumption in a way consistent with the LCH/PIH. The FRB model of "CON" is:

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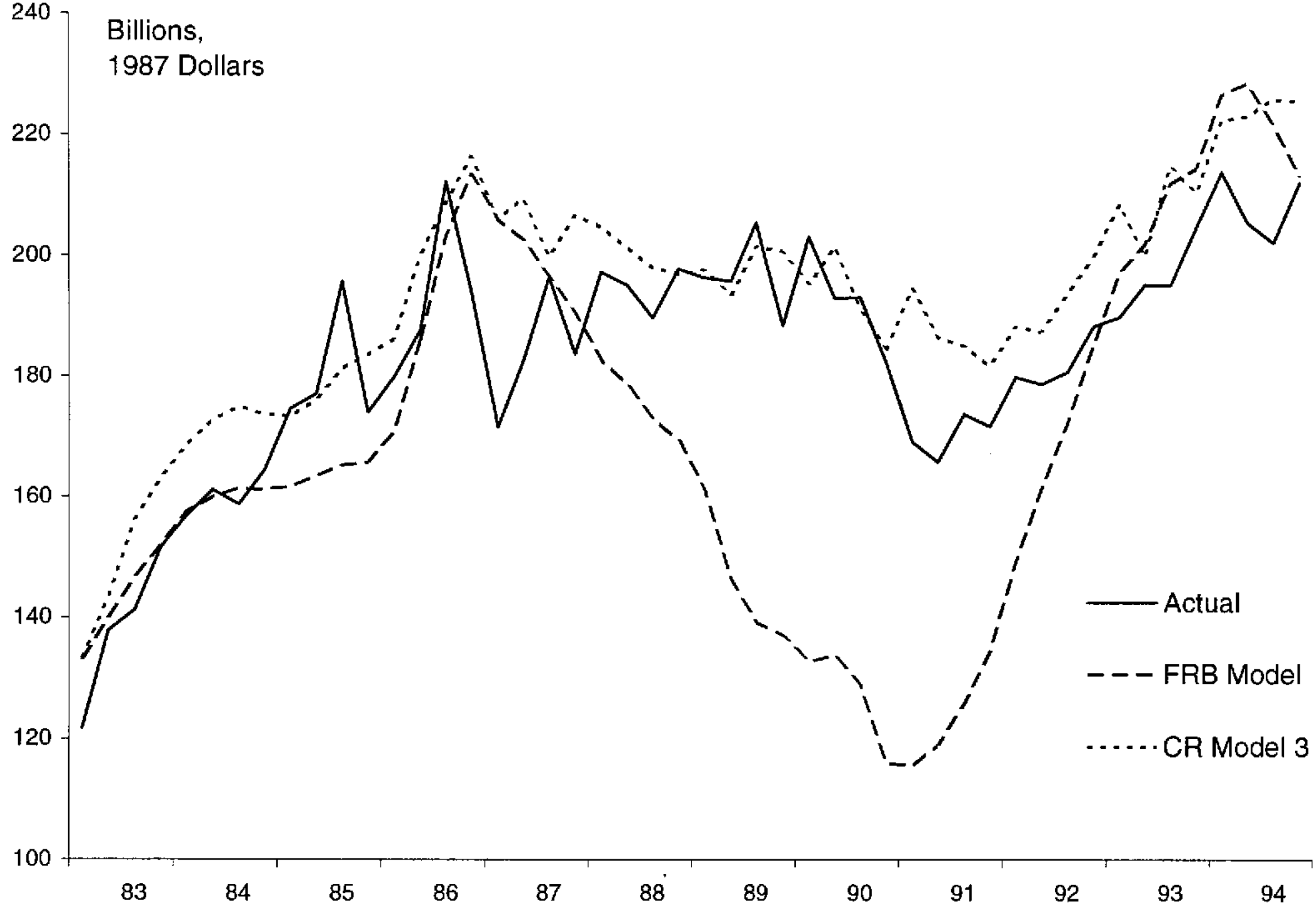
[19] While the CR-augmented model of nonauto durables also outperforms the FRB model in ex post forecasts, the difference is not as striking as in the case of autos. This may owe to improvements in computers that make it difficult to track nonauto durable demand well out-of-sample and to the fact that because nonauto durable items are less expensive than new cars, nonauto durable purchases are relatively less dependent on obtaining financing.

[20] Figure 2 plots forecasted levels of real auto durable purchases that were derived from durable stock growth forecasts generated by the models.

Figure 2
Actual & Forecasted Motor Vehicle Purchases



$$CON_t = \Sigma_{i=0,7}\alpha_{t-i}y^l_{t-i} + \Sigma_{i=0,5}\beta_{t-i}y^{tr}_{t-i} + \Sigma_{i=0,3}\delta_{t-i}y^p_{t-i} + \eta w^s_t + \Phi w^n_t + \tau OIL_t, \tag{20}$$

where CON, the w's and the y's are per capita, y^l≡after-tax labor income (instrumented using lags of y^l and the real federal funds rate), y^{tr} ≡ transfer income, y^p≡after-tax property income, w^s (w^n)≡the six-quarter moving average of stock market (other) wealth deflated by P^{con}, and OIL ≡ 1974 oil shock dummy.

Since CR has a mean near zero, CR may temporarily affect savings. As a test, a set of variables interacting CR_{t-i} with y^l_{t-i} were added to eq. (20). These terms are jointly significant with a positive sum of coefficients and residuals are better behaved in their presence regardless of whether jointly insignificant terms interacting y^l_{t-i} with a credit control dummy are present (table 6). These results suggest that loosening nonrate credit terms boosts consumer spending by temporarily lowering the savings rate.

Nevertheless, the interactive terms have a smaller effect on model fit and are less significant in the "CON" models than in the the two durable models. These differences plausibly reflect that "CON" includes: (1) non-durable purchases which are much less credit intensive than durable purchases, and (2) the imputed service flow from the <u>stock</u> of durables which is more stable and less affected by credit conditions than are <u>purchases</u> of durables.

6. Conclusion

This study finds that bank consumer lending reflects not only demand factors and supply influences related to interest rates, taxes, and nonbank competition, but also nonrate credit conditions. In addition, a proxy for nonrate credit conditions is found to have significant effects on consumer durable spending. These results are consistent with cross-section evidence that borrowing constraints have large effects on households [e.g., Duca and Rosenthal (1993), Jappelli (1990), and Cox and Jappelli (1992)] and with theoretical models that bank credit is allocated with nonrate terms (e.g., Jaffee and Russell (1976), Stiglitz and Weiss (1981), and Williamson (1986)), as well as rates. Evidence also shows that bank willingness to make consumer loans is decreasing in the real federal funds rate and positively related to a leading indicator of better macroeconomic conditions. These two findings are consistent with a modified Stiglitz and Weiss (1981, part IV) screening model, a view that credit availability is partly endogenous, and with the continued use of credit standards by banks in evaluating loan applications. Overall, the results imply that, in addition to working through interest rate and income channels, monetary policy influences bank consumer lending and consumer durable purchases by affecting nonrate credit conditions. Findings also have two other important implications for monetary policy. First, the impact of federal funds rate changes on the willingness to lend index is smaller after the 1970s in models omitting a Reg Q variable and models with such a variable imply that deposit deregulation has expanded credit availability. Second, the omission of the lending index likely creates an upward bias to the post-1970s impact of monetary policy, consistent with the fact that the FRB model of consumer durables severely underpredicts consumer durables in the late-1980s, while a model including the credit availability index as a determinant of stock adjustment does not (Figure *). Together, these findings imply that deposit deregulation has reduced the impact of interest rates on consumer credit availability and are consistent with the position of Miron, Romer, and Weil (1995) that the relative strength of the bank credit channel of monetary policy has declined over time.

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Table 1: Granger Causality Results

Direction	F Statistic	Direction	F Statistic
CR -> DUR	10.22**	DUR -> CR	2.10
CR -> Δl^b	5.24**	Δl^b -> CR	2.39
CR -> Δle^b	6.03**	Δle^b -> CR	1.33
CR -> ΔRFF	4.16**	ΔRFF -> CR	1.91
CR -> GM22	4.77**	GM22 -> CR	1.57
CR -> ΔPAPERBILL	1.98	ΔPAPERBILL -> CR	1.76
CR -> ΔYCURVE	2.27	ΔYCURVE -> CR	5.29**
RFF -> GM22	2.74*	GM22 -> RFF	.64
CR -> GLI	2.00	GLI -> CR	1.30

All tests include a dummy for the imposition and lifting of credit controls in 1980 (CONTROL) and are based on 4 lags with samples over 1968:Q1-94:Q4, except for dle^b where data are available for 1968:Q1-82:Q4 sample period.

-> denotes test of causality from the left-hand side variable to the right-hand side variable.

*(**) denotes significant at the 5% (1%) level.

Variable Definitions:

CR ≡ index of relative change in bank willingness to make consumer installment loans.

Δl^b ≡ percent change in real bank consumer loan outstandings.

Δle^b ≡ percent change in real bank consumer installment loan extensions.

ΔRFF ≡ first difference of the federal funds rate minus the annualized 2-quarter growth rate of PCE deflator.

GM22 ≡ 2 quarter growth rate of real M2.

ΔPAPERBILL ≡ first difference of the spread between the 4-6 month prime commercial paper rate and the 6 month Treasury bill rate.

ΔYCURVE ≡ first difference of the spread between the 10 year Treasury note and 3 month Treasury bill rate.

GLI ≡ 1 quarter percent change in the index of leading economic indicators.

Table 2
Results of Modeling Changes in Bank Willingness to Lend
(Sample: 1967:Q1-1994:Q4)

	Models					
	1	2	3	4	5	6
constant	27.49** (7.48)	19.60** (5.70)	21.94** (6.21)	20.86** (5.83)	26.14** (7.29)	24.52** (6.66)
ΔRFF_t	-2.42** (-3.28)				-2.05** (-2.79)	-1.68* (-2.20)
$GM22_t$		1.14* (2.00)				
$\Delta PAPERBILL_t$			-6.41** (-2.95)		-5.25* (-2.41)	
$\Delta YCURVE_t$				4.77** (3.75)		3.78** (2.80)
$GLI2_t$	3.14** (4.82)	2.25** (2.91)	3.40** (5.08)	3.96** (5.71)	3.48** (5.38)	3.90** (5.72)
$REGQ_t$	-10.75** (-5.42)	-11.19** (-5.67)	-11.43** (-5.75)	-10.53** (-5.28)	-10.27** (-5.29)	-9.78** (-5.03)
$CONTROL_t$	-52.36** (-10.64)	-53.82** (-10.46)	-49.92** (-9.71)	-55.83** (-11.80)	-48.71** (-9.63)	-53.91** (-11.20)
$MMDA_t$	25.99** (3.10)	31.96** (3.61)	24.89** (2.95)	38.87** (4.53)	23.26** (2.81)	34.83** (3.98)
$\bar{R}^2$	.810	.797	.806	.815	.820	.823
rho	.690	.653	.707	.716	.684	.686
D.W.	1.85	1.90	1.93	1.90	1.93	1.88
Q(24)	23.87	19.45	23.20	20.44	21.15	22.83

*(**)--significant at the 5% (1%) level. t-ratios are in parentheses.

Variable Definitions:

ΔRFF ≡ first difference of the real federal funds rate.
GM22 ≡ 2 quarter growth rate of real M2.
ΔPAPERBILL ≡ Δ of 4-6 mon. commercial paper rate minus 6 month T-bill rate.
ΔYCURVE ≡ Δ of the 10-yr. Treasury note-3 month T-bill spread.
GLI2 ≡ 2 qtr. percent change in the index of leading economic indicators.
REGQ ≡ measure of bindingness of regulation Q ceilings.
CONTROL ≡ credit control dummy = 1 in 1980:2 and -1 in 1980:3.
MMDA ≡ dummy equal to 1 in 1982:Q4 when MMDAs were introduced.

Table 3: Impact of Excluding Reg Q Measures on Estimated Coefficients on Monetary Policy Measures (full sample, 1967:1-94:4)

Monetary Variable	Models with REGQ	Models without REGQ	% Abs. Change in Monetary Coeff. From Dropping REGQ
ΔRFF_t	-2.42** (-3.28)	-3.78** (4.48)	-36%
$GM22_t$	1.14* (2.00)	1.67** (2.66)	-32%
$\Delta PAPERBILL_t$	-6.41** (-2.95)	-8.18** (-3.37)	-22%
$\Delta YCURVE_t$	4.77** (3.75)	6.38** (4.67)	-25%

Interactive Dummy Tests for Different Post-1978 Effect of Monetary Variables[1]

Monetary Variable	Models with REGQ	Models without REGQ
ΔRFF_t	1.92 (1.30)	3.74* (2.31)
$GM22_t$	-0.62 (-0.69)	-0.84 (-0.80)
$\Delta PAPERBILL_t$	-13.26** (-3.04)	-9.36+ (-1.71)
$\Delta YCURVE_t$	-6.62* (-2.42)	-8.92** (-3.05)

1. These tests add an interactive dummy variable to each model using one monetary policy measure, where the interactive variable equals the product of that monetary policy variable and a dummy equal to one after 1978:Q4. The models correspond to models 1-4 from table 2, with and without REGQ, as noted.

*(**)--significant at the 5% (1%) level. t-ratios are in parentheses.

Variable Definitions:

ΔRFF = first difference of the real federal funds rate.
GM22 = 2 quarter growth rate of real M2.
ΔPAPERBILL = Δ of 4-6 mon. commercial paper rate minus 6 month T-bill rate.
ΔYCURVE = Δ of the 10-yr. Treasury note-3 month T-bill spread.

Table 4: Results of Modeling Real Bank Consumer Loan Growth 1973:Q3-94:Q4

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
constant	-.3858**	-.3548**	-.3368	-.3223**	-.3403**	-.3251**
	(-4.30)	(-4.54)	(-4.08)	(-4.35)	(-4.13)	(-4.40)
EC_{t-1}	-.0645**	0.0594**	-.0568**	-.0543	-.0564**	0.0548**
	(-4.19)	(-4.42)	(-4.01)	(-4.28)	(-4.06)	(4.32)
$CR_{t-1}*EC_{t-1}$			-.0030**	-.0023		
			(-4.06)	(-3.34)		
CR_{t-1}					0.0176**	0.0133**
					(4.08)	(3.34)
$DUM802_t$		-.0337**		-.0285**		-.0285**
		(-5.07)		(-4.44)		(-4.42)
$\Delta\log(L^b)_{t-1}$	0.5618**	0.5244**	0.4402**	0.4378**	0.4386**	0.4369**
	(4.38)	(4.69)	(3.65)	(4.05)	(3.63)	(4.04)
$\Delta\log(L^b)_{t-2}$	0.1968+	0.2180*	0.2529*	0.2574**	0.2545**	0.2584**
	(1.78)	(2.26)	(2.48)	(2.82)	(2.50)	(2.83)
$\Delta\log(CON)_{t-1}$	0.3503	0.3038	0.1433	0.1537	0.1448	0.1553
	(1.33)	(1.33)	(0.58)	(0.70)	(0.59)	(0.71)
$\Delta SPREAD_{t-1}$	-.0007	-.0008	-.0004	-0.0005	-.0004	-.0038
	(-0.66)	(-0.86)	(-0.43)	(-0.65)	(-0.42)	(-0.64)
r_{t-1}	0.0004	0.0035	-.0002	-.0001	-.0002	-.0001
	(0.55)	(0.68)	(-0.36)	(-0.10)	(-0.36)	(-0.10)
ΔU_{t-1}	-.0072*	-.0074**	-.0011*	-.0068**	-.0064*	-.0068**
	(-2.52)	(-2.99)	(-2.44)	(-2.89)	(-2.44)	(-2.89)
$\bar{R}^2$	.8356	.8755	.8631	.8902	.8634	.8903
D.H.	0.0085	-2.4568**	-0.6196	-0.9549	-0.6188	1.1001
S.S.E.	.00380	.00320	.00352	.00280	.00351	.00278
Q(24)	20.31	17.00	18.85	13.44	18.71	13.34
88:1-94:4 Forecast S.S.E.	.00170	.00156	.00133	.00122	.00132	.00121

*(**)--significant at the 5% (1%) level. t-ratios are in parentheses.

Variable Definitions:

EC ≡ error correction term for bank loan outstandings.
CR ≡ index of change in bank willingness to make consumer loans.
L^b ≡ real stock of U.S. bank consumer loans, securitization adjusted.
CON ≡ proxy for permanent income.
DUM802 ≡ credit control dummy = 1 in 1980:Q2.
CON ≡ MPS model's proxy for permanent income.
SPREAD ≡ finance company auto loan rate minus bank auto loan rate, new cars.
r ≡ real, after-tax auto loan rate.
U ≡ civilian unemployment rate.

Table 5: Results From Auto and NonAuto Consumer Durable Regressions (Sample: 1968:Q1-94:Q4)

	Auto Durables				NonAuto Durables			
Variables	FRB Mod.	Model 1	Model 2	Model 3	FRB Mod.	Model 4	Model 5	Model 6
constant	-.0617** (-4.84)	-.0296* (-2.18)	-.0173 (-1.24)	-.0184 (-1.37)	-.0152 (-1.20)	0.0137 (-0.14)	-.0189 (-1.54)	0.0178 (1.47)
EC_{t-1}	-.2243** (-4.32)	-.1067* (-2.29)	-.0698 (-1.53)	-.0753 (-1.63)	-.0637* (-2.47)	-.0182 (-0.63)	0.0144 (0.57)	0.0102 (0.41)
CR_t*EC_{t-1}		-.0963** (2.82)				-.0001** (-3.49)		
$\Sigma_{i=0,3}CR_{t-i}*EC_{t-1}$			-.2052** (-5.16)	-.1979** (-4.96)			-.0215** (-5.82)	-.0203** (-5.50)
$CONTROL_t*EC_{t-1}$		0.0369 (0.66)		0.0782* (2.33)		0.0015 (0.28)		0.0105** (2.85)
i_{t-1}/k_{t-2}	0.4813** (4.30)	0.5201** (5.29)	0.2906** (2.66)	0.2956** (2.69)	0.8977** (24.92)	0.9547** (24.27)	0.9443** (28.98)	0.9386** (28.96)
i_{t-2}/k_{t-3}	0.2625** (2.82)	0.2367** (2.78)	0.3193** (3.59)	0.3099** (3.41)				
Δy^d_{t-1}	0.3844 (1.72)	0.3836 (1.64)	0.4635* (2.19)	0.4690* (2.25)	0.1071* (2.26)	0.0732 (1.54)	0.0374 (0.91)	0.0416 (1.05)
Δr^a_t or Δr^o_t	-.2842* (-2.21)	-.1878 (-1.42)	-.3512* (-2.58)	-.3229* (-2.35)	-.0361 (-1.60)	-.0162 (-0.80)	-.0384** (-2.01)	-.0329 (-1.68)
$\Delta\log[P^{gas}/P^{con}*MPG]_t$	-.1106** (-3.10)	-.0670 (-1.82)	-.0957* (-2.64)	-.0915* (-2.50)				
R^2 (corrected)	.73605	.75901	.79128	.79339	.89786	.91449	.9249	.9270
d.h.[1]					2.225**	-.7047	-.1929	-.4743
d.w.	1.913	2.114	2.076	2.116				
S.S.E.	.03225	.02886	.02449	.02400	.00171	.00141	.00121	.00116

<u>Variable Definitions:</u> EC ≡ error correction term for auto or nonauto consumer durables; CR ≡ index of change in bank willingness to make consumer loans; CONTROL ≡ credit control dummy = 1 in 1980:2 and -1 in 1980:3; i/k ≡ depreciation adjusted durable spending divided by the stock; r^a (r^o) ≡ user cost of capital for auto (nonauto) durables; y^d ≡ real disposable income; and $[P^{gas}/P^{con}*MPG]$ ≡ real price of gasoline per mile driven.
*(**) significant at the 5% (1%) level. t-ratios corrected for heteroskedasticity are in parentheses.
1. Since d.h. statistics could not be computed for the auto runs, d.w. statistics are provided.

Table 6: Selected Statistics From CON Regressions (1969:Q1-94:Q4)

Variables	FRB Model	Model 7	Model 8
$\Sigma_{i=0,7}y^{l}_{t-i}$	0.7013** (10.05)	0.7235** (13.21)	0.7249** (12.71)
$\Sigma_{i=0,5}y^{tr}_{t-i}$	1.2180** (8.40)	1.0424** (7.44)	1.0750** (7.38)
$\Sigma_{i=0,3}y^{p}_{t-i}$	0.2556** (2.83)	0.2588** (3.14)	0.2597** (3.10)
w^s	0.0291* (2.58)	0.0325** (3.16)	0.0294** (2.77)
w^n	0.0594** (4.79)	0.0621** (5.71)	0.0611** (5.46)
OIL	-.0500 (-1.90)	-.0570* (-2.20)	-.0541* (-2.08)
$\Sigma_{i=0,7}(y^{l}*CR)_{t-i}$		0.0373** (2.88)	0.0393** (2.77)
$\Sigma_{i=0,7}(y^{l}*CONTROL)_{t-i}$			0.0037 (0.17)
$\bar{R}^2$	.99957	.99955	.99955
rho	.92674	.90163	.90699
D.W.	1.75	1.92	1.96
S.S.E.	.11376	.10457	.10224

*(**)--significant at the 5% (1%) level. t-ratios are in parentheses.

Variable Definitions:

CON = MPS model's proxy for permanent income.
y^l = real labor income.
y^{tr} = real income from transfers.
y^p = after-tax property income (e.g., dividends, interest, and rent).
w^s = the six-quarter moving average of real stock market wealth.
w^n = the six-quarter moving average of real non-stock market wealth.
OIL = 1974 oil shock dummy.

List of Variable Definitions (Not intended for publication)

E^i = expected loan revenue from household i.
q^i = expected loan quality of household i.
d^i = expected default rate of household i.
y^i = underlying income potential of household i.
ϕ, i = real, riskless cost of funds to banks.
β = positive indicator of the macroeconomic outlook.
f = notional loan demand.
L^t = average per capita demand for real consumer loans from all lenders.
L^b = real stock of U.S. bank consumer loans, securitization adjusted.
α^b = bank share of total consumer loans.
Q = population share that qualifies for a loan and borrows.
N = population.
C = real personal consumption expenditures.
r = real, tax-adjusted bank auto loan rate.
π^e = expectations of inflation.
R = nominal bank auto loan rate (source: Federal Reserve surveys)
t = marginal federal income tax rate for a proto-typical family of four.
σ = current share of consumer loan interest that is tax deductible.
Ω = 4-year ahead share consumer loan interest that is tax deductible.
DUR = real consumer durable spending growth ($ 1987).
CR = index of change in bank willingness to make consumer loans.
Δ = first difference operator.
Δl^b = percent change in real bank consumer loan outstandings.
Δle^b = percent change in real bank consumer <u>installment</u> loan extensions.
ΔRFF = first difference of the real federal funds rate.
GM22 = 2 quarter growth rate of real M2.
ΔPAPERBILL = Δ of 4-6 mon. commercial paper rate minus 6 month T-bill rate.
ΔYCURVE = Δ of the 10-yr. Treasury note-3 month T-bill spread.
GLI = 1 qtr. percent change in the index of leading economic indicators.
GLI2 = 2 qtr. percent change in the index of leading economic indicators.
REGQ = measure of bindingness of regulation Q ceilings.
CONTROL = credit control dummy = 1 in 1980:2 and -1 in 1980:3.
MMDA = dummy equal to 1 in 1982:Q4 when MMDAs were introduced.
EC = appropriate error correction terms for various models.
DUM802 = credit control dummy = 1 in 1980:Q2.
CON = MPS model's proxy for permanent income.
SPREAD = finance company auto loan rate minus bank auto loan rate, new cars.
r = real, after-tax auto loan rate.
U = civilian unemployment rate.
i/k = depreciation adjusted durable spending divided by the durable stock.
r^a (r^o) = user cost of capital for auto (nonauto) durables, depreciation adj.
y^d = real disposable income.
$[P^{gas}/P^{con}*MPG]$ = real price of gasoline per car mile driven.
P^{gas} = nominal price index for gasoline.
P^{con} = price deflator for CON, the MPS model's measure of permanent income.
MPG = gas mileage adjustment for calculating the real price of gasoline per car mile driven.
y^l = real labor income.
y^{tr} = real income from transfers.
y^p = after-tax property income (e.g., dividends, interest, and rent).
w^s = the six-quarter moving average of real stock market wealth.
w^n = the six-quarter moving average of real <u>non</u>-stock market wealth.
OIL = 1974 oil shock dummy.

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