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Liquidity Constraints on Consumption: The Real Effects of "Real" Lending Policies

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This article argues that households are often prevented from consuming as much as their permanent income justifies. The hypothesis is advanced that lending criteria based on payment-to-income ratios often inappropriately constrain borrowing and therefore consumption. The evidence indicates that the variables presumed to proxy for payments and for income, the nominal interest rate and the unemployment rate, respectively, significantly affect consumption growth in the manner suggested by this hypothesis. In contrast, there is little evidence that real interest rates have important effects on consumption.

Personal consumption expenditures typically comprise about two-thirds of total national spending. Not only is consumption the single largest category of spending, but it changes by large amounts. In absolute terms, the variability of consumption expenditures is as large as that of business investment. Moreover, the variabilities of the components of consumption (services, nondurables, and durables) are large. The variabilities of nondurables and of services individually are nearly as large as that of consumer durable expenditures and the variability of the sum of nondurables and services is appreciably larger than that of durables.[1] An understanding of the movements in and determinants of consumption and its components clearly is important for the conduct of monetary policy.

The widely accepted permanent income hypothesis posits that consumption is driven by households' wealth and their expectations of income over the long run. Although actual income may fluctuate, these fluctuations are hypothesized not to affect consumption unless they alter households' expectations of their longer-run average, or permanent, income. Instead, when households are faced with deviations of actual from permanent income, they are presumed to vary borrowing and lending in order to steady consumption.

Considerable recent empirical research, however, based on both macroeconomic and microeconomic data bases, suggests that movements in actual income have sizeable effects on consumption apart from the effect of those movements on permanent income. Likewise, theory suggests that real, after-tax interest rates should affect consumption, but that nominal interest rates should not. The evidence, however, indicates that exactly the opposite is more likely to be true. Consistently, the data point to significant nominal interest rate effects on expenditures for durables, nondurables, and services, and to insignificant real-interest-rate effects.[2] This is surprising indeed.

This article suggests that a single factor helps to explain these two findings—that consumption expenditures are reduced both by higher nominal interest rates and by the shortfall of actual, current real income below its permanent level. These interest-rate and income effects both result from a borrowing constraint which prevents households from obtaining sufficient credit to finance as much

consumption as their permanent income justifies. In particular, this borrowing, or liquidity, constraint is hypothesized to emanate from the prevailing lending practice of granting credit subject to virtually-never-changing payment-to-income-ratio ceilings.[3]

The first section presents a brief exposition of the permanent income theory of consumption and its empirical implications. Then it is argued that current credit-granting practices lead to liquidity constraints that are associated with nominal interest rates and real income. Section II reviews the evidence from microeconomic data bases regarding liquidity constraints. It also suggests what these constraints portend for macroeconomic data. Section III econometrically assesses the extent to which nominal interest rates and unemployment rates affect aggregate consumption, apart from their effects on permanent income. The estimates suggest that each has powerful effects on consumption expenditures. The evidence points toward the liquidity constraint that operates through the payment-to-income ratio as the source of these important effects on consumer expenditure. The short- and longer-run implications of these results for national spending and saving, for economic policy, and for financial institutions are discussed in the concluding Section IV.

I. Permanent Income, Consumption, and Constraints

The permanent income hypothesis posits that consumers base desired consumption on permanent income. The theory can be summarized as

$$C = kY^P \tag{1}$$

where C is the level of real, per capita consumption, k is the (average and marginal) propensity to consume out of permanent income and Y^P is the level of real, per capita permanent income. Permanent income, Y^P, is the average, discounted income a consumer expects to receive over the relevant horizon. In logs, (1) becomes

$$log(C) = log(k) + log(Y^P) \tag{2}$$

Note that actual income does not appear. The permanent income hypothesis states that actual income affects consumption only to the extent that if affects permanent income. Consumers are presumed to have access to capital markets, and therefore are not constrained by cash flow or current income. Borrowing and lending are viewed as shock absorbers for temporary fluctuations in income, making it possible for households to maintain consumption in the face of changes in actual income that are perceived to be temporary or are anticipated. Access to capital markets also permits consumption to change when permanent income changes in advance of actual income.

Permanent income represents a forecast, not a measured quantity. When consumers use all the information that is available at a given time to form estimates of permanent income, those estimates will change from period to period only as new information is received. Hence, changes in estimates of permanent income will be unpredictable. This is common to optimal forecasts; over time, the change in what is expected to happen over any given future period is random.[4] This is embodied in

$$log(Y^P) = log(Y^P)_{-1} + \mu \tag{3}$$

which shows that today's forecast of future income differs from last period's forecast of income over the same future period by an unforecastable amount, μ. No information available prior to the current period would help predict the change in permanent (or forecasted) income. Otherwise, it already would have been incorporated in last period's estimate of permanent income.

Taking first differences of (2) and using (3) generates

$$\Delta log(C) = \Delta log(k) + \mu \tag{4}$$

On the assumption that k is constant over time, the growth rate of consumption, $\Delta log(C)$, should be random. No information available prior to the current period should reliably predict changes in consumption growth.

This model, however, is correct only if expected, real, after-tax interest rates are constant. When they are not constant, theory predicts that households defer more consumption when the reward for doing so is higher. This means that, ceteris paribus, higher interest rates last period reduce last-period's consumption relative to current consumption, thereby raising the growth rate of consumption:

$$\Delta log(C) = \gamma + \delta r^e_{-1} + \mu \tag{5}$$

Liquidity-Constrained Consumption

One potential weakness of this permanent-income formulation is that it assumes perfect capital markets, in which households can borrow and invest in order to smooth consumption across time periods. If capital markets are not perfect, however, households' desired spending patterns may be "liquidity constrained" in significant ways.[5] Thus, the presence of liquidity constraints could make the permanent income hypothesis an inferior explanation for aggregate consumption behavior, particularly

since changes in borrowing flows are an empirically important factor in consumption patterns.[6]

The alternative hypothesis advanced here is that liquidity constraints are indeed binding for a significant portion of households and that the aggregate amount of liquidity constraint is associated with unemployment and nominal interest rates. As either rises, liquidity constraints both bind more tightly on previously constrained households and begin to bind on more households. Each aspect drives consumption further below the unconstrained value that the permanent income hypothesis predicts.

Consumers subject to liquidity constraints are assumed to behave differently from those who are not. Their consumption generally will respond vigorously to changes in current income or other sources of cash flow, even if those changes are anticipated, since, by definition, constrained households want to consume more but are prevented from doing so by restrictions on their ability to borrow. Consumers not subject to borrowing constraints, in contrast, would be expected to react little to anticipated, or to past income changes since their estimates of permanent income and their consumption plans already have adjusted to those developments. Liquidity-constrained consumers already may have changed their desired consumption, but actual consumption may have to await increases in actual income and the increased cash flow and ability to borrow that comes with it.

The liquidity constraint impinging on an individual may be relatively short-lived or very long-lived. Borrowing may be constrained to less-than-optimal levels for households with expected (average, discounted) lifetime earnings that are above their actual, current earnings for periods extending into years. Given the typical upward tilt in the age-earnings profile, most young households would be expected to be substantial net debtors for many years. Kotlikoff (1988) shows that in practice, however, there is very little net borrowing by the young, whose consumption tracks earnings very closely at least up to age 45. And it may be that not only the young are liquidity constrained. Wilcox (1989) cites several studies that suggest that a substantial portion of the elderly may be liquidity constrained.[7]

Liquidity constraints resulting from the combination of lending criteria based on current income and the usual upward slope of the age-earnings profile then may lead to a very important and relatively constant share of households whose spending is constrained. For an individual, this type of liquidity constraint may become less binding as actual earnings approach potential earnings and as financial assets are accumulated.[8] The number of households subject to this form of liquidity constraint may change as time passes, probably slowly and in tandem with the ratio of young to total households.

In addition to the households subject to this age-related constraint, a changing fraction of households is likely to experience varying degrees of liquidity constraint in response to variations in unemployment and nominal interest rates.[9] One reason consumers may become liquidity constrained is that lenders widely follow a practice of restricting consumer borrowing so as to keep payment-to-income ratios below some ceiling level. A recent American Bankers Association textbook on consumer lending suggests that a borrower's capacity to repay a loan can be measured by the payment-to-income ratio.[10] This means that applications for credit are likely to be disapproved if the ratio of total loan payments to income breaches a ceiling, for example, of 40 percent.[11] Note that, in practice, this policy refers to *current* payment-to-*current* income. One consequence of this policy is that lenders generally refuse to extend credit to the currently unemployed.[12]

Using a payment-to-income rule means that movements in current income relative to permanent income can lead to consumers being liquidity constrained. This practice suggests a capital market imperfection that may explain why current income and cash flow affect consumption when the permanent income theory suggests they should not.

These credit practices also suggest that the extent to which consumption is liquidity constrained will vary with nominal interest rates. Lending policies that predetermine a payment-to-income ratio ceiling reduce the *real* amount of credit that would be made available to a borrower as the *nominal* interest rate rises.

Consider a $10,000, 48-month fully-amortizing loan. Suppose that the real interest rate is six percent.[13] If the expected inflation rate built into interest rates were zero percent, the resulting six percent loan would entail monthly payments of $235.[14] Since the actual and expected inflation rate is zero for this period, the actual payments and their real, or inflation-adjusted, values are both $235 per month for 48 months. The lower horizontal line in Figure 1 shows that payment, which is level in dollar, or nominal, terms and in real terms.

Suppose now that the actual inflation rate and the expected inflation rate incorporated into nominal interest rates rises from zero to five percent and that the real interest rate remains at six percent. The resulting eleven percent market interest rate means that the same loan now carries a $258 payment, an increase of 10 percent. This higher, nominal amount is shown as the upper horizontal line in Figure 1. This repayment pattern has the same six

percent real return over the life of the contract. The real burden of those higher nominal payments is shown as the diagonal line in Figure 1. Note that relative to the constant real payments in the zero-percent inflation case, the level dollar payments in the five-percent inflation case, in real terms, are higher early on and lower later in the life of the loan.

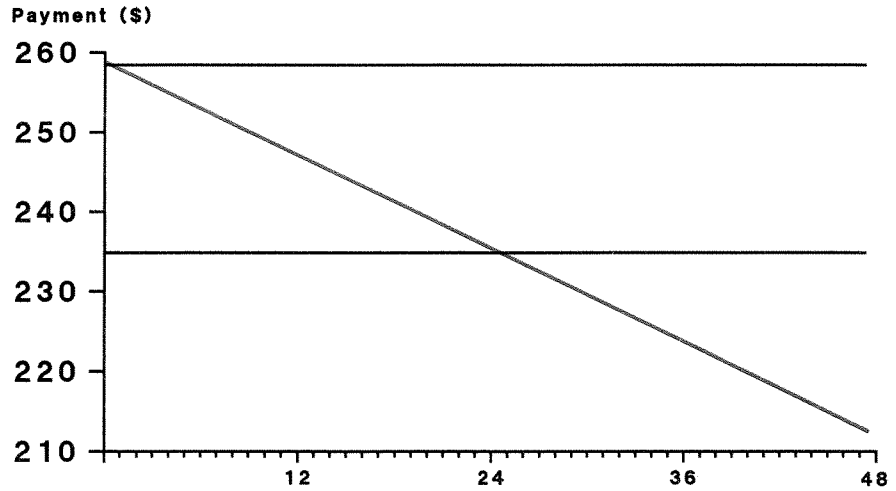
Level nominal payments during a period of inflation imply falling payments in real terms over time. An increase in expected inflation leads to an immediate one-time increase to higher nominal payments. The problem is that the onset of inflation does not have the same effect on household incomes. Incomes generally rise gradually as the level of prices rises. They do not jump by the same 10 percent in the first month that payments do. Thus, an increase in nominal interest rates stemming from an increase in the inflation premium would raise the initial real burden of this loan by virtually 10 percent. Suppose that a lender followed a payment-to-income rule and that the borrower would be permitted in either inflation scenario to borrow an amount that would imply a $235 payment. In the zero percent inflation case, a loan of $10,000 would be granted; in the five percent inflation case, a loan of only $9,087 would be granted.

This happens even though households and financial institutions both may think that they are adjusting for inflation. By basing their decisions on the ratio of two (nominal or real) flows, which often leads to an inflation-adjusted magnitude, they may be attempting to make a "real" decision. They are not. The reason is straightforward: the dollar payment per dollar of credit extended rises with the nominal interest rate. The only type of loan repayment schedule currently available provides for level dollar repayments. As time passes and inflation raises the level of wages and prices, those level payments constitute falling real payments.[15] Since later nominal repayments will be less in real terms, earlier ones must be greater to preserve the same average real payment and real rate of interest.

Over time, lenders might be expected to make lending policy parameters "realistic" to maintain optimal real borrowing limits. In practice, adjustments in lending policy take place so slowly that the aggregate amount of consumption that is liquidity constrained is likely to rise with the level of inflation. To the extent that nominal interest rates respond to (expected) inflation, payment-to-income ceilings would have to rise and fall with inflation to avoid tightening of liquidity constraints. It does appear that, on average, consumer credit parameters may have become somewhat looser in higher inflation periods. It does not appear, however, that they became tighter as inflation fell over the past ten years. In any event, lending parameters seem to be adjusted slowly enough, if ever, that as nominal interest rates move in response to inflation, more households become subject to these interest-rate-related restrictions.

The extension of loan maturities may reflect an attempt to overcome the high, initial, real payments brought on by inflation-related increases in nominal interest rates. The evidence does seem to be that loan maturities have consistently lengthened over the past four decades, but that seems to have gone on apart from the rise and fall of inflation. Regardless, attempting to solve the real-payment-tilt problem with longer maturities is indirect and inefficient since longer loans have lower, but still level, dollar payments.

Figure 1
Nominal and Real Loan Payments*



*Based on $10,000, 48-month, fully-amortizing loan with a 6% real interest rate.

II. Micro Evidence

One potential way to measure the extent of aggregate liquidity constraint is to look at data on loan applications disapproved.[16] However, the results of such a study will almost certainly understate the degree of liquidity constraint since borrowing constraints related to actual income may not be imposed only by lenders but also (self-imposed) by households. To the extent they recognize that lenders impose payment-to-income restrictions, households are likely to adjust current borrowing behavior as a hedge against temporary declines in actual income in the future. This may explain why, for example, so many households purchase lines of credit through credit card fees. Such lines may provide access to the credit that lenders otherwise would refuse to extend under circumstances that would lead a borrower to seek it. By tempering their debt accumulation and by maintaining lines of credit, households effectively have credit-access insurance.

Likewise, households may not bother applying for credit when they (accurately) forecast that they do not fall under lenders' payment-to-income ceilings. Most households are likely to believe (accurately) that their prospects for obtaining additional credit are dim when they are unemployed, for example, and therefore may not even apply. Finally, even though the constrained may end up obtaining credit, the amount they borrow will be less than if they were not constrained. In the mortgage market, for example, it is common for potential borrowers to seek prior estimates from lenders directly or indirectly of the maximum mortgage they would qualify for and then to adjust home purchases accordingly.

As an alternative approach to assessing the extent to which consumers are liquidity constrained, a number of empirical studies have investigated the consumption behavior of individual households. The important question for our purposes is whether liquidity-constrained consumers are numerous enough or receive a large enough share of aggregate income that aggregate consumption patterns are importantly affected. Below, I briefly review the results of studies of the spending patterns of individuals with that in mind.

Hall and Mishkin (1982) used data from the early 1970s on income and consumption of food by individual families. They conclude that 80 percent of these actual consumption expenditures appear to move in the manner prescribed by the liquidity-*unconstrained,* permanent income hypothesis. Their results further suggest that much of the deviation of actual from unconstrained consumption is due to the inability to borrow to overcome temporary income shortfalls. Hall and Mishkin conclude that "food consumption behaves as if constraints on borrowing were relatively unimportant."

Hayashi (1985) analyzed consumption behavior of two groups of consumers in the early 1960s: those who had high savings and those who did not. The hypothesis was that consumers who had accumulated wealth were unlikely to be constrained in their consumption behavior since they could self-finance more consumption by saving less, or even by dissaving. In contrast, those who did not have high savings were more likely to find their consumption restricted if liquidity constraints did, in fact, exist.

When the empirical model that best tracked the consumption of the high savers was used to predict the consumption of the low savers, Hayashi found that low savers tended to spend *less* (and save more) than the model forecasted. The rationale given for that result is that liquidity constraints prevented the group with low accumulated savings from consuming as much as they otherwise would have chosen; their inability to borrow precluded spending. The group whose consumption seemed most constrained was young households. That result is consistent with the typical upward tilt in age-earnings and in age-wealth profiles.

Mariger (1986) also concluded "that liquidity constraints are quite prevalent." Again employing the early 1960s data set, his estimates suggest that about twenty percent of families were liquidity constrained. These families accounted for about one-sixth of aggregate consumption.

Zeldes (1988) uses food consumption data collected from the late 1960s through the early 1980s to assess whether binding liquidity constraints have been widespread. Like Hayashi, he splits the individual-family data set in two. The specific criterion is whether the family has a non-negligible wealth-to-income ratio. He then estimates whether either group seems to exhibit consumption behavior that is consistent with the presence of borrowing constraints. He finds that, as Fitzgerald and Hemingway first conjectured, the rich are different.[17] Their consumption displayed no indication of being constrained by an inability to borrow, whereas that of the group with the low wealth-to-income ratio did.

These studies each find that a minority of households has been influenced by either binding current, or potentially-binding future, liquidity constraints. Taken together, these studies seem to make a compelling case for the practical importance of liquidity constraints. First, the fraction of households deemed to be constrained was a substantial minority. Finding that about 20 percent of consumers had been constrained implies serious deviation from the un-

constrained model of aggregate consumption. Since the unconstrained consumers are able optimally to smooth their consumption, it may be that the remaining consumers account for a very large fraction of total consumption variability.[18]

Second, of all the items in the household budget, expenditure for food would seem to be one of the *least* likely to be liquidity constrained. Food consumption is usually considered very income *in*elastic; it is the last purchase to be sacrificed when income falls. Evidence that the food expenditures of twenty percent of all households are constrained suggests that expenditures on the remaining categories of expenditure may be vastly more affected.[19]

III. Macro Evidence

Given the evidence from studies of the spending patterns of individual households, this section investigates whether liquidity constraints have important effects on aggregate consumption behavior. According to the liquidity-unconstrained version of the permanent income hypothesis of consumption, no lagged values of any variable should help predict the growth rate of consumption. Table 1 provides evidence to the contrary. It presents the results of regressing consumption on the first four lags of (personal disposable) income. Rows 1, 2, and 3 present the results of using lagged income to predict total consumption expenditures (C), the sum of consumer expenditures on nondurables and on services (CNS), and consumer expenditures on durables (CD), respectively. All variables in Table 1 are expressed as real, per capita, seasonally-adjusted percentage changes at annual rates. Current growth rates are based on current relative to prior-quarter levels.

The first two lagged income coefficients tend to be sizeable and significant. Lags three and four tend to be smaller and negative. Not surprisingly, the reaction of durable goods expenditures to lagged income is considerably different from that of nondurables and services. For nondurables and services, it is reasonable to take both the size and the timing of the consumption services that flow from them to be the same as expenditures on them. When it comes to durables, such an assumption is patently unreasonable.[20] A $20,000 expenditure this quarter for a new automobile is almost entirely investment and little consumption. The continuing flow of consumption services from past durable goods purchases, therefore, suggests that a positive response of durable goods expenditures to income is likely to be followed by negative ones. That is what Row 3 shows. After large and significant positive responses to the first two lags of income, large, negative responses appear.

The F-statistics in each row test whether the lagged values of income significantly help predict consumption. Since each of the calculated F-statistics exceeds the .05 significance level (critical value of 2.37), I conclude that each of the measures of consumption is predicted by lagged, actual-income movements.[21] This predictability of consumption growth argues against the simplest version of the permanent income theory as a sufficient explanation for consumption.

Table 1

Lagged Income Predicts Consumption

Quarterly Data, 1949Q3–1988Q3
(t-statistics in parentheses)

Dependent Variable	Constant	Coefficient on Income Lagged 1	2	3	4	F	R^2	D.W.
1. Total Consumption Expenditures	1.51 (4.37)	0.200 (3.30)	0.147 (2.50)	−0.054 (−0.92)	−0.023 (−0.39)	4.46	.105	2.11
2. Expenditures on Nondurables and Services	1.49 (6.14)	0.132 (3.09)	0.042 (1.01)	−0.004 (−0.09)	0.024 (0.59)	2.87	.070	1.88
3. Expenditures on Durables	1.51 (0.85)	0.672 (2.16)	0.939 (3.13)	−0.411 (−1.37)	−0.352 (−1.16)	4.29	.102	2.33

The results in Table 1, however, do not point to the reasons the permanent income hypothesis might be violated. The results presented in Table 2 suggest that lagged income and lagged consumption appear to affect consumption to the extent that each serves as a proxy for current income. Table 2 shows the results of arbitrarily splitting the sample period into decades and testing whether lagged values of consumption and income help predict consumption and income. (Reported F-statistics above 2.65 in Table 2 indicate statistical confidence above the .95 level.) When current income is predicted by its own lags, as in the 1950s and, to a lesser extent, the 1960s, lagged income serves as an effective proxy for current income. Those are also the periods when consumption is predicted by lagged income.[22] When income is not predicted by past income, as in the 1970s and 1980s, lagged income does not serve as an effective proxy for current income. In those periods, consumption is not predicted by past income.

Similar findings pertain to lagged consumption. When actual income is predicted by, and therefore effectively proxied by, lagged consumption, as in the 1980s, consumption is significantly related to its own lags. When lagged consumption does not serve as an effective proxy for current income, lagged consumption does not significantly predict current consumption. The exception to this pattern is that, in the 1970s, when income is not predicted by lags of consumption, lagged consumption still helps predict consumption.[23] These results indicate that it is not lagged income or lagged consumption *per se* that affects consumption. Instead, what they suggest is that consumption reacts to current income to an extent greater than is warranted by the permanent income hypothesis.

Table 2

Income and Consumption Predictability over Various Sample Periods

	Dependent Variable	Regressors (lags of)	F-Statistic 1950s	1960s	1970s	1980s
1.	Consumption	Income	4.50	4.63	1.39	1.85
2.	Income	Income	3.21	2.18	0.78	0.71
3.	Consumption	Consumption	1.17	0.46	4.06	2.34
4.	Income	Consumption	1.56	1.06	1.74	3.31

Testing for Liquidity Constraints

The finding that consumption does not correspond to the predictions of the simplest version of the permanent income hypothesis does not necessarily invalidate it. As noted earlier, consumption growth also may be affected by changes in the real interest rate and be completely in accord with the permanent income hypothesis. The apparent violation reported above may reflect that effect. However, as I argue, an alternative explanation for the results in Tables 1 and 2 is that consumption is importantly affected by liquidity constraints associated with payment-to-income ceilings on borrowing.

This hypothesis implies that changes in the *nominal* interest rate (i), as distinguished from changes in the real interest rate, and changes in the unemployment rate (U), which proxy for changes in current income, affect the growth rate of aggregate consumption expenditures on nondurables and services, apart from their effects on permanent income.[24] Suppose that the propensity to consume out of permanent income apart from the liquidity constraints associated with i and U is k^*, that the actual propensity to consume is k, and that the two are related by:[25]

$$k = k^* e^{(\alpha U + \beta i)} \qquad (6)$$

On the assumption that α and β are negative, equation (6) embodies the hypothesis that, as either the unemployment rate or the nominal interest rate rises, consumption is reduced relative to the level implied by permanent income. The reason is that as either rises, liquidity constraints will bind on more households and more consumption per household. Taking logarithms of equation (6), then substituting into equation (1), and allowing for the real interest rate effects discussed earlier produces:

$$\Delta log(C) = \gamma + \delta r^e_{-1} + \alpha \Delta U + \beta \Delta i + \mu \qquad (7)$$

Table 3 shows the results of estimating equation (7) and some variations of it. To ensure consistent estimates and valid statistical inference of the effect of each of these right-hand-side variables on consumption growth, an instrumental variables estimation technique was used.[26] This approach addresses two problems. First, the current changes in unemployment and interest rates (and presumably in almost all other macroeconomic variables) are very likely to be correlated with current revisions to permanent income and are, therefore, correlated with the equation's error term.

Second, even if households are continuously obeying the permanent income hypothesis, quarterly-average measures of consumption growth will be correlated with the previous period's consumption growth, which is deter-

mined by the previous period's new information. This apparent violation of the permanent income hypothesis emanates from time-averaging of data, not from a violation of the theory. The induced autocorrelation implies that, when time-averaged data are employed (as they are here), the consumption equation error term will be correlated with one-period-lagged variables, such as the one-period-lagged expected real interest rate that equation (7) suggests is relevant. Thus, one-period-lagged variables are not valid instruments.

The variables used as instruments are a constant term and lags two through five of the first differences of the unemployment rate, the expected inflation rate, the auto loan rate, the Treasury bill rate, and the real, after-tax Treasury bill rate.[27] Expected real interest rates were derived by subtracting the one-year expected inflation rate from the nominal interest rate.[28]

The top and bottom halves of Table 3 use as the consumption measure the sum of expenditures on consumer nondurables and services (CNS) and expenditures on consumer durables (CD), respectively. Row 1 presents results from estimating equation (5), the modified (unconstrained) permanent income hypothesis, using the real, after-tax Treasury bill interest rate as the measure of the lending rate that consumers face.[29] As can be seen from these results, the real interest rate does not have a significant effect on consumption. Row 2 adds the two presumed determinants of the degree of economy-wide liquidity constraint: the unemployment rate and an interest rate at which consumers can borrow. The borrowing rate that households face is taken to be the nominal, before-tax, interest rate on auto loans. Row 3 includes both the borrowing and the lending interest rates households face. The lending rate is taken to be the Treasury bill rate. The borrowing and lending rates that consumers face did not always move closely over this period, in part due to

Table 3

Effects of Expected Real Interest Rates, Unemployment Rates, and Nominal Interest Rates on Consumption

1949Q3–1988Q3
Estimation Method: Instrumental Variables
(t-statistics in parentheses)

	Coefficient on							
			First Difference of Current:					
Dependent Variable	Constant	Level of Lagged Expected Real After-Tax Lending Rate	Unemployment Rate	Nominal Borrowing Interest Rate	Nominal Lending Interest Rate	R^2	S.E.E.	D.W.
1. Expenditures on Nondurables and Services	1.96 (9.92)	−0.099 (−0.81)	—	—	—	0.010	2.25	1.71
2. Expenditures on Nondurables and Services	2.05 (10.08)	−0.120 (−0.87)	−1.78 (−2.70)	−2.12 (−2.58)	—	0.115	2.14	1.99
3. Expenditures on Nondurables and Services	2.03 (9.32)	−0.089 (−0.55)	−1.73 (−2.58)	−2.10 (−2.54)	0.130 (0.36)	0.119	2.14	2.00
4. Expenditures on Nondurables and Services	1.96 (11.48)	—	−1.99 (−3.31)	−1.81 (−2.48)	—	0.132	2.11	2.00
5. Expenditures on Durables	2.76 (1.87)	0.786 (0.86)	—	—	—	−0.002	16.76	2.18
6. Expenditures on Durables	3.51 (2.47)	0.478 (0.50)	−10.00 (−2.17)	−15.00 (−2.61)	—	0.212	14.95	2.40
7. Expenditures on Durables	3.70 (2.41)	0.262 (0.23)	−10.32 (−2.18)	−15.20 (−2.61)	−0.904 (−0.36)	0.206	15.11	2.38
8. Expenditures on Durables	3.38 (3.19)	—	−9.14 (−2.13)	−16.24 (−3.12)	—	0.196	15.06	2.37

regulations, in part due to maturity differences. The estimates show that the borrowing rate clearly is the dominant financial force.[30] That the entire interest-rate impact takes place through the nominal borrowing rate is just what a payment-to-income constraint leads us to expect.

Consistently, the estimated effect of (lagged, expected) real interest rates on nondurables and services expenditure is negative, small, and statistically indistinguishable from zero. This coincides with most earlier research and holds regardless whether liquidity constraint proxies are included. By contrast, the liquidity constraint proxies are large and significant.[31]

Rows 5–8 use expenditures on durables as the dependent variable. These results are qualitatively similar to those for nondurables and services. The unemployment rate and interest rate coefficients are large and clearly statistically significant in each row. Again, the borrowing rate dominates the lending rate. The real-rate effects are positive and much larger than for nondurables and services, but never approach statistical significance.

The estimates in Table 3 also embody some equalities that support the payment-to-income-constraint hypothesis. Since the coefficients for durables are about five times as large as those for nondurable and services spending and since the level of the latter category is about five times as large as that of the former, the estimated reduction in spending due to a rise in either the unemployment rate or the nominal interest rate is about the same for both spending categories.

Second, equality of the interest-rate- and unemployment-rate-spending elasticities cannot be rejected. Tests of that hypothesis for expenditures on nondurables and services and for expenditures on durables generate t-statistics of -0.8 and -1.8, respectively, each of which is below the critical value for a .05 significance test.[32] These results are consistent with the hypothesis concerning payment-to-income constraints since equal percentage changes in the interest rate and in the unemployment rate should have (approximately) the same effect on the payment-to-income ratio and therefore on the degree of liquidity constraint.

Third, when Rows 4 and 8 of the table are re-estimated using the two individual components of the nominal interest rate, the expected real rate and the expected inflation rate, the estimated coefficients on the components are close to that on their sum. Statistical tests of this equality within each spending category do not call for rejection; the respective t-statistics were -0.6 and 1.7, considerably below the critical value for confidence at the .95 level. Thus, it seems that it is not the expected inflation rate nor the real rate component of the nominal interest rate, but the nominal interest rate *in toto*, that affects consumer spending. This finding is consistent with the hypothesis advanced here that the nominal interest rate affects payments and through this channel, affects spending.

Equation (6) can be rewritten as

$$k/k^* = e^{(\alpha U + \beta i)} = e^{\alpha U} e^{\beta i} = k_U\, k_i \qquad (8)$$

The heavy line in Figure 2 plots the constraint for nondur-

Figure 2
Constraints on Consumption of Nondurables and Services

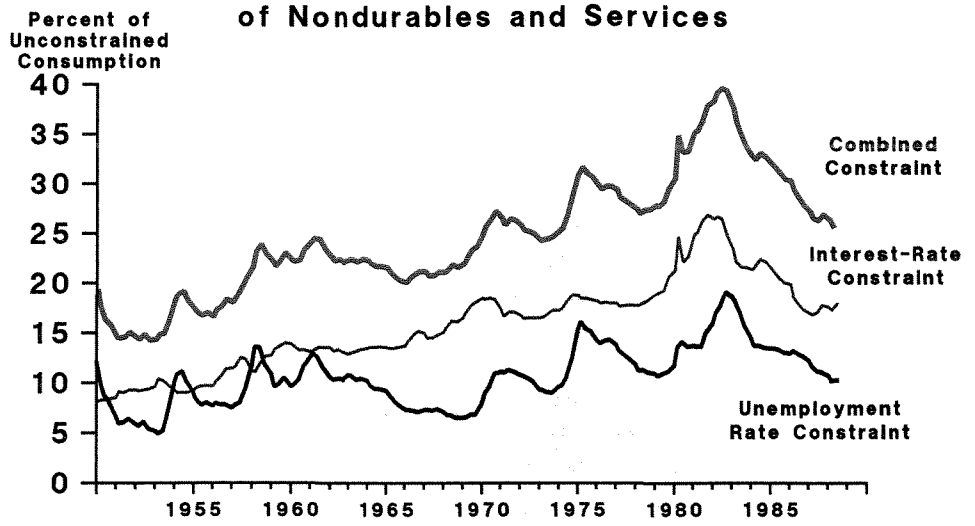
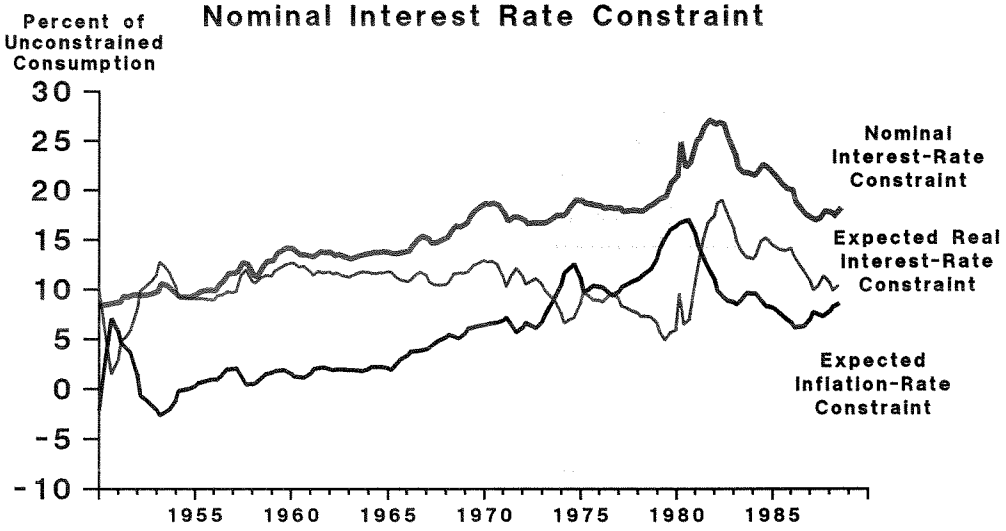


Figure 3
Decomposition of the Nominal Interest Rate Constraint



ables and services spending implied by the estimates in Row 4 of Table 3. This constraint shows the joint effects on the propensity to consume out of permanent income over time due to changes in unemployment and interest rates. In the 1970s, this constraint rose and then declined briskly after 1980. Apparently, the effects of rising nominal interest rates have offset those of falling unemployment rates over the last few years, stalling the decline in the constraint.

The separate effects of unemployment and interest rates are also plotted in Figure 2. The estimates suggest that the constraint related to the nominal interest rate generally has had a much larger effect on spending than that related to the unemployment rate. The reason for this may be that many more households are affected by payment changes than by income changes.

Equation (9) separates k_i into its components, the effects of changes in expected real rates, k_r, and of changes in expected inflation, k_p.

$$k_i = e^{\beta i} = e^{\beta(r+p)} = e^{\beta r} e^{\beta p} = k_r\, k_p \qquad (9)$$

All three are plotted in Figure 3. Figure 3 reflects the dominant role of expected inflation in interest rate movements and consequently in changes in the constraint. The secular rise of expected inflation until the 1980s is estimated alone to have increased the constraint by about 15 percentage points. Since the early 1980s, lower expected inflation and lower real rates have combined to reduce liquidity constraints operating through nominal interest rates, thereby freeing consumers to spend more.

IV. Interpretations and Implications

The evidence presented here points to large and reliable responses of aggregate consumption expenditures to changes in unemployment and in nominal interest rates. This is consistent with the view that large numbers of households find themselves liquidity constrained. I argue that this constraint emanates from households being constrained in their ability to borrow as a result of lenders' payment-to-income restrictions.

These borrowing restrictions become more binding as nominal interest rates rise. Given that the major factor driving nominal rates has been expected inflation, households become increasingly liquidity constrained as expected inflation rate rises. This prevents households from carrying out their utility-maximizing consumption. This is an example of a large, real cost of expected inflation, one that may help account for households' generally inexplicable antipathy to *expected* inflation.

The presence of, and even the possibility of future, liquidity constraints means that aggregate spending will behave very differently than is predicted by models that ignore such constraints. The impacts of fiscal and monetary policies, short-run or long-run, will depend upon the amount and nature of liquidity constraints faced by various households. Since the degree of liquidity constraint is likely to differ systematically by group, assessment of these policies should allow for differential effects on the

young and the old, the rich and the poor, the homeowner and the renter. Without allowance for these distributional considerations, the workings of the economy and the effects of policies are likely to be misunderstood.

In the absence of liquidity constraints, changes in fiscal policy that the public perceives to be temporary would not be expected to affect consumption much, especially that of the young. In the presence of liquidity constraints, however, the change in cash flows can greatly alter households' ability to achieve desired consumption, especially that of the young. A temporary income tax reduction, for example, might change permanent income very little, but might raise consumption virtually dollar-for-dollar, as consumers found themselves less bound by liquidity constraints.[33] The widespread presence of liquidity constraints also affects the effectiveness of monetary policy, since nominal interest rate changes have large effects on expenditures. In fact, in contrast to much recent theorizing, anticipated monetary policy may have larger effects than unanticipated policy, since it is the anticipated part of inflation that primarily affects nominal interest rates.

The substantial response of aggregate consumption to nominal-interest- and expected-inflation rates suggests that a large number of households are genuinely bound by the cash-flow constraint associated with those factors. This paper has not addressed the reasons that such constraints persist. To the extent they are associated with institutional and psychological factors that can be overcome, the financial services industry can satisfy a heretofore-constrained, enormous household demand for credit. The easiest way to tap this unmet demand is to introduce financial instruments the payments of which are geared to the upward tilt in household income associated with long-run aggregate productivity increases, long-run individual real income increases, and, especially, increases in the average level of prices.

NOTES

1. The variabilities referred to are the standard errors of the estimate generated by separately regressing the ratio of each spending component (in real terms) to detrended real GNP on a linear trend with the 1947Q2–1988Q3 quarterly data. Detrended real GNP consists of the exponentiated fitted values obtained by regressing the log of real GNP on a constant, a linear trend, and the square of the linear trend.

2. For example, a nominal interest rate variable is significant when added to the FRBSF econometric model's current equation for consumer expenditures on nondurables and services. The durables expenditure equation already has a nominal rate variable included, in order to handle credit rationing effects. For a typical example of significant estimated nominal interest rate effects on aggregate consumption, see Blinder and Deaton (1985).

3. Consumers and households are referred to interchangeably, as are liquidity or borrowing or financing constraints. I do not attempt to ascertain why lenders have chosen their lending criteria or why they so seldom change them.

4. Of course, the optimal forecast may be that actual income will change. During a period of perceived-to-be-temporary unemployment, the optimal forecast will be that income will rise on average over time. The optimal forecast of what average income will be over a fixed period will be revised as new information arrives, but the direction and size of those revisions will not be predictable. Optimal forecasts have the property that no one, including the forecaster, can forecast how the forecast will change.

5. Liquidity constraints may affect not only households. Econometric estimates of business investment spending long have found substantial effects of various financial variables which can be interpreted as indicating whether firms are likely to face liquidity constraints. Recent microeconomic evidence concurs with the earlier aggregate estimates that support the significant role played by these constraints on business borrowing. Given the size of the economic units involved and the relatively more collaterizable nature of the assets being financed by businesses, it is easy to imagine that individual households also might be subject to financing constraints.

6. Household expenditures are financed with some combination of current income, changes in gross household debt, and changes in gross household savings (assets). To illustrate the typical financing pattern, three regressions were performed. In each, the change in personal consumption expenditures was regressed on the change in one of the methods of financing. The data were monthly, current-dollar, seasonally adjusted at an annual rate, and covered the period 1975:03–1988:10. Each regression contained one regressor but no constant term. Income was calculated as the sum of the consumption and net saving measures. Consumption was taken to be total personal consumption expenditures. The flow of net saving was taken to be personal saving. The flow of debt was taken to be the net (extensions minus repayments) change in consumer installment credit.

The results show that an additional dollar of consumption typically is financed with an estimated $0.62 of additional income, $0.13 of reduced (gross) saving, and $0.25 of additional debt. Although aggregate household assets exceed household liabilities, the distribution of financial assets is very skewed, with most households owning very few. One consequence is that, per dollar change in consumer spending, the change in the flow of credit is about twice as large as that of (gross) saving. Thus, changing credit flows are an integral part of changes in consumption. These estimates also hint that the borrowing, rather

than the lending, rate that households face may be more relevant for household spending.

7. Applying lending criteria based on current income to recipients of social security income, which is tied to the CPI by statute, seems especially perplexing.

8. Credit-granting processes that do not use age as a determining factor then may inadvertently discriminate against the young.

9. Tobin and Dolde (1971) discuss some types of liquidity constraints and, through simulations, assess their effects on consumption. Walsh (1986) models the fraction of consumers whose consumption is liquidity constrained due to an inability borrow against future income. The fraction is affected by the level of wealth and also fluctuates with actual aggregate income. He concludes that it is inappropriate in such circumstances to treat aggregate consumption as being the outcome of fixed shares of constrained and unconstrained households.

10. See Beares (1987). One example in Beares (1987) shows how the average maturity of a consumer's loans can be lengthened in order to reduce the payment-to-income ratio and thereby enable the lender to extend credit to a loan applicant that it would otherwise turn down. This does not mean that a payment-to-income ceiling is the sole criterion. Various consumer lending textbooks refer to various criteria, e.g., the six "c's" of credit. The literature and discussions with consumer lending officials do suggest that lending policies set ceilings on payment-to-income ratios, and rely much less on debt-to-income ratios. In spite of that, it is apparently common in this industry and its literature to refer to debt-to-income ratios when meaning payment-to-income ratios.

11. Such rules may have developed from either households' or financial institutions' fear of default. Households' recognition that they may be subject to future constraints may also influence their current behavior.

12. The unemployed referred to here are those who would not generally be deemed to be guaranteed re-employment. We mean to exclude the seasonally unemployed and those on definitely temporary layoff, for example, but it is not apparent that much is made of this distinction in the credit process.

13. Suppose, for the sake of this example, that income taxes are irrelevant.

14. In this example all dollar amounts have been rounded to the nearest dollar. Calculations were based on unrounded amounts.

15. It is commonly, and mistakenly, thought that adjustable rate loans cure this problem. They do not. Such loans allow payments to vary with the interest rate, and therefore indirectly with the inflation rate. In a period of steady inflation, they do not, however, imply constant real payments over the repayment period. Similarly, graduated payment mortgages provide for payments that are lower initially and rise for a short period. The rate of increase of those payments is not tied to the inflation rate. After the initial period, payments typically are constant in nominal terms for the remainder of the term of the mortgage, and therefore likewise fall in real terms if there is inflation.

16. The American Bankers Association's annual *Retail Bank Credit Report* for the years 1979, 1980, and 1981 (only) does contain a table headed "Reasons why borrowers may fail to qualify for financing during (that year)." The candidate reasons were inadequate income, insufficient equity, inadequate income management, and other. For large banks, the percentage judged to have "inadequate income" rose over those years from 31 to 43 to 47 percent.

17. F. Scott Fitzgerald: "You know, Ernest, the rich are different from us."

Ernest Hemingway: "Yes, they have money." (attributed)

18. Optimal smoothing is not the same as total smoothing. Since permanent income varies, optimal consumption will too.

19. Hall and Mishkin state that their results for food imply nothing about the behavior of other expenditures.

20. It is, however, reasonable to question how durable much of what is classified in the national income accounts as services and nondurables is.

21. Table 1 shows the ability of lagged income to predict consumption. That contrasts with the results presented by Hall (1978), whose sample period ended with 1977Q1 data. When my sample period is terminated at 1977Q1, I get results much like his (F-statistic = 2.19). Re-estimating with a sample that is just one year longer, however, implies rejection of the unpredictability hypothesis. Both longer and shorter samples generally lead to rejection of the unpredictability hypothesis. Variables other than income also may lead to that result.

22. From now on, unless otherwise noted, consumption refers to the sum of nondurables and services, expenditures on which correspond most closely to the flow of consumption services. Total consumption service flow would also include the flow of services from the outstanding stock of consumer durables. Since our objective here is to explain expenditures, we consider expenditures on only these two consumption categories.

23. This hints that there are factors other than changes in current income that are associated with the violation of the permanent income hypothesis.

24. The unemployment rate is used here to proxy for aggregate income. Flavin (1985) concludes that the unemployment rate is superior empirically to a measure of the deviation of actual income from its permanent value in accounting for consumption.

25. Even if there were no interest- and unemployment-rate-related liquidity constraints, those arising from the age-earnings profile might exist. In what follows, I take k^* to be equal to one.

26. For a more complete discussion of these issues, see Hall (1988) and Campbell and Mankiw (1987).

27. Specifically, I used the investment yield to maturity on a three-month Treasury bill. The finance rate on 48 month

automobile loans comes from DRI. Until 1984, I used the average marginal personal income tax rate on interest income from Peek and Wilcox (1987). The rates for 1984, 1985, and 1986 have been calculated in the same manner. The rates for 1987 and 1988 are assumed to be 27 and 25 percent, respectively. For each quarter I used the corresponding annual rate. The tax rate for the upcoming quarter is applied to the interest rate for the current quarter.

28. The expected inflation data are taken from the Livingston survey, which records expectations each June and December. I used those values for the second and fourth quarter observations, respectively. First and third quarter observations were obtained by interpolating between second and fourth quarter observations.

29. Using lags of the explanatory variables required shortening the sample slightly. Starting the sample after the Korean War, omitting 1975 (due to the one-time income tax rebate), and omitting 1980 (due to the imposition and removal of credit controls) each seemed to make little difference to the estimates.

30. To the extent that credit rationing effects stemming from adverse selection become more severe as open-market nominal interest rates rose, I would have expected the Treasury bill yield better to have explained consumption. The reason is that if banks do not raise loan rates commensurately with open market rates, the open market rate would likely better capture the combined constraint effects of bank rules (as already proxied by the borrowing rate) and of credit rationing (as captured by the difference between the lending and borrowing rates). In fact, these estimates provide little evidence to support that effect.

31. An alternative functional form for k is one which is linear, as opposed to the linear-in-logarithms form in (6). Specifying $k = k^* + \alpha U + \beta i$ necessitates using a nonlinear instrumental variables estimation technique. Doing so produces qualitatively similar results to those presented in Table 3. Estimates of the linear form were also obtained while including the squares of the unemployment rate and of the interest rate. This allowed the data to suggest whether liquidity constraints bind more, or less, than proportionately as rates rise. Significantly negative coefficients estimated for the squared unemployment and interest rate terms would imply that an accelerating-constraint hypothesis fit the data better. The squared terms turned out to be negative, but insignificant. Thus no strong conclusion about the appropriate functional form for k emerged.

32. Since these consumption equations do not deliver constant elasticities, the test is for equality of the elasticities at the respective sample means of the unemployment and interest rates.

33. Even a permanent, anticipated, balanced-budget shift in tax policy could affect aggregate spending. One way to do so would be to have some parameters of the tax code be age-specific, perhaps by making average income tax rates rise with the age of the taxpayer. To the extent that young-household cash flows were enhanced and balanced by reductions for older households, the average amount of constraint would be loosened.

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