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A Reconsideration of Monetary Velocity: The Effects of the Housing and Stock Markets

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Abstract

This paper examines the evidence for stability in the income-velocity of money by allowing for the effects of the housing and stock markets. It is shown that much of the hitherto unexplained behavior of the income velocity (the so-called "velocity puzzle") can be explained by housing transactions as well as the returns on housing. Stock market transactions and wealth effects of changes in stock prices are also shown to have a statistically significant effect on the income-velocity of money.

INTRODUCTION

Support for monetarism has surged and waned with the evidence on the stability of the velocity of money.[1] The last decade and a half has not been one of the more buoyant periods for the monetarist camp as velocity has weaved a path that, at least according to some researchers, cannot easily be explained.[2]

It is the purpose of this paper to re-examine the evidence for stability in the income-velocity of money by allowing for the effects of the housing and stock markets. The purpose is first of all to see whether the use of money for transactions involving the exchange of existing housing has been responsible for the hitherto unexplained behavior of velocity. We are able to show that indeed, a part of the puzzling behavior of velocity can be traced to housing transactions. The paper also considers the effects of returns and wealth in the housing market, and of transactions, wealth and returns in the stock market. We are able to conclude that to a large extent, the so-called 'velocity puzzle' has been due to a failure to consider the transactions and substitution effects of housing, and the wealth and substitution effects of the stock market.

The paper is organized as follows. Part 1 considers the importance of the housing market for explaining velocity. Part 2 examines the stock market. Part 3 offers some concluding remarks.

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[1]Some of this evidence is discussed in Dewald (1988) and the papers he cites.

[2]For example, see Stone and Thornton (1987). For an alternative view see Hallman, Porter and Small (1991).

1. VELOCITY AND HOUSING MARKET TRANSACTIONS

As Irving Fisher knew so well, there are more transactions than those involving the sale of final goods and services which contribute to the transactions demand for money. For example, transactions involving the exchange of existing assests such as houses also demand the use of money[3]. With money demanded for all transactions, a failure to consider some of these in an empirical investigation of the demand for money or velocity can distort findings. In particular, it would be expected that an increase in the use of money to exchange existing housing vis à vis the exchange of final goods and services would, *ceteris paribus*, increase the demand for money vis à vis national income. Consequently, increasing transactions in the housing market vis à vis GNP should be associated with a lower income velocity of money.

By extending arguments advanced in the context of the stock market by Friedman (1988), there are two other effects which the housing market may have on monetary velocity. The first of these is a wealth effect. Via this effect, increases in the value of houses should increase money demand and thereby reduce velocity.[4] The second effect described by Friedman is a substitution effect. *Ceteris paribus*, the higher the expected increase in housing prices, the lower is money demand and hence the higher is velocity.

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[3] Intermediate transactions are also settled with money and, like sales of existing assets, may not move in parallel with final transactions.

[4] This wealth effect could, in principle, be large. As Ibbotson and Fall (1979) have shown, from 1960-1978 residential housing was by far the largest form of non-human wealth in the U.S.. For example, in 1978, housing constituted 39.1 percent of the "market portfolio" while common stocks were only 20.8 percent.

While the motivation for this paper is primarily to consider the effect of transactions, the wealth and substitution effects of the housing market on the income velocity of money are also examined.

If we are to judge the importance of including the housing market in an explanation of the income velocity of money, we should do so by considering how much housing market variables add to our prior understanding of velocity. The first column of Table 1 shows how income velocity, V2, depends on the nominal interest rate, taken as the long-term Treasury bond yield, and the real GNP. This is the "base case" against which we can judge the effect of the housing market. The results in Table 1 are obtained using quarterly data over the period 1968.III - 1989.I. All variables are in first differences. That is, the base case regression is

$$\Delta\frac{Y}{M} = \beta_0 + \beta_1\Delta r + \beta_2\Delta Q + \mu \qquad (1)$$

where the income velocity is measured as the ratio nominal GNP to the money supply, M2, Δr is the change in the average long-term Treasury bond yield from quarter-end to quarter-end, and ΔQ is the change in GNP in 1982 dollars.

Table 1 shows that both the interest rate and real GNP are statistically significant and between them explain 40 percent of the variation in velocity. The effect of interest rates on velocity is positive. This is as we would expect: a higher opportunity cost of money reduces money demand and thereby increases velocity. The effect of the real GNP is also positive. This is not what would be expected from the perspective of an

income elasticity of demand for money that exceeds unity: higher income increases money demand and *reduces* income velocity. It is also not what would be expected if real GNP proxies for the wage rate, and therefore for the value of time spent organizing liquidity: higher wages increase money demand and reduce velocity. However, we can explain a positive effect of real GNP by adapting an argument offered by Friedman (1988 ibid, pp 222-23, point (1)) in the context of stock prices.

Real GNP fluctuates more than wealth or permanent income. Consequently, when real GNP is increasing, wealth and hence the demand for money should be increasing less than GNP. Therefore, the velocity of money should be increasing with GNP. This is the association that is found in all the results shown here, and while the matter is only tangential to our concern for the effect of the housing and stock markets, we note both the strength and the persistence of this effect.

The effect of housing transactions on velocity is shown in the second column of regression results in Table 1 which reports

$$\Delta\frac{Y}{M} = \beta_0 + \beta_1\Delta r + \beta_2\Delta Q + \beta_3\Delta HT + \mu \ , \qquad (2)$$

where ΔHT is the quarter-to-quarter change in the value of housing transactions. Because the value of new houses is included in the dependenent variable as part of Y and could therefore cause spurious correlation, the value of housing transactions, HT, is measured from the sales of existing houses.

Several steps were required to compute the value of sales of existing houses.

First, at our request, quarterly data on median prices, mean prices, and the number of existing housing sold were computed by Haver Analytics from data provided to them by the National Association of Realtors. These data were previously available only on an annual basis. Unfortunately, while median prices and units sold were available for the full period, 1968.III - 1989.I, data on mean prices were available quarterly only from 1975.I. Therefore, for the missing mean prices for the years 1968-74, the available means were regressed against median prices. This gave a very close fit.[5] The mean values were then interpolated, and the interpolated and actual means then multiplied by the number of existing houses sold.

As Table 1 shows, changes in house transactions do add to the explanation of velocity, with the adjusted R^2 increasing from 0.40 to 0.51 and the standard error of the estimate declining 0.0158 to 0.0142. Furthermore, house transactions are statistically significant, despite the fact that one of the possible causes of changes in house transactions, namely the interest rate, is already present in the regression. The sign of the housing transactions variable is as expected. It would appear that increases in the turnover of houses increases the demand for money and thereby reduces income velocity. The significance of the effect is not surprising in view of the fact that, while relatively

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[5] The prediction equation for mean prices is, with 't'-values below coefficients:

$$\bar{PH} = 4.9504 + 0.9819\tilde{PH} + 0.00081\tilde{PH}^2 + \mu$$
$$(3.4046) \quad (56.498) \quad (18.137)$$
$$R^2 = 0.9981 \qquad D - W = 0.6337$$

where $\bar{PH}$ = mean price, and $\tilde{PH}$ = median price.

few houses change ownernship during any time period, the amounts of money involved, which at some time must in the buyers' or vendors' bank accounts, are extremely large.

The two other possible effects of housing on monetary velocity that we have mentioned, namely the wealth effect and substitution effect, are considered along with the transactions effect on the right-hand side of Table 1. It would be expected that the value of the housing stock would increase closely with the average price of housing.[6] Therefore, if the level of money demand depends on housing wealth, which is to be expected given the importance of housing in household wealth, then the change in velocity should depend on the change in house prices. However, velocity should depend on the change in *real* house prices. Therefore, we add the change in real house prices, calculated as nominal prices deflated by the GNP deflator, to the change in transactions and other variables in the regression.

The substitution effect of housing involves the effect of the expected return on housing on the demand for money. To measure the partial effect of housing we include the rate of change of housing prices minus the interest rate.[7] If the level of money demand depends on this variable, the change in money demand depends on the change

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[6] The only other component of wealth in housing is the housing stock which should change slowly.

[7] This is, of course, only one component of the overall housing return, and is the realized rather than the expected return. The use of the realized instead of expected changes in house prices as a measure of the opportunity cost of holding money adds measurement error. However, as long as forecast errors are random with zero mean, actual changes are an unbiased estimate of expected changes. This random error biases the coefficient on housing returns towards zero, as shown in Levi (1973, 1977). If the coefficient is nevertheless significant despite this downward bias, as we shall show it to be, then the true effect is *a fortiori* significant.

in this variable. Hence, to check the importance of the transactions, wealth, and substitution effects we estimate

$$\Delta\frac{Y}{M} = \beta_0 + \beta_1\Delta r + \beta_2\Delta Q + \beta_3\Delta HT + \beta_4\Delta(PH/P) + \beta_5\Delta(\dot{PH}-r) + \mu \qquad (3)$$

where $\Delta(PH/P)$ is the change in the average house price deflated by the GNP deflator and $\Delta(\dot{PH}-r)$ is the change in the risk premium on housing, calculated as rate of change of housing prices minus the bond yield.[8]

The results in Table 1 show that the effects of the interest rate, real GNP and housing transactions remain significant when the wealth and substitution effects of housing are included. The wealth effect itself is insignificant, but the substitution effect, measured by the rate of change in house prices minus the interest rate, is significant and of the expected sign. That is, higher returns on housing reduce the demand for money and increase monetary velocity. We see from Table 1 that allowance for the various effects of the housing market increases the explanation of the change in velocity vis à vis the base case, the adjusted R^2 increasing to 0.54 and the SEE falling further to 0.0138.

The relatively low Durbin-Watson statistic in the OLS regression results might bias the 't'-values on coefficients upwards. In order to check this we show on the right-hand-side of Table 2, the results using the Cochrane-Orcutt adjustment technique. We see that, contrary to expectations, the 't'-values of the significant variables are in every case higher

[8] Several researchers have considered whether real estate risk is priced independently of other nondiversifiable risks such as stock market risk. It has been shown by Bajic (1985), Crocker *et. al.* (1990), Schnare and Struyk (1970), Gyourke and Linneman (1988) and Capozza and Schwann (1990) that returns on real estate depend on factors (risks) other than stock market risk.

than in the OLS regression. It would appear that housing market transactions and returns, as well as the interest rate and real GNP, are important factors in explaining the income velocity of money.

2. VELOCITY AND THE STOCK MARKET

The arguments that we have advanced in the context of the housing market apply also to the stock market, and indeed, the effect of the stock market on the velocity of money has been examined by Friedman (1988).[9] In order to consider the transactions effect of the stock market, we add to our previous regression a variable proxying for the change in value of transactions on the New York and American Stock Exchanges from quarter to quarter.[10] In order to measure the wealth effect of the stock market, we also add the change in the real price of stocks to our regression, calculated as the S & P 500 Index divided by the GNP Deflator. Finally, to consider the effect of the expected return on stocks we add the rate of change of stock prices, given from the S & P 500 Index,

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[9] The effect of stock market transactions on velocity has been theoretically examined by Boyle (1990), who provided a general equilibrium explanation for Friedman's (1988) hypotheses. The reverse question of the effect of money on stock returns has been investigated by many authors. See, for example, Geske and Roll (1983, 1987), Fama (1981, 1990), Sorenson (1982), Tanner and Trapani (1977) and Fischer and Merton (1984).

[10] The value of transactions is obtained by multiplying the volume of transactions on the two exchanges combined, by the S & P 500 Index. While the use of the S & P Index does not convert volumes to values, the constructed variable should move closely to the value of transactions differing mainly by a scaling factor.

minus the nominal interest rate.[11] That is, we estimate:

$$\Delta\frac{Y}{M} = \beta_0+\beta_1\Delta r+\beta_2\Delta Q+\beta_3\Delta HT+\beta_4\Delta ST+\beta_5\Delta(PH/P) +\beta_6\Delta(PS/P)+\beta_7\Delta(P\dot{H}-r)+\beta_8\Delta(P\dot{S}-r)+\mu \quad (4)$$

where ΔST is the quarter-to-quarter change in the "value" of stock transactions, $\Delta(PS/P)$ is the change in the S & P 500 Index divided by the GNP Deflator, and $\Delta(P\dot{S}-r)$ is the change in the "return" on stocks versus bonds. The results are shown in Table 2.

We notice first from Table 2 that adding the stock market variables leaves the significance of the previously studied variables intact. That is, the interest rate, real GNP, housing market transactions and housing market returns are still significant. We also notice in Table 2 that, unlike transactions in the housing market which are highly statistically significant, the value of stock market transactions does not impact the velocity of money. However, there are significant wealth and substitution effects of the stock market. In particular, an increase in real stock prices, which means an increase in real household wealth, appears to increase money demand, thereby causing a decline in velocity. Also, an increase in the return on stocks vis à vis bonds appears to cause a reduction in money demand and hence an increase in velocity. These effects, which are in the expected direction, are highly significant. It is also worth noting that when we

[11] As in the case of the effect of returns on housing, if expectations are rational the use of actual returns adds an errors-in-the-variables bias which biases the variable's coefficient towards zero. If the coefficient is nevertheless statistically significant despite this downward bias, as it indeed is, then we can conclude *a fortiori* that the variable is significant. We also note that we exclude dividends. However, the relative stability of dividends should mean that excluding them in this context should not have a major effect.

account for the transactions, wealth and substitution effects of the housing and stock markets as in Table 2, along with the real GNP and yield on Treasury bonds, we explain 65 percent of the variation in the change in velocity. This is a substantial improvement over the base case which ignores the housing and stock markets.

As in the case of adding the housing market effect to monetary velocity, the Durbin-Watson statistic of 1.32 suggest possible bias in 't'-values. However, the righthand-side of Table 2 shows that this is not a problem. When the Cochrane-Orcutt autocorrelation correction procedure is applied the significance of the variables is preserved, and indeed, even enhanced. We see very clearly that there is an effect on velocity of housing market transactions and returns, and of changes in stock market wealth and returns, in addition to the effects of interest rates and real GNP. All the significant factors are significant at beyond the 1 percent level.

3. CONCLUSION

Because the settlement of transactions in housing involves the use of money, there is an *a priori* reason to expect housing market transactions to affect money demand and therefore velocity. This indeed appears to be so, with housing transactions having a statistically significant effect in every regression we have examined. Furthermore, it is an important factor adding noticeably to the adjusted R^2 and reducing the SEE. With housing also a major component of household wealth and of household portfolios, we would also expect the value of housing and the return on housing to have an effect. We

find that while housing wealth does not have a significant effect on velocity, the return on housing does affect monetary velocity. Because the stock market could affect the demand for money and velocity in the same way as the housing market, we have also considered the influence of stock market transactions, wealth and returns. We find that while transactions do not appear to be important, there are significant wealth and substitution effects.

The improvement in the explanation of the income velocity of money we have achieved in this paper has potentially important implications for helping to unravel the "velocity puzzle" of the 1980s. The large swings in housing and stock market transactions, wealth and returns in that decade could be responsible for the changes in velocity that have hitherto been unexplained. While our study has covered a longer period than just the 1980s, the results are suggestive that events in the housing and stock markets could help resolve the velocity puzzle.

Table 1

Transactions, Wealth and Substitution Effects of the Housing Market on Income Velocity of Money, V2, 1968.III - 1989.I

Parameter estimates of equations (1) - (3)								
	Base Case		Transactions Effect		Transactions, Wealth & Subt. Effects			
					Standard Regression		Cochrane-Orcutt Correction	
	Coeff.	"t"-value	Coeff.	"t"-value	Coeff.	"t"-value	Coeff.	"t"-value
Interest rate*	0.0107	3.2270	0.0089	2.9447	0.8630	2.5508	0.7321	3.5809
Real GNP+	0.3335	5.9297	0.3855	7.3876	0.3917	7.7438	0.5392	13.473
Housing Transactions			-0.1606	-4.3442	-0.1808	-4.5109	-0.1488	-5.0128
Housing price (real)					0.9598	1.2601	0.4942	0.9756
Housing return					0.85523	2.5254	0.7326	3.5788
Constant	-0.0060	-3.5055	-0.00614	-3.2170	-0.0063	-3.4023	-0.0091	-2.3886
Adjusted R^2	0.40		0.51		0.54		0.69	
SEE	0.0158		0.0142		0.0138		0.0113	
D-W stat.	1.48		1.16		1.15		2.03	

* Long-term Treasury bond yield

+ GNP, 1982 dollars.

Table 2

Transactions, Wealth and Substitution Effects of the Housing and Stock Markets on Income Velocity of Money, V2, 1968.III - 1989.I.

Parameter estimates of equation (4)					
	Standard Regression			Cochrane-Orcutt Correction	
Explanatory variable	Coeff.	"t"-value		Coeff.	"t"-value
Interest rate*	1.1341	3.7074		0.9245	4.4197
Real GNP+	0.4551	9.7966		0.5455	13.731
Housing transactions	-0.1682	-4.5980		-0.1636	-5.4699
Stock transactions**	0.0004	0.7998		-0.0003	-0.7663
Housing price (real)	1.1960	1.7821		0.8414	1.6814
Stock price (real)++	-0.7130	-4.6236		-0.4701	-3.1553
Housing return	1.0345	3.4324		0.8643	4.2199
Stock return	0.0908	4.2335		0.0592	3.2134
Constant	-0.0084	-4.9640		-0.0092	-3.0643
Adjusted R^2	0.65			0.73	
SEE	0.0120			0.0106	
D-W Stat.	1.32			1.99	

* Long-term Treasury bond yield
\+ GNP, 1982 dollars
** S&P 500 Index times shares traded
++ S&P 500 Index

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