

Financial Evolution and the Long-Run Behavior of Velocity: New Evidence from U.S. Regional Data

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I. INTRODUCTION

Monetary economists have devoted considerable effort to establishing a link between the financial innovations of the past two decades and the coincident instability of conventional econometric money demand specifications.¹ They have paid little attention, in contrast, to the more general question of how financial developments may have influenced the demand for money over longer periods of U.S. monetary history. Thus, one survey of the literature notes, new hypotheses about the effects of financial innovation "have for the most part been tested on the same body of data that suggested them in the first place" [Judd and Scadding (1982), p.1001]. It is unclear whether these hypotheses can be useful in understanding the effects of earlier innovations or in predicting the effects of future innovations.

The utility of a stable econometric money demand function, however, lies precisely in its ability to forecast out-of-sample so as to indicate, for instance, what rate of nominal money growth will be consistent with a desired rate of inflation. A satisfactory theory attributing changes in money demand to innovations in the financial sector must therefore account for the effects of a long history of past innovations and be able to predict the effects of future innovations. Such a theory has recently been developed and tested by Michael Bordo and Lars

Jonung (1987, 1990) as part of an extensive research project on the long-run behavior of the income velocity of money.²

Bordo and Jonung suggest that the institutional and financial factors that systematically influence the demand for money in an economy over the entire course of its development are of two types. On the one hand, the process of monetization—meaning the growth of the commercial banking system in addition to the expansion of formal market activity at the expense of barter and production for own use—ought to increase the demand for money as an economy grows. On the other hand, the emergence of a variety of nonbank financial intermediaries offering assets that potentially substitute for money and the invention of cash management techniques used to economize on real balances ought to have the opposite effect of lowering money demand. Bordo and Jonung's hypothesis is that the first set of effects will dominate early in the course of economic development but will be eclipsed by the second set in later stages of growth; velocity will therefore tend to trace out a U-shaped pattern over time. In recently published work [Bordo and Jonung (1987, 1990)], they provide evidence that this pattern can indeed be found in both U.S. and international data.

This paper shows how Bordo and Jonung's hypothesis derives from traditional theories of velocity's long-run behavior. It then discusses some objections that have been raised in reviews of their empirical work. In response to these objections, it examines a new data set containing figures for demand deposit velocity by region in the United States since 1929. Regression equations estimated with the new data support Bordo and Jonung's theory. The

* Thanks go to Marvin Goodfriend, Robert Hetzel, Tom Humphrey, Jeff Lacker, Barbara Mace, and Richard Manning for making helpful suggestions, and to Andy Atkeson and Rachel van Elkan for providing unpublished worksheets containing regional demand deposit data. The opinions expressed herein are those of the author and do not necessarily reflect those of the above-mentioned individuals, the Federal Reserve Bank of Richmond, or the Federal Reserve System.

¹ The first among recent empirical studies to attribute money demand instability to financial innovation include Enzler, Johnson, and Paulus (1976) and Goldfeld (1976). Judd and Scadding (1982) and Goldfeld and Sichel (1990) survey the subsequent literature.

² The income velocity of money is defined as the ratio of national income (in nominal terms) to the nominal money supply. It is therefore a convenient measure of how money demand compares to income, with lower money demand relative to income translating into higher velocity and vice versa.

regional figures are also found to be consistent with an explanation for the recent weakness in M1 velocity. These results suggest that the new data set represents a valuable untapped source of evidence with which a variety of hypotheses about the behavior of velocity can be tested.

II. THEORIES OF VELOCITY'S LONG-RUN BEHAVIOR

Figure 1 displays the long-run behavior of the income velocity of the U.S. monetary aggregate M1, using gross national product as the measure of income.³ It shows that M1 velocity declined secularly from 1869 until the end of World War II and has risen secularly since then.

The downward trend in velocity prior to 1945, as well as the short-run movements that accompanied it, is documented in great detail by Friedman and Schwartz (1963).⁴ They propose that real money balances be viewed as a luxury good, having an income elasticity in excess of unity, and therefore

³ All data sources are listed in the appendix.

⁴ Friedman and Schwartz use M2 as their empirical definition of money. The long-run behavior of M2, however, does not differ substantially from that of M1 until after World War II, when M2 velocity levels off and M1 velocity rises sharply. Thus, Friedman and Schwartz's explanation of M2 velocity's initial downward trend works equally well in explaining the prewar behavior of M1.

attribute the secular decline in velocity to the concurrent secular rise in real income. To explain the trend's subsequent reversal, which at the time their volume was written had only just begun, Friedman and Schwartz point to postwar expectations of greater economic stability that worked, they said, to decrease the demand for money as a safe and highly liquid asset.

Friedman and Schwartz's luxury good hypothesis became increasingly difficult to apply in explaining the postwar behavior of M1 as its velocity continued to rise. Thus, a number of researchers, including Latané (1960), Meltzer (1963), and Lucas (1988) argue instead for a unitary income elasticity and a significantly negative interest rate elasticity of money demand, thereby implying that movements in velocity are directly attributable to movements in interest rates. In their later work, Friedman and Schwartz (1982) also include an interest rate variable in regression equations used to describe the demand for money in the United States and the United Kingdom from 1869 to 1975. Figure 2, which shows the behavior of the commercial paper rate from 1869 to 1989, does suggest the existence of a close velocity-interest rate relationship, as both variables trace out U-shaped patterns over time.

After studying the long-run demand for money in two countries, however, Friedman and Schwartz (1982) conclude that movements in velocity cannot

Figure 1
M1 VELOCITY
1869-1989

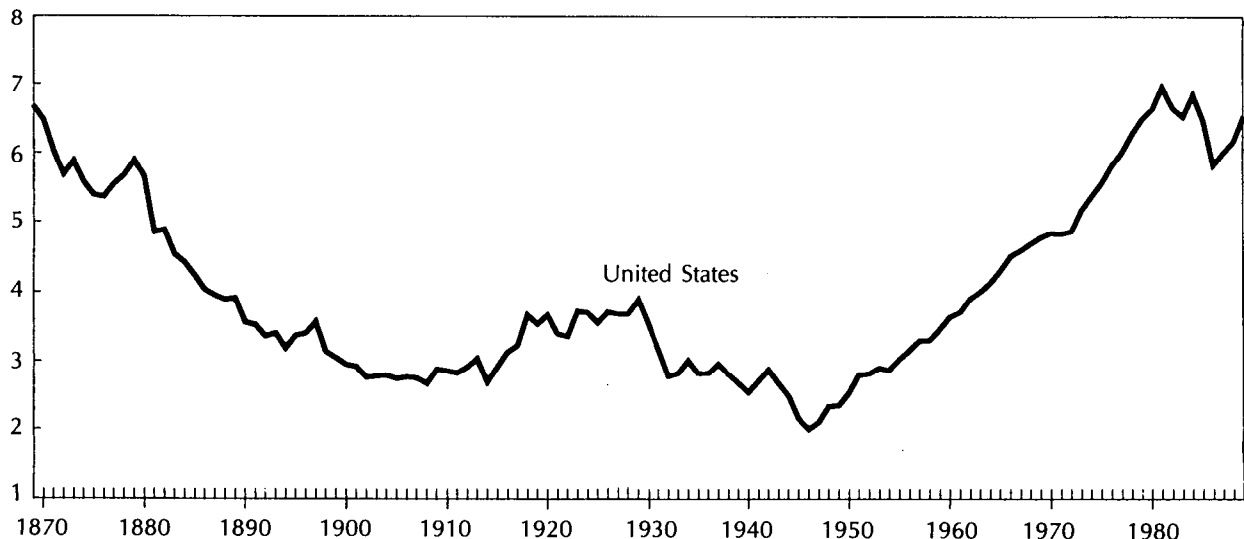
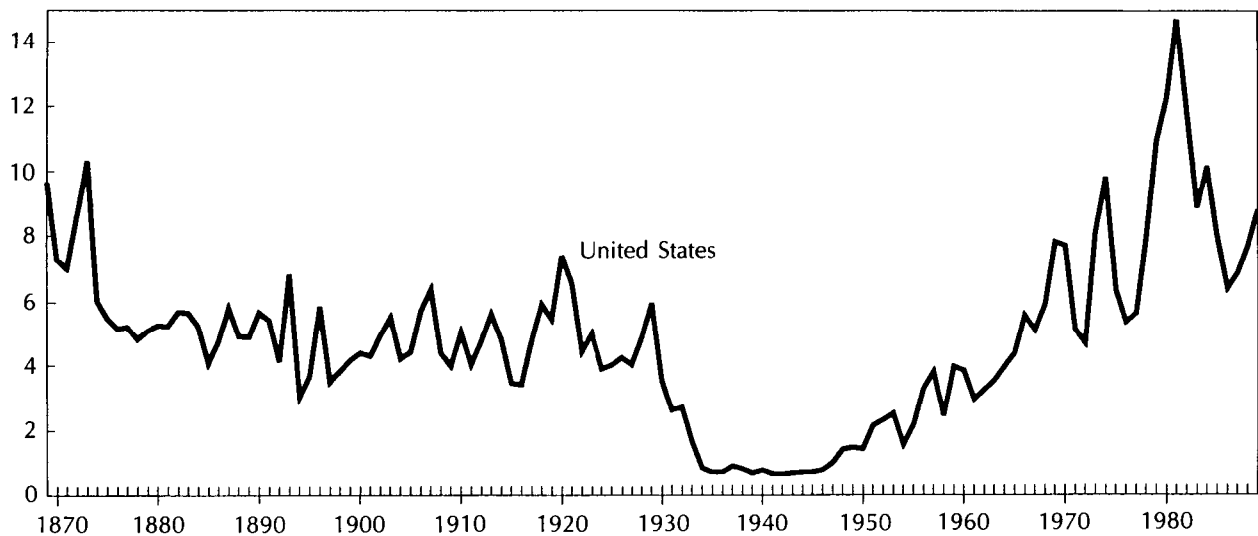


Figure 2
COMMERCIAL PAPER RATE
 1869-1989



be attributed exclusively to movements in income and interest rates. Figure 3 displays the Friedman-Schwartz M2 velocity and interest rate data for the United States and the United Kingdom from 1880 to 1910.⁵ Although interest rates in both countries moved within a narrow range, velocity fell sharply in the United States while remaining remarkably stable in Britain. Friedman and Schwartz (pp. 146-47) explain the divergence in the two velocity series by noting that while in 1880 the United Kingdom's economy was far more financially sophisticated than that of the United States, by 1910 this gap had narrowed:

From 1880 to 1910, the United States population nearly doubled, but the number of banks multiplied more than sevenfold. The fraction of the population residing in rural areas had declined from over two-thirds to only a bit over one-half; the fraction of the work force in agriculture had declined from one-half to less than one-third. . . .

. . . the change in relative financial sophistication of the United Kingdom and the United States . . . was probably by all odds the single most important factor accounting for the divergent trends in real balances.

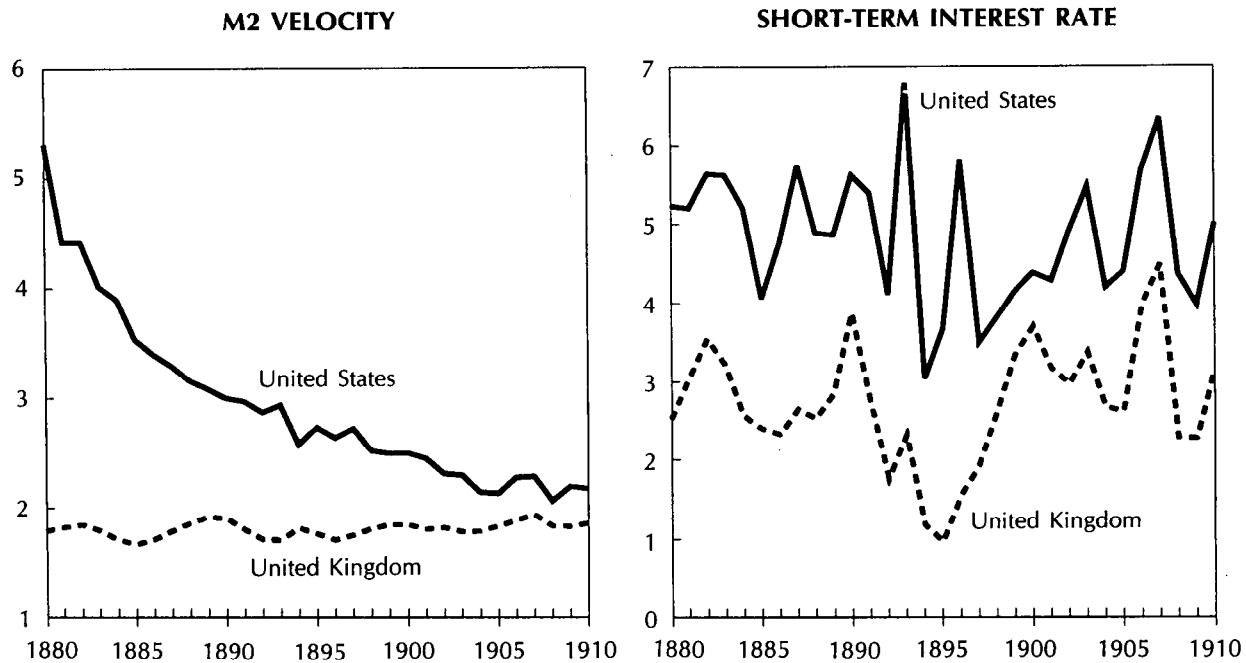
By using a dummy variable in their two-country model to capture the effects of changing levels of financial sophistication in the United States relative to Britain during the late nineteenth and early

⁵ Friedman and Schwartz use net national product as the measure of income in computing velocity for both countries. Their interest rates are the six-month commercial paper rate for the United States and the three-month bill rate for the United Kingdom.

twentieth centuries, Friedman and Schwartz take an approach to modifying a money demand equation that mirrors the approach taken by many others to repair conventional money demand specifications for the most recent two decades: they acknowledge that in one instance financial innovation has apparently shifted the relationship between income, interest rates, and the demand for money, without considering the possibility that other episodes of instability in this relationship may have occurred and may yet occur. Friedman and Schwartz's approach is, in fact, exactly the same as that of Hafer and Hein (1982), who use period-specific dummy variables to restore stability to a money demand equation for the years following 1973.

Bordo and Jonung's hypothesis, in contrast, views all observed episodes of money demand instability as symptomatic of an ongoing process of financial evolution; indeed, their hypothesis suggests that it is not appropriate to regard money demand instability as episodic at all, but rather as a predictable and regular phenomenon. That is, the Bordo-Jonung hypothesis implies that when the demand for money equation is properly specified to include proxies for their two types of ongoing financial innovation, the equation will be stable for the 1890s, the 1980s, and all decades in between without needing period-specific variables. Thus, Bordo and Jonung's work both acknowledges and extends that of Friedman and Schwartz and those who have studied the effects of more recent financial innovations.

Figure 3



The idea that financial innovations may systematically influence velocity over long periods of time is not solely Bordo and Jonung's. In fact, they give credit to Knut Wicksell, who argues (1936, Ch. 6, Sec. C) that the velocity of currency is likely to increase as an economy's banking system develops, for inspiring their work. Irving Fisher (1963, Ch. V, Sec. 3) lists among the determinants of velocity "habits as to the use of book credit and to the use of checks," both of which have varied considerably over time. Warburton (1949), who finds that the initial downward trend in velocity seen in Figure 1 extends back to 1799, attributes the trend to changes such as the increase in the share of national output sold in organized markets, the increase in the fraction of the population working for wages instead of producing for their own consumption, and the increase due to specialization in the number of intermediate payments required in production, all of which Bordo and Jonung would classify as aspects of the monetization process. Among more recent studies, both Townsend (1987) and Goodfriend (1991) describe how improvements in communications and information-gathering technologies facilitate the substitution of privately issued securities for currency as means of payment; their analyses suggest that technological progress may simultaneously drive the process of real economic growth and allow the payments system to evolve over time. Bordo and Jonung's work is unique, however, in the extent to

which it attempts to find quantitative evidence, drawn from a variety of data sources, in support of their hypothesis.

III. EVIDENCE OF VELOCITY'S LONG-RUN BEHAVIOR

Bordo and Jonung take four distinct approaches to document that the financial evolution that accompanies the process of real economic growth exerts an ongoing systematic influence on velocity's long-run behavior. First, the authors show that, as predicted by their theory, the U-shaped velocity pattern found in Figure 1 for the United States can be found in data from a number of other countries as well. Second, they modify the traditional regression equation expressing velocity as a function of income and interest rates by adding proxies for the two types of institutional changes identified by their hypothesis. The ratio of M2 to currency and the fraction of the labor force employed outside of the agricultural sector should both increase as part of the monetization process and therefore have a negative effect on velocity. Meanwhile, the ratio of nonbank financial assets to total financial assets should be a proxy for the rise of nonbank financial intermediaries and the development of money substitutes and therefore have a positive effect on velocity. When estimated using data extending back into the nineteenth century for Canada, Norway, Sweden, the

United Kingdom, and the United States, the regression coefficients on these three proxies all have the expected signs.

Next, Bordo and Jonung focus in detail on the monetization process as it occurred in Sweden from 1871 to 1913. They show that a number of other proxies for institutional change, including the number of commercial bank accounts per capita and the share of agricultural wages paid in cash, enter significantly into regression equations for velocity. Finally, they show that evidence of U-shaped velocity patterns can be found in cross-sectional data from 84 countries; those with low levels of income per capita have tended to experience falling velocity in the postwar years, while those with more developed economies have recently seen velocity rise over time.

In spite of their success in presenting an extensive and diverse body of evidence to support their hypothesis, Bordo and Jonung have not escaped criticism. Reviewers have found problems with their empirical work, with most of the criticism directed at the augmented velocity equations estimated for the five advanced industrialized countries. Raj and Siklos (1988), in commenting on an earlier presentation of Bordo and Jonung's results [Bordo and Jonung (1981)], warn that the significance of the institutional variables in the velocity equations may be the product of a spurious regression rather than a true economic relationship. Granger and Newbold (1986, pp. 205-16) demonstrate that standard test statistics from a regression of one random walk variable on another, independent random walk variable will often incorrectly suggest that the two are correlated. Since Raj and Siklos find that the variables in Bordo and Jonung's regressions behave like random walks, the test statistics from these regressions may be misleading. Bordo and Jonung's proxies continue to be significant when the equations are reestimated in first-differenced form, however. Because differencing serves to remove the random walk component from each variable, Raj and Siklos conclude that the test results are probably not spurious.

In more damaging reviews, Hamilton (1989) and Huizinga (1990) point out that it is difficult to defend the assumption, made implicitly by Bordo and Jonung when they use single-equation econometric methods, that financial variables such as the M2-currency ratio and the ratio of nonbank financial assets to all financial assets, used as independent variables in their model, are truly exogenous in a world in which the supply of as well as the demand for money and other assets responds to

changes in income and interest rates. Both Hamilton and Huizinga note, for example, that the ratio of M2 to currency is approximately equal to the M2 money multiplier. If, through the reserve decisions of banks, the money multiplier depends on the nominal interest rate, Hamilton (pp. 341-43) demonstrates that the M2-currency ratio may appear to be significant in Bordo and Jonung's regressions not because it is standing proxy for the effects of monetization on money demand, but because it is an important variable in determining money supply. Bordo and Jonung's parameter estimates, therefore, potentially suffer from simultaneous-equations bias.⁶

The simultaneity problem is a difficult one to overcome in the study of money demand, and direct attempts to do so have met with only limited success.⁷ In fact, by repeating their analysis with a variety of data sets, Bordo and Jonung take what is perhaps the only route toward establishing that their estimates do not suffer from this problem. Indeed, Hamilton (p.343) admits as much:

When one finds, as they document, evidence of a consistent, reproducible pattern that is robust across a large number of specifications, one begins to establish a compelling scientific case that there is a predictable regularity in the correlations warranting a structural interpretation.

Likewise, Friedman and Schwartz (1991) argue that confidence in statistical results on money demand can be established only by repeating the analysis with data from as many time periods and as many countries as possible. The remainder of this paper takes Hamilton's and Friedman and Schwartz's advice: it attempts to answer the critics of Bordo and Jonung's empirical work by looking for evidence to support their financial-innovations hypothesis in a new data set.

IV. NEW EVIDENCE FROM U.S. REGIONAL DATA

A. A New Data Set

Andy Atkeson and Rachel van Elkan, both working at the University of Chicago, have recently

⁶ Of course, the effect of interest rates on reserve decisions is just one of many potential sources of simultaneous-equations bias in Bordo and Jonung's work. For instance, Goodfriend (1991) describes how the spread of the commercial banking system and the coincident development of interbank credit markets allow banks to economize on their holdings of reserves. Thus, the supply of as well as the demand for money is intimately related to the process of monetization.

⁷ See Goldfeld and Sichel (1990) for a review of work on the problems of simultaneity and exogeneity as they relate to the estimation of money demand functions.

compiled a data set containing figures for demand deposits by region in the United States from 1929 to 1988. Along with the Commerce Department's state personal income data, these figures may be used to construct series for demand deposit velocity by region over a 60-year period. The Commerce Department's regional definitions, used here, are given in Table 1.

As the public's currency holdings cannot be broken down geographically, demand deposit velocity is the closest analog to M1 velocity available at the regional level. Indeed, Figure 4 reveals that the U-shaped pattern found in the aggregate M1 series is shared by all eight regional demand deposit velocity series, with velocity in each region falling before World War II and rising thereafter.

B. Empirical Strategy

Since the patterns found by region may simply be reflections of the pattern found in the aggregate, the time-series properties of the data shown in Figure 4 should not necessarily be thought of as providing new and independent evidence in support of the assertion that velocity ought to follow a U-shaped pattern as an economy develops. There is, however, considerable variation in levels of velocity across regions at any given point in time, suggesting the possibility of using the cross-sectional properties of

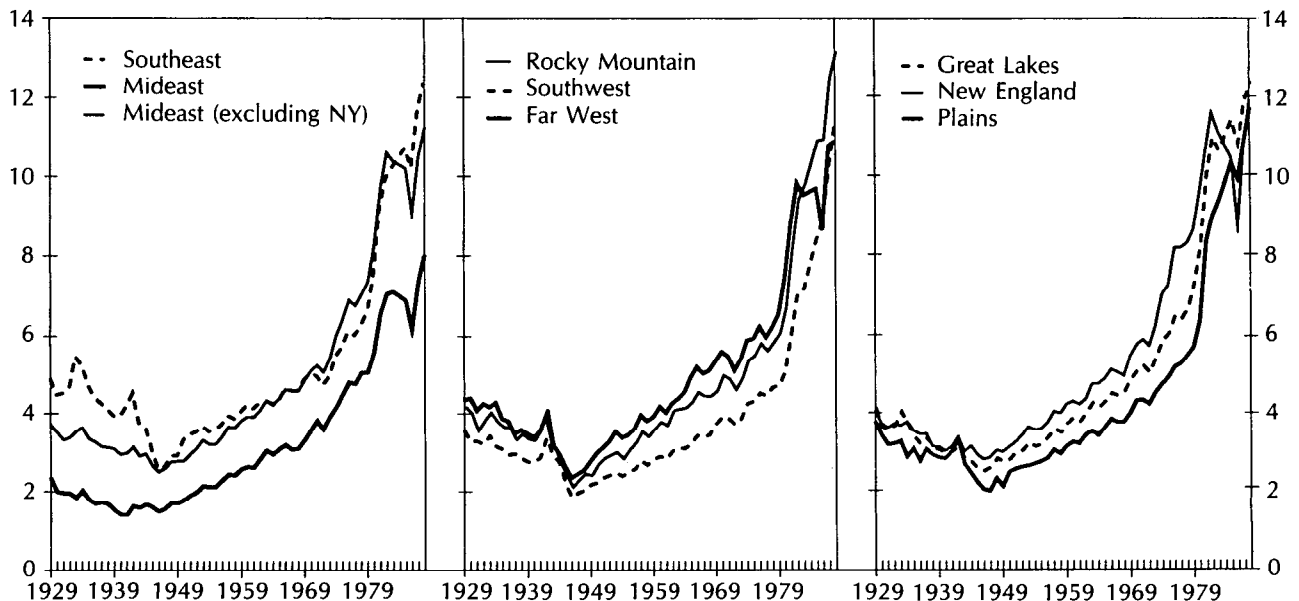
Table 1
**Regional Definitions,
U.S. Department of Commerce**

<i>New England:</i> Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
<i>Mideast:</i> Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania
<i>Great Lakes:</i> Illinois, Indiana, Michigan, Ohio, Wisconsin
<i>Plains:</i> Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota
<i>Southeast:</i> Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia
<i>Southwest:</i> Arizona, New Mexico, Oklahoma, Texas
<i>Rocky Mountain:</i> Colorado, Idaho, Montana, Utah, Wyoming
<i>Far West:</i> California, Nevada, Oregon, Washington

the data to test Bordo and Jonung's hypothesis. Specifically, the theory predicts that for earlier years (during which the commercial banking system was still expanding geographically) a negative correlation should be observed between velocity and indexes of

Figure 4

DEMAND DEPOSIT VELOCITY



financial sophistication across regions. For later years (with the spread of nonbank intermediaries) this correlation should turn positive.

C. Cross Section Regression Equations

State personal income data provide two proxies for the level of financial development by region. The first, personal income per capita, is a simple proxy under the assumption that the processes of real economic growth and financial evolution are synchronized. The second, the share of total earnings originating in finance, insurance, and real estate (FIRE), the narrowest industrial class including banks and nonbank financial intermediaries for which data beginning in 1929 are available, is a more direct measure of financial sophistication. Although the share of earnings in FIRE does not distinguish between growth in banking and growth in nonbank finance, such a distinction is not necessary because changes in the proxy should primarily reflect changes in banking early on and changes in nonbank finance later.

Let v_{it} denote demand deposit velocity in region i at time t , $PIPC_{it}$ denote personal income per capita in region i at time t , and $FIRE_{it}$ denote the share of total earnings originating in finance, insurance, and real estate in region i at time t . Bordo and Jonung's hypothesis predicts that v_{it} should be negatively correlated with both $PIPC_{it}$ and $FIRE_{it}$ for early t and positively correlated for later t . Thus, consider the cross section regression equations

$$(1) \quad v_{it} = \alpha_t + \beta_t PIPC_{it} + e_{it}$$

$$(2) \quad v_{it} = \delta_t + \gamma_t FIRE_{it} + u_{it}$$

to be estimated for each t from 1929 to 1988 (a total of 120 regressions). Bordo and Jonung's hypothesis predicts that β_t and γ_t should be negative for the early years and positive later. More generally, the coefficients should increase as functions of t .⁸

D. Results: 1929-1980

Figure 4 reveals that the Mideast region inclusive of New York has considerably lower levels of velocity than the other regions. Comparing the numbers

⁸ For the reasons given in Section IV.B, equations (1) and (2) focus only on the cross-sectional patterns appearing in the regional data. An alternative and perhaps equally informative approach would be to pool all the observations in the data set and specify a model that simultaneously tests both the cross-sectional and time-series implications of Bordo and Jonung's hypothesis. This task is left for future research efforts.

for the Mideast as a whole to those for the Mideast excluding New York State indicates that it is the New York data that make this region an outlier. In fact, if figures for New York are included in the data set used to estimate (1) and (2), they dominate the regressions, generating coefficients β_t and γ_t that are negative for all t . Including New York reveals only that as a financial center for the world, New York City has a high concentration of demand deposits, a high level of income per capita, and a large fraction of its labor force employed in finance. Thus, the data for the Mideast region exclusive of New York State, used to obtain the results discussed below, are more informative in assessing the relevance of the Bordo-Jonung hypothesis.

Equations (1) and (2) are estimated by ordinary least squares. The slope coefficients β and γ are plotted as functions of t in Figure 5 to see if they increase over time as expected. Since each coefficient is estimated using only eight observations, the standard errors are quite large. The point estimates, however, show the data from 1929 to 1980 to be consistent with Bordo and Jonung's hypothesis. The coefficients follow upward paths over the first 50 years for which data are available; for years prior to World War II they are negative, and after World War II they become positive. In fact, beginning in 1959 for β and in 1969 for γ , the slope estimates are at least one standard deviation greater than zero.

The changes that underlie the switch from negative to positive slope coefficients in the 1940s may be seen in Table 2. Between 1942 and 1946, velocity fell in every region, but the decline was less pronounced in New England, the Mideast, and the Great Lakes than in the other regions. Attributing these relative changes to the geographic expansion of the banking system is consistent with data presented in Goldsmith (1958, Ch. V), which document the spread of commercial banking from the northern United States to the South and West during 1929-1949.

E. Results: 1981-1988

In contrast to the first 50 years of data, the most recent figures fail to display the pattern predicted by Bordo and Jonung's theory, with the slope coefficients falling over time and even becoming negative again. Driving this reversal, as may be seen in Table 3, is declining velocity in the more financially sophisticated regions: New England, the Mideast, and the Far West. The timing of the breakdown in the expected

Figure 5

OLS COEFFICIENTS
(with ± 1 standard error band)

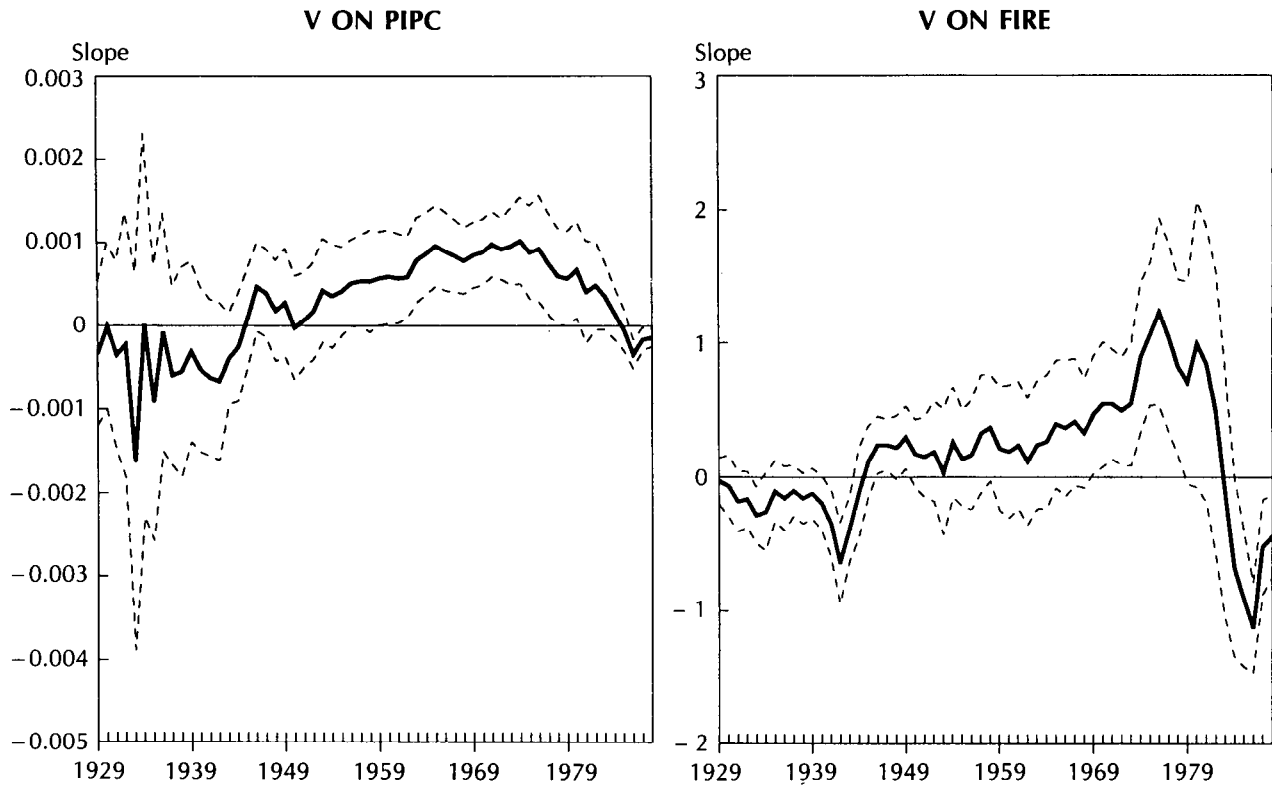


Table 2

**Changes in Demand Deposit Velocity
1942-1946**

New England	-0.58
Mideast (excluding New York)	-0.65
Great Lakes	-0.63
Plains	-1.26
Southeast	-1.93
Southwest	-1.51
Rocky Mountain	-1.97
Far West	-1.60

Table 3

**Changes in Demand Deposit Velocity
1981-1986**

New England	-1.90
Mideast (excluding New York)	-0.66
Great Lakes	+0.80
Plains	+1.58
Southeast	+0.97
Southwest	+2.84
Rocky Mountain	+2.73
Far West	-0.16

pattern of coefficients suggests that it may be related to the coincident break in M1 velocity's postwar trend (see Figure 1), which has received considerable attention in the money demand literature.⁹

⁹ See, for example, Rasche (1987), Stone and Thornton (1987), Darby, Mascaro, and Marlow (1989), and Hetzel and Mehra (1989).

In fact, one explanation that has been offered for M1 velocity's mysterious behavior is also consistent with the surprising cross-sectional pattern to have emerged in the past decade. Stone and Thornton (1987) argue that the weakness in M1 velocity during the 1980s is most likely the result of two distinct forces. First, the nationwide introduction of NOW accounts in 1981 attracted funds

out of other interest-bearing assets; since M1 includes NOW account balances, this substitution caused its velocity to decrease. Second, if the demand for money is a function of permanent income (or wealth) rather than current income, as suggested by Friedman (1959), then velocity measured using current income will fall as permanent income increases relative to current income. In particular, expectations of improved future income following the recessions of the early 1980s can explain the decrease in measured M1 velocity.

If the availability of NOW accounts has drawn funds out of demand deposits as well as out of non-M1 assets, then demand deposit velocity should have increased even as M1 velocity fell. Table 3 reveals that, in fact, demand deposit velocity did continue to rise throughout the 1980s in regions other than New England, the Mideast, and the Far West. Interest-bearing checkable deposits were available before 1981 in New England and New Jersey, so the nationwide introduction of these accounts would not have put the same upward pressure on velocity in New England and the Mideast region (the two regions with large decreases in velocity) as it did elsewhere. Moreover, patterns in real estate prices suggest that the nationwide increase in wealth during the 1980s was concentrated in New England, the Mideast, and the Far West, putting downward pressure in measured velocity through the permanent income effect in those three regions, but not in the others. Thus, NOW accounts explain why velocity rose in some regions, while changes in permanent income explain why velocity fell in others; together, the two parts of Stone and Thornton's hypothesis explain why the regression coefficients change sign in the 1980s.

If Stone and Thornton's theory is correct, the regional regression results for the 1980s do not contradict Bordo and Jonung's hypothesis. The introduction of NOW accounts was a consequence of regulatory change rather than institutional or technological innovation, for interest-bearing checkable deposits existed prior to their prohibition in 1933. To the extent that regional patterns in velocity during the 1980s are the product of this regulatory change, the patterns say nothing about the

accuracy of Bordo and Jonung's predictions for the effects of financial evolution. Since Bordo and Jonung use permanent income as the scale variable in their velocity equations, they would also predict that velocity measured using current income would fall when permanent income increases; regional patterns induced by changes in permanent income are not evidence against Bordo and Jonung's theory either.

On the other hand, since deviations of permanent income from current income are by definition transitory, Bordo and Jonung's hypothesis implies that barring further significant regulatory change, the slope coefficients in equations (1) and (2) should soon become positive again. Thus, only if the experience of the 1980s is found, in light of future developments, to be an exceptional aberration in an otherwise unbroken pattern will the most recent data help in establishing their hypothesis as a useful guide for predicting the effects of financial innovation.

V. CONCLUSIONS

The empirical results obtained here show Bordo and Jonung's hypothesis to be consistent with 50 years of regional demand deposit data from 1929 to 1980. Although the figures for 1981-1988 fail to fit the expected pattern, they have an explanation that is not inconsistent with the Bordo-Jonung hypothesis. Overall, therefore, the regional data can be counted as part of the large and diverse body of evidence that Hamilton (1989) and Friedman and Schwartz (1991) argue is necessary to support the claim that the correlations found between velocity and various proxies for financial sophistication reflect the structural relationship implied by Bordo and Jonung's theory.

In addition, the regional figures support Stone and Thornton's (1987) explanation for the weakness in M1 velocity during the 1980s. This finding suggests that regional data are a valuable untapped source of evidence with which competing hypotheses about the recent behavior of M1 can be tested. In particular, any theory that purports to explain the fall in velocity must also explain why this reversal in trend has been confined to the east and west coasts.

APPENDIX: DATA SOURCES

M1, United States, 1869-1891: The M1 series is extended back to 1869 by multiplying M2 figures by 0.962, the ratio of M1 to M2 in 1892, the first year for which M1 data is available. The M2 data is taken from Milton Friedman and Anna J. Schwartz, *Monetary Trends in the United States and the United Kingdom: Their Relation to Income, Prices, and Interest Rates, 1867-1975*. Chicago: University of Chicago Press, 1982. Table 4.8, Column 1. *1892-1914:* U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1957*. Washington, D.C., 1960. Series X-267. Adjusted upward to link with later data. *1915-1970:* U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970*. Washington, D.C., 1975. Series X-414. *1971-1989:* *Economic Report of the President*. Washington, D.C., 1991. Table C-67.

Gross National Product, United States, 1869-1928: Nathan S. Balke and Robert S. Gordon, "The Estimation of Prewar Gross National Product: Methodology and New Evidence." *Journal of Political Economy* 97 (February 1989): 38-92. Table 10. *1929, 1933, 1939-1989:* *Economic Report of the President* (1991). Table B-1. *1930-1932, 1934-1938:* U.S. Department of Commerce, *The National Income and Product Accounts of the United States, 1929-1982: Statistical Tables*. Washington, D.C., September 1986. Table 1.1.

Six-Month Commercial Paper Rate, United States, 1869-1975: Friedman and Schwartz (1982). Table 4.8, Column 6. *1976-1989:* *Economic Report of the President* (1991). Table C-71.

M2 Velocity, United States, 1880-1910: Friedman and Schwartz (1982). Table 4.8, Column 1 (M2) divided by Column 2 (Net National Product).

M2 Velocity, United Kingdom, 1880-1910: Friedman and Schwartz (1982). Table 4.9, Column 1 (M2) divided by Column 2 (Net National Product).

Three-Month Bill Rate, United Kingdom, 1880-1910: Friedman and Schwartz (1982). Table 4.9, Column 6.

Demand Deposits by Region, United States, 1929-1988: Unpublished worksheets compiled by Andy Atkeson and Rachel van Elkan. For 1929-1949, their data are figures for total demand deposits less interbank and federal government demand deposits at all banks, taken from Board of Governors of the Federal Reserve System, *All Bank Statistics, United States, 1869-1955*. April 1959. For 1950-1968, the data are figures for business and personal demand deposits at all banks, as reported in various issues of Federal Deposit Insurance Corporation, *Assets and Liabilities and Capital Accounts—Commercial and Mutual Savings Banks*. For 1969-1977, the data are figures for demand deposits at all insured commercial banks, as reported in various issues of *Assets and Liabilities and Capital Accounts—Commercial and Mutual Savings Banks*. For 1978-1988, the data are unpublished figures for demand deposits at all insured commercial banks, obtained directly from the FDIC.

Personal Income by Region, United States, 1929-1982: U.S. Department of Commerce, *State Personal Income: 1929-1982*. Washington, D.C., February 1984. *1983-1988:* U.S. Department of Commerce, *Survey of Current Business*. August issues, 1986-1990.

Personal Income per Capita by Region, United States, 1929-1982: *State Personal Income, 1929-1982* (1984). *1983-1988:* *Survey of Current Business*. August issues, 1986-1990.

Earnings by Region and by Industry, United States, 1929-1982: *State Personal Income, 1929-1982* (1984). *1983-1988:* *Survey of Current Business*. August issues, 1986-1990.

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