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Wealth, Financial Liberalization, and the Demand for Money in Japan

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Abstract

This paper presents estimates of a demand function for broad money in Japan. The function explains both secular trends in broad money during the 1970s and 1980s and the sharp decline in the income velocity of broad money during 1986-88. The inclusion of wealth and a measure of the return on holding broad money is essential to the specification of the money-demand function. Developments in these variables, as opposed to a behavioral shift brought about by the rapid pace of financial liberalization, explain the decline in money velocity during 1986-88.

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Summary

This paper presents estimates of a demand function for broad money in Japan that can explain both secular trends in the growth of broad money during the 1970s and 1980s as well as the sharp decline in the income velocity of broad money after 1985. The ability of the estimated function to explain the more recent developments in broad money, which coincided with extensive liberalization of financial markets in Japan, contrasts with the conclusions of other researchers.

The demand function estimated here incorporates both transactions and portfolio motives for holding money. The inclusion of wealth in the estimated equation turns out to be crucial to the specification of the portfolio demand for broad money. Over the last two decades, the more rapid growth of wealth, compared to the growth of income, has led to a decline in the relative importance of the transactions demand for money and contributed to a declining share of broad money in private financial portfolios. The sharp decline in the income velocity of broad money also resulted, in part, from a rapid growth in wealth. In addition, a decline in the opportunity cost of holding money fueled money demand in this period.

The growth of wealth and decline in the opportunity cost of holding money were partly due to the process of financial liberalization. However, the paper concludes that financial liberalization did not cause a break in money-demand behavior after 1985.

I. Introduction

Contrary to some recent estimates, this paper finds that a conventional money-demand function can explain the sharp decline in the income velocity of broad money in Japan that coincided with the extensive liberalization of Japanese financial markets after 1985. ^{1/} The inclusion of wealth and a measure of the return on holding broad money turns out to be crucial to the specification of the money-demand function, and it is developments in these variables that account for most of the decline in velocity. The paper therefore concludes that financial liberalization did not cause a shift in demand-for-money behavior but, rather, affected money demand via its indirect effects on the overall demand for financial assets and the opportunity cost of holding money.

The paper is organized as follows. Section II describes trends in broad money during 1970-88 and provides background information for the subsequent empirical analysis. Sections III and IV describe, respectively, the specification and estimation of a money-demand function that is appropriate for the analysis of a broad monetary aggregate. Section V then describes how the estimated money-demand function can be used to explain broad money growth in the period 1986-88. Conclusions are summarized in Section VI.

II. Trends in Broad Money, 1970-88

The focus of this paper is M2 plus certificates of deposit (CDs), hereafter denoted as broad money. The aggregate consists of cash plus demand and time deposits in the banking system, with CDs included since their introduction in May 1979. Reflecting the importance placed on broad money in the formulation of monetary policy in Japan, the monetary authorities have announced one-quarter-ahead growth forecasts for broad money since July 1978.

During the 1970s and 1980s, the growth of broad money consistently outstripped income growth but, nevertheless, failed to keep up with the growth in total demand for financial assets. As a result, the share of broad money in private financial portfolios declined gradually at a time when the gap between the return on money and other assets was narrowing (see Chart 1, upper panel, and tabulation below). A possible explanation for the declining portfolio share would be the more rapid growth of wealth, compared to income, in the 1970s and 1980s, which would have reduced the relative importance of the transactions demand for money. This in turn would have offset the increased portfolio demand for money

^{1/} For example, Bank of Japan (1988) and Suzuki and others (1988) report money-demand equations that considerably underpredict broad money growth in this period.

stemming from the declining opportunity cost of holding money. This explanation would also be consistent with the rising share of quasi-money in broad money during the past two decades (Chart 1, lower panel).

Japan: Average Return on Financial Assets, 1971-88

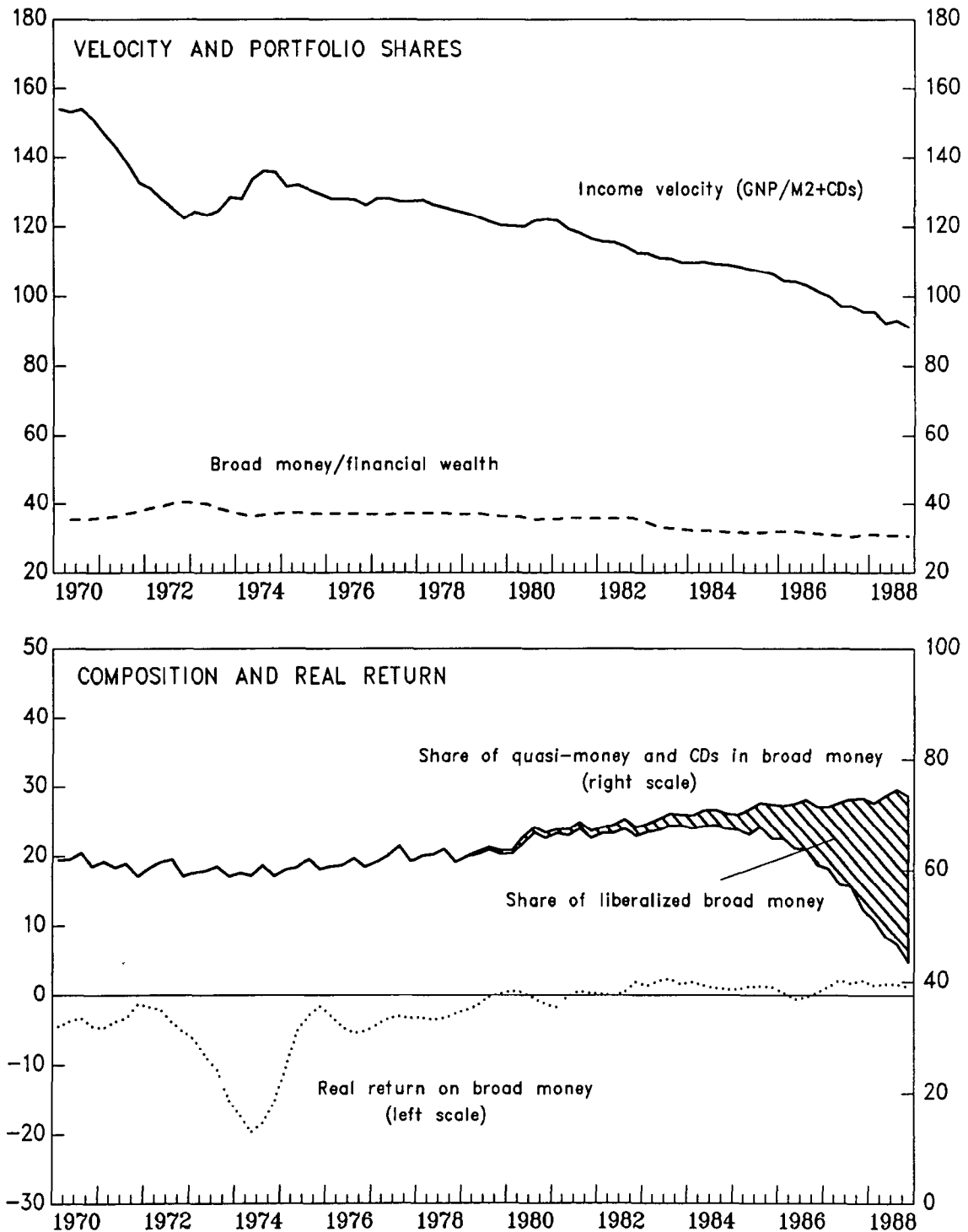
(In percent)

	1971-75	1976-80	1981-85	1986-88
Return on broad money ^{1/}	2.7	2.5	2.7	1.9
Three-month Gensaki rate	9.0	7.1	6.7	4.3
Government bond yields	7.9	7.8	7.5	4.5
Memorandum item:				
GNP deflator (percent change)	10.2	5.8	2.2	0.9

The trend decline in the income velocity of broad money accelerated sharply to over 4 1/2 percent per annum during 1986-88 from an average annual rate of around 2 percent in the preceding ten-year period. The acceleration, which mainly reflected a strong demand for quasi-money, coincided with significant progress toward deregulating interest rates in Japan. Until then, most bank deposit rates had been set by the authorities, typically at levels below the rate of inflation. From 1985 onward, interest rates on deposits were progressively liberalized and deposit-type instruments were made accessible to a wider range of investors. Notable developments were the liberalization of interest rates on large time deposits, reductions in the minimum size holdings of CDs, and the introduction of money market certificates (see Appendix II for a detailed chronology). Partly as a consequence of these measures, there was a substantial increase in the proportion of broad money paying a market-related rate of return and the average real return on holding broad money increased (Table 1).

^{1/} Author's calculations; see Appendix I for more details.

CHART 1
JAPAN
BROAD MONEY, 1970-88
(In percent)



Source: Author's estimates.

Table 1. Japan: Composition of Broad Money, 1970-88

	1970:I	1979:I	1985:II	1988:IV
<u>(In trillions of yen; end period)</u>				
Broad money (M2+CDs)	46.6	177.6	299.8	419.7
Cash and currency	3.9	14.0	21.0	31.5
Deposit money	13.9	52.6	66.3	80.3
Quasi-money	28.8	111.0	202.4	297.5
(Time deposits with liberalized interest rates) <u>1/</u>	(--)	(--)	(--)	(85.5)
(Money market certificates) <u>1/</u>	(--)	(--)	(3.1)	(29.5)
Certificates of deposit	--	--	10.0	10.4
<u>(In percent of total broad money)</u>				
Broad money (M2+CDs)	100.0	100.0	100.0	100.0
Cash and currency	8.3	7.9	7.0	7.5
Deposit money	29.9	29.6	22.1	19.1
Quasi-money	61.8	62.5	67.5	70.9
(Time deposits with liberalized interest rates)	(--)	(--)	(--)	(20.3)
(Money market certificates)	(--)	(--)	(1.0)	(7.0)
Certificates of deposit	--	--	3.3	2.5
Memorandum item:				
Share of broad money with market-related interest rates <u>2/</u>	--	--	4.3	29.8

Sources: Bank of Japan, Economic Statistics Monthly; and author's estimates.

1/ Data for banking accounts of all banks, Sogo banks, and Shinkin banks.

2/ Money market certificates plus certificates of deposits plus time deposits with liberalized interest rates.

III. The Specification of the Demand-for-Money Function

The specification of the demand function for a broad monetary aggregate such as M2 plus CDs should take into account the aggregate's dual nature: it is held both to finance transactions and as a store of value. Thus, it is unlikely that commonly estimated functions, which link money demand to income and interest rates, would adequately capture the portfolio demand for broad money. Instead, the store of value characteristic of broad money provides a strong argument for including a measure of wealth in the demand function in order to capture portfolio allocation decisions among financial assets.

The money demand function should also take into account the fact that a large proportion of broad money is interest bearing. In typical theoretical specifications, money demand depends negatively on the opportunity cost of holding money. This latter variable should, therefore, be defined as the return on competing assets net of the average return on holding broad money. The average real return paid on broad money has risen over the last two decades because of the increasing share of quasi-money in broad money and, more recently, because of financial liberalization.

Theoretical and empirical specifications of money demand functions are surveyed exhaustively elsewhere (e.g., Laidler (1985)). In short, most specifications relate money demand to scale variables, such as income and wealth, opportunity cost variables, and, sometimes, to other miscellaneous factors. In this paper, the money demand function is specified in real terms, assuming a log-linear functional form. In the long run, the money demand function can be written as:

$$\log(M/P) = A_0 + a_1 \log(W/P) + a_2 \log(Y/P) + a_3 \log(1+R) \quad (1)$$

where M is money, P a price index, W wealth, Y income, and R the opportunity cost of holding money (relative asset returns). The a 's are elasticities to be estimated and A_0 is a constant. However, because of adjustment costs and because expected developments in the independent variables are partly adaptive to recent outcomes, a dynamic version of equation (1) is required for estimation. ^{1/} The dynamic specification chosen here is of the error-correction variety (see Davidson and others (1978)) in which changes in money demand depend on both changes in and the levels of the independent variables, plus lagged dependent variables. The error-correction model is a more complex form of partial adjustment (see Nickell (1985)) whereby deviations from long-run desired

^{1/} In principle, it would be preferable to separate out the dynamics arising from expectations formations and adjustment costs. Cuthbertson (1988) details one such attempt, but the econometric demands are substantial and may not ultimately improve the specification (see Hendry (1988)).

money holdings (as represented by equation (1)) lead to changes in money demand to restore equilibrium. A major benefit of the error correction specification is that it permits estimation of long-run relationships between the levels of economic variables that are often lost by the first-differencing of variables needed to circumvent the econometric problem of nonstationarity (see Hylleberg and Mizon (1989)).

IV. Estimation Results

The estimation results support the hypothesis that demand for broad money in Japan is influenced both by transactions and portfolio investment motives. The estimation procedure isolated significant positive coefficients on income and a measure of financial wealth, as well as negative coefficients on terms that measure the opportunity cost of holding money. 1/ After dropping some insignificant terms from an initially more general dynamic specification, the estimated equation was:

$$\begin{aligned}
 \text{Dlog}(M/P) = & 0.587 \text{ Dlog}(M/P)_{-1} \\
 & (5.05) \\
 & + 0.191 \text{ Dlog}(Y/P)_{-1} - 0.438 \text{ Dlog}(1+R) \\
 & (1.82) \qquad (2.25) \\
 & - 0.061 (\log M_{-1} - \log W_{-1}) \\
 & (2.72) \\
 & - 0.053 (\log M_{-1} - \log Y_{-1}) - 0.175 \log(1+R)_{-1} \\
 & (3.47) \qquad (1.88) \\
 & + 0.061 \qquad (2) \\
 & (2.31)
 \end{aligned}$$

Instrumental variables estimation, 1970:IV-1988:IV 2/

$$\bar{R}^2 = 0.779 \quad SE = 0.0070 \quad DW = 2.09 \quad \text{AUTO}(5) = 4.17 \quad (11.07)$$

$$\text{STAB}(16) = 13.55 \quad (26.30) \quad \text{STAB}(36) = 27.24 \quad (50.96)$$

where:

1/ The positive influence of financial wealth on broad money is consistent with results for other industrial countries. See, for example, Bennett (1987) and Grice and Bennett (1984).

2/ Estimation by instrumental variables provides some protection against potential estimation biases arising from simultaneity. The instruments used were real government consumption, lagged changes in the yen-dollar exchange rate, average government bond yields, the U.S. Treasury bill rate, and U.S. real GNP.

Dlog = first difference of the log of the variable

M = average stock of broad money

P = GNP deflator

Y = nominal GNP

W = average stock of private financial wealth (see Appendix I for a more detailed description)

R = three-month Gensaki rate minus the average return on broad money (see Appendix I for a more detailed description)

AUTO(5) = chi-squared test statistic for (up to) fifth-order autocorrelation (Godfrey (1978)); critical 95 percent confidence level in parentheses. This test is passed, implying that there is no evidence of residual autocorrelation.

STAB(n) = chi-squared test statistic for parameter stability in the last n periods of the data sample (Hendry (1980)); critical 95 percent confidence level in parentheses. As discussed in Section IV, both these tests are passed.

According to the dynamics of the equation, there are no immediate effects on money demand of a change in financial wealth, but, instead, money demand changes gradually over a fairly long period to restore desired portfolio shares. By contrast, changes in income and interest rates have a significant short-run impact on money demand.

The terms defined as the difference between the levels of money and wealth and between money and income give the equation's dynamics their error-correcting properties. These terms arose from restrictions on a more general specification that included lagged-level terms in money, income, and wealth. To bring out more clearly the nature of the error-correction mechanism, the estimated equation can be rewritten as:

$$\begin{aligned} \text{Dlog}(M/P) = & 0.587 \text{ Dlog}(M/P)_{-1} \\ & + 0.191 \text{ Dlog}(Y/P)_{-1} - 0.438 \text{ Dlog}(1+R) \\ & - 0.113 (\log M_{-1} - \log M^*_{-1}) \end{aligned} \quad (3)$$

where M^* is defined by the relationship:

$$\log(M^*/P) = 0.54 + 0.54 \log(W/P) + 0.46 \log(Y/P) - 1.55 \log(1+R) \quad (4)$$

which corresponds to the long-run money demand function (compare with equation (1)). Thus, as the level of money holdings rises above the desired level for a given level of income, wealth, and interest rates, the error-correction mechanism acts to reduce money demand growth.

The long-run money demand function has the property that the income and wealth elasticities of money demand sum to one. ^{1/} This implies that, for a given level of the opportunity cost of holding money, if income and wealth grow at the same rate, the demand for broad money will also grow at this rate. As a consequence, the long-run money-demand function can be rewritten in the following form:

$$\log(M/W) = A_0 + 0.46 \log(Y/W) - 1.55 \log(1+R) \quad (5)$$

From equation (5), it is clear that, in the long run, the share of money in financial wealth is only affected by the relative return on money and competing financial assets, and changes in the relative importance of the transactions demand for money brought about by differential growth rates between income and wealth (compare with Tobin (1969)). This result confirms the explanation for the observed trends in broad money demand over the last two decades suggested in Section I above. That is, whereas the faster growth of wealth compared to the growth of income in this period contributed to the declining income velocity of money, it also led to a decline in the relative importance of the transactions motive for holding money. Therefore, the share of money in total financial assets declined despite the progressive fall in the opportunity cost of holding money.

As a postscript to this section, two caveats to the estimation results should be noted. First, the wealth term in the equation only measures private financial assets and therefore does not capture some potentially interesting effects on money demand stemming from revaluations in real assets such as land. Unfortunately, more comprehensive measures of wealth were not available at a quarterly frequency, although it is worth pointing out that, for most of the sample, annual movements in national accounts measures of net private worth closely followed movements in private financial wealth. Second, the equation only includes one relative return variable when, in principle, the relative returns on many diverse assets might be expected to influence money demand. However, potential multicollinearity between asset returns placed econometric restrictions on the number of opportunity cost variables that could be included in the equation.

^{1/} In the unrestricted version of the equation, the elasticities summed to 0.92. The restriction that the sum of the elasticities is unity is not rejected by the data: $F(1,65)=0.38$ (3.99).

V. The Demand for Broad Money, 1986-88

The estimated equation explains the growth of broad money during 1986-88 quite well, and can account for the sharp acceleration of the decline in money velocity that occurred (Chart 2). Furthermore, formal parameter stability tests find no evidence of a behavioral break in this period, or, indeed during the 1980s in general. 1/ This perhaps surprising result, bearing in mind the rapid pace of financial deregulation in this period, contrasts with the findings of Bank of Japan (1988) and Suzuki and others (1988).

The parameter stability can be traced to the inclusion of both wealth--which is omitted from the money-demand functions estimated in those studies cited above--and the return on broad money in the equation. In this regard, the equation's parameters are no longer stable if wealth is omitted from the equation (compare with Ueda (1988)). Furthermore, omitting the return on broad money from the opportunity cost variable leads to a significant increase in the within-sample prediction error in the period 1986-88. Thus, the parameter instability after 1985 of money-demand equations that omit wealth most likely results from misspecification. When the equation is properly specified, it does not appear that financial liberalization caused a break in money demand behavior.

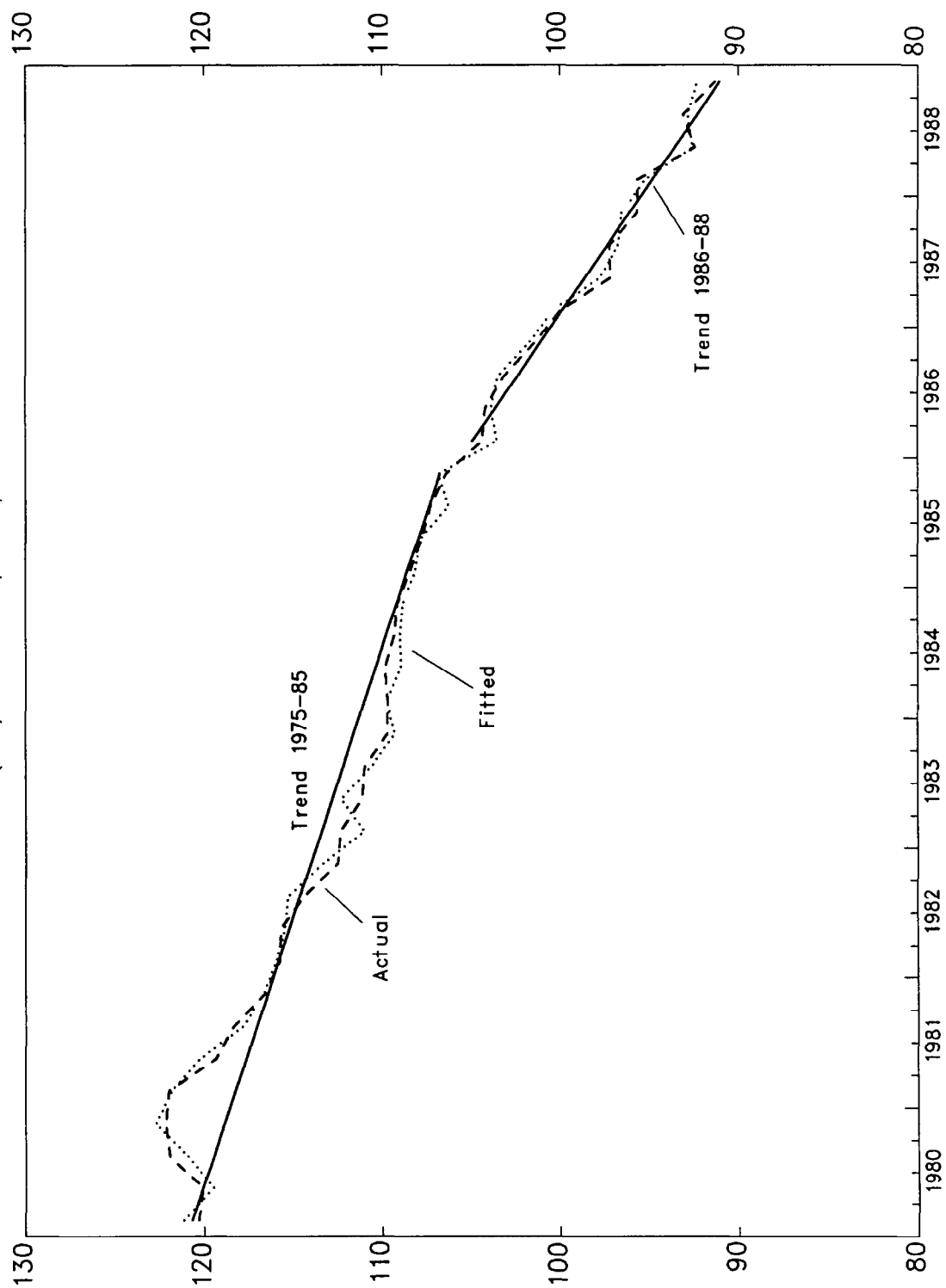
The accelerated decline in the income velocity of broad money during 1986-88 can be attributed to two factors: the rapid growth of wealth and the declining opportunity cost of holding money. 2/ Simulations of the equation reveal that, of these two factors, the growth of wealth was the most important. For example, if wealth had grown at the same rate as GNP, as opposed to nearly twice as fast, growth of broad money would have been about 2 1/2 percent per annum slower. At the same time, if the opportunity cost of holding money had remained unchanged, instead of declining by about 2 percentage points, the growth of broad money would have been about 1 1/4 percent per annum slower. 3/

1/ Although the sharp acceleration in velocity dates from the beginning of 1986, the statistical test STAB(16) tested for parameter stability during 1985-88 in order to examine, more generally, possible behavioral changes during the recent period of progressive interest rate deregulation. The test STAB(36) tested for parameter stability during 1980-88.

2/ A slight rearranging of equation (5) shows that, in the long run, velocity can be written as:
velocity (Y/M) = $B_0(W/Y)^{-0.54} (1+R)^{1.55}$.

3/ Of the 2 percentage point decline in the opportunity cost of holding money in this period, about three fourths can be attributed to different movements in regulated and unregulated interest rates and the remainder to the rising share of deposits paying a market-related return.

CHART 2
JAPAN
INCOME VELOCITY OF BROAD MONEY, 1980-88
(GNP/M2+CDs in percent)



Source: Author's estimates

These two simulations easily account for the more rapid decline in money velocity in 1986-88. Some caution is warranted in interpreting these results too strictly, however, because of the partial equilibrium nature of the simulations.

VI. Conclusions

A conventional money-demand function can describe both secular trends during the 1970s and 1980s and recent developments in broad money in Japan quite well. However, the money-demand function must properly take into account the store of value characteristics of broad money by including a measure of wealth, and adjust the opportunity cost variable for the rate of return on money. Furthermore, the results presented here suggest that money-demand behavior has not changed significantly during the recent period of financial liberalization in Japan. Instead, the acceleration in the decline of the income velocity of broad money during 1986-88 can be attributed to the rapid increase in wealth and a narrowing gap between the rate of return on broad money and competing assets.

Data Sources and Definitions

The data sources used were Nikkei Keizai Shimbun, Inc. Nikkei Telecom; Japan News and Retrieval (Tokyo); Bank of Japan, Economic Statistics Monthly (Tokyo); and IMF, International Financial Statistics (Washington). All data, except for interest rates, were seasonally adjusted. For money and wealth, seasonal adjustment was carried out by the author using the X11 program.

The definitions of most of the data described in the main text, with the exception of financial wealth and the opportunity cost of holding money, do not require further elaboration. Financial wealth was defined from flow-of-funds data as the average of beginning and end period stocks of the sum of the total positive financial assets of the personal and corporate sectors. The opportunity cost of holding money was defined as the three-month Gensaki rate minus the average return on holding money. The latter was defined as a weighted average of the interest rate on three-month certificates of deposit and the guideline three-month deposit rate. The weight on the CD rate was equal to the share of liberalized time deposits and banking sector money market certificates (from Table 12 of Economic Statistics Monthly) plus CDs in broad money. The weight on the guideline deposit rate was equal to the share of quasi-money, excluding liberalized time deposits, money market certificates, and CDs, in broad money.

Interest Rate and Related Financial Deregulation in Japan, 1985-88

<u>Date</u>	<u>Measure</u>
March 1985	Introduction of money market certificates (MMCs) for mutual banks and credit associations. Minimum denomination ¥ 50 million, maturity 1-6 months.
April 1985	Introduction of MMCs for other banks. Minimum denomination ¥ 50 million, maturity 1-6 months. Reduction of minimum denomination of CDs from ¥ 300 million to ¥ 100 million; minimum maturity of CDs shortened from three months to one month.
October 1985	Decontrol of interest rates on deposits of ¥ 1 billion or more with maturity of 3-24 months. Enlargement of the ceiling on CD issues from 100 percent to 150 percent of each bank's net worth. Enlargement of the ceiling on MMC issues from 75 percent to 150 percent of each bank's net worth.
April 1986	Decontrol of interest rates on deposits of ¥ 500 million or more. Maximum CD maturity lengthened from 6 to 12 months and ceiling on CD issues enlarged from 150 percent to 200 percent of each bank's net worth. Enlargement of the ceiling on MMC issues from 150 percent to 200 percent of each bank's net worth.
May 1986	Enlargement of the ceiling on deposit insurance from ¥ 3 million to ¥ 10 million.
September 1986	Decontrol of interest rates on deposits of ¥ 300 million or more. Reduction of the minimum amount of MMCs from ¥ 50 million to ¥ 30 million and enlargement of the ceiling on MMCs from 200 percent to 250 percent of each bank's net worth. Enlargement of the ceiling on CD issues from 250 percent to 300 percent of each bank's net worth.

April 1987	Decontrol of interest rates on deposits of ¥ 100 million or more.
	Reduction of the minimum denomination of MMCs from ¥ 30 million to ¥ 20 million; maximum maturity of MMCs lengthened from 12 to 24 months; enlargement of the ceiling on MMC issues from 250 percent to 300 percent of each bank's net worth.
	Enlargement of the ceiling on CD issues from 250 percent to 300 percent of each bank's net worth.
October 1987	Minimum maturity of large-denomination time deposits shortened from three months to one month.
	Minimum denomination of MMCs reduced from ¥ 20 million to ¥ 10 million.
	Ceilings on issues of MMCs and CDs removed.
April 1988	Reduction of the minimum denomination of large time deposits and CDs from ¥ 100 million to ¥ 50 million.
	Range of CD maturities widened from 1 to 12 months to 2 weeks to 2 years.
November 1988	Decontrol of interest rates on deposits of ¥ 30 million or more.

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