Money aggregates and economic activity during the Great Depression and 2007-11

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(Working paper)

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1. ABSTRACT.

This working paper examines monetary aggregates as means of explaining economic activity. Comparative analysis of the Great Depression and the years 2007-11 is used to test the explanatory power of monetary aggregates in accordance with their use in monetarist explanations of the Great Depression. A conclusion from this analysis is that monetarist theory can structure monetary-aggregate data to produce useful insights about economic activity for the years 2007-11.

2. KEY WORDS: Price level; money supply, monetary policy; monetarism; Great Depression

3. JEL CODES: E31; E50; N12

1. INTRODUCTION.

US economic activity during 2007-11 is unique among years since the end of WWII. A decline in economic activity followed by its persistence below trend is evident. The last similar period of economic activity in the US is the Great Depression of the 1930s. An additional commonality is both periods are associated with historically large private debt levels followed by financial instability. A comparison between these periods is therefore relevant.

The Great Depression caused a paradigm shift within the economics profession. Economists working after the war required conformity from theory to economic relationships revealed during the depression. This requirement generated consistency among the results of scholarship, and separated this period's scholarship from scholarship that preceded the depression.

The motivation of this working paper's analysis is that economic activity since 2007 will generate similar, although weaker, forces within scholarship to those which followed the Great Depression. This working paper is a result from reengaging with some of the early post-war economic literature, and applying directly its methods of analysis to developments in the years 2007-11. The economic literature surveyed for this working paper is in many ways the product of a similar survey of earlier methods by its authors.[1]

Economists begin to apply seriously analysis of monetary aggregates as means of explaining the Great Depression in the early post-war years. They present analysis showing that measures of economic activity are correlated with measures of the price level and money aggregates. The explanations for US economic activity through prices and money by Friedman and Schwartz, especially their representation of the Great Depression, is lucid and compelling.[2] It is a classic application of monetarist theory. They show that prices and a money aggregate both sharply decline as large numbers of banks fail in the early 1930s, while at the same time measures of economic activity continue to

1 See Friedman (1970).
2 See Friedman and Schwartz (1963).

worsen broadly. This is the starting point for this working paper's analysis.

The structure of this working paper follows: this introduction followed by an exploration of the data, a brief analysis of these data as means of explanation, a summary of conclusions, a list of references used in this analysis, and a listing of the data and their sources.

2. EXPLORATION OF THE DATA.

Table 1 compares economic measures and other elements relevant to an economic system for the Great Depression and the years 2007-11. It is immediately apparent from Table 1 that measures decline much more severely and persistently during the Great Depression. Some direct comparisons of standard economic measures are not possible, unfortunately. Collection of many measures of economic activity in use today begins only as theory develops in response to the Great Depression. For example, there is no measure of unemployment for the US during the Great Depression comparable to current measures. Additionally, economists working with national-account systems at one time focused primarily on GNP, rather than on GDP. Much more contemporary analysis for the measure GNP is available.[3] These differences illustrate the importance of theory to even mundane matters of economic analysis.

Item 1 in Table 1 displays information about the monetary system in place during each period. The monetary authority in both periods is the Federal Reserve System, but there are important differences in the monetary regime, policy mission, and policy constraints. Firstly, the US recognized the right of private individuals to exchange its currency for a fixed amount of gold until April 1933.[4] One important feature of all fixed exchange-rate systems is that they restrict discretionary control of the money supply by a monetary authority. The US recognized no obligation to exchange its currency at fixed rates in the years 2007-11. The differences between these two monetary regimes can engender

3 Table 1 reports GNP as the measure of output for the Great Depression and GDP for the years 2007-11.

4 Private holdings of monetary gold in the US were outlawed by executive order in April 1933. See Barber (1996).

different responses to identical economic conditions by the same monetary authority pursuing the same policy objectives.

Secondly, there is no explicit policy mission statement for the monetary authority during the Great Depression. No explicit constraints with respect to policy exist for this period, either. Both a policy mission statement and constraints that support a political system's economic objectives are important, in order to ensure relevant and desirable responses from a monetary authority. Ambiguity with respect to policy characterizes the monetary authority during the Great Depression.

The Federal Reserve System has a policy mission statement for the years 2007-11. This policy mission is subject to the constraints of maximum employment, price-level stability, and moderate long-term interest rates. The first constraint obligates the monetary authority to pursue its mission while balancing any effects identified on employment; the second constraint includes deflation as well as inflation.

Item 2 in Table 1 lists measures of total economic output for the two periods. Declines are more severe and persistent during the Great Depression than for the years 2007-11.[5] Item 3 allows no comparison of unemployment rates. Item 4 shows the greatest decline from the pre-recessionary peak in quarterly averages of a stock-price index. This measure was of greater importance anecdotally to contemporaries of the Great Depression, although ownership of stock equity is more widespread during the years 2007-11. The decline is almost twice as great during the Great Depression.

Item 5 in Table 1 compares declines in the price level that are concurrent with declines in output for the two periods.[6] There is a striking difference between the two periods, with the price level falling sharply and persistently during the Great Depression. Item 6 compares changes in the high-powered money aggregate coincident with the two downturns in output; both are of short duration, but the size of the decline is larger during the Great Depression. Item 7 shows a relationship for the monetary

5 The duration of below-trend real output is inconclusive thru 2011.

6 Measure of the price level is the implicit deflator for the respective measure of output.

aggregate “M1” similar to the price level in item 5. Item 8 compares the number of bank failures in years where both the quarterly price level and output declined. There is again a striking difference between the two periods; the number of bank failures during the Great Depression is much greater. The measures in items 5-8 of Table 1 are important to monetarist explanations of the Great Depression. They are the focus of analysis in this working paper.

Figure 1 depicts the money aggregate “M1” (M), the high-powered money aggregate (H), the ratio of checkable deposits to currency (D/C), and the ratio of checkable deposits to reserves (D/R), all for the years 1959-2011. These are central to monetarist explanations of price-level changes, and hence to its explanations of broader economic activity. Figure 1 shows that there is no discernible deviation of “M” or “D/C” from their respective trends for the years 2007-11, whereas there is discernible deviation for “H” and “D/R”.[7] These relationships are the objects of further analysis in this working paper.

3. ANALYSIS.

The monetarist explanations for the Great Depression's severity and persistence are supported broadly by the data in Table 1. A brief recitation of these explanations follows: subsequent to a downturn in economic activity, a large number of banks failed, causing downward pressure on the supply of money, to which the monetary authority did/could not respond. Decline in the price level ensued, generating further sustained, downward pressures on broader economic activity. It is noteworthy that the monetary regime contemporary with the downturn period of the Great Depression, and the absence of a policy mission and policy constraints, afforded few options to the monetary authority without direct intervention by higher political authorities.[8]

Analysis continues by examining whether or not data for the years after the classic expositions of monetarism are consistent with the following monetarist explanations for the Great Depression: (1),

7 Trend is calculated for each measure with respect to time thru 2007.

8 President Hoover supported publicly the conversion of currency to gold at fixed rates of exchange. See Brands (2008).

the severity and persistence of the Great Depression is attributed to a large and persistent fall in the price level; and (2), changes in the price level are a monetary phenomenon. Correlation of the price level with the money aggregate "M" and real output is listed in Table 2 for the years 1959-2011.[9] These correlations do not support rejection of the monetarist hypothesis that changes in the price level are a monetary phenomenon and that they have real economic consequences.

Table 1 shows no large decline in the price level for the years 2007-11, and Figure 1 depicts no discernible deviation of the money aggregate "M" from its trend. A weak monetarist conclusion would attribute the lower severity and weaker persistence of declines in measures of economic activity for the years 2007-11 to stability in the price level. A strong monetarist conclusion would attribute this directly to stability in the money aggregate "M". The data for the years 2007-11 do not support rejection of monetarist explanations for the Great Depression.

Stability in the money aggregate "M" for the years 2007-11 can be examined further using the following identity relation:

$$M = H \cdot \frac{D/R \cdot (1 + D/C)}{(D/R + D/C)} \tag{1}$$

, where, per monetarist explanations of the Great Depression, "H" is attributed behaviorally to the monetary authority, "D/C" to individuals, and "D/R" to financial intermediaries.[10] Figure 1 shows that "D/C" does not deviate from its trend for the years 2007-11; analysis continues with "H" and "D/R".

Figure 1 shows for the years 2007-11 no discernible deviation of the money aggregate "M" from its trend, while the high-powered money aggregate deviates positively, and the ratio "D/R" deviates negatively. Following from the identity relation in equation (1) and monetarist explanations of the Great Depression, behavior by the monetary authority (ΔH) completely offsets behavior by financial intermediaries ($\Delta D/R$), keeping the money aggregate "M" stable. A monetarist interpretation

9 Measure of the price level is the implicit GDP deflator.
10 See Temin (1976).

of observed price stability during the years 2007-11 is that the money aggregate "M" is stable with respect to its trend. This interpretation supports the assertion that the monetary authority acts within its second constraint to deliver price stability. Achievement of its stated policy mission, subject to the first constraint of maximum employment, is supported by the monetarist interpretation that behavior of the monetary authority averted a large decline in the price level, by way of averting a large decline in the money aggregate "M", thereby minimizing decline in economic output. The monetary authority is maintaining simply the trend growth in the money aggregate "M" by adjusting growth in the high-powered money aggregate, delivering jointly price stability and support to broader economic activity. The data for the years 2007-11 do not support rejecting these interpretations.

The other discernible behavior per monetarist explanations of the Great Depression depicted in Figure 1 is by financial intermediaries, through the ratio "D/R". A reasonable assumption within the framework of monetarist theory is that "D/R" will remain stable in the absence of great stress to the banking system. Competition and the opportunity cost of reserves to banks makes this assumption reasonable. The opportunity cost of reserves is expressed in the following equation:

$$(2) \qquad OC_R = R \cdot (1 + r)^t - R,$$

which is the interest income forgone. One possible explanation for instability in "D/R" is that as $r \rightarrow 0$, so does the opportunity cost associated with reserves. When the interest rate is low, "D/R" could be less stable. If so, this is a behavioral foundation for a limitation to policy response by a monetary authority.

An interesting debate about monetary policy in the 1930s concerns reserve requirements equal to 100% of deposits, where "D/R" is equal to 1, as a means to achieving near-perfect control of the money supply by the monetary authority.[11] The ratio "D/R" is less than 1 in the years 2009-11. This affords the monetary authority with a risk-free alternative to increasing high-powered money in order

11 See Barber (1996).

to increase the money aggregate “M”.

Other possible explanations for instability in “D/R” include imperfect competition in money markets and an insufficient quantity of good-quality borrowers. Regardless, a conclusion from monetarist theory is that instability in “D/R” necessitates action by the monetary authority to adjust “H”, so as to maintain stability in “M”, in order to deliver joint stability in the price level and economic activity. Data for the years 2007-11 do not support rejection of this conclusion.

The comparison of bank failures in item 8 of Table 1 shows that there are far fewer bank failures corresponding to the period of both price-level and output declines for the years 2007-11. The Federal Reserve System's policy response includes large purchases of bank assets during the years 2007-11. A monetarist interpretation is that the monetary authority prevented large and persistent decline in the price level by preventing bank failures through its purchases of bank assets. This interpretation of the consequences stemming from the monetary authority's behavior is consistent with its policy mission and policy constraints. It suggests preemptive action informed by an analysis consistent with monetarist theory.

Figure 2 depicts a short-run relationship between supply and demand for real quantities of money. The supply relationship, $M_S=f(H,D/C,D/R)$, restates generally the identity relation in equation (1), where changes to “H”, “D/C”, or “D/R” cause a shift of the supply curve depicted vertically in Figure 2. The demand relationship is a simple abstraction of the relationship between demand for money and both the interest rate (r) and a measure of total output (Y). The demand relationship with respect to the interest rate is an explicit movement along the downward-sloping demand curve, whereas a positive (negative) change in “Y” causes a positive (negative) shift of the demand curve. Price is expressed in real terms ($r-\pi$) to correspond with quantity expressed in real terms (M/P). Figure 2 is broadly consistent with many expositions of a market for money, and it can depict graphically the consequences of many relationships analyzed in this working paper.

4. CONCLUSIONS.

There are important differences in the monetary system during the Great Depression and the years 2007-11. The monetary regime during the Great Depression greatly restricts the options of the monetary authority to respond to declines in either money aggregates or the price level. This is not true for the years 2007-11. Further, a policy mission statement and policy constraints are in place for the years 2007-11, requiring the monetary authority to consider explicitly maximum employment and price stability. The response during the years 2007-11 is consistent with the monetary authority's policy mission and policy constraints.

Exploratory analysis of the data demonstrated differences between the Great Depression and the years 2007-11. Most importantly, the severity and persistence of declines in measures of economic output are much worse during the Great Depression. The data are consistent with monetarist explanations for the Great Depression, as price levels and the money aggregate “M” both decline sharply and persistently during the Great Depression. These measures do not decline severely or persistently for the years 2007-11, which does not conflict with monetarist explanations of the Great Depression.

The use of monetary aggregates and economic theory that does not provide explicit proofs for its assumptions is not popular currently. This paper's analysis produces insights without subjecting its working assumptions to rigorous skepticism. A simple test of the assumptions, using data from years subsequent to when those assumptions were first developed, does not reject them. The literature surveyed for this working paper is in many ways a response by its authors to directions in economic theory contemporary with the authors. It is noteworthy that there is an economic literature rich in both explanatory power and simplicity that was produced in response to the Great Depression.

5. TABLES AND FIGURES.

(A) TABLES 1-2.

TABLE 1: Comparison between the Great Depression and 2007-11

Item	Measure / Element	Great Depression	2007-11*
1.A	Monetary authority	Federal Reserve System	Federal Reserve System
1.B	Monetary regime	Gold standard (to April 1933)	Fiat money
1.C	Monetary authority's policy mission statement	N/A	Maintain long-run growth of the monetary and credit aggregates commensurate with the economy's long-run potential to increase production
1.D	Monetary authority's policy constraints	N/A	Maximum employment, price stability, moderate long-run interest rates
2.A	Decline in nominal output	53.4%	3.9%
2.B	Decline in real output	36.2%	5.1%
2.C	Rate of decline in real output (annualized)	12.7%	3.5%
2.D	Duration of decline in real output	14	6
2.E	Duration of below-trend real output	48	+16
3.A	Increase in unemployment rate	N/A	5.1%
3.B	Duration of elevated unemployment rate	N/A	+14
4.	Maximum decline in DJIA index of stock prices	84.8%	42.6%
5.A	Decline in price level	26.9%	0.1%
5.B	Rate of decline in price level (annualized)	8.8%	0.4%
5.C	Duration of decline in price level	14	1
6.A	Decline in high-powered money	3.6%	0.1%
6.B	Rate of decline in high-powered money (annualized)	7.2%	0.6%
6.C	Duration of decline in high-powered money	2	1
7.A	Decline in money (M1)	27.9%	0.9%
7.B	Rate of decline in money (M1 (annualized))	8.6%	1.9%
7.C	Duration of decline in money (M1)	15	2
8.	Number of bank failures during period of decline in price level**	9,805	140

Periodicity of items 1-7 is quarterly; item 8 is annually.

* Some measures are provisional as they remain depressed into 2012. Those measures are depicted thru 2011 by the prefix '+'.

** 1929-33; 2009.

TABLE 2: Correlation with Price Level, 1959-2011

	P
M	97.5%
Y	98.2%

(B) FIGURES 1-2.

FIGURE 1.A: Monetary Aggregate M
(1959-2011)

FIGURE 1.B: Monetary Aggregate H
(1959-2011)

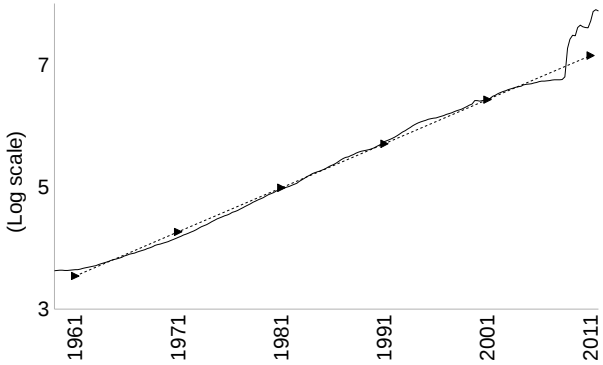


FIGURE 1.C: Monetary Ratio D/C
(1959-2011)

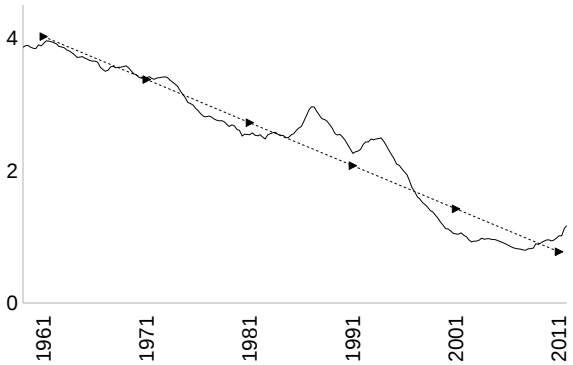


FIGURE 1.D: Monetary Ratio D/R
(1959-2011)

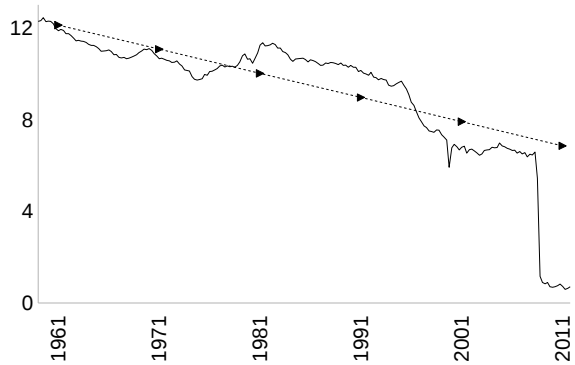
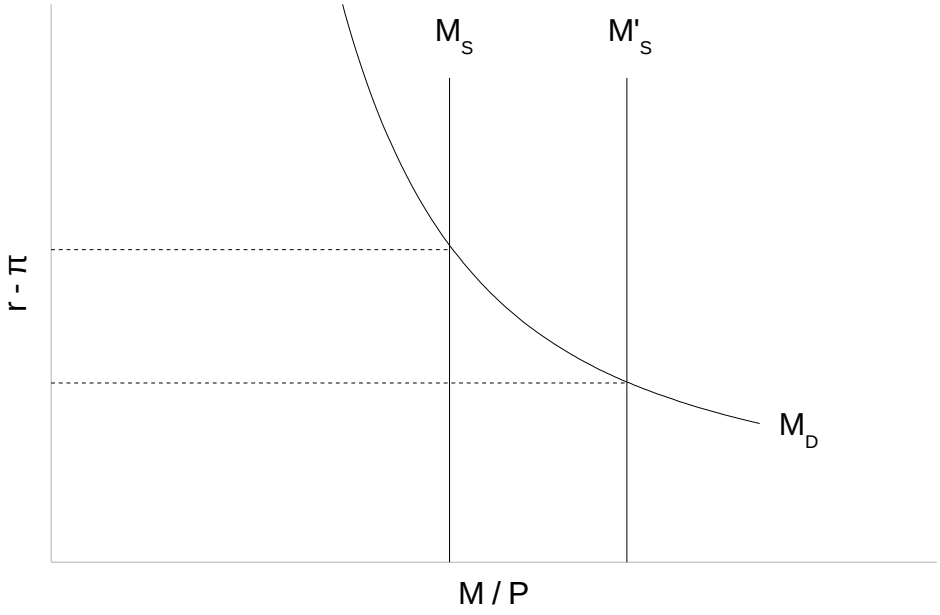


FIGURE 2: MS(H,D/C,D/R) = MD(Y,r)



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