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The Money View Versus the Credit View

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Abstract

We evaluate the relative merits of the "money view" and "credit view" as accounts of macroeconomic outcomes. We first lay out core elements of the money view as articulated by Friedman and Schwartz. We then reconsider the findings regarding the money view versus the credit view in recent literature. Schularick and Taylor's (2012) result that credit outperforms money in predicting financial crises is fully consistent with the money view of macroeconomic outcomes; consequently, one needs to examine those outcomes directly to discriminate between the money view and the credit view. Our analysis of the postwar evidence suggests that money outperforms credit in predicting *economic downturns* in the 14 countries included in the Schularick-Taylor database. For our reexamination of the evidence, we have constructed new, more reliable, annual data on money.

JEL Classification: E32; E51.
Keywords: money view, credit view, recessions, financial crises.

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1 Introduction

A considerable literature has examined whether the links between the financial sector and business cycles are better understood using monetary variables or with variables specifically measuring a credit mechanism (see, for example, Bernanke, 1983; Friedman, 1986; Romer and Romer, 1990). Recently, Gertler (2016) suggests that a series of recent research papers culminating in Jordá, Schularick, and Taylor (2016) has settled the matter. Gertler (2016, p. 272) observes: "John Gurley once said, 'Money is a veil, but when the veil flutters the economy sputters.' What we learn from Jordá, Moritz [Schularick], and Taylor is to replace the word money with credit."

It is not controversial to contend that credit factors likely played a large role in the U.S. recession that followed the global financial crisis. But pre-2008 postwar U.S. business cycles are a different matter. For those episodes, an explanation in the spirit of Friedman and Schwartz's (1963) monetary account of business cycle fluctuations has been widely accepted. This explanation assigns an important role to monetary policy in driving business cycles, but it does not suggest that a lending channel features prominently. The monetary account has long informed theoretical and empirical work in macroeconomics designed to explain postwar U.S. business cycles. Mankiw (1989), for example, argued that the Friedman-Schwartz account motivated the development of New Keynesian analysis, while Stock and Watson (1989) suggested that money did well in formal econometric prediction of postwar U.S. output behavior.[1] Furthermore, in comparing money-oriented explanations with credit-oriented explanations of postwar U.S. output fluctuations, Romer and Romer (1990) found that the money view performed better. Such interpretations of the evidence from the second half of the twentieth century would suggest that credit channels are crucial for understanding output dynamics in 2008–2009, but that prior postwar historical business cycles do not necessarily require reinterpretation as credit-driven events. As Ben Bernanke has recently said (Bernanke, 2018, pp. 2–3), it is only "possibly" the case that credit factors figure prominently in the generation of the "more ordinary" or "garden variety" postwar U.S. business cycles that were not associated with large-scale financial crises of the 2007–2008 type.

In light of this background, it is worth taking a closer look at the evidence regarding money versus credit that has appeared in recent research, and in particular in the important series of papers to which Gertler (2016) referred. Of the three core studies conducting such an examination—Schularick and Taylor (2012), Jordá, Schularick, and Taylor (2013), and Jordá, Schularick, and Taylor (2016)—it turns out that the key article examining the role of money versus credit in pre-2008 postwar macroeconomic behavior is Schularick and Taylor (2012). Schularick and Taylor (2012, pp. 1030, 1035) juxtapose what they call the "money view" associated with "canonical monetarists like Friedman and Schwartz (1963)"—in which monetary aggregates are important for understanding macroeconomic outcomes—with the "credit view," which emphasizes the significance of movements in credit

[1] As we discuss below, the money view does not necessarily require assigning a direct role to the money stock in aggregate output determination; rather, the effects of monetary policy can be transmitted via interest rates under this view. Indeed, as Romer and Romer (2013) stress, the simplest interpretation of Friedman and Schwartz's (1963) money view is one in which the transmission mechanism of Federal Reserve actions on quantities is via affecting the interest rate in an IS equation that features a single interest rate. For the purposes of contrasting it with the credit view, the key characteristic of the money view is that it sees monetary policy as operating via monetary policy's generation of liquidity and portfolio-balance effects on interest rates, working in conjunction with short-run price or wage stickiness, and does not rely on the presence of features specifically relating to credit.

aggregates (in particular, aggregate commercial bank loans) for the economy. These authors regard their findings as strongly against the money view and in favor of the credit view.[2]

In this paper, we reexamine the evidence on the money view versus the credit view of macroeconomic outcomes. In doing so, we find it necessary, in Section 2, to go back to the Friedman and Schwartz (1963) reference and other relevant writings of Milton Friedman and Anna Schwartz. Our discussion provides an accurate definition of the money view as expounded by Friedman and Schwartz. Having defined the money view correctly, we are in a better position to compare the money and credit views of macroeconomic outcomes.

We further argue that a comparison, as in Schularick and Taylor (2012), of credit growth and monetary growth as financial-crisis predictors does not provide a valid and clear-cut test of the money view of macroeconomic outcomes—specifically, the output fluctuations for which the money and credit theories provide rival explanations. This is because, in the postwar period, financial-crisis dates are not closely connected to recession dates, and because the money view does not involve prediction of financial crises. We reexamine the postwar evidence by conducting more direct tests of the money view against the credit view. For these tests, we have constructed new annual series on money for fourteen countries. The construction of our annual nominal money series is based on all twelve monthly observations on money (or four quarterly observations for the infrequent cases in which monthly data are unavailable); this contrasts with Schularick and Taylor (2012), whose procedure for constructing annual data on nominal money discards eleven of the twelve monthly observations. Our way of constructing nominal money implies a series of real money that is internally consistent, as it means that the same time aggregation is used for the numerator (money) and the denominator (the price level). Notably, the results (given in Section 4) based on our new series are favorable to the money view. Specifically, money outperforms credit in predicting postwar economic downturns in fourteen countries.

Our clarification of the money view, improved money data, and empirical results lead us to conclude (in Section 5) that, for the the period up to 2008 that was the concern of Schularick and Taylor (2012), postwar fluctuations are better understood using monetary aggregates than with credit aggregates. Two appendices to the paper give our data sources and additional empirical results.

2 Characterizing the money view

It is widely acknowledged that the "money view" is inevitably associated with Milton Friedman's view of the business cycle and, in particular, with the position articulated in Friedman and Schwartz (1963). In this section, we lay out and document three characteristics of the money view, in order to provide an accurate characterization of that view. Specifically, we outline what the money view is intended to describe (Section 2.1), what the money view predicts (Section 2.2), and the status that the money view assigns to money *vis a vis* credit (Section 2.3).

[2] The subsequent study of Jordá, Schularick, and Taylor (2013), focused on credit/output relationships, with no mention appearing in the article's main text or footnotes of money, the money view, or Friedman. Jordá, Schularick and Taylor (2016) likewise did not mention the money view or Friedman. They presented some results on money, but in these results, their "post-Bretton Woods" postwar sample was defined to include post-2008 data. For this reason, their results do not bear specifically on the issue of the validity of the money view *vis-a-vis* the credit view for pre-2008 postwar business cycles.

2.1 The money view is an account of output fluctuations—not financial crises

As Bordo, Rappoport, and Schwartz (1992, p. 196) note in their section on "Money Versus Credit," the concern of both advocates of the money view (including Friedman and Schwartz, 1963, and more recently Romer and Romer, 1990) and proponents of the credit view (including, for instance, Benjamin Friedman, 1983, 1986) has been to "explain variations in real output."[3]

During the postwar period, financial crises are not invariably associated with notably adverse macroeconomic outcomes, in particular downturns in output. For example, in the financial-crisis classifications of many authors, including Reinhart and Rogoff (2009) and Schularick and Taylor (2012), 1984 corresponds to a year of financial crisis for both the United Kingdom and the United States. Yet neither of these countries had a recession in 1984 or at any point later in the 1980s. Another example is Canada. Canada had no financial crisis in the postwar period, according to standard chronologies, but it did have two recessions in the 1959–2008 period. Consequently, analyses that evaluate the money view versus the credit view on the basis of financial-crisis dates would omit Canada's experience; but an evaluation of the merits of the money and credit views for the understanding of macroeconomic outcomes should include Canada.

These examples likely underscore the importance of cross-checking traditional chronologies of financial crises—an undertaking on which Romer and Romer (2017) make major strides. However, as our interest is in the relationship between financial (money and credit) aggregates and the economy—rather than in the relationship between financial aggregates and financial crises—we do not reopen the matter of financial-crisis chronology in this paper. For our purposes, the key points are that financial-crisis dates were not invariably associated with recessions, and that many countries' recessions were not associated with financial crises.

The absence of a firm correspondence between financial crises and economic downturns is demonstrated in Table 1. The table shows that in 1959–2008, 20 years (in the annual data on the 14 countries in the Schularick-Taylor dataset) are classified as seeing the onset of a financial crisis in a country, but about a quarter of these financial crises were not associated with recessions.[4] Furthermore, as Table 1 documents, many recessions (50 of 65) in this half-century did not feature financial crises, and a good number (14 of 22) of longer recessions (defined as having at least two consecutive years of negative growth) were not associated with financial crises. Evidently, for the postwar period, financial crises are not very clear indicators of output behavior. Furthermore, as already indicated, the money view and the credit view are rival accounts of output dynamics (macroeconomic fluctuations). Consequently, it is preferable to test these views using data that refer *directly* to output behavior—as we do in Sections 3 and 4 below—instead of using a financial-crisis indicator.

[3]Indeed, it was the fact that Milton Friedman's money view pertained to output that led to the Gurley (1961) characterization of that view cited in the Gertler (2016) passage that we quoted in the introduction, The precise Gurley quotation is (1961, p. 308): "Money is a veil, but when the veil flutters, real output sputters." See also Lucas (1972, p. 121).

[4]Recessions are defined as periods in which an observation of negative growth in real GDP occurred after a period of positive growth. Consecutive years of negative growth are classified as part of a single recession.

Table 1: Relationship between financial crises and recessions, 1959–2008

	Original Schularick-Taylor sample[1]	Including 2009 recessions[2]
1. Total number of financial crises	20	20
2. Total number of all recessions[3]	56	63
2a. Multi-year recessions[4]	24	24
3. Number of financial crises associated with a recession in the same year or the following year	15	15
3a. Multi-year recessions	9	9

[1] Source: Schularick and Taylor (2012) dataset, included in the authors' replication materials on Alan Taylor's website, http://amtaylor.ucdavis.edu/.
[2] These totals include recessions that, in the annual data, occurred in 2009 (which are outside Schularick and Taylor's sample period) in the recession total. For multi-year recessions, the number includes those recessions that took place in 2008–2009 in the annual data.
[3] Recessions are defined as observation(s) on negative growth of real GDP in the annual data, after a period of positive growth. Schularick and Taylor's (2012) data on real GDP were used for ascertaining years of negative output growth, with the following exceptions: (*i*) The FRED series on Germany's annual real GDP was used, as the Schularick-Taylor real GDP series for Germany has a major break at the time of reunification; (*ii*) 2008 was classified as a recession year for the United Kingdom, as U.K. output growth is positive for 2008 in Schularick and Taylor's dataset, but not in FRED.
[4] For multi-year recessions, the number in the first column includes those recessions that took place in 2008–2009. FRED data (Federal Reserve Bank of St. Louis) were used to ascertain growth rates in 2009 and 2010.

2.2 The money view and financial crises

In this subsection, we show that the money view of Friedman and Schwartz does not predict that monetary expansion predicts financial crises. Nor is the money view inconsistent with the notion that rapid credit growth predicts financial crises.

This interpretation of the money view, which we document presently, contrasts with some characterizations of the credit view—in particular, the version of the credit view in which credit booms "go bust." According to this account, a period of rapid growth in bank lending precedes a period of contraction in bank loans. Thus, in this account, credit predicts financial crises in the following way: *positive* bank lending leads to the period of *negative* growth in loans that frequently occurs in financial crises.[5]

Such an interpretation presupposes that the money view is symmetric with the credit view: that the money view takes rapid monetary growth as a precursor of coming financial (and economic) downturns. On this interpretation of the money view, rapid monetary (and economic) expansions automatically give rise to monetary (and economic) downturns. However, this was *not* the money view expressed by Friedman and Schwartz. On the contrary, Friedman and Schwartz (1963, p. 699) made their position explicit that the U.S. monetary collapse of the 1930s was "not an inevitable consequence of what had gone before," and Friedman (1964) indicated that, in his vision of cyclical fluctuations, the scale of economic downturns was unrelated to the size of the preceding economic expansion. The Friedman-Schwartz money view of the cycle did not reflect a belief that output contractions flowed

[5] On this, see, for example, page 1045 of Schularick and Taylor (2012).

from monetary expansions; instead, they contended that, at the business cycle frequency, money tended to be *positively* correlated with current and future output.

Consequently, from the perspective of the money view, if a period of negative monetary and output growth occurs after a period of rapid monetary growth, this is likely a reflection of the monetary policy decisions of the authorities—not of the structural relationship between monetary fluctuations and economic fluctuations. Because the money view does not offer money as a predictor of financial crises and does not preclude the possibility that credit predicts such crises, one cannot conclude against the money view on the basis of evidence that credit predicts financial crises better than does money. That being so, it is desirable to examine more directly the money view's prediction of a positive money/output relationship—as we do in this paper.

2.3 The money view does not regard the money stock as a proxy for credit

Friedman (1970, pp. 18–19) lamented "the failure of the monetary authorities to distinguish money from credit and their related emphasis on the credit effects of monetary actions." He went on to stress the sharp difference in perspective between himself and those who, when considering the relationship between financial quantities and the economy, were "really concentrating on bank assets and the role of banks in the credit market" instead of on the money stock. Friedman specifically indicated that he disagreed with those whose interest in monetary aggregates relied on those aggregates' status as a "bank credit proxy." In a similar vein, James Tobin's review of Friedman and Schwartz's *Monetary History* noted (Tobin, 1965, p. 466): "The authors are strongly opposed to giving attention to 'credit' as against 'money.'"

These points highlight the fact that advocates of money do not see monetary aggregates' importance as arising from money's ability to proxy the dynamics of credit.[6] Further, advocates of the money view in the research literature have not, in fact, rested their case on the notion that money and credit move together. On the contrary, the money view is recognized as depending on distinct transmission mechanisms, such as portfolio-balance channels, from those associated with the credit view (see, for example, Bordo and Schwartz, 1979, p. 56; Romer and Romer, 1990).[7] Indeed, Friedman (1970, pp. 18–22) was emphatic that his belief in money's importance for economic fluctuations did not rely on any requirement that money and credit move together.[8]

To sum up our discussion in this section: The money view focuses on output behavior

[6] These points likewise suggest that it would not be appropriate to characterize monetarists as using money to proxy credit—and that empirical deviations of credit from money should not be regarded as themselves constituting evidence in favor of the credit view. These conclusions are in line with the picture of the money view implied by the literature already cited, as well as with Schwartz's (1969, p. 12) observation: "However money is defined, the evidence is clear that it changes at very different rates than do particular types of bank credit or total bank credit."

[7] Bernanke (1983, 2012), although advocating the credit channel, acknowledged that the money channel is conceptually distinct and empirically important.

[8] Furthermore, as a matter of principle, it is not the case that during episodes in which the growth rates of money and credit depart from one another, monetary growth is necessarily of less value than credit growth in understanding economic fluctuations. Indeed, while Benjamin Friedman (1983, 1986) argued that credit was more useful than money in understanding U.S. output behavior, the subsequent work of Friedman and Kuttner (1992, p. 477) found that when data from the 1980s (a decade of considerable divergence between bank asset growth and monetary growth) were added to a 1960–1979 estimation sample, M2 growth remained a significant predictor of U.S. output growth, while growth in their credit series did not.

and predicts a positive relationship between money and real economic activity over the business cycle. It does not contend that rapid monetary growth predicts financial crises. Nor is it inconsistent with the notion that credit does better than money in predicting financial crises. The money view does suggest that money should outperform credit in predicting economic downturns, but the dates of such downturns are not well proxied in the postwar period by financial-crisis dates. Finally, the emphasis on the behavior of the money stock implied by the money view does not rest on money being a stand-in for credit.

3 Defining money

In this section, we discuss our development of new, "streamlined" money data. After examining the Schularick-Taylor (2012) data on monetary aggregates, we found it necessary to improve upon their data construction effort in a number of ways to create our streamlined money series.

The standard practice for measuring monetary aggregates in empirical work using annual data is to take *annual averages* of the series. For example, Balke and Gordon (1986)—one of the fundamental references on U.S. historical data—described their annual data on M2 for 1875–1983 as being "averaged from the quarterly M2 series" (p. 789). Growth rates can then be computed as the log-differences of the annual averages.[9] Furthermore, previous studies of monetary data such as Hendry and Ericsson (1991) have highlighted the important effect that breaks in monetary series can have on econometric results, if adjustment for the breaks is not made prior to estimation.

This background highlights a couple of respects in which Schularick and Taylor's (2012) approach to constructing data on monetary aggregates required improvement. At the outset, it must be stressed that their undertaking of generating a "newly assembled dataset on money and credit" (p. 1031) is to be applauded; and we condition on their credit data throughout our analysis below.[10] But their construction of *monetary* data deviates from best practice in the following ways: (1) For a few countries, their money series contain major untreated series breaks; a couple of key examples are highlighted below. Failure to allow for these breaks leads to materially lower money/output correlations for these countries. (2) For the vast majority of the countries in their sample, the annual observation on money is an *end-of-period* value, while, as indicated above, theoretical and empirical approaches instead imply that the appropriate money variable is an *average-of-period* series. As is confirmed empirically below, end-of-period money data produce choppiness and unnecessary volatility in the annual observations on monetary growth—features that tend to make the correlation between money and output lower than it would otherwise be.

Additionally, the price-level series that they use for each country are *annual-average* series. Therefore, their observations on real money typically consist of an end-of-period series divided by an average-of-period series. This combination does not appropriately convey the purchasing power of end-of-year money, for the denominator includes old values of the price level.[11]

[9] See, for example, Barro's (1977) classic study of the relationship between money and real economic activity, especially p. 102.

[10] We also condition on Schularick and Taylor's real GDP data (except in the case of Germany) and price-level (CPI) data. Furthermore, we follow their practice of ending the sample period in 2008.

[11] Even in models in which lagged or expected future price levels enter the structural equations, it remains the case that the price level relevant for defining real money balances is the index that refers to the same period as that for nominal money balances (see, for example, Andrés, López-Salido, and Vallés, 2006). The

In light of these considerations, we improve on these series included in their dataset by constructing, for the postwar period, "streamlined" broad money series for each of the countries in their study. The streamlined monetary aggregates that we construct are adjusted for major series breaks and consist of annual averages derived from the underlying monthly or quarterly monetary data for each country.

We proceed in this section to illustrate the importance of our use of streamlined money series for the analysis of the postwar behavior of money and the dynamic correlations of money and output. Then, in Section 4, we evaluate the money view and credit view in terms of their ability to predict output contractions (recessions) in the postwar period (which, following Schularick and Taylor, we take as spanning through 2008). We find that, on this criterion, money has a more important and reliable relationship with macroeconomic outcomes than does credit.

3.1 Construction of streamlined money series

As discussed above, for the fourteen countries considered by Schularick and Taylor (2012), we have constructed our own broad money series—streamlined monetary data—by obtaining annual averages from monthly or quarterly observations. We commence these series in 1957 because that is when one key data source—the International Monetary Fund's *International Financial Statistics* (*IFS*)—starts reporting data for many countries on a monthly or quarterly basis.[12] In order to have a complete and (as far as possible) break-free series for each country, we have used the *IFS* data in conjunction with information from other international databases as well as country-specific sources. Details of the construction of our monetary series are given in Appendix B.

We now illustrate, by considering a selection of countries' data, a few of the virtues of our streamlined monetary data.

3.2 Selected country comparisons

The difference implied by our use of averages is demonstrated in Figure 1, which compares the monetary-growth data arising from the two approaches. The first panel of Figure 1 shows U.S. broad money growth series from the two datasets. In both cases, money is measured by M2, the original series exhibits greater choppiness; this exemplifies the extra variability in series that typically arises from the sampling of end-of-year values instead of annual averages.[13] It is also important to note an additional problem, discussed further in Section 3.3 below: the use of end-of-year data for period t leads to a money series that refers to a date later than their observation for period-t output (which is an annual average). Consequently, for any year's observations, end-of-year monetary data in effect refer to a period *following* the period associated with the output data. This implies that

fact that Schularick and Taylor (2012) use the average-of-year price level in their real-money calculations also amounts to an implicit acceptance that the appropriate money series is an average-of-year concept. So too is their use of average-of-year data on nominal money for one of the countries in their sample (Norway).

[12]Defining the postwar period as starting in the late 1950s also has the virtue of omitting the immediate post-World War II years, in which wartime economic controls remained prevalent in several countries, as well as the Korean War period.

[13]The preferability of period-average data over end-of-period data was also forcefully stressed (in the context of a discussion of the appropriate calculation of monthly data) by Milton Friedman (1983, p. 340), who pointed to the increase in variability implied by end-of-period sampling of series.

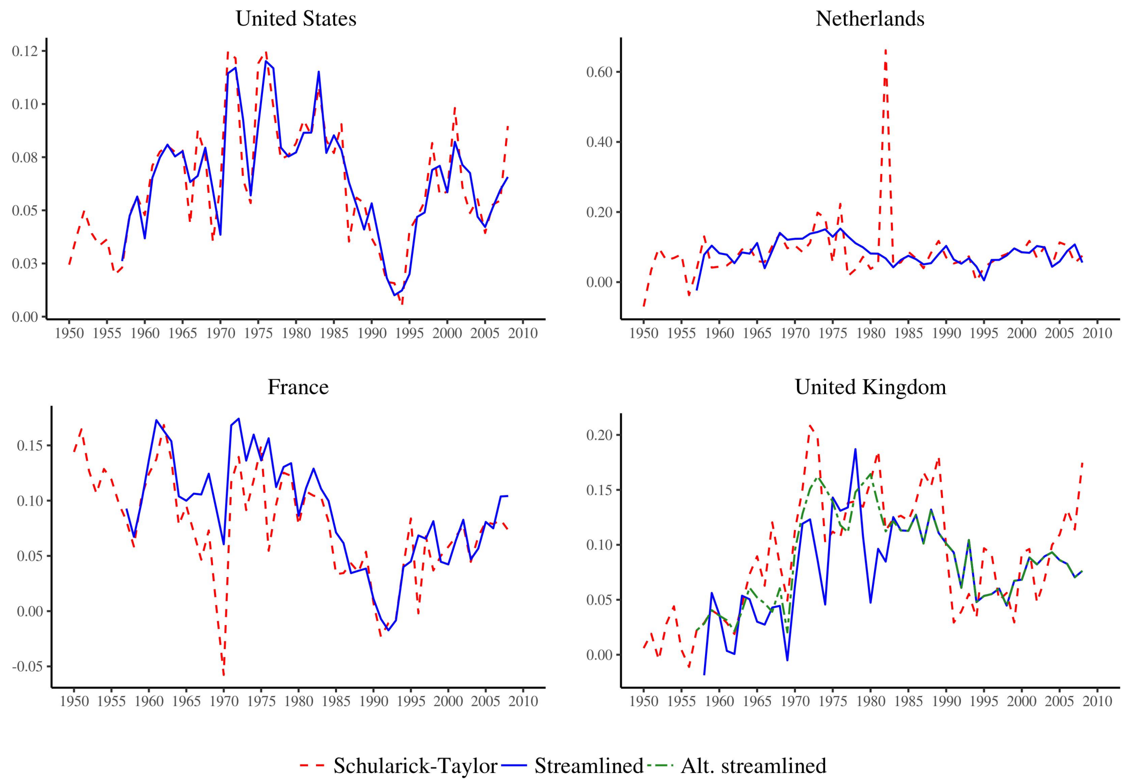

Figure 1: Measures of nominal broad money growth

evaluations of the dynamic relationship between the growth rates of money and output would not be reliable if one used end-of-year monetary series.

The volatility of end-of-year data on money is also evident in the next country considered: the Netherlands. As the top-right panel of Figure 1 shows, our streamlined series for monetary growth in this country is smoother. A further problem in this instance is that for the Netherlands the original series has a very severe break (of well over 50 percent of the level of the series) in the early 1980s. This break—clearly visible in the panel—has a material effect on the correlation between real broad money growth and the same year's output growth for the Netherlands. Using these data on money, this correlation is negative and insignificant for 1959–2008 (-0.13). In contrast, when our streamlined series for the Netherlands' monetary growth (a series that relies on sources that avoid the break) is used for the same period, there is a positive and statistically significant correlation (0.32).

The third country we consider is France (bottom-left panel of Figure 1). Monetary growth for France displays a sharp series break in 1970; in our money data construction, we avoid this break. Our streamlined series for France's money stock has a notably stronger relationship with France's real GDP. For example, for 1959–2008, the correlation between real money growth and the same year's output growth is 0.21 using the original money series, compared with 0.53 using our money series.

The final country we consider in these selected comparisons is the United Kingdom (bottom-right panel of Figure 1). We use an M2 series (also called "Retail M4") to compute monetary growth from 1984 onward. Over 1984 to 2008, the resulting streamlined series

Table 2: Means and standard deviations of nominal monetary growth: Schularick-Taylor series and streamlined series

	Schularick-Taylor		Streamlined series		Standard deviations: Ratio of Schularick-Taylor to streamlined series
	Mean	Std. dev.	Mean	Std. dev.	
Australia	0.103	0.048	0.095	0.044	1.087
Canada	0.085	0.046	0.090	0.036	1.281
Denmark	0.085	0.061	0.087	0.045	1.337
France	0.071	0.047	0.090	0.049	0.976
Germany	0.081	0.041	0.076	0.034	1.199
Italy	0.108	0.056	0.105	0.054	1.039
Japan	0.094	0.066	0.095	0.066	1.002
Netherlands	0.091	0.092	0.086	0.033	2.826
Norway	0.090	0.033	0.090	0.033	1.006
Spain	0.124	0.055	0.131	0.045	1.213
Sweden	0.076	0.040	0.073	0.036	1.113
Switzerland	0.059	0.034	0.062	0.031	1.082
United Kingdom	0.101	0.049	0.079	0.039	1.251
United Kingdom (Alt. M)	0.101	0.049	0.089	0.040	1.235
United States	0.067	0.028	0.067	0.026	1.072

exhibits behavior very different from the original series, as is brought out in Figure 1.[14] In order to have a money series that covers the years prior to the early 1980s—the period for which U.K. M2 data are not available—we have constructed two alternative U.K. monetary series: one ("streamlined") using annual averages of M1 data and the other ("alternative streamlined") using annual averages of a broader U.K. monetary total. Both series are joined to the U.K. M2 series that begins in the 1980s; consequently, although we use two streamlined money series for the United Kingdom, the two series have identical growth rates from 1984 onward, as Figure 1 indicates. In our empirical exercises below, we provide results using each version of our streamlined U.K. monetary series.

3.3 Summary of comparisons of the money series

Table 2 provides evidence on the differences between the original and streamlined monetary-growth series by reporting series means and standard deviations. The money series tend to have similar means in each country, but the use of the streamlined series delivers lower standard deviations. This difference reflects the extra measurement error induced by approximating money's behavior for the whole year by its value in a single month.

Furthermore, the December observation tends to be unrepresentative of behavior of the money stock *during* the year. In particular, being the final observation for the year, the December observation is tilted toward containing information that, when the data are correctly measured as annual averages, is actually contained in the observation for the *following* year. This fact is brought out in Table 3, in which we calculate the correlations of the original Schularick-Taylor monetary growth series with (i) the same year's stream-

[14]For their dataset, Schularick and Taylor (2009, p. 32) give the money series they use as "M2 or M3." However, for the final few decades of their sample period, they actually used (end-of-period) M4 for the United Kingdom.

Table 3: Correlations of Streamlined and
Schularick-Taylor Money Growth, 1959–2008

	Correlation of streamlined monetary growth and Schularick-Taylor monetary growth of k years earlier		
	$k = 0$	$k = 1$	$k =$ 0–1
Australia	0.783	0.521	0.776
Canada	0.803	0.802	0.874
Denmark	0.722	0.635	0.847
France	0.794	0.646	0.812
Germany	0.753	0.514	0.730
Italy	0.774	0.792	0.826
Japan	0.978	0.969	0.994
Netherlands	0.178	0.102	0.205
Norway	0.993	0.644	0.894
Spain	0.879	0.826	0.917
Sweden	0.728	0.699	0.873
Switzerland	0.892	0.719	0.904
United Kingdom	0.581	0.484	0.575
United Kingdom (Alt. M2)	0.739	0.749	0.803
United States	0.887	0.816	0.961

Note: "$k =$ 0–1" refers to the average of the current and first lag of the Schularick-Taylor monetary growth series.

lined monetary growth, (ii) the following year's streamlined monetary growth, and (iii) the average of the current and following year's streamlined monetary growth.

Two notable features emerge from the table. First, in two cases, the original monetary growth series is more correlated with the next year's than with the current year's streamlined monetary growth. Second, in 11 of the 14 relevant cases, the original monetary growth series has a stronger correlation with the forward-looking moving average of streamlined monetary growth than with the current year's streamlined monetary growth.[15]

Thus, the end-of-year sampling creates two problems: Table 2 shows that the sampling makes the original monetary growth series noisier than a correctly-time-aggregated monetary growth series, while Table 3 indicates that a second problem is that the original series, although intended to measure the current year's monetary growth, tends instead to be a leading indicator of the correctly-measured monetary growth concept.

3.4 Money and output: correlation evidence

As already noted, Schularick and Taylor (2012) judged the money/output and money/credit relationships only indirectly, on the basis of the relationship between the financial aggregates

[15] The relevant cases do not include Norway, for which Schularick and Taylor (2012) did use annual-average data for their money series.

and financial crises. However, direct examination of the relationship between financial aggregates and output is preferable. We pursue this matter in Section 4. As preliminary evidence, we show in Table 4 the correlations of output growth with real monetary growth and with real credit growth. As in Schularick and Taylor (2012), real credit growth is measured by log-differences of the real value of their bank loans series. We consider two series for growth in the real money stock: real money growth derived using Schularick and Taylor's monetary series, and real money growth using our streamlined monetary data. In deciding what lags to consider, we used Friedman's (1970, p. 7) suggestion that movements in U.S. monetary growth typically precede movements in output growth by about nine months.[16] On annual data, a lag of this length could imply that output growth has its highest correlation with monetary growth of the current year ("lag 0"), of the prior year ("lag 1"), or an average of the current and prior years ("lag 0–1"). Therefore, for each country, we computed for 1959–2008 the (output growth, real growth in financial aggregate) correlation for each of these lags.

In Table 4 we summarize this exercise by reporting the maximum correlation (across these three lag choices) for each country and each aggregate.[17] The table indicates that the use of streamlined monetary aggregates raises the monetary growth/output growth correlations for 13 out of 14 countries. In addition, for 11 out of 14 countries, the correlation between streamlined monetary growth and output growth is higher than the correlation between credit growth and output growth. And in the case of those countries (the United Kingdom, the Netherlands, and the United States) for which the credit/output correlation is higher than the money/output correlation, the latter correlation is uniformly significantly positive and, in certain cases, fairly sizable. Specifically, the value of the correlation is 0.33 for the Netherlands, 0.55 for the United Kingdom (or 0.44 using the alternative U.K. money series), and 0.54 for the United States.

4 Money versus credit as recession predictors

As indicated earlier, Schularick and Taylor (2012) compared the ability of credit growth and monetary growth to account for macroeconomic outcomes by performing separate logit regressions, thereby ascertaining the effect of each of these financial variables on the probability of the onset of a financial crisis. However, a more appropriate approach in evaluating the usefulness of the money view and the credit view—which are both accounts of macroeconomic fluctuations—would use information on recessions directly. That approach is the focus of this section.

As a preliminary step, we re-run Schularick and Taylor's (2012, Table 5) main regression for their 14-country dataset for our sample period of 1963–2008.[18] The regression sample

[16] Friedman's generalization was based on the relationship between nominal monetary growth and (real and nominal) aggregate spending growth.

[17] Although they used real money growth in their regressions and drew conclusions about the money/output relationship, Schularick and Taylor (2012) did not specifically present money growth/output growth correlations. Jordá, Schularick, and Taylor (2016, pp. 241–242) do report some such correlations using Schularick-Taylor (2012) money series, extended in time beyond 2008. Their results therefore do not bear specifically on pre-2008 postwar money/output relations; in addition, they do not contemplate dynamic relationships and they use monetary data that have the shortcomings described above. In contrast, we consider the period up to 2008 in isolation, use our streamlined monetary aggregates, and compute correlations of output growth with both current and prior monetary growth.

[18] We have used the replication code provided by the authors among the replication materials for their paper at Alan Taylor's website http://amtaylor.ucdavis.edu/; the later regressions are obtained from this

Table 4: Dynamic correlations of output growth with monetary and credit series, 1959–2008

	Real loans growth	Real broad money growth (Schularick-Taylor series)	Real broad money growth (streamlined series)
Australia	0.393 (lag 0)	0.546 (lag 0)	0.551 (lag 0)
Canada	0.457 (lag 0)	0.389 (lag 0–1)	0.482 (lag 0–1)
Denmark	0.285 (lag 0)	0.294 (lag 0–1)	0.477 (lag 0–1)
France	0.541 (lag 0–1)	0.309 (lag 1)	0.580 (lag 0–1)
Germany	0.549 (lag 1)	0.524 (lag 1)	0.641 (lag 1)
Germany (Alt. GDP)	0.708 (lag 0–1)	0.651 (lag 0–1)	0.766 (lag 0–1)
Italy	0.500 (lag 0–1)	0.570 (lag 1)	0.617 (lag 1)
Japan	0.688 (lag 0–1)	0.797 (lag 0–1)	0.808 (lag 0–1)
Netherlands	0.437 (lag 0–1)	0.024 (lag 1)	0.327 (lag 0–1)
Norway	0.180 (lag 0)	0.176 (lag 0)	0.194 (lag 0)
Spain	0.337 (lag 0–1)	0.623 (lag 0–1)	0.699 (lag 0–1)
Sweden	0.153 (lag 0–1)	0.374 (lag 0–1)	0.415 (lag 1)
Switzerland	0.583 (lag 1)	0.616 (lag 1)	0.660 (lag 1)
United Kingdom	0.609 (lag 0)	0.468 (lag 0)	0.545 (lag 0–1)
United Kingdom (Alt. M)	0.609 (lag 0)	0.468 (lag 0)	0.440 (lag 0)
United States	0.656 (lag 0)	0.587 (lag 1)	0.537 (lag 1)

Note: As the correlations are obtained from a sample of 50 observations, correlations are statistically significant at the conventional 5 per cent level if they exceed about 0.275 in absolute value. “Alt. GDP” uses FRED data on Germany’s real GDP.

period starts in 1963 because our data on streamlined monetary growth start in 1958 and regressors such as monetary growth appear with five lags in Schularick and Taylor’s (2012) regressions.[19] The regression specification is as follows:

$$logit(p_{it}) = b_{0i} + b_1(L)DlogCREDIT_{it} + e_{it} \tag{1}$$

where $logit(p_{it}) = log(\frac{p_{it}}{1-p_{it}})$ is the log of the odds ratio of a financial crisis for country i in year t and b_{0i} is a country-specific intercept term. As indicated above, specification (1) includes lags 1–5 of each variable. The variable $CREDIT_{it}$ stands for the Schularick-Taylor real credit (specifically, bank loans) series; it will be replaced by real money in some regressions. Just as in Table 4 above, this real credit series is defined as total bank loans deflated by the CPI, and it enters the regression in log first-differenced form. In columns (1.2) to (1.4) of Table 5, lags of real credit growth are replaced by lags of real monetary

code using our new dependent variables. As already noted, although this dataset covers fourteen countries, the financial-crisis regressions in Schularick and Taylor’s (2012) Table 5 do not include Canada, which did not have a financial crisis in their postwar chronology. Correspondingly, our regressions in Table 5 also exclude Canada. As all countries had recessions in the 1963–2008 period, all countries are included in our later regressions (such as those in Tables 6 and 7 below).

[19]Schularick and Taylor’s (2012) postwar regressions use a sample period of 1953–2008; due to the five annual lags in the regressions, the regressions use data on the right-hand-side variables back to 1948. We successfully replicated the postwar regressions in their Tables 4 and 5 (pp. 1048–1049), before estimating our own regressions for the 1963–2008 period.

growth (Schularick and Taylor's series, then the two sets of our streamlined money series). The lag polynomial $b_1(L)$ summarizes the relationship between the probability of a financial crisis and the lagged values of real growth in the financial aggregate (credit or money). A positive b_1 coefficient would suggest that high credit (or monetary) growth portends a financial crisis. The error term is denoted by e_{it}.

In Table 5, we report estimates of the above regression specification for our sample period.[20] As in Schularick and Taylor (2012), these regressions indicate that—fully consistent with the money view—credit is a better predictor of financial crises than money. However, as stressed above, because the money view does not predict that rapid monetary growth foreshadows financial crises, regression results of this kind do not constitute evidence against the money view. Furthermore, we argued above that financial-crisis prediction does not provide a valid basis for assessing the ability of the money view and the credit view to account for macroeconomic fluctuations.

We perform a more valid assessment in the next regression specification by examining the relationship of these variables with output directly. This will also bring out the importance of our use of the streamlined monetary series.

The results of this more valid test are reported in Table 6. The table reports logit regressions for the probability of the onset of a recession (that is, of the first year of negative growth) for 1963–2008 in our 14-country dataset. The specification is identical to equation (1) above, except that the dependent variable is redefined:

$$logit(p_{it}^r) = b_{0i} + b_1(L)DlogCREDIT_{it} + e_{it} \tag{2}$$

where $logit(p_{it}^r) = log(\frac{p_{it}^r}{1-p_{it}^r})$ now corresponds to the log of the odds ratio for a *recession* for country i starting in year t. As before, we consider in succession real credit growth using Schularick and Taylor's loans series, real monetary growth using their broad money series, and real monetary growth using our streamlined broad money series. We continue to follow Schularick and Taylor's choice of a lag length of five years (that is, lags 1 to 5 of the financial series).[21]

Three features are notable in the results in Table 6. First, irrespective of money series used, the terms in monetary growth are jointly statistically significant. The lag polynomial for monetary growth also has a negative coefficient sum. This implies a positive relationship between money and output over the business cycle, as suggested by the money view of Friedman and Schwartz (1963). Schularick and Taylor (2012) found that rapid credit growth predicts financial crises and does so better than monetary growth. But this regularity does not imply that the money view provides a poor account of macroeconomic outcomes, as the money view does not predict a structural relationship between easy money and subsequent economic or financial downturns (i.e., it does not predict a positive regression coefficient). However, the money view *does* imply that recessions tend to be preceded by weakness in monetary growth (so that there is a negative regression coefficient on money)—and our results confirm this prediction.[22]

[20] We include the regression summary statistics reported by Schularick and Taylor (2012).

[21] As it turns out, the longer lags tend to have statistically insignificant coefficients. In Appendix A, we report results using a three-year lag length.

[22] In contrast, whether the credit view predicts a negative or positive coefficient on loans growth in a recession-prediction equation is unclear. Typically, the credit view is taken as implying that fluctuations in credit aggregates should be positively related to fluctuations in both current and future output (see, for example, Romer and Romer, 1990). This prediction is consistent with the emphasis on a positive credit-growth/output-growth relationship in Jordá, Schularick, and Taylor (2016). However, insofar as

Table 5: Logit regressions for prediction of financial crisis

	Dependent variable: Log odds ratio for start of financial crisis			
	(1.1)	(1.2)	(1.3)	(1.4)
VARIABLES	1963–2008 using loans	1963–2008 replacing loans with broad money	1963–2008 using streamlined broad money	1963–2008 using streamlined broad money, alternative U.K. series used
L1. Δ (loans/P)	−0.478	3.283	4.850	5.997
	(3.374)	(4.168)	(8.186)	(8.858)
L2. Δ (loans/P)	9.582***	4.834**	−2.919	−2.146
	(2.940)	(2.362)	(6.126)	(5.815)
L3. Δ (loans/P)	3.601	4.274**	9.030	6.424
	(2.914)	(2.178)	(5.997)	(6.354)
L4. Δ (loans/P)	0.482	−0.870	−8.217	−3.137
	(3.003)	(5.698)	(8.066)	(7.624)
L5. Δ (loans/P)	−1.505	0.816	6.622	5.474
	(3.694)	(4.085)	(7.005)	(7.589)
Observations	598	598	598	598
Marginal effects at	−0.0108	0.0878	0.133	0.165
each lag evaluated	0.217	0.129	−0.0799	−0.0590
at the means	0.0817	0.114	0.247	0.177
	0.0109	−0.0233	−0.225	−0.0863
	−0.0342	0.0218	0.181	0.151
Sum	0.265	0.330	0.256	0.347
Sum of lag coefficients	11.680**	12.340**	9.365	12.610*
Standard error	5.890	6.151	7.139	7.459
Test for all lags, $= 0, \chi^2$	11.860**	12.150**	5.454	4.395
p-value	0.0367	0.0327	0.363	0.494
Test for country effects, $= 0, \chi^2$	6.291	5.950	7.287	6.821
p-value	0.901	0.919	0.838	0.869
Pseudo R^2	0.0909	0.0520	0.0460	0.0441
Pseudolikelihood	−79.650	−83.070	−83.590	−83.750
Overall test statistic, χ^2	33.300**	19.580	11.200	13.490
p-value	0.0103	0.296	0.846	0.703
AUROC	0.727***	0.671***	0.664***	0.679***
Standard error	0.0671	0.0602	0.0604	0.0574

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Note: Fixed effects are estimated throughout. Robust standard errors are given in parentheses.

Second, monetary growth outperforms credit growth in the regressions, irrespective of money series used. Money enters with a more sizable coefficient sum than credit (i.e., all money series have more negative coefficient sums than credit) and the regressions with money also have a better fit than those with credit, by the criterion of the pseudo-R^2. These results support the notion that the money view's success in accounting for macroeconomic

Schularick and Taylor's (2012) generalizations about financial crises are meant to apply also to business cycle fluctuations, the implication of Schularick and Taylor (2012) might be that output growth is negatively related to prior loans growth, with rapid loans growth presaging recessions.

Table 6: Logit regressions for prediction of onset of recessions, all countries

	Dependent variable: Log odds ratio for recession start			
	(2.1)	(2.2)	(2.3)	(2.4)
VARIABLES	1963–2008 using loans	1963–2008 replacing loans with broad money	1963–2008 using streamlined broad money	1963–2008 using streamlined broad money, alternative U.K. series used
L1. Δ (loans/P)	−5.120*	−9.369**	−18.280***	−17.130***
	(2.975)	(3.697)	(4.605)	(4.521)
L2. Δ (loans/P)	2.985	3.090	7.473	5.690
	(2.480)	(2.420)	(5.161)	(5.020)
L3. Δ (loans/P)	4.117*	2.479	1.377	2.130
	(2.406)	(2.420)	(5.228)	(5.488)
L4. Δ (loans/P)	1.380	−2.033	3.270	2.664
	(2.417)	(2.917)	(5.257)	(5.394)
L5. Δ (loans/P)	−2.162	2.382	1.289	0.578
	(2.183)	(2.768)	(4.123)	(4.346)
Observations	644	644	644	644
Marginal effects at	−0.342	−0.623	−1.147	−1.096
each lag evaluated	0.199	0.206	0.469	0.364
at the means	0.275	0.165	0.0864	0.136
	0.0921	−0.135	0.205	0.170
	−0.144	0.158	0.0808	0.0370
Sum	0.0801	−0.230	−0.306	−0.388
Sum of lag coefficients	1.200	−3.452	−4.873	−6.066
Standard error	3.829	5.041	6.090	6.298
Test for all lags, $= 0, \chi^2$	8.880	9.457*	17.440***	15.100***
p-value	0.114	0.0922	0.00374	0.00993
Test for country effects, $= 0, \chi^2$	8.003	6.919	5.501	5.357
p-value	0.843	0.906	0.962	0.966
Pseudo R^2	0.0450	0.0458	0.0754	0.0672
Pseudolikelihood	−174.900	−174.700	−169.300	−170.800
Overall test statistic, χ^2	17.010	17.490	28.790*	26.750*
p-value	0.522	0.490	0.0510	0.0837
AUROC	0.680***	0.665***	0.738***	0.721***
Standard error	0.0374	0.0409	0.0340	0.0347

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Note: Equation estimated is specification (2) in text. Dates of recession starts during 1963–2008 are ascertained as described in Table 1. Fixed effects are estimated throughout. Robust standard errors are given in parentheses.

fluctuations does not rest fundamentally on money being a proxy for loans or bank credit.[23]

Third, monetary growth's significance in the regressions increases when we use our streamlined monetary series, consistent with these series providing a more appropriate measurement of money than do Schularick and Taylor's (2012) data.

[23]The correlation of real monetary growth (streamlined series) and real credit growth (Schularick and Taylor's series) for 1959–2008 is below 0.81 for all countries, and below 0.70 for all but three countries (the United States, Germany and Japan).

We now turn to a further set of results involving a slight variation in the definition of the dependent variable. As Table 1 indicated, some recessions in the sample period are multi-year. The multi-year nature of recessions was not recognized in Table 6, in which the dependent variable involved merely the *onset* of a recession (the first year of negative real GDP growth). To consider all years of recession in our sample period, we now change the dependent variable in the logit regressions from one involving the onset of a recession to one involving the occurrence of negative rates of economic growth. The new regression specification is as follows:

$$logit(p^n_{it}) = b_{0i} + b_1(L)DlogCREDIT_{it} + e_{it} \tag{3}$$

The only difference between specification (2) and specification (3) is the definition of the left-hand-side variable. Specifically, $logit(p^n_{it}) = log(\frac{p^n_{it}}{1-p^n_{it}})$ now represents the log of the odds ratio of a *period of negative growth* for country i in year t.[24] Again, in the columns labeled (3.2) to (3.4) of Table 7, real credit growth is replaced with real monetary growth. The results continue to favor money over credit and our streamlined money series over the Schularick-Taylor money series.

Our results favoring the money view in Table 6 hold also in Table 7: monetary growth has a more negative and more statistically significant coefficient sum than credit, indicating that money outperforms credit in predicting economic downturns. The regressions with lags of real monetary growth as right-hand-side variables also have a superior fit to those that use credit, by the criterion of the pseudo-R^2.

Schularick and Taylor's (2012) logit regressions included extensions of their financial-crisis prediction equations. These extensions served as robustness checks on their original results by augmenting the financial-crisis prediction specification (1) with additional regressors: lags of a number of additional macroeconomic variables, including real GDP growth, inflation, the nominal short-term interest rate and the corresponding real interest rate, and the change in the investment/output ratio. We now carry out analogous extensions for our own estimated specifications. For the case in which the dependent variable pertains to the probability of a recession start, the estimated equation becomes:

$$logit(p^r_{it}) = b_{0i} + b_1(L)DlogCREDIT_{it} + b_2(L)\mathbf{X}_{it} + e_{it} \tag{4}$$

This specification differs from specification (3), due to the fact that the vector $\mathbf{X}_{it}$ consists of one of the aforementioned macroeconomic series.

We present the robustness results in Tables 8 and 9. In Table 8, the additional regressors are nominal variables (specifically, nominal interest rates and inflation), while Table 9 considers specifications in which the additional regressors are real variables.

In Table 8, as a result of limits on data availability, there is a substantial drop in the number of observations in the regressions when interest rates are included. Partly for this reason, both money and credit tend to lose significance when the additional regressors are included. Notwithstanding these caveats, the robustness results, like the earlier findings, tend to favor money over credit in predicting recessions. The sum of the lag coefficients on money (irrespective of money series used) shows a tendency to be more negative than does that for credit, and when streamlined money is used it has a negative coefficient sum across specifications. Furthermore, when the dependent variable refers to the probability

[24] That is, the dependent variable is constructed using an indicator variable that is equal to 1 in each year of negative growth, and 0 otherwise, instead of taking nonzero values only for the first year of a recession.

Table 7: Logit regressions for prediction of negative real GDP growth, all countries

	Dependent variable: Log odds ratio for negative growth			
	(3.1)	(3.2)	(3.3)	(3.4)
VARIABLES	1963–2008 using loans	1963–2008 replacing loans with broad money	1963–2008 using streamlined broad money	1963–2008 using streamlined broad money, alternative U.K. series used
L1. Δ (loans/P)	−9.198***	−14.380***	−24.650***	−21.860***
	(2.849)	(3.477)	(4.711)	(4.558)
L2. Δ (loans/P)	2.492	1.637	5.436	4.125
	(2.502)	(2.285)	(4.410)	(4.389)
L3. Δ (loans/P)	4.592**	2.344	1.851	2.048
	(2.053)	(2.196)	(4.415)	(4.732)
L4. Δ (loans/P)	1.193	−1.030	3.440	2.348
	(2.151)	(2.420)	(4.268)	(4.471)
L5. Δ (loans/P)	−0.785	0.798	2.607	1.423
	(2.034)	(2.603)	(3.610)	(3.776)
Observations	644	644	644	644
Marginal effects at	−0.777	−1.196	−1.889	−1.755
each lag evaluated	0.211	0.136	0.417	0.331
at the means	0.388	0.195	0.142	0.164
	0.101	−0.0857	0.264	0.189
	−0.0663	0.0664	0.200	0.114
Sum	−0.144	−0.884	−0.867	−0.957
Sum of lag coefficients	−1.706	−10.630**	−11.310**	−11.920**
Standard error	3.493	5.030	5.758	5.925
Test for all lags, $= 0, \chi^2$	16.070***	19.060***	30.910***	24.750***
p-value	0.00664	0.00187	$9.78e{-}06$	0.000156
Test for country effects, $= 0, \chi^2$	15.500	13.360	11.700	12.130
p-value	0.277	0.420	0.552	0.517
Pseudo R^2	0.0806	0.0875	0.133	0.110
Pseudolikelihood	−211.200	−209.600	−199.200	−204.400
Overall test statistic, χ^2	30.740**	35.400***	54.640***	45.780***
p-value	0.0309	0.00842	$1.46e{-}05$	0.000319
AUROC	0.718***	0.719***	0.774***	0.757***
Standard error	0.0315	0.0330	0.0274	0.0278

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Note: Equation estimated is specification (3) in text. Dates of negative growth during 1963–2008 are ascertained as described in Table 1. Fixed effects are estimated throughout. Robust standard errors are given in parentheses.

of negative growth, the first lag of streamlined money is significant when either of the additional regressors is included; in addition, the coefficient sum on all of the lags of money is significant in the case when inflation is the additional regressor.

In Table 9, when real variables are the additional regressors, real monetary growth tends to have a negative coefficient sum, and this sum remains larger in absolute value than that of real loans growth in the corresponding regressions using credit. When the real interest rate is the additional regressor, and the dependent variable refers to recessions,

Table 8: Robustness exercises

		Dependent variable: Log odds ratio for:			
		Recession start	Negative growth	Recession start	Negative growth
Baseline: Logit regression for prediction of dependent variable		Baseline plus 5 lags of inflation		Baseline plus 5 lags of nominal short-term interest rate	
Loans	Coefficient on L1	−0.955	−4.898	−0.304	−4.753
	Sum of lag coefficients	−3.082	−5.518	3.542	0.422
	Joint significance of lags, χ^2	10.650*	9.753*	6.392	8.327
	Pseudo R^2	0.113	0.142	0.175	0.215
	Observations	644	644	570	570
Schularick-Taylor money series	Coefficient on L1	−0.982	−6.984*	−1.879	−6.288
	Sum of lag coefficients	−9.415*	−17.450***	0.626	−5.488
	Joint significance of lags, χ^2	5.792	14.500**	11.210**	16.280***
	Pseudo R^2	0.103	0.147	0.180	0.226
	Observations	644	644	570	570
Streamlined money series	Coefficient on L1	−10.260*	−19.200***	−8.412	−16.220***
	Sum of lag coefficients	−9.847	−15.690**	−1.413	−6.236
	Joint significance of lags, χ^2	6.279	17.920***	4.227	9.956*
	Pseudo R^2	0.114	0.166	0.174	0.229
	Observations	644	644	570	570
Streamlined money series (using alt. U.K. M series)	Coefficient on L1	−6.795	−12.960**	−7.842	−13.160**
	Sum of lag coefficients	−12.690*	−18.170***	−2.893	−6.741
	Joint significance of lags, χ^2	7.263	13.310**	2.838	7.444
	Pseudo R^2	0.114	0.153	0.170	0.217
	Observations	644	644	570	570

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Note: Data for additional regressors is from the Schularick-Taylor (2012) database.

there is some tendency for the coefficients on real monetary growth and real credit growth to change sign, becoming positive. This tendency is more pronounced in the case of real credit growth. However, once the dependent variable is altered to refer to negative growth, monetary growth uniformly has a negative coefficient sum (with its first lag always highly significant). In contrast, real credit growth continues to have a positive coefficient sum for this dependent variable, in the case of two of the three real variables considered as additional regressors.

Overall, the robustness exercises reported in Tables 8 and 9 continue to favor money over credit in predicting macroeconomic fluctuations. In particular, these results suggest that, for the postwar decades leading up to the 2008 financial crisis, judgments about the importance of the link between lending aggregates and business cycles are more sensitive to the inclusion of additional regressors than are judgments concerning the link between monetary aggregates and business cycles. These robustness exercises therefore reinforce our earlier results regarding the money view versus the credit view.

Table 9: Further robustness exercises

		Dependent variable: Log odds ratio for:					
		Recession start	Negative growth	Recession start	Negative growth	Recession start	Negative growth
Baseline: Logit regression for prediction of dependent variable		Baseline plus 5 lags of real GDP growth		Baseline plus 5 lags of real short-term interest rate		Baseline plus 5 lags of change in I/Y	
Loans	Coefficient on L1	−2.669	−2.830	−5.452	−9.820***	−5.539*	−7.235**
	Sum of lag coefficients	3.978	3.396	4.602	1.258	−1.364	−4.529
	Joint significance of lags, χ^2	9.088	7.421	11.630**	21.280***	8.387	10.470*
	Pseudo R^2	0.069	0.178	0.098	0.132	0.063	0.110
	Observations	644	644	570	570	644	644
Schularick-Taylor money series	Coefficient on L1	−6.802*	−8.24**	−9.494**	−14.430***	−9.530**	−13.340***
	Sum of lag coefficients	−2.123	−5.591	3.973	−3.228	−7.693	−14.520**
	Joint significance of lags, χ^2	6.963	9.724*	9.094	15.500***	8.317	17.090***
	Pseudo R^2	0.064	0.186	0.086	0.115	0.064	0.130
	Observations	644	644	570	570	644	644
Streamlined money series	Coefficient on L1	−15.960***	−18.900***	−18.520***	−24.770***	−17.620***	−23.470***
	Sum of lag coefficients	−0.760	−0.644	2.142	−4.541	−9.402	−15.34**
	Joint significance of lags, χ^2	11.780**	13.490**	21.660***	33.930***	17.410***	26.850***
	Pseudo R^2	0.084	0.204	0.121	0.169	0.09	0.16
	Observations	644	644	570	570	644	644
Streamlined money series (using alt. U.K. M series)	Coefficient on L1	−14.710***	−15.500***	−18.390***	−22.880***	−16.590***	−20.330***
	Sum of lag coefficients	−3.559	−2.023	1.615	−3.742	−11.210	−16.300**
	Joint significance of lags, χ^2	9.734*	9.598*	20.130***	29.580***	15.690***	21.170***
	Pseudo R^2	0.078	0.190	0.117	0.150	0.085	0.140
	Observations	644	644	570	570	644	644

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Note: Data for additional regressors is from the Schularick-Taylor (2012) database, with the exception of the investment/output ratio for Germany for 1957–1959, and France for 1957–1958, for which their observations were missing. We obtained the observations for Germany from European Conference of Ministers of Transport (1964, Annex Table 1), and for France from FRED, and they were arithmetically spliced into the Schularick-Taylor series on the investment/output ratio.

5 Conclusions

This paper has investigated the money view and the credit view of output behavior. Our starting point was to ground the characterization of the money view firmly in the statements of Friedman and Schwartz (1963). This has led to results that contrast with Schularick and Taylor's (2012) conclusion that, for the postwar period, the data strongly favor the credit view over the money view. In our analysis, we have focused on the link between growth in financial quantities and output behavior, rather than the link between growth in financial quantities and financial crises. This is because the money view does not predict a link between rapid monetary growth and the onset of financial crises; consequently, it is invalid to compare the money view and the credit view on the basis of financial-crisis prediction. In addition, we have improved upon Schularick and Taylor's (2012) end-of-period data for broad money by using average-of-period data and correcting for series breaks. With these more appropriate series for monetary aggregates, we have found support for the money view by direct examination of the relationship of money and output. For the final half-century (1959–2008) of the period covered by Schularick and Taylor's 14-country dataset, we have found that our money series has a correlation with output that is competitive with, and usually slightly better than, that of Schularick and Taylor's money and credit series. In addition, money outperforms credit in predicting postwar economic downturns. This result—which continues to hold in a variety of robustness exercises—suggests that the money view of macroeconomic fluctuations gives a better description of five decades' worth of international postwar historical data than does the credit view.

We note two caveats concerning our results. First, we have followed Schularick and Taylor (2012) in using sample periods that end in 2008, thereby largely excluding from consideration the major economic and financial disruptions that began in late 2008 and continued in the following years. This approach is consistent with Schularick and Taylor's (2012, p. 1029) call for an approach using the historical record—including confining the postwar period to the period through 2008—to examine the money and credit views. Recent years (that is, 2009 onward) have presented new information, not used by us or by Schularick and Taylor (2012), relevant for discriminating between the money and credit views. This evidence could tip the balance in favor of credit aggregates for the understanding of macroeconomic fluctuations. If it does so, however, one should consider this a break with pre-2009 postwar norms. As we have seen, the pre-2009 postwar record favors the money view over the credit view on the criterion of predicting macroeconomic fluctuations. This result contrasts with Schularick and Taylor's (2012, p. 1047) finding—which they note has "broad implications for economic history"—that credit aggregates have been more important than monetary aggregates in predicting macroeconomic outcomes.

Second, we have followed Schularick and Taylor (2012) in using monetary and loan aggregates to represent the money and credit views. Evaluation of the relative merits of the two views, as well as the incorporation of both money and credit channels into empirical models, would benefit from an examination of other kinds of data. For example, Divisia series might provide better measures of monetary aggregates, and Belongia and Ireland (2016) suggest that Divisia monetary series are more closely related with U.S. output fluctuations than are conventional measures of the U.S. money stock. In addition, it may be that both the money view and the credit view are better captured by asset-price reactions than by financial aggregates: for example, the credit channel likely operates in part by affecting credit spreads (see, for example, Gertler and Lown, 1999, and Gilchrist and Zakrajšek, 2012), while the money channel involves a portfolio balance mechanism that affects term premiums, among other variables.

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A Additional results

Table A1: Full results for correlation of output growth with real money growth and real credit growth, 1959–2008

	Correlation of output growth and real credit growth of k years earlier			Correlation of output growth and real monetary growth (Schularick-Taylor series) of k years earlier			Correlation of output growth and real monetary growth (streamlined series) of k years earlier		
	$k = 0$	$k = 1$	$k = 0–1$	$k = 0$	$k = 1$	$k = 0–1$	$k = 0$	$k = 1$	$k = 0–1$
Australia	0.393	−0.079	0.190	0.546	0.140	0.472	0.551	0.169	0.435
Canada	0.457	−0.082	0.250	0.387	0.265	0.389	0.399	0.397	0.482
Denmark	0.285	0.055	0.187	0.161	0.278	0.294	0.470	0.337	0.477
France	0.466	0.424	0.541	0.205	0.309	0.302	0.525	0.534	0.580
Germany	0.475	0.549	0.545	0.351	0.524	0.521	0.431	0.641	0.617
Germany (Alt. GDP)	0.698	0.633	0.708	0.497	0.598	0.651	0.631	0.702	0.766
Italy	0.419	0.443	0.500	0.343	0.570	0.505	0.485	0.617	0.595
Japan	0.685	0.556	0.688	0.734	0.742	0.797	0.787	0.699	0.808
Netherlands	0.431	0.290	0.437	−0.131	0.024	−0.081	0.318	0.203	0.327
Norway	0.180	0.023	0.126	0.176	−0.015	0.097	0.194	0.011	0.127
Spain	0.271	0.269	0.337	0.556	0.557	0.623	0.641	0.659	0.699
Sweden	0.134	0.100	0.153	0.236	0.354	0.374	0.236	0.415	0.408
Switzerland	0.404	0.583	0.564	0.277	0.616	0.514	0.376	0.660	0.580
United Kingdom	0.609	0.385	0.572	0.468	0.246	0.406	0.516	0.427	0.545
United Kingdom (Alt. M)	0.609	0.385	0.572	0.468	0.246	0.406	0.440	0.199	0.364
United States	0.656	0.201	0.494	0.235	0.587	0.483	0.381	0.537	0.526

Note: As the correlations are obtained from a sample of 50 observations, correlations are statistically significant at the conventional 5 percent level if they exceed about 0.275 in absolute value.

Table A2: Logit regression, prediction of onset of recessions, all countries: lag length for regressors restricted to three years

	Dependent variable: Log odds ratio for recession start			
	(2.5)	(2.6)	(2.7)	(2.8)
VARIABLES	1963–2008 using loans	1963–2008 replacing loans with broad money	1963–2008 using streamlined broad money	1963–2008 using streamlined broad money, alternative U.K. series used
L1. Δ (loans/P)	−5.098*	−9.413***	−17.490***	−16.750***
	(2.943)	(3.631)	(4.438)	(4.447)
L2. Δ (loans/P)	3.015	3.302	6.668	5.081
	(2.484)	(2.381)	(4.989)	(4.905)
L3. Δ (loans/P)	4.307*	2.012	3.546	3.877
	(2.251)	(2.463)	(4.471)	(4.684)
Observations	644	644	644	644
Marginal effects at	−0.343	−0.631	−1.106	−1.075
each lag evaluated	0.203	0.221	0.422	0.326
at the means	0.289	0.135	0.224	0.249
	0.00520	0.00446	0.00408	0.00406
	−0.0297	−0.0277	−0.0199	−0.0203
Sum	0.125	−0.298	−0.476	−0.516
Sum of lag coefficients	2.225	−4.099	−7.272	−7.789
Standard error	3.275	4.492	5.463	5.604
Test for all lags, $= 0, \chi^2$	7.625*	7.787*	17.180***	15.040***
p-value	0.0544	0.0506	0.000649	0.00178
Test for country effects, $= 0, \chi^2$	8.238	6.909	5.537	5.354
p-value	0.828	0.907	0.961	0.967
Pseudo R^2	0.0430	0.0437	0.0730	0.0660
Pseudolikelihood	−175.200	−175.100	−169.800	−171.000
Overall test statistic, χ^2	16.240	17.170	28.940**	26.600**
p-value	0.436	0.375	0.0243	0.0461
AUROC	0.680***	0.662***	0.735***	0.720***
Standard error	0.0375	0.0404	0.0338	0.0346

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Note: Equation estimated is specification (2) in text. See notes to Table 5.

Table A3: Logit regression, prediction of periods of negative growth, all countries: lag length for regressors restricted to three years

	Dependent variable: Log odds ratio for negative growth			
	(3.5)	(3.6)	(3.7)	(3.8)
VARIABLES	1963–2008 using loans	1963–2008 replacing loans with broad money	1963–2008 using streamlined broad money	1963–2008 using streamlined broad money, alternative U.K. series used
L1. Δ (loans/P)	−9.205***	−14.450***	−23.720***	−21.530***
	(2.828)	(3.453)	(4.556)	(4.501)
L2. Δ (loans/P)	2.494	1.736	4.364	3.511
	(2.511)	(2.258)	(4.238)	(4.326)
L3. Δ (loans/P)	4.985**	2.118	4.236	3.650
	(1.947)	(2.202)	(4.044)	(4.208)
Observations	644	644	644	644
Marginal effects at	−0.778	−1.204	−1.839	−1.732
each lag evaluated	0.211	0.145	0.338	0.282
at the means	0.422	0.176	0.328	0.294
	0.00410	0.00300	0.00276	0.00287
	−0.0311	−0.0233	−0.00363	−0.00597
Sum	−0.173	−0.903	−1.173	−1.159
Sum of lag coefficients	−1.726	−10.600**	−15.120***	−14.370***
Standard error	2.994	4.313	5.196	5.245
Test for all lags, $= 0, \chi^2$	16.180***	17.740***	30.420***	24.540***
p-value	0.00104	0.000497	1.12e−06	1.93e−05
Test for country effects, $= 0, \chi^2$	15.560	13.410	11.820	12.160
p-value	0.274	0.417	0.543	0.515
Pseudo R^2	0.0800	0.0872	0.129	0.108
Pseudolikelihood	−211.300	−209.700	−200.100	−204.800
Overall test statistic, χ^2	30.780**	35.170***	54.390***	45.210***
p-value	0.0144	0.00377	4.47e−06	0.000129
AUROC	0.718***	0.718***	0.770***	0.756***
Standard error	0.0312	0.0330	0.0275	0.0279

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Note: Equation estimated is specification (3) in text. See notes to Table 6.

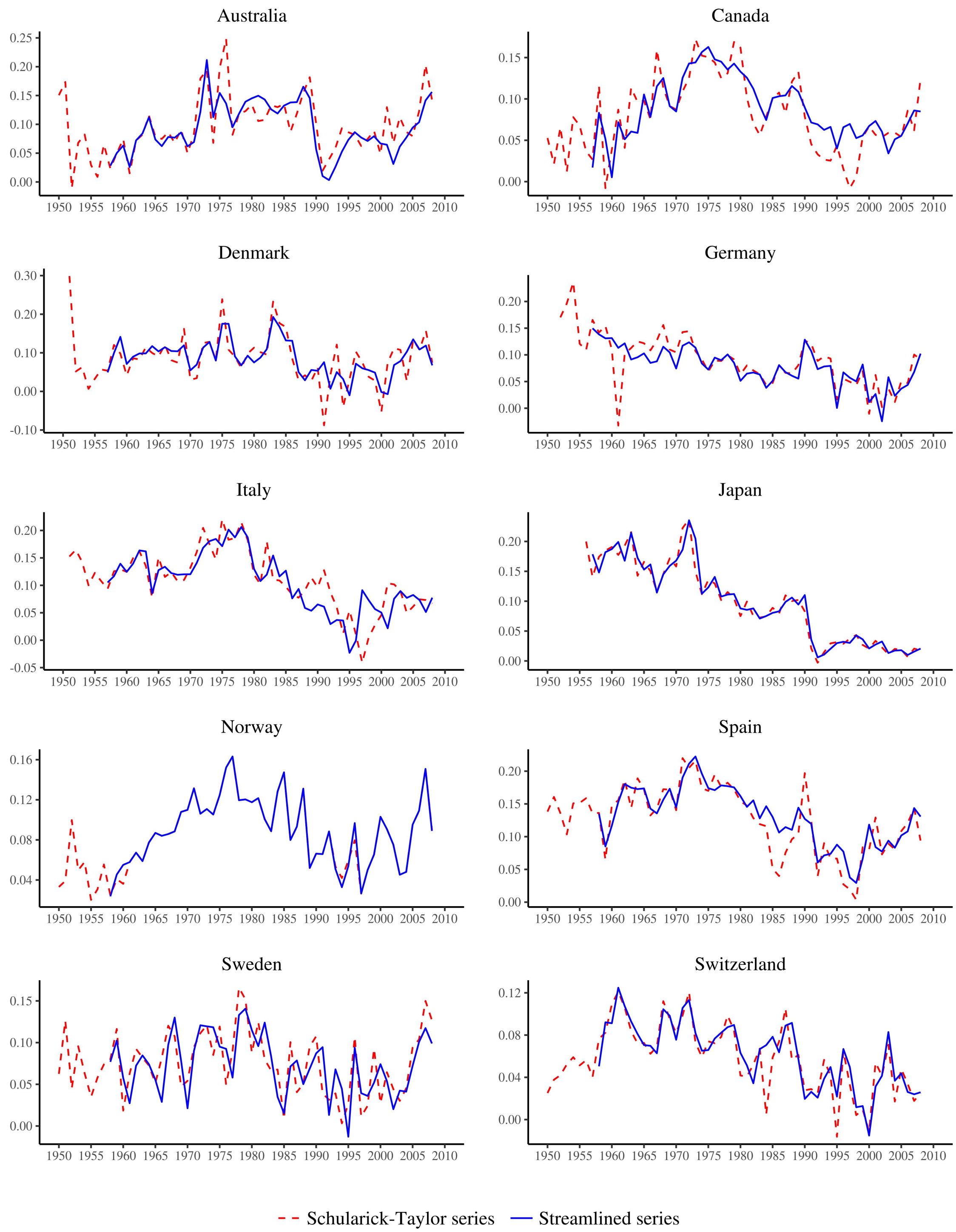

Figure A1: Measures of nominal broad money growth for remaining countries in the sample

B Details of the construction of streamlined broad money series

This appendix describes the construction of the streamlined series on broad money that were used above as alternatives to the series constructed by Schularick and Taylor (2012).[25]

As indicated in the main text, a major criterion for our construction of broad monetary aggregates (that is, M2 or a similar aggregate) has been that the series correspond, as far as possible, to average-of-year (that is, average of monthly observations) annual data—as opposed to the end-of-year monetary data predominantly used by Schularick and Taylor (2012). In those rare instances—indicated below—in which observations for the money stock for every month of the year were not obtainable for a particular country, annual data have been obtained as the average of the end-of-quarter observations on money (that is, as an average of four observations).

The annual sample period over which annual observations on monetary growth have been constructed here is the fifty-year period 1959–2008. This choice was in large part motivated by the fact that monthly monetary data are not always clearly available for many countries for the period before 1957—the earliest year for which the electronic and hardcopy versions of the International Monetary Fund's (IMF's) *International Financial Statistics* report monthly and/or quarterly observations on money.

As will be detailed below, the money-data construction has involved retrievals from the electronic version of the *International Financial Statistics* database (available on the IMF's website) as well as consultation of national sources—electronic and hardcopy—on monetary aggregates. In addition, two sources that tabulated time series for monetary data should be mentioned as being of particular usefulness in the task of obtaining a complete run of cross-country monetary data for the whole 1959–2008 period. The first source is Lothian, Cassese, and Nowak (1983). That study gave the results of an effort to construct, on a quarterly basis for the period from the 1950s to the mid-1970s, data on monetary aggregates (among other series) for several advanced economies. The second key source is the International Monetary Fund's (1983) *International Financial Statistics Supplement on Money.* This publication tabulated monthly *IFS* data on monetary aggregates for IMF member countries for the period from 1967 to 1982. For some countries, the tabulations in this IMF publication report monetary data that are not available in the modern-day electronic version of the *IFS* database.

Details of construction of broad money series for each country are provided below.

B.1 Australia

The broad money series for Australia used here corresponds to the series officially called M3, spliced into the series officially called "Broad Money."

The Reserve Bank of Australia (RBA) website provides monthly seasonally adjusted M3 data starting in July 1959. The annual averages of this series from 1960 onward were used to calculate monetary growth (defined as log-differences) for Australia for 1961–1968. Pre-1961 observations on annual monetary growth were obtained from an annual average of White's (1973) total of currency and all bank deposits for the period 1956–1960. (The

[25]The authors are grateful to the following individuals for their help and advice on locating monetary data for various countries: Kim Abildgren, Michael Bordo, Kimberly Doherty, Christina Gerberding, Jesper Lindé, Stefano Neri, Alasdair Scott, and Robert York.

log-differences of White's series very closely match those of the official M3 series for 1961–1968.)

For the 1969–1977 period, monetary growth for Australia consists of the log-differences of the annual averages of M3, with the annual averages obtained from the quarterly seasonally adjusted M3 data reported in Bullock, Morris, and Stevens (1988). The Bullock-Morris-Stevens data imply observations on M3 growth that are generally similar to the growth rates obtainable from the official M3 series that is available on the RBA website. However, the Bullock-Morris-Stevens data are preferable to the online series because the former incorporate some corrections for series breaks and they also have greater decimal precision than the RBA website's M3 data. (The *IFS*' "money plus quasi-money" series for Australia, not used here, has very similar growth rates to that of the Bullock-Morris-Stevens M3 data.)

The RBA website provides monthly data, starting in August 1976, on a series labeled "Broad Money." This series includes, in addition to currency, deposits issued both by commercial banks and by nonbank financial institutions. The series therefore internalizes some of the shifts of deposits between the two types of institution (including shifts that occurred on those occasions when nonbank depositories in Australia officially become commercial banks). The Broad Money series is consequently usable for the generation of growth rates of the annual average of the money stock for Australia for the period beginning in 1978 and is likely preferable for this purpose to using M3 data. Accordingly, monetary growth for Australia from 1978 onward is defined here as the log-differences in the annual averages of seasonally adjusted monthly observations on Broad Money. Prior to the computation of the annual averages, the Broad Money series was adjusted for a break in the first quarter of 1983 associated with a definitional change. This adjustment consisted of multiplying the March 1983 observation by the ratio of the pre-definitional-change to post-definitional change values of not-seasonally-adjusted Broad Money, with the values used being those reported in Bullock, Morris, and Stevens (1988).

In summary, M3 (adjusted for breaks) is used to measure monetary growth for Australia for 1958 to 1977; and Broad Money, adjusted for a break in 1983, is used to measure monetary growth for Australia for 1978 to 2008.

B.2 Canada

Log-differences of annual averages of the data for Canadian M2 given in Lothian, Cassese, and Nowak (1983) were used as the observations on monetary growth for Canada for the period from 1954 to 1968 inclusive. The series with the suffix "SQA" was used. For 1969 through 2008, monetary growth in Canada was defined as the log-differences in the annual averages of the monthly series "M2, alternative definition 4" (a series that starts in January 1968), compiled by the Bank of Canada and downloaded from the Federal Reserve Bank of St. Louis's FRED portal.

B.3 Denmark

Monetary growth is defined as the log-difference of Denmark's M2. This M2 series is the annual average of the quarterly series constructed by Abildgren (2009) and available at http://www.nationalbanken.dk/en/publications/Documents/ 2012/01/Data _WP78_web.xls.

B.4 France

The study *A Monetary History of France in the Twentieth Century* (Patat and Lutfalla, 1990) tabulated monthly data on an M2 series for France through the late 1960s. We used log-differences of annual averages of M2 obtained from this source as the measure of monetary growth in France from 1951 to 1967 inclusive. For 1968 to 1978 inclusive, M2 growth in France is the log-difference of the annual average of the monthly series "money plus quasi-money" reported for France in International Monetary Fund (1983). Log-differences of annual averages of the official Bank of France monthly series on M2 were used as the measure of monetary growth in France from 1978 onward. The sources used for obtaining this official M2 series were the Federal Reserve Bank of St. Louis' FRED portal (whose data on M2 for France were used to generate monetary growth from 1979 to 1998 inclusive) and the Bank of France's website (whose data on M2 for France were used to generate monetary growth from 1999 onwards).

B.5 Germany

For the period from 1957 to 1980 inclusive, annual growth in M2 for Germany is measured as the log-differences in the annual averages of the Bundesbank's national definition of M3. The basis for our use of M3 instead of M2 for this period is that, during the 1970s, M2 growth in Germany was subject to large fluctuations arising from substitutions between M2 and non-M2 assets, with many of these substitutions canceling within M3 (den Butter and Fase, 1981, p. 211).[26] From 1981 onward, annual growth in M2 for Germany is measured as the log-differences in the annual averages for Germany of the EMU-consistent definition of M2. For both our pre-1980 and post-1980 monetary series, the annual averages were computed from monthly data on series supplied to the authors by Christina Gerberding.

B.6 Italy

Monetary growth for Italy for the postwar period through 1998 was obtained as the log-difference in the annual average of M2 for Italy. The source for this series was the M2 historical series (pre-EMU definition) on the Bank of Italy's website. Monetary growth from 1999 onward was obtained as the log-differences in the annual averages (starting in 1998) of monthly data on "Total liabilities of Italian MFIs and the post office included in M2." The monthly data used to obtain the annual averages were downloaded from the Bank of Italy's website.

B.7 Japan

M2 growth for Japan was defined as the log-differences in the annual averages of the monthly M2 series for Japan that is available in the Federal Reserve Bank of St. Louis' FRED portal (and itself sourced to *IFS*).

B.8 Netherlands

For the period from 1955 to 1967 inclusive, annual broad money growth for the Netherlands was measured as the log-differences in the annual averages of the Lothian, Cassese, and

[26] It is also the case that, over this period, the general movements in the Bundesbank M3 concept appear to be closer to those of the German money stock used by Schularick and Taylor (2012) than does the Bundesbank M2 series.

Nowak (1983) M2 series for the Netherlands. For the period from 1968 to 1982 inclusive, annual broad money growth for the Netherlands was measured as the log-differences in the annual averages of the monthly "money plus quasi-money" series reported in International Monetary Fund (1983).

The website of De Nederlandsche Bank reports a monthly M3 series for the Netherlands that starts in December 1982. This source also indicates the magnitude and timing of various breaks in the M3 series that have occurred since 1982. Using this information, a break-adjusted monthly M3 series was created. This series was then joined to the aforementioned International Monetary Fund (1983) monthly "money plus quasi-money" series using the ratios of their overlapping values for December 1982. Observations on broad money growth for the Netherlands for the period 1983–2008 were then obtained as the log-differences of the annual averages of this extended monthly series.

B.9 Norway

For the period starting in 1961, M2 growth for Norway was defined as the log-differences of the annual average of Norway's monthly M2 series. The latter series is available in the Federal Reserve Bank of St. Louis' FRED portal. For the period from 1958 to 1960, monetary growth was defined as the log-difference in the annual average of end-of-quarter observations on Norway's "money plus quasi-money" series. These end-of-quarter observations were obtained from the online *IFS* database.

B.10 Spain

The online *IFS* database reports data on broad money for Spain starting in 2001:Q4, so it is used here to obtain annual broad money growth in Spain only for the period starting in 2003. A long run of annual historical data through 1998 on Spain's broad money appears in Martín Aceña and Pons (2005) (and is also tabulated in Tortella and Ruiz, 2013, pp. 208–209). Schularick and Taylor (2012) used the Martín Aceña-Pons (2005) data to calculate monetary growth in Spain for 1950–1979. We elected not to use this source, as Martín Aceña and Pons (2005) indicate that their monetary data (which essentially corresponds to an extended version of the official M3 series) are end-of-year, not average-of-year. Instead we used FRED's monthly data on M3 for Spain from January 1962 to December 1998 to calculate annual averages for 1962–1998 and thus, using log-differences, a broad money growth series for 1963–1998. Broad money growth for 1958–1962 was computed using log-differences of annual averages constructed from end-of-quarter data, from 1957 to 1962, for Spain's "money plus quasi-money" as reported in the *International Financial Statistics Annual Supplements* for 1963/1964 and 1965/1966—with data for 1957:Q1–1960:Q4 given in the former volume spliced into the series in the latter volume, whose monetary data tables begin in 1960:Q4—and in the July 1966 issue of *International Financial Statistics*. For 1999 to 2002 inclusive, broad money growth for Spain was defined as the log-differences of the annual averages of monthly data on the sum of deposits held by households and firms. The components of these sums were downloaded from the Bank of Spain's website.

B.11 Sweden

A hardcopy of the *International Financial Statistics Annual Supplement* for 1965/1966 was used to obtain end-of-quarter observations on Sweden's "money" and "quasi-money." The sum of these series was then defined as broad money, and the log-differences of the annual averages of the sum were used to define broad money growth for Sweden for the period from 1958 to 1960.

The online *IFS* database was used to obtain monetary growth in Sweden for 1961 to 1967 inclusive. In particular, for 1961 through 1965, broad money growth was defined as the log-differences of the annual averages of the *IFS*' end-of-quarter "money plus quasi-money" series for Sweden, and for 1966 and 1967 broad money growth was defined as the log-differences of the annual averages of the *IFS*' monthly "money plus quasi-money" series for Sweden. (The full series is only available in archived versions of the *IFS* from 2017.) Monetary growth for 1968 through 1981 was defined as the log-differences of the annual averages of the *IFS* monthly "money plus quasi-money" series for Sweden as reported in International Monetary Fund (1983). Prior to this computation, a break in this monthly series that occurred in January 1970 was removed using the information on *end-of-year* observations for Sweden's M3 for December 1969 and December 1970 given in Edvinsson and Ögren (2014, p. 331).

For 1982 to 1998 inclusive, broad money growth for Sweden was defined as the log-differences in the annual data on average-of-year M3, a series that begins in 1981 and that was obtained from Statistics Sweden's website.[27] Prior to the taking of log-differences, the levels series was adjusted for a redefinition of M3 in 1996; this adjustment was made using information on Statistics Sweden's website about the quantitative implications of the redefinition. From 1999 onward, M2 growth for Sweden was defined as the log-differences in the annual averages of the monthly official M2 series for Sweden. This official M2 series begins in 1998 and is available in the Federal Reserve Bank of St. Louis' FRED portal.

B.12 Switzerland

Historical tables from the Swiss National Bank (SNB) website were used to obtain data on Switzerland's M3 since the 1950s. For the 1950s through 1965, monetary growth was defined as the log-changes in the annual averages of the SNB's "Definition 1975" of M3. For the period from 1966 through mid-1975, only June and December observations on this series are available. Consequently, for 1966 through 1976, annual monetary growth was defined as the log-differences of one year's average of the June and December observations from those in the previous year. For the period from 1977 through 1984, monetary growth was again defined as the log-changes in the annual averages of the monthly "Definition 1975" of M3. For the period after 1984, monetary growth was defined as follows. The "Definition 1995" of M3 was spliced into the monthly observation for December 1984 on the "Definition 1975" of M3. Log-changes in the annual averages of the resulting series were used as the measure of growth in broad money.

B.13 United Kingdom

An official M2 series, also called "Retail M4," is available on a monthly basis for the United Kingdom for the period since July 1982. It is therefore available on an annual-average basis starting in 1983. The monthly U.K. M2 series was downloaded from the Bank of England's website, annual averages were constructed for 1983 onward, and monetary growth for the United Kingdom from 1984 was defined as the log-differences in the annual-average series.

[27] https://www.scb.se/en/finding-statistics/statistics-by-subject-area/financial-markets/financial-market-statistics/financial-market-statistics/pong/tables-and-graphs/money-supply-annually/

For the extension of the series back before 1983, two alternative approaches were followed. The U.K. M2 series is a broad money series but, like the official U.S. M2, it excludes wholesale deposits. However, because of the absence of continuous, official, partitioned U.K. data on total retail deposits before 1982 (that is, a series that isolates the retail portion of aggregate commercial bank deposits), it does not appear possible to obtain a U.K. broad money series before the 1980s that is very closely analogous to the definition of M2 used in the United States. Instead, the main options available for extending the U.K. M2 series back in time are either to join it to a broad money series (M3 or M4) that *includes* wholesale deposits, or to join it to an M1 series, in which the included deposits are mainly retail deposits but from which retail time deposits are excluded. Each of these two approaches was followed here, and they resulted in two alternative long postwar annual-data series on broad money for the United Kingdom.

The first of these series took pre-1984 U.K. monetary growth to be M3 growth for 1955–1969 and M4 growth for 1970–1983. In this construction, M3 growth for 1955–1969 consisted of the log-differences of annual averages of Capie and Webber's (1985) data on monthly averages of M3 data from January 1954 to December 1969, while M4 growth for 1970–1983 was the log-difference of an annual M4 series consisting of annual averages of end-of-quarter values (downloaded from the Bank of England's website) for M4 for 1969 through 1983. As already noted, from 1984 onward monetary growth in the United Kingdom was measured by M2 growth.

The second U.K. series on growth in the money stock was obtained by defining U.K. monetary growth prior to 1983 as the log-differences of annual averages of M1, with monetary growth being M2 growth from 1983 onward. The M1 series used in this calculation consisted of the log-differenced annual averages of Capie and Webber's (1985) monthly U.K. M1 data up to 1963, combined with the log-differences of annual averages of Hendry and Ericsson's (1991) quarterly-average, break-adjusted U.K. M1 data, available at https://www.nuff.ox.ac.uk/us-ers/hendry/hendry.html, for 1964–1983.

B.14 United States

Log-differences in the annual data on M2 reported in Balke and Gordon (1986), which were generated as annual averages of the old (that is, pre-1980) Federal Reserve Board definition of M2, were used to provide annual observations on U.S. monetary growth for 1948 through 1959. For 1960 onward, annual data on U.S. monetary growth were obtained as the log-differences of the annual averages of the seasonally adjusted monthly observations on the Federal Reserve Board's modern definition of M2, as given in the Federal Reserve Bank of St. Louis' FRED portal.