The Money View Versus the Credit View

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The Money View Versus the Credit View:
A Comment on Schularick and Taylor, "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870–2008"

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Abstract

We argue that Schularick and Taylor's (2012) comparison of credit growth and monetary growth as financial-crisis predictors does not necessarily provide a valid basis for achieving one of their stated intentions: evaluating the relative merits of the "money view" and "credit view" as accounts of macroeconomic outcomes. Our own analysis of the postwar evidence suggests that money outperforms credit in predicting *economic downturns* in the 14 countries in Schularick and Taylor's dataset. This contrasts with Schularick and Taylor's (2012) highly negative verdict on the money view. In accounting for the difference in findings, we first explain that Schularick and Taylor's characterization of the money view is defective, both because their criterion for its validity (that rapid monetary growth predicts financial crises) is misplaced, and because they incorrectly take the money view's proponents as relying on the notion that monetary aggregates are a good proxy for credit aggregates. In fact, the money view of Friedman and Schwartz does not predict an automatic relationship between rapid monetary growth and (financial or economic) downturns, nor does it rest on money being a good proxy for credit. We further show that Schularick and Taylor's data on money have systematic faults. For our reexamination of the evidence, we have constructed new, and more reliable, annual data on money for the countries studied by Schularick and Taylor.

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

1 Introduction

In an important study, Schularick and Taylor (2012, p. 1030) have investigated "the dynamics of money, credit, and output across a broad sample of countries over the long run." A key part of their analysis is the focus of this comment.

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 fluctuations—with the "credit view," which emphasizes the significance of movements in credit aggregates (in particular, aggregate commercial bank loans) for the economy.[1] In order to test the merits of the two views, they conduct a logit regression analysis, using a dataset they constructed of annual observations for 14 countries. In the regressions, distributed lags of a credit aggregate (real loans growth) and then of a monetary aggregate (the growth in the real stock of money), are used to predict the likelihood of the onset of a financial crisis. For the postwar period, the credit aggregate performs better than the monetary aggregate: the credit-growth terms are more statistically significant than the monetary-growth terms, and the regression using credit growth has a better fit than the regression using monetary growth. Specifically, see Schularick and Taylor's (2012, p. 1049) Table 5, which compares credit with broad money.[2] The authors conclude (Schularick and Taylor, 2012, p. 1051): "[F]or the pre-WW2 sample, money and credit moved hand in hand, so that a Friedman 'money view' of the financial system, focusing on the liability side of banks' balance sheets, was an adequate simplification. After WW2 this was no longer the case, and credit was delinked from broad money aggregates, which would beg the question as to which was the more important aggregate in driving macroeconomic outcomes. At least with respect to crises, the results of our analysis are clear: credit matters, not money."

Schularick and Taylor (2012) evidently regarded their findings as strongly against the money view and in favor of the credit view.[3] In contrast, we argue (see Section 2 below) that Schularick and Taylor's comparison of credit growth and monetary growth as financial-crisis predictors does not provide a clear-cut test of the money view of *macroeconomic outcomes*—specifically the output fluctuations for which the money and credit theories provide rival explanations. We reexamine the postwar evidence by conducting additional, and more direct, tests of the money view against the credit view. For these tests, we have constructed new annual series on money for the countries studied by Schularick and Taylor (2012). These series are more reliable than the Schularick-Taylor data on money; the latter, as we show in Section 3, contain systematic errors. Our results (given in Section 4) are favorable to the money view. Section 5 concludes. Two appendices give data sources and

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[1] We follow Schularick and Taylor (2012) in representing the money and credit views as rival hypotheses, each represented by aggregate financial quantities. However, in practice both money and credit channels likely operate (see, for example, Bernanke, 1983), in which case evidence for the credit view need not be seen as evidence against the money view, and conversely. Furthermore, asset-price-based measures of monetary and credit conditions may be preferable to quantity measures. For example, credit spreads (such as spreads between corporate bond and government bond rates) might well provide a better index of credit market conditions more than do credit aggregates (see, for example, Gertler and Lown, 1999, and more recently Gilchrist and Zakrajšek, 2012).

[2] We focus here on Schularick and Taylor's comparisons of credit with broad money (that is, an M2-type aggregate). Schularick and Taylor (2012) also report results using a narrower monetary aggregate.

[3] Indeed, their results were evidently considered sufficiently decisive that the follow-up study of the same period (that is, through 2008) by 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.

supplementary results.

2   Schularick and Taylor's characterization of the money view

A major problem with Schularick and Taylor's analysis is that the authors' characterization of the "money view" is faulty. It misstates the money view on four major dimensions.

First, Schularick and Taylor's conclusion (quoted above) takes crises as necessarily being a subset of the macroeconomic outcomes for which the credit and money views offer rival accounts. As already noted, however, these "crises" are *financial* crises—those years for each country that Schularick and Taylor, in light of historical information and prior research, classify as periods of "banking stress"—while the money and credit views pertain to aggregate output fluctuations.[4] But for the postwar period, such financial crises are not invariably associated with notably adverse macroeconomic outcomes, in particular downturns in output. For example, Schularick and Taylor classify 1984 as 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 of the problem of narrowing an examination of macroeconomic outcomes to instances of financial crises is provided by Canada. In Schularick and Taylor's chronology, Canada had no financial crisis during the postwar period. Consequently, even though Canada had two recessions in the final half-century (1959–2008) of Schularick and Taylor's sample period, that country's experience plays no role in the regressions that provide the basis for Schularick and Taylor's conclusions about the merits of the money and credit views in understanding macroeconomic outcomes.

These examples likely underscore the importance of cross-checking traditional chronologies of financial crises—a process that has taken place in studies conducted since Schularick and Taylor (2012) appeared, especially by Romer and Romer (2017).[5] 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 pursue the matter of financial-crisis chronology further. For our purposes, the key points are that the financial-crisis dates used in Schularick and Taylor (2012) were not invariably associated with recessions, and that many recessions in their sample of countries were not associated with financial crises.

The absence of a firm correspondence between financial crises and economic downturns is demonstrated in Table 1 below. The table shows that in the final half-century of Schularick and Taylor's dataset, 20 years (in the annual data on the 14 countries in the 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.[6] Furthermore, as Table 1 also shows, 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 fluctuations. Furthermore, as

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[4]The prior research includes Reinhart and Rogoff (2009).

[5]Indeed, in describing the financial-crisis dates used in Schularick and Taylor (2012), Schularick and Taylor (2009, p. 31) indicated that, while their dating of financial crises was based on chronologies available in the literature, they had omitted some financial-crisis dates used in earlier studies, due to insufficient support for the position that the dates corresponded to crises.

[6]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	65
2a. Multi-year recessions	18	22
3. Number of crises associated with a recession in the same year or the following year	11	15
3a. Multi-year recessions	5	8

[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) to the recession total. For multi-year recessions, the number includes those recessions that took place in 2008–2009 and 2009–2010. FRED data (Federal Reserve Bank of St. Louis) was used to ascertain growth rates in 2009 and 2010.

[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 was 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.

Schularick and Taylor noted in the passages already quoted, 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 relying on a financial-crisis indicator.

Even if the financial-crisis chronology did adequately capture economic downturns, the Schularick-Taylor results comparing money and credit would be undermined by a second flaw in the authors' characterization of the money view. This flaw is their misinterpretation of the implications of the money view. The authors' version of the credit view, as their paper's title implies, is one in which credit booms "go bust." According to this account—which is supported by the authors' regressions—a period of rapid growth in bank lending precedes a period of contraction in bank loans. Thus, credit predicts financial crises in their regressions in the following way: *positive* bank lending leads to the period of *negative* growth in loans that frequently occurs in financial crises.[7] The authors proceed to argue against the money view using the result (again, see their Table 5) that rapid credit growth is more successful—in a pairwise comparison of regressions—than monetary growth in predicting financial crises (that is, collapses in bank lending).

Schularick and Taylor thus presuppose that the money view is symmetric with their own 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 of fluctuations, rapid monetary (and economic) expansions automatically give rise to monetary (and economic) downturns. However, this was *not* the money view expressed by Friedman

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[7]See, for example, Schularick and Taylor (2012, p. 1045).

and Schwartz.[8] 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 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. Seen in this light, the results of Schularick and Taylor (2012) indicating that rapid money growth is less useful than rapid lending growth in predicting financial crises do not provide evidence against the money view. 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 comment.

A third fault of Schularick and Taylor's characterization of the money view is that, according to their account, advocates of money believe that monetary aggregates' importance arises from their ability to proxy the dynamics of credit. They take Friedman and Schwartz's analysis of pre-World War II developments as having made the approximation that money was a good stand-in for credit. Correspondingly, Schularick and Taylor take the increased importance in the postwar period of wholesale deposits, and of other commercial bank liabilities that are often not counted in M2-type monetary aggregates, as *ipso facto* invalidating the money view.[9] However, 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).[10] Indeed, Friedman (1970, pp. 18–22) was emphatic that his belief in money's importance for economic fluctuations did not rest on any requirement that money and credit move together.[11]

The fourth reason why Schularick and Taylor (2012) do not adequately characterize the money view is that, for many countries, their data on money are simply incorrect. 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.[12] But their *monetary* data contain major errors of two kinds: (1) For a few countries, their money series contains major untreated series breaks; a couple of key examples are

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[8]Friedman and Schwartz (1963) and other Friedman monetary writings must serve as a key criterion for assessing what is meant by the money view. Schularick and Taylor (2012) refer to Friedman repeatedly and, as already indicated, specifically attribute the money view to him and Schwartz.

[9]See the quotation given above from Schularick and Taylor (2012, p. 1051), as well as their statement (p. 1031) that "the 'money view' of the world looks entirely plausible" only under conditions in which money and credit move together.

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

[11]That they do not in fact move together was a major message of Schularick and Taylor (2012) and one we affirm below using our improved money series. However, as the Friedman (1970) discussion attests, Schularick and Taylor's (2012) contention that advocates of money believed that money and credit move together is inaccurate.

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

highlighted below. Failure to allow for these breaks leads to materially lower money/output correlations for these countries. (2) For the vast bulk of the countries in their sample, the annual observation on money is an *end-of-period* value, while standard theoretical and empirical approaches instead imply that the appropriate money variable is an *average-of-period* series.[13] Schularick and Taylor's (2012) use of end-of-period money produces 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.

We improve on Schularick and Taylor's money series by constructing, for the postwar period, "streamlined" broad money series for each of the countries in their study. Like Schularick and Taylor's money series, our streamlined monetary data are obtained from national and international data sources. But unlike Schularick and Taylor's typical money series, 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 the next 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 Comparisons of money series

For the fourteen countries considered by Schularick and Taylor (2012), we have constructed our own broad money series by obtaining annual averages from monthly or quarterly data. 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 money-stock data for many countries on a monthly basis.[14] 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 advantages of our streamlined monetary data over those compiled by Schularick and Taylor (2012).

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[13]Even if, contrary to standard practice, end-of-period money was deemed the series of interest, Schularick and Taylor's use of money in their regressions would be invalid. Money in these regressions is a *real* money series obtained by deflating money by the price level. Schularick and Taylor's (2012) price-level series for each country is an annual-average series. Therefore, their observations on real money typically consist of an end-of-period series divided by an average-of-period series—an invalid combination.

[14]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.
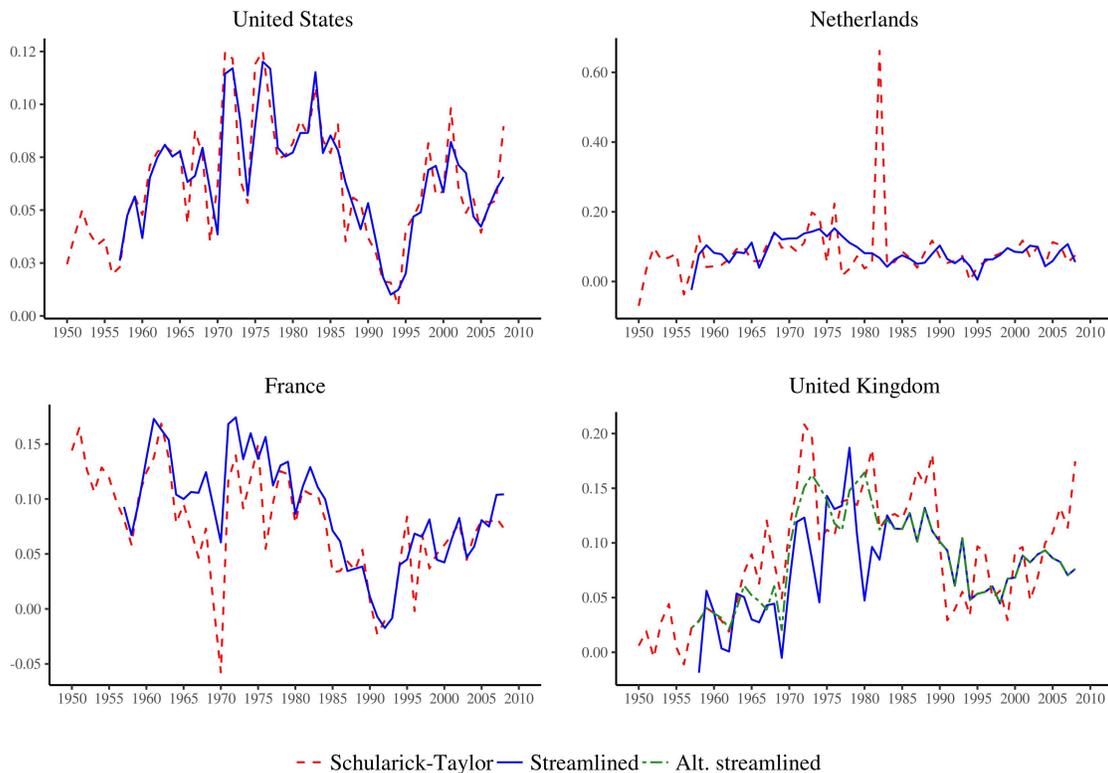
Figure 1: Measures of nominal broad money growth

3.1 Selected country comparisons

As already indicated, our monetary series are average-of-year variables. The Schularick and Taylor (2012) series, in contrast, are primarily end-of-year data.[15] The difference implied by our more valid approach to time aggregation of money 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, but Schularick and Taylor's M2 growth 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. It is also important to note an additional problem: 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, Schularick and Taylor's monetary data in effect refer to a period *following* the period associated with the output data. This implies that evaluations of the dynamic relationship between the growth rates of money and output would not be reliable if one used the Schularick-Taylor 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 than the Schularick-Taylor series. A further

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[15]In the case of Norway, Schularick and Taylor (2012) evidently use average-of-year data on money for substantial parts of the postwar period. That is, while Schularick and Taylor (2012) predominantly use end-of-year data on money, they do not follow this practice consistently across countries.

problem in this instance is that Schularick and Taylor's money series for Netherlands 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 Schularick and Taylor's 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). Schularick and Taylor's monetary growth series for France displays a sharp series break in 1970; in our construction of a streamlined money series from data sources for France, we avoid this break. Our streamlined series for France's money stock has a notably stronger relationship with France's real GDP than does Schularick and Taylor's series. For example, for 1959–2008, the correlation between real money growth and the same year's output growth is 0.21 using Schularick and Taylor's 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). In describing their data, Schularick and Taylor (2009, p. 32) give the money series they use as "M2 or M3." In fact, for the final few decades of their sample period, Schularick and Taylor used neither M2 nor M3 in measuring U.K. broad money. The M3 series for the United Kingdom was abolished in 1989, so it was not available as a monetary measure in recent decades; furthermore, Schularick and Taylor did not measure U.K. money by M2. Rather, they actually used (end-of-period) M4. However, an M2 series (also called "Retail M4") is available in the Bank of England's database starting in mid-1982; and we use this series' annual average to compute monetary growth from 1984 onward. Over 1984 to 2008, the resulting M2 growth series and Schularick and Taylor's series on U.K. monetary growth often behaved very differently, as is brought out in Figure 1.

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.

3.2 Overall comparisons of the money series

Table 2 provides evidence on the differences between the Schularick-Taylor 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 Schularick-Taylor series almost invariably have larger 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.

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 aggregates 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

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

evidence, we show in Table 3 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 3, 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
replacing the Schularick-Taylor monetary aggregate with a streamlined aggregate raises the
monetary growth/output growth correlations for 13 out of 14 countries. In addition, for

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[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.
However, the money data used in computing these correlations were the incorrect Schularick-Taylor (2012)
money series, extended in time beyond 2008. These systematic data errors imply that Jordá, Schular-
ick, and Taylor's conclusion that "monetary aggregates come a distant second [to credit] when it comes
to the association with macroeconomic variables" is unreliable. In addition, in reaching their verdict on
the money/output association, Jordá, Schularick, and Taylor (2016) do not consider correlations of output
growth with *prior* monetary growth.

Table 3: 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.

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, as documented in Section 2 above, not all financial crises are associated with recessions, and many recessions are not associated with financial crises. 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 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:

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

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 already indicated, 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 3 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 4, lags of real credit growth are replaced by lags of real monetary 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 the real growth in the financial aggregate (credit or money). A positive b_1 coefficient would suggest that high credit (or monetary) growth in a preceding period portends a financial crisis. The error term is denoted by e_{it}.

In Table 4, we report the results of the above regression specification for our sample period; we include the regression summary statistics reported by Schularick and Taylor (2012). Our results do not overturn Schularick and Taylor's finding that credit is a better predictor of financial crises than money. The individual and summed coefficients on credit growth tend to be more negative and more statistically significant than those on monetary growth (whether using Schularick and Taylor's money series or our streamlined series), while the regression with credit growth has a better fit, as measured by the pseudo-R^2. However, as indicated above, we do not see the money view as predicting that rapid monetary growth foreshadows financial crises, so we do not regard regression results of this kind as 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 5. 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 Schularick and Taylor's 14-country dataset. The specification follows that of Schularick and Taylor (2012), given in equation (1) above, except that the

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[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 code using our new dependent variables. As already indicated, although this dataset covers fourteen countries, the financial-crisis regressions in Schularick and Taylor's (2012) Table 5 does not include Canada, which did not have a financial crisis in their postwar chronology. Correspondingly, our regressions in Table 4 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 5 and 6 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.

Table 4: 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
L. 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.

dependent variable is redefined:

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

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 their real credit growth using their 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 lag length of five years (that is, lags 1 to 5 of the financial series).[20]

Three features are notable in the results in Table 5. 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—results that we have found in Table 4 continue to hold on the 1963–2008 sample period and with our streamlined money series. 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.[21]

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., 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 fluctuations does not rest fundamentally on money being a proxy for loans or bank credit.[22]

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

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 4, in which the dependent variable involved merely the *start* 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:

$$logit(p_{it}^n) = b_{0i} + b_1(L)DlogCREDIT_{it} + e_{it} \qquad (3)$$

The only difference between specification (2) and specification (3) is the definition of the left-hand-side variable. Specifically, $logit(p_{it}^n) = log(\frac{p_{it}^n}{1-p_{it}^n})$ now represents the log of

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[20]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.

[21]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 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 that output growth is negatively related to prior loans growth, with rapid loans growth presaging recessions.

[22]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).

Table 5: 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
L. 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.

the odds ratio of a *period of negative growth* for country i in year t.[23] The results continue to favor money over credit and our streamlined money series over the Schularick-Taylor money series. Again, in the columns labeled (3.2) to (3.4) of Table 6, real credit growth is replaced with real monetary growth.

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[23]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 6: Logit regressions for prediction of negative real GDP growth, all countries

VARIABLES	*Dependent variable: Log odds ratio for negative growth*			
	(3.1)	(3.2)	(3.3)	(3.4)
	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
L. 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.

Our results favoring the money view in Table 5 hold also in Table 6: 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. These extensions served as robustness checks on their original results by

Table 7: Robustness exercises

Financial variable		Baseline plus 5 lags of real GDP growth	Baseline plus 5 lags of inflation	Baseline plus 5 lags of nominal short-term int. rate	Baseline plus 5 lags of real short-term int. rate	Baseline plus 5 lags of change in I/Y
		Dependent variable: Log odds ratio for recession start				
Loans	Sum of lag coefficients	3.978	−3.082	3.542	4.602	−1.364
	Standard error	5.158	4.246	4.793	4.951	4.408
	Pseudo R^2	0.069	0.113	0.175	0.098	0.063
	Observations	644	644	570	570	644
Schularick-Taylor money series	Sum of lag coefficients	−2.123	−9.415*	0.626	3.973	−7.693
	Standard error	6.948	5.617	6.817	6.013	5.694
	Pseudo R^2	0.064	0.103	0.180	0.086	0.064
	Observations	644	644	570	570	644
Streamlined money series	Sum of lag coefficients	−0.760	−9.847	−1.413	2.142	−9.402
	Standard error	9.322	6.770	8.491	8.089	6.791
	Pseudo R^2	0.084	0.114	0.174	0.121	0.090
	Observations	644	644	570	570	644
Streamlined money series (using alt. U.K. M series)	Sum of lag coefficients	−3.559	−12.690*	−2.893	1.615	−11.210
	Standard error	9.915	6.798	8.655	8.287	6.980
	Pseudo R^2	0.078	0.114	0.170	0.117	0.085
	Observations	644	644	570	570	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.

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:

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

This specification differs from specification (2) in that the vector of variables $\mathbf{X}_{it}$ contains the aforementioned macroeconomic variables.

In Table 7, we summarize the outcome of adding these additional regressors. In the regressions that include interest-rate variables, there is a substantial drop in the number of observations in the regressions. Partly for this reason, both money and credit tend to lose significance when the additional regressors are included. Moreover, for the robustness tests that include lagged real GDP growth, interpretation of the regressions is complicated

Table 8: Further robustness exercises

Financial variable		Baseline plus 5 lags of real GDP growth	Baseline plus 5 lags of inflation	Baseline plus 5 lags of nominal short-term int. rate	Baseline plus 5 lags of real short-term int. rate	Baseline plus 5 lags of change in I/Y
		Dependent variable: Log odds ratio for negative growth				
Loans	Sum of lag coefficients	3.396	-5.518	0.422	1.258	-4.529
	Standard error	4.911	4.114	4.62	4.443	4.262
	Pseudo R^2	0.178	0.142	0.215	0.132	0.110
	Observations	644	644	570	570	644
Schularick-Taylor money series	Sum of lag coefficients	-5.591	-17.450^{***}	-5.488	-3.228	-14.520^{**}
	Standard error	6.709	5.565	6.265	5.851	5.852
	Pseudo R^2	0.186	0.147	0.226	0.115	0.130
	Observations	644	644	570	570	644
Streamlined money series	Sum of lag coefficients	-0.644	-15.690^{**}	-6.236	-4.541	-15.340^{**}
	Standard error	8.291	6.260	7.662	7.499	6.382
	Pseudo R^2	0.204	0.166	0.229	0.169	0.160
	Observations	644	644	570	570	644
Streamlined money series (using alt. U.K. M series)	Sum of lag coefficients	-2.023	-18.170^{***}	-6.741	-3.742	-16.300^{**}
	Standard error	8.808	6.304	7.883	7.574	6.536
	Pseudo R^2	0.190	0.153	0.217	0.150	0.140
	Observations	644	644	570	570	644

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

Note: See notes to Tables 6 and 7.

by the fact that lagged real GDP growth enters into the construction of the left-hand-side variable. Notwithstanding these caveats, the robustness results, like the earlier results, tend to favor money over credit in predicting recessions. In particular, for all specifications, the sum of the lag coefficients on money (irrespective of money series) shows a tendency to be more negative than does credit.

When inflation and the change in the investment-to-output ratio are the additional regressors, real monetary growth continues 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 other additional right-hand-side variables are included—particularly the real interest rate—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.

In Table 8, the same robustness results are reported for the case in which the dependent variable refers (as in specification (3)) to the incidence of negative growth. Even more so than in the recession-start regressions of Table 7, real monetary growth displays a tendency to maintain a negative coefficient sum in the presence of the added regressors, and this sum is larger in absolute value than that on real loans growth. Notably, real monetary growth maintains negative coefficient sums when the interest-rate variables are included, while this is not true for real loans growth.

Overall, the robustness exercises reported in Tables 7 and 8 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.

5   Conclusions

In this comment, we have reexamined Schularick and Taylor's (2012) evaluation of the money and credit views of macroeconomic fluctuations. For the postwar period, Schularick and Taylor conclude that the data strongly favor the credit view over the money view. However, Schularick and Taylor's interpretation of the money view is faulty, as they see its validity as requiring that rapid monetary growth predicts financial crises, and they take the money view's proponents as appealing to a proposition that changes in the money stock are a good proxy for changes in bank credit (specifically, bank loans). In fact, the money view of Friedman and Schwartz (1963) does not predict an automatic relationship between rapid monetary growth and (financial or economic) downturns, and it does not rest on money being a good proxy for credit. In addition, Schularick and Taylor's (2012) data for broad money have systematic errors resulting from their use of end-of-period instead of average-of-period data, and their failure to take adequate account of discontinuities. With a corrected 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 multi-country dataset, we find 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, we found that money outperforms credit in predicting economic downturns in the 14 countries in Schularick and Taylor's dataset. This result—which continued 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 considering regressions that end in 2008, thereby largely excluding from our sample 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 use of historical information, 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 in understanding 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) claim to have established a finding—which they note has "broad implications for economic history"—that credit aggregates have been crucially important and monetary aggregates have not been.

Second, we have followed Schularick and Taylor (2012) by concentrating on monetary and loan aggregates in representing the money and credit views. Evaluation of the relative merits of the money and credit 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 to 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 works in part by affecting credit spreads, 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		
	$k=0$	$k=1$	$k=0\text{-}1$	$k=0$	$k=1$	$k=0\text{-}1$	$k=0$	$k=1$	$k=0\text{-}1$
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
L. 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

VARIABLES	Dependent variable: Log odds ratio for negative growth			
	(3.5)	(3.6)	(3.7)	(3.8)
	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
L. 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.
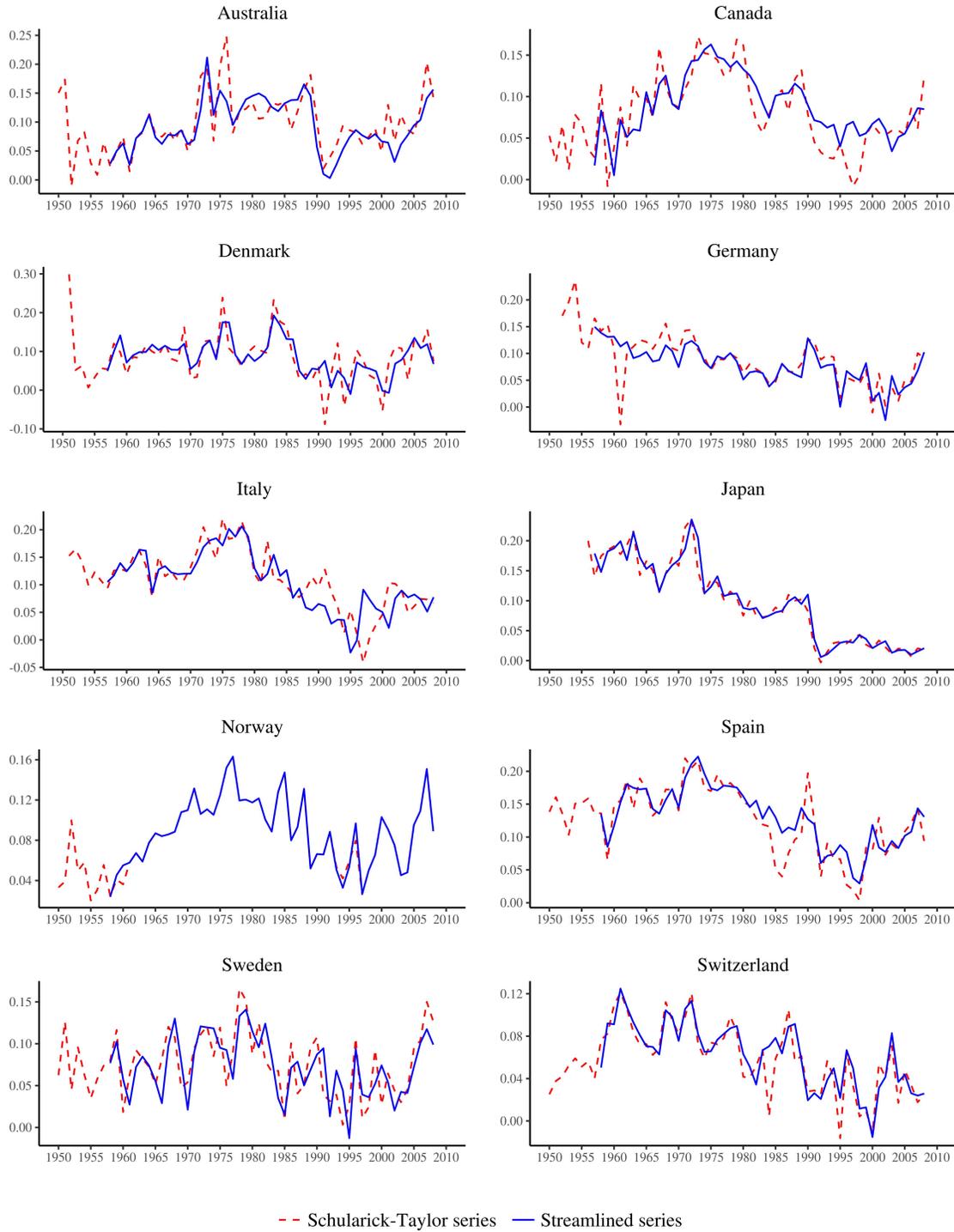
Figure A1: Measures of nominal broad money growth for remaining countries in the sample

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).[24]

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

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[24]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).[25] 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

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[25]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.[26] 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 on 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.

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[26]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-average 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.