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Financial fragility in the Great Moderation

Dirk Bezemer [a,*], Maria Grydaki [b]

[a] Faculty of Economics and Business, University of Groningen, The Netherlands
[b] Division of Economics, University of Stirling, United Kingdom

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ABSTRACT

A nascent literature explores the measurement of financial fragility. This paper considers evidence for rising financial fragility during the 1984–2007 Great Moderation in the U.S. The literature suggests that macroeconomic stability combined with strong growth of credit to asset markets, in asset prices and in credit relative to output are all indicators of rising financial fragility. We show each of these trends in the Great Moderation. We derive the testable implication that in the Great Moderation credit growth is driven more by past credit growth and less by output growth (Allen and Gale, 2000), relative to pre-Great Moderation years. Results from a VAR model estimated on quarterly data for 1955–2007 are consistent with the hypothesis. This invites a reinterpretation of the Great Moderation. Our methodology may help understand when a credit boom turns into a credit bubble, and contributes to the development of methods of measuring financial fragility.

1. Introduction

How does the relation between credit growth and output growth change during a credit boom? Which of these changes are likely to turn credit booms into credit bubbles? Understanding the changes during the boom may help us better understand if and how credit booms precipitate credit crises. In the present paper we focus on this question in an empirical study of the US credit boom which preceded the 2008 crash.

We build on the financial fragility literature which suggests that macroeconomic stability combined with strong growth of credit to asset markets, of asset prices and of credit relative to output, are all indicators of rising financial fragility. We show each of these trends for the 1984–2007 Great Moderation in the U.S. We select a testable implication of rising financial fragility, which is that credit growth becomes driven more by past credit growth and less by output growth (Allen and Gale, 2000). We present evidence that during the Great Moderation, this was true for credit towards the financial and real estate sectors, compared to the pre-Great Moderation years. Results from a VAR model estimated on quarterly data for 1955–2007 are consistent with our hypothesis. This invites a reinterpretation of the Great Moderation and may help understand when a credit boom turns into a credit bubble.

Credit growth leads to output growth (Schumpeter, 1934; King and Levine, 1993; Levine, 2005), but may simultaneously lead to imbalances and crisis. The first effect has been intensively researched, but the conditions for the second effect are not yet well understood. Classical credit cycle theories (Wicksell, 1898; Veblen, 1904; Fisher, 1933; Schumpeter, 1939; Minsky, 1964, 1986) applied and extended in contemporary work (Allen and Gale, 2000; Keen, 1995, 2013; Borio, 2012) describe how the function of credit in the economy changes over the course of a credit boom and in the run up to a bust. The use of credit shifts from financing low-risk, low-return investment in fixed capital accumulation and productivity improvements, towards financing high-risk, high-return investments in real estate and financial assets and instruments, with increasing leverage and financial fragility (Bezemer, forthcoming). The distribution of the credit stock shifts away from the nonfinancial sectors and towards the financial and real estate sectors (Beck et al., 2012a). In the process, the link between credit dynamics and output growth becomes looser (Tobin, 1984). At the end of a speculative boom, credit growth and rising asset prices are reinforcing each other, so that credit growth is no longer mainly driven by economic fundamentals, but more by its own past dynamics (Allen and Gale, 2000).

* Corresponding author at: Nettelbosje 2, 9747 AE Groningen, The Netherlands.
E-mail addresses: d.j.bezemer@rug.nl (D. Bezemer), maria.grydaki@stir.ac.uk (M. Grydaki).

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Another feature of the run-up to a boom is that 'stability is destabilizing', as Minsky (1978) wrote. Low volatility in real and financial variables encourages more debt-financed investment and risk taking (Bean, 2011). Greater-than-usual stability is so both caused by more generous credit conditions, and encourages financial innovation and further expansion of credit and leverage. Leverage, in turn, increases financial fragility, measured as vulnerability to asset prices changes (Sutherland et al., 2012). Financial innovations also increase financial fragility (Beck et al., 2012b; Gennaioli et al., 2013).

The US economy during the credit boom which preceded the 2007 Great Crash conformed to each of these features. The 'Great Moderation' years 1984–2007 saw both unusual macroeconomic stability[1], financial innovation and expansion of credit, and a shift in the distribution of credit towards the financial and real estate sectors. This is evidenced in macro-level US credit data (shown below). Kalemli-Ozcan et al. (2012) use micro evidence to show the rise of leverage ratios of US investment banks and financial firms, but not of US non-financial firms. All this suggest that the financial fragility of the US economy was increasing during the credit boom which characterized the Great Moderation years.[2] Therefore this episode may offer an opportunity to study the conditions which distinguish sustainable credit growth from fragility-increasing credit growth.

Financial fragility cannot be directly observed, but based on the literature we develop three testable hypotheses. We consider Granger causation between credit aggregates and output growth when financial fragility is increasing. Although this is no proof of "true" causality, it is evidence that "[t]he cause contains information about the effect that that is unique, and is in no other variable" (Granger, 2003).[3] The hypotheses are (i) a weakening of Granger causation from output growth to growth in credit to the nonfinancial sectors, (ii) a weakening of Granger causation from both output growth and growth in credit to nonfinancial business to growth in credit to the real estate and financial markets, and (iii) stronger Granger causation of growth in credit to real estate and financial markets to its own future growth.

We test these hypotheses in a VAR framework on quarterly U.S. data during the Great Moderation (1984–2008) and before the Great Moderation (1955–1979) (where nothing depends on the precise choice of break dates), controlling for inflation and for the stance of monetary policy. We conduct Granger causation tests, impulse response functions and forecast error variance decompositions to probe our hypotheses. Among other findings, we observe that during the Great Moderation, output growth ceases to Granger-cause growth in credit to the nonfinancial sectors. We also find that the percentage of forecast error variance of credit to real estate and financial markets explained by its own past growth rises from 27.5% before the Great Moderation to 85.1% during the Great Moderation. We tentatively suggest that these and other changes in the relation of credit and output can be interpreted as indication of increasing financial fragility.

We make two contributions. First, despite strongly increased research interest in financial fragility, the concept remains elusive and its measurement difficult. We suggest a translation of key notions in the fragility literature into empirically observable trends. We make no strong claims about the finality of our definitions, but we believe that approaching financial fragility as a change in the relations between variables (credit growth, output growth, volatility) rather than as some variables may prove fruitful in the developing financial fragility research agenda. Second, we link empirically the stability of the U.S. Great Moderation period to the changing relations between credit and output in the U.S. Thus, our contribution is not so much in the technical methods (which are conventional) as in suggesting measures of developing financial fragility.

In the next section we present and discuss the stylized facts of credit and growth in the U.S. from the early 1950s to 2008. We motivate the functional differentiation of two credit aggregates. In Section 3 we present the methodology, the data and the analysis. Section 4 concludes with a discussion of limitations and possible extensions.

2. The functional differentiation of credit: trends in the U.S

To understand the build-up of fragility, we should "distinguish between different categories of credit, which perform different economic functions", as Turner et al. (2010:16) urge. We therefore propose a functional differentiation of credit.

The deepening of markets for financial intermediation, often measured as an increase in the ratio of bank credit to GDP, has long been viewed as a key driver of growth in output.[4] However, a string of recent papers shows that a high value of this ratio may slow down growth (Rousseau and Wachtel, 2011; Arcand et al., 2012; Cecchetti and Kharroubi, 2012), while high growth of the credit-to-GDP ratio increases financial fragility, carrying the risk of crisis (Reinhart and Rogoff, 2009; Schularick and Taylor, 2012; Jordà et al., 2011). Financial fragility is defined as sensitivity of default rates to income or asset price shocks (Jappelli et al., 2008), increasing the probability of financial instability (Minsky, 1978).

In particular, growth of credit *other than* to nonfinancial firms – such as household mortgage credit or credit to financial firms – has been linked with increasing financial fragility (Jappelli et al., 2008; Barba and Pivetti, 2009; Büyükkarabacak and Valev, 2010). Allen and Gale (2000) show theoretically how, by simultaneously driving up asset prices and leverage in a mutually enforcing process, such financing may increase financial fragility. Borio and Lowe (2004) find empirically that high credit growth coupled with an asset price boom is a good predictor of financial fragility and instability. Bernoth and Pick (2011) demonstrate that linkages between banks and insurance companies are important when forecasting financial fragility. Each of these findings suggest a special role for credit supporting price rises in (real estate and other) assets, distinct from credit to nonfinancial firms, supporting the production of goods and services. Kalemli-Ozcan et al. (2012) link the rise in their measure of financial fragility in the US in the 2000s to increasing leverage in households and in nonbank financial firms, but not in non-financial firms.

This suggests that bank credit to markets for real estate, stock, bonds and other financial assets and instruments – jointly labeled

[1] See e.g. Bernanke (2004). Blanchard and Simon (2001) showed that the standard deviation of quarterly growth and inflation in the U.S. declined by half and by two thirds, respectively, since 1984. Stock and Watson (2002), Kim and Nelson (1999) and Warnock and Warnock (2000) also found this, with strongly declining employment volatility. See Cecchetti et al. (2006) for cross country evidence.

[2] Note that in this paper we do not explain Great Moderation itself. Our argument is different from, but compatible with, a wide range of explanations for the Great Moderation in the literature. This includes labor market changes (Jaimovich and Siu, 2009), oil shocks and responses to shocks (Nakov and Pescatori, 2010; Gambetti et al., 2008), inventory management (McConnell and Perez-Quiros, 2000; Kahn et al., 2002; McCarthy and Zakrajsek, 2007), external balances (Fogli and Perri, 2006), better monetary policies (Bernanke, 2004) and 'good luck' (Ahmed et al., 2002; Cogley and Sargent, 2005; Primiceri, 2005; Sims and Zha, 2006; Gambetti et al., 2008; Benati and Surico, 2009).

[3] In his Nobel acceptance speech, Granger (2003) continued to say that "[a]t that time, I had little idea that so many people had very fixed ideas about causation, but they did agree that my definition was not "true causation" in their eyes, it was only "Granger causation". I would ask for a definition of true causation, but no one would reply." (Granger, 2003:366).

[4] The empirical literature started with King and Levine's (1993) seminal *Finance and Growth: Schumpeter Might Be Right* which builds on Schumpeter (1934, 1939), Goldsmith (1969), McKinnon (1973) and Shaw (1973). Levine (2005) and Ang (2008) provide overviews. Beck et al. (2009) present recent empirical results.