Essays on the U.S. financial cycle: construction, real effects and cross-border spill-overs

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CHAPTER 1

Introduction

1.1 Background and motivation

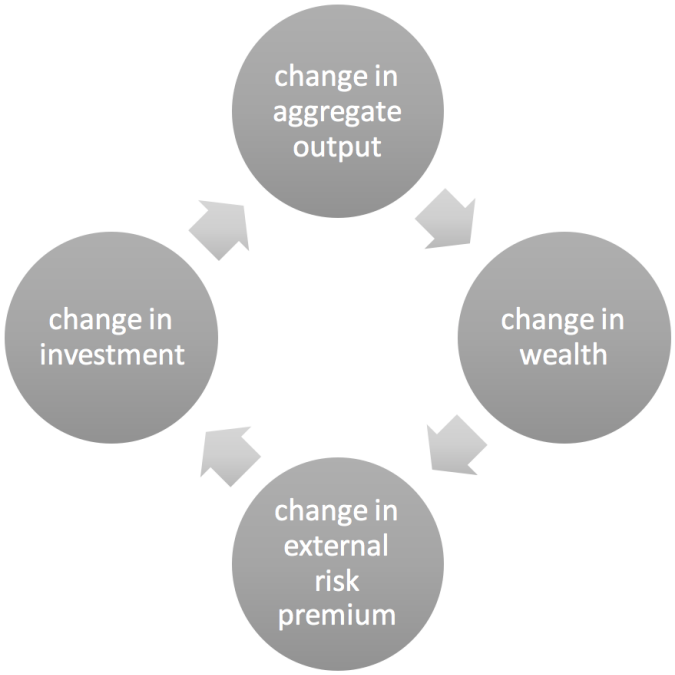
This doctoral thesis contributes to the macroeconometric literature on financial cycles with a particular focus on the United States. When this project was started in 2013, little research addressed financial cycles. Now that the project is concluded, it is part of a fast-growing and already voluminous literature. According to Borio (2014), the financial cycle represents "self-reinforcing interactions between perceptions of value and risk, attitudes towards risk and financing conditions, which translate into booms followed by busts" (see also Claessens et al., 2009; Ng, 2011; Hatzius et al., 2010).

Until a few years ago, financial conditions were not typically included in macroeconomic models. Therefore, in contrast to the large and long-standing literature streams addressing financial development (beginning with Schumpeter, 1934; Gurley & Shaw, 1960) and business cycles (see Schumpeter, 1939; Burns & Mitchell, 1946), little work on financial cycles exists. The current research focuses on the construction of measures reflecting financial conditions. It is motivated by the question of whether financial conditions have an impact on macroeconomic outcomes that cannot be reduced to real factors. The answer comes in two varieties.

First, in the "financial accelerator" literature, information-based credit market frictions reflect and amplify economic fundamentals (Bernanke & Gertler, 1989; Kiyotaki & Moore, 1997; Bernanke, Gertler, & Gilchrist, 1999). Although the framework deals mostly with the transmission of monetary policy, the key ideas are also relevant to the broader set of relations between the financial and real sides of the economy. Various theoretical mechanisms explain how financial conditions may amplify a business cycle, all of which are based on the concept of interplay between an economic agent's wealth and external finance premium (see Figure 1.1). The external finance premium is defined as the difference between cost of funds raised externally and opportunity

costs internal to a borrower. The net worth is defined as the sum of liquid assets and the collateral's value of illiquid assets minus any outstanding obligations.

Figure 1.1: Financial accelerator



Notes: Financial accelerator mechanisms model amplification and propagation of economic shocks due to the interplay between an economic agent's net worth and the external finance premium resulting from asymmetric information between lenders and borrowers.

For example, the "balance sheet channel" examines how the strength of a borrower's balance sheet affects the external finance premium. The greater the borrower's net worth, the lower the external finance premium. The borrower with more collateral has a higher stake in the success or failure of a project, which helps realign borrower's and lender's incentives. Another well-known transmission mechanism is the "bank lending channel" (Bernanke & Blinder, 1988), in which firms react to changes in monetary policy rates, which changes reserves available to banks for lending and may also affect the external funding premium (Bernanke & Blinder, 1988). Transmission of monetary policy shocks is most visible for smaller, less liquid banks (e.g., De Haan, 2003).

A second set of arguments with regard to financial cycles builds on the idea that financial cycles play a separate role. Here, credit expansion is not necessarily fully caused by real sector changes; it may be propelled by asset market valuations, which are not necessarily equal to the rationally discounted value of expected cash flows

from the asset. Minsky (1977, 1978) developed a theory of finance-driven instability in financial systems that allows agents to create means of payments based on perceived collateral values. This instability is endogenous to the financial system, rather than caused by exogenous shocks and then amplified by the system. Minsky notes that expectations and sentiments change the saleability of assets, which defines their liquidity and, therefore, their value as collateral. Increasing collateral values drive increasing levels of financial investments, on increasingly risky financing profiles, without necessarily being a reference to the productivity or profitability of underlying real assets. The increasing returns feed back into more optimistic assessment of collateral values and into more appetite for leverage and for risk. Research using Minsky's mechanisms includes Keen (1995, 2013) and Ryoo (2013, 2016).

In view of the apparent impact of financial conditions on economic growth and stability, the demand for financial condition measures has surged since the 2007 financial crisis. As to policy implications, financial conditions are incorporated in macro-prudential policy frameworks such as Basel III and Basel IV–for example, in the specification of countercyclical capital buffers. These and other factors justify attempts to define and quantify the financial cycle and to investigate its linkages to growth, crisis, recession, investment and productivity.

Empirical studies provide various approaches to constructing a measure of a financial cycle (see Chapter 2 for some of the measures). The selection of financial indicators is the first step. The most commonly used are real estate prices, credit to gross domestic product (GDP) ratios, stock market prices and nominal long-term rates (e.g., Schüler et al., 2015). From these indicators, a financial cycle can be constructed using various methods.

One approach is to use multivariate structural time series models such as that used in Harvey and Koopman (2009) and Galati et al. (2016) (see also Table D.0.1). Drehmann, Borio and Tsatsaronis (2011) suggest that the financial cycle should be four times longer than the business cycle.[1] This metric is also used as a leading indicator for macro-prudential decisions put forward by the Basel Committee.

Turning point analysis compares turning points in house prices and credit indicators (e.g., Burns & Mitchell, 1946; Claessens et al., 2012). A turning point date of the common cycle must satisfy two criteria. For example, to find a peak date in the common cycle, it is necessary to identify a local minimum of the median distance for all individual series to their closest (own) peak. In addition, one must find the a

[1] They suggest using a Hodric-Prescot filter applied on credit to GDP series with lambda factor 400 k for quarterly data.

prespecified window within which all individual peaks are located (for more details, see Harding & Pagan, 2006; Drehman et al., 2012).

To construct financial cycles, researchers typically use multivariate (stationary) financial indicators to compute averages or principal components (e.g., Hatzius et al., 2010). These stationary series may represent growth rates or filtered cyclical components obtained with univariate filtering methods such as Christiano and Fitzgerald's (2003) optimal asymmetric bandpass filter, which requires that the lower and the upper bounds of a cycle extracted are specified beforehand. The required ad hoc restriction risks extracting spurious cycles or missing important dynamics of a cycle.

The literature on measuring financial cycles has several limitations. First, selection of the input series typically tends to focus on asset prices and credit data or on a very broad set of variables that are not motivated by theory. We offer a middle ground by extending the basic set of variables with investor, household and manager sentiment measures, thereby improving on a financial cycle measurement. We also deviate from the popular practice of analyzing the aggregate credit to GDP data series and instead consider nonfinancial leverage and household leverage data separately, because these series have very different dynamics and implications for the economy. Household sentiment depends on income and (expected) demand for real estate whereas investor sentiment depends on future profit expectations translated into capital asset prices. Both depend on the conditions under which short- and long-term finance are available (see, e.g., Minsky, 1978). Second, the literature provides no consensus on how to combine information from separate time series into a financial cycle; to close this research gap, we offer an approach in Chapter 2.

Does investment depend on a financial cycle? The academic literature has identified several plausible explanations why this is the case. Indirectly, financial valuations influence investors' propensity to consume and aggregate demand, which affects investment. For example, financial liberalization and innovations allow households to extract capital gains through collateral-based borrowing; thus, it can act as a consumption smoothing instrument (see, e.g., Cambell & Cocco, 2007; Muellbauer & Williams, 2011).

A financial cycle may have an impact on investment through its influence on stock market prices, that is, market valuations. Baker and Stein (2004) and Baker and Wurgler (2006) investigate this link (see also Barberis, Shleifer, & Vishny, 1998; Elton, Gruber, & Busse, 1998; Neal & Wheatley,1998 Brown & Cliff, 2004). If investment is driven by market valuations that in turn are sensitive to investor sentiment, then a link between investment and sentiment should be evident (see Chapter 3). Baker and Wurgler (2003) investigate how investor sentiment influences a financially constrained

U.S. firm. They examine a transmission channel through external dependence on finance, a firm-level measure developed by Kaplan and Zingales (Kaplan & Zingales, 1997). In Chapter 3, we conduct an alternative analysis on the industry-level data investigating whether investment of externally more dependent industries (see Rajan & Zingales,1998 for the definition of external dependence) is more sensitive to investor sentiment. We use industry-level data because the concept of external dependence was developed as an industry feature. Similarly, we examine whether growth industries, which are more subject to stock market mispricing, are more sensitive to financial cycles, classifying growth industries using Tobin's Q.

Chapter 4 takes a step away from the financial cycle applications in the United States and examines the cyclical co-movements between U.S. and Mexican macroeconomic indicators. Mexico is a small open economy and is as such exposed to external influences from the United States. We examine whether Mexico has its own financial cycle after accounting for the U.S. influence. This insight not only is relevant for Mexico, but also fits the broader discussion on how independent the monetary policy of small open economies can be (see Rey, 2015). Mexico is an interesting case to analyze considering its membership in the North American Free Trade Agreement (NAFTA) from 1994 onwards. Similar studies have shown that co-movements between key Mexican and U.S. macroeconomic variables increased (see Kose, Meredith, & Towe, 2004). The research in Chapter 4 is novel in that it measures domestic indicator cyclical movements at business cycle and financial cycle frequencies, quantifying domestic versus global dynamics. Comparing business cycle estimates before NAFTA and in the late NAFTA period shows increasing influence of the U.S. economy on Mexico for real activity indicators.

1.2 History of the US financial sector regulation

Our data cover four decades of U.S. macroeconomic history. Financial indicator dynamics also depend on the changing financial sector regulation. In our analyses, we do not control explicitly for changes in the U.S. legal framework. However, by working with real indicators, we do control for changes in nominal effects that regulation may affect. To determine whether other limitations are relevant to our chosen sample periods, we next provide a brief survey on the U.S. financial sector regulation.[2]

After Black Tuesday (1929), financial regulators moved toward reduced systematic risks and increased transparency in financial markets. In the 1930s, Congress passed

[2]For a more extensive discussion of the time line of U.S. financial (de)regulation, see Sherman, 2009.

the Glass-Steagall Act, which placed limits on the interest rates banks could offer on deposits, established deposit insurance for consumers and prohibited banks from "engaging principally" in nonbanking activities. The Glass-Steagall Act separated commercial (depository) banking from investment banking. In 1934, the Securities and Exchange Commission (SEC) was established to regulate secondary trading on stock exchange. Firms were required to submit quarterly and annual reports to the SEC, which in turn was responsible to prevent fraud. The Commodity Exchange Act of 1936 was drafted to regulate commodities and futures trading. In 1933, the Federal Home Loan Bank Board was established to oversee thrifts, that is, institutions that specialized in taking deposits and making home mortgage loans. However, insurance business remained subject to various state legislations.

In the 1970s, inflation surged, and state-level usury laws became a serious constraint for the bank lending business. Money market funds had emerged as an unregulated alternative to banks, offering attractive market interest rates during this high inflation period. However, they had no reserve requirements and no deposit insurance. In 1978, national banks were allowed to export the maximum interest rate regulation nationwide. To attract commercial bank businesses, South Dakota completely eliminated the usury ceiling, which meant that the de facto usury ceiling disappeared nationwide. In 1980, President Carter signed the Depository Institutions Deregulation and the Monetary Control Act to completely phase out interest rate ceilings within six years, established obligatory reserve requirements for banks to keep with the Federal Reserve and increased federal deposit insurance to $100,000. This act allowed all banks and saving institutions to compete with money market mutual funds but removed previously more favorable interest rate regulation advantages for mortgage institutions. Having lost its interest rate ceiling advantage, the thrift industry now had to compete with spiraling interest rates, and in addition, it faced asset-liability mismatch. In the 1980s, thrift institutions reported large losses and were distressed. The Federal Home Loan Bank Board passed more lenient accounting standards to allow for loss recognition over an increased time horizon. In 1982, the Garn–St. Germain act was passed to allow thrifts to engage in commercial loans up to 10% of asset value; thus, thrifts entered into competition with money market funds. The Alternative Mortgage Transactions Parity Act of 1982 liberalized exotic feature mortgage loans (e.g., adjustable interest rates). Between 1982 and 1985, thrifts attracted large funds and started to focus on investing in commercial real estate. Commercial real estate was a favorable investment option until 1986 when tax-cut regulations eliminated its advantage, reversing investment flow and leading to decline in thrift industry.

In 1986, after extensive lobbying efforts, banks were allowed to earn 5% of gross

revenues from investment banking business. Regulations became more lenient over next decades, after Alan Greenspan was appointed as Chairman of the Federal Reserve. In 1996, the Federal Reserve allowed banks to increase their investment banking exposure even further: up to 25% of revenues.

In 1994, the Riegle–Neal Interstate Banking and the Branching Efficiency Act removed restrictions on interstate banking and branching, which led to mergers in the banking sector. The Glass–Steagall separation between banking and nonbanking activities was completely abandoned in 1998 after regulators approved the merger of Travelers Insurance Group with Citibank. In 1999, the Financial Modernization Act legalized business combinations of insurance, banking and securities.

No regulation or transparent record was applied to fast-evolving derivative markets. In 2000, the Commodity Futures Modernization Act exempted this sector from regulation, which led to fast expansion. New financial instruments designed for mortgage markets were held by a majority of financial institutions. In 2004, regulators relaxed capital requirements for global investment banks and allowed them to rely on their internal models in risk assessment. In 2008, mortgage-backed securities started to lose their value, which led to the Great Financial Crisis (2008). The Treasury interfered by buying up troubled assets and injecting liquidity.

In 2009, the Dodd–Frank Wall Street Reform and Consumer Protection Act represented a first attempt to regain regulatory power over the financial system. The aim was to increase transparency of derivatives by bringing them onto exchanges: the Volcker Rule requires bank holding companies to restructure or divest their proprietary trading and hedge fund and private equity businesses, and the Collins Amendment eliminates trust preferred securities as an element of Tier 1 capital. A new regulator called the Financial Stability Oversight Council was established to serve as an early warning system, identifying risks in firms and market activities. In 2018, the signs of easing financial regulation resurfaced as the Senate passed a bill to reduce oversight for banks with assets below $250 billion, meaning that the Dodd–Frank provisions were partially rolled back, which arguably increased systematic risks.

To sum up, interventions by regulators will influence the risk taking behavior of economic agents and change financial sector mechanisms. For example, interventions by a regulator can limit downside vulnerability of profit flows at the same time increasing inflationary bias to the economy (Minsky, 1992). The largest part of our considered sample period coincides with a decreasing regulation of the financial system. An important implication of this is that our collected financial indicators should reflect well market sentiment. This sentiment is assumed not to be subject to major regulatory constraints and thereof similar system behavior is expected to hold

throughout the sample period.

1.3 Outline of the thesis

Chapter 2 offers a new approach to estimate financial cycles with the application to the United States over the period 1973–2014. Using the financial cycle concepts of Schumpeter and Minsky, we select six indicators: the slope of the yield curve, the Purchasing Managers' Index, real estate price returns, the S&P stock price index returns and leverage ratios of households and nonfinancial corporations. To construct factors, we estimate lead–lag relations between the indicators using spectral analysis and compute principal components of the aligned series. We find that two factors, capturing corporate and household sentiments, account for over 60% of the cumulative variance in our data. The data show that corporate optimism peaks before crisis episodes, which implies that increasingly optimistic valuations of capital assets eventually lead to present value reversals. The turning points of both factors lead on average the turning points of GDP growth cycle. Our factors perform well compared with alternative measures of financial and real activity.

Chapter 3 examines manufacturing industries investment sensitivity to investor sentiment in the United States over the period 1974–2014. We examine whether industries with higher growth opportunities and more dependence on external finance respond more strongly to market sentiment. Similar to Malmendier and Tate (2005), we use Tobin's Q to proxy for growth opportunities. We estimate an industry's external dependence on (debt) finance in a novel way, using a panel-data regression. The results offer qualified support for the external dependence channel: the positive correlation between U.S. investor sentiment and industry-level investment growth is stronger in industries that depend more on external finance. However, we find no evidence that growth opportunities, as measured with Tobin's Q, affect the sentiment–investment relationship. The latter finding is consistent with the idea that Tobin's Q also represents a market mispricing component. Mispricing may lead managers to invest in outside opportunities to avoid decreasing the marginal product of capital further. Our results are robust to instrumenting and to a variety of specifications.

Chapter 4 examines Mexico's exposure to short- and long-term changes in global conditions over the period 1981–2016. We estimate U.S. and Mexican business and financial cycle components and analyze their cyclical co-movement. We find long-term countercyclicality and short-term pro-cyclicality between U.S. investor sentiment and Mexican leverage growth and the net financial account. We also find short- and

long-term countercyclicality of Mexico's net financial account with U.S. GDP growth rates and U.S. household sentiment, respectively. Our findings are in line with Rey's (2015) findings that emerging market capital flows and credit growth are subject to the global financial cycle. In a separate analysis, we estimate that in the late NAFTA sample, cyclical movements in Mexican GDP and stock market index growth are driven by the U.S. business cycle. At the same time, the proportion of idiosyncratic shocks in the Mexican indicators decreased. Similarly, Kose, Meredith, and Towe (2004) find an increase in cross-country correlations of the major macroeconomic aggregates and decrease in output volatility. Finally, Chapter 5 concludes with policy recommendations and suggestions for future research directions.