The Financial Cycle and the Regulatory Pendulum in the United Kingdom (1885-2016)

German Forero-Laverde[♠]

Abstract

The goal of this paper is twofold. First, we study whether there is evidence for a financial cycle, characterised by the joint movement of stock markets and credit aggregates in the United Kingdom from 1885 until 2016. Secondly, we test whether the relationship between both variables is contingent on the level of financial repression or liberalisation. Formally, we will contrast if changes in regulation affect the causal relationship between stock markets and credit aggregates after controlling for an assortment of variables that may be driving the relationship. Regarding the first question, we find evidence of a time-varying relationship between stock markets and credit throughout the period. Additionally, there is a relationship between the financial cycle and the real economy during economic booms. Regarding the second question, our tests show a robust causal relationship between stocks and credit both in the short and long-run. Moreover, said relationship is contingent on whether the economy is experiencing a period of financial repression or latitude. Finally, we contribute evidence that changes in the regulation/deregulation dynamic in 1914 and 1979 coincide with structural breaks in our VAR model. Under deregulation, the relationship between both variables was of bidirectional causality, particularly in the short and long-run specifications. Contrarily, during financial repression, causality runs only from the stock market to credit in the short run while the long run nexus is broken.

Keywords

Financial history; Deregulation; Financial cycle; United Kingdom; Financial stability.

JEL Codes

N14, N24, G18, F33

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Introduction

The financial crisis of 2008 confirmed what some researchers, particularly at the Bank for International Settlements (BIS), have been saying from the beginning of this century: central banks and regulators cannot assume a direct correspondence between low inflation and financial stability as suggested by Bernanke & Gertler (1999). Under this view, the link between credit and asset prices runs through a "financial accelerator" channel, in which increases in the price of collateral-worthy assets strengthen balance sheets for firms and households easing their credit restrictions (Bernanke, Gertler & Gilchrist, 1999). Consequently, the financial system plays the role of an amplifier of exogenous shocks.

The alternative view, hypothesised by the BIS, posits that there is a financial cycle, composed of the joint behaviour of assets and credit, which accumulates imbalances during periods of excessive growth resulting in financial crises as they unwind (Borio, 2014b). Recently, a rich set of literature has evolved to contrast this hypothesis by explaining the sources of synchronisation/decoupling of the asset and credit cycles, understanding the role monetary policy and capital flows may play in their evolution and deriving implications for both crisis management and prevention. In this view, that arises from the works of Minsky (1986, 1992) and Kindleberger & Aliber (2005), the financial system is a source of endogenous shocks: excessive credit growth can fuel asset price booms disconnected from fundamentals and lead to what Jordà, Schularick & Taylor (2015) have termed "leveraged bubbles".

The literature on the interactions between credit and asset prices has reached valuable conclusions for the general evolution of the financial cycle. First, asset booms fueled by excessive credit growth have long-run consequences when imbalances unwind (Borio, 2014b). Secondly, recessions that are coupled with the unwinding of imbalances tend to be broader than those that happen independently (Jordà, Schularick & Taylor, 2011, 2013, 2015). Third, credit growth is a sufficient early-warning indicator for the presence of financial instability (Dell'Ariccia et al., 2013). Finally, from the policy perspective, deregulation and liberalisation of financial systems have been found to play a critical role in their evolution.

For instance, in credit markets, as constraints on both lenders and borrowers are reduced, the number of (apparently) credit-worthy individuals increases, and credit expansions ensue (Diaz-Alejandro, 1985; Borio, 2014b). A similar process is evidenced in capital markets where liberalisation processes increase access to capital markets both by domestic and foreign agents and may foster stock market booms (Henry 2000a, 2000b, 2003). On the side of financial repression, Reinhart & Rogoff (2009) and Jordà, Schularick & Taylor (2011), using a database for banking crises, indicate that the prevalence of crises was reduced during periods of stringent capital controls such as the Bretton Woods period. Posen (2006) goes even further and indicates that no amount of monetary discipline can substitute sufficient financial regulation and supervision.

This paper aims to explore the British financial cycle, as proxied by stock market prices and the level of real domestic credit to the non-financial sector from 1885 until 2016. The question we wish to answer is whether there is evidence of a financial cycle in the UK in the period of study and, if so, whether the relationship between stock markets and credit aggregates is contingent on the regulatory framework in place. Formally, we will test if changes in regulation affect the causal relationship between stock markets and credit aggregates after controlling for an assortment of variables that may be driving the relationship.

We find that there is a consistent, time-varying link between asset prices and the level of domestic credit in the UK for the period under study. This link is also evident between financial cycle variables and the real economy, but it seems to break down during economic expansions. Secondly, we identify two structural breaks in the relationship between assets and credit. The first one in 1914, concurrent with the dramatic changes in economic institutions brought with the advent of WWI. The second one in 1979, concurrent with the deregulation process that had started since the Competition and Credit Control Bill of 1971 (Offer, 2017) and that peaked with the ascent of Margaret Thatcher to the government in 1979. Additionally, through a standard VAR approach, we find that the causal relationship between stock markets and credit is bidirectional in the short and long-run specifications under financial latitude. Under financial repression, we find that, in the short run, changes in stock prices seem to cause changes in credit levels. In the medium and long run, this nexus is broken.

In the usual explorations of the interplay between asset prices and credit aggregates, researchers usually employ binary sequences to indicate the presence of a crisis or a bust. Apart from the lack of consensus on the methodology for their construction, these dummy sequences are unable to reflect the full breadth and depth of information from the original series.[1] Additionally, the implication of marking all busts with a 1 is that they are all treated as formally identical events and that there is no transition between stability and crisis; it resembles turning on a switch (Pagan & Sossounov, 2003; Schüler et al., 2015; Romer & Romer, 2015). Finally, since crises are rare events, researchers are forced to build long and wide panels to favour identification. Single country analyses are challenging because of the lack of variability in the dependent variable.

In that sense, the first contribution of this paper is offering a study of the financial cycle for a single country. To tackle the identification issues discussed above, we will use the Local Bull-Bear Indicator (LBBI) developed by Forero-Laverde (forthcoming). The LBBI methodology is preferred above turning point or filtering methods for several reasons: it contains more

[1] There are two different strands of literature from which researchers derive these binary sequences. One group borrows from business cycle theory and use a non-parametric algorithm to find peaks and troughs in time series (Bry & Boschan, 1971; Pagan & Sossounov, 2003). Others use parametric filtering techniques to determine periods of above or below trend growth (Hodrick & Prescott, 1997; Christiano & Fitzgerald, 2003).

variability than a comparable dummy sequence; its informational content is closer to the original data; it indicates whether there is a boom or bust and provides a measure of their intensity, and it emerges from the full empirical distribution of the data. The second contribution of this paper is extending the single asset analysis in Forero-Laverde (forthcoming) to a bivariate analysis of LBBIs for real credit volume and stock price growth to characterise the financial cycle for over 130 years. The final contribution is to integrate Reinhart & Rogoff's (2013) idea of a regulatory pendulum that sways from financial repression to liberalisation into the financial cycle framework. We expect the results from this analysis will allow researchers to advance some hypotheses on the link between the financial cycle and the general institutional framework.

The choice of the UK as the subject of this study is pertinent for several reasons. First, regarding the stock market, Van Nieuwerburgh et al. (2006) highlight the relevance of a well-functioning stock market both in the expansion of the industrial revolution since the mid-eighteenth century and for finance-led growth in Britain. Moreover, London became the foremost financial centre during the nineteenth century since it aided in the financing of railway companies, among other endeavours that transformed the British economy (Campbell et al., 2018). Additionally, since the end of World War I, equity issues in the LSE increased until they became the financing vehicle of choice for firms, surpassing debentures by the 1950s (Chambers, 2009). This occurred in a scenario where the 'weakly protected, retail investor, bond-centric world of pre-1913 was giving way to the more tightly regulated, institutional investor, equity-centric financial system characteristic of the second half of the twentieth century' (Chambers, 2010, p.51).

Regarding real credit to the private non-financial sector, Sheppard (1971) shows that from 1920 until 1962, the total financial assets of the British financial institutions grew by a factor of eight. Furthermore, according to data from Jordà, Schularick & Taylor (2017), the growth in real credit to the private non-financial has averaged a 3.21% annually since 1885 until 2016, exceeding the growth rate of the US, Switzerland, Norway or Denmark. Additionally, the UK banking system is of interest because since the 1920s and until the 1970s, roughly our financial repression period, the Bank of England allowed large clearing banks "to collude in setting interest rates on deposits, loans and in the London money market", while by the late 1970s and early 1980s, greater competition among banks was fostered as monetary policy was liberalized (Saunders & Wilson, 1999, p. 542). At the same time, there was a substantial liberalisation of the stock market, particularly with the elimination of capital controls in 1979 (Henry, 2003).

The rest of this paper is structured as follows. Section one presents the data, summarises de LBBI methodology and offers some preliminary evidence on the British financial cycle. In Section 2, we describe the historical context of the regulatory process that took place with the onset of the First World War and the deregulation process that occurred in the UK financial market in the later part of the 1970s. We use this historical evidence to argue for the existence of two structural breaks in both credit and stock market institutions. Section 3 presents the empirical results from the VAR approach. A final section concludes and offers avenues for further research.

1. Some Preliminary Evidence on the British Financial Cycle

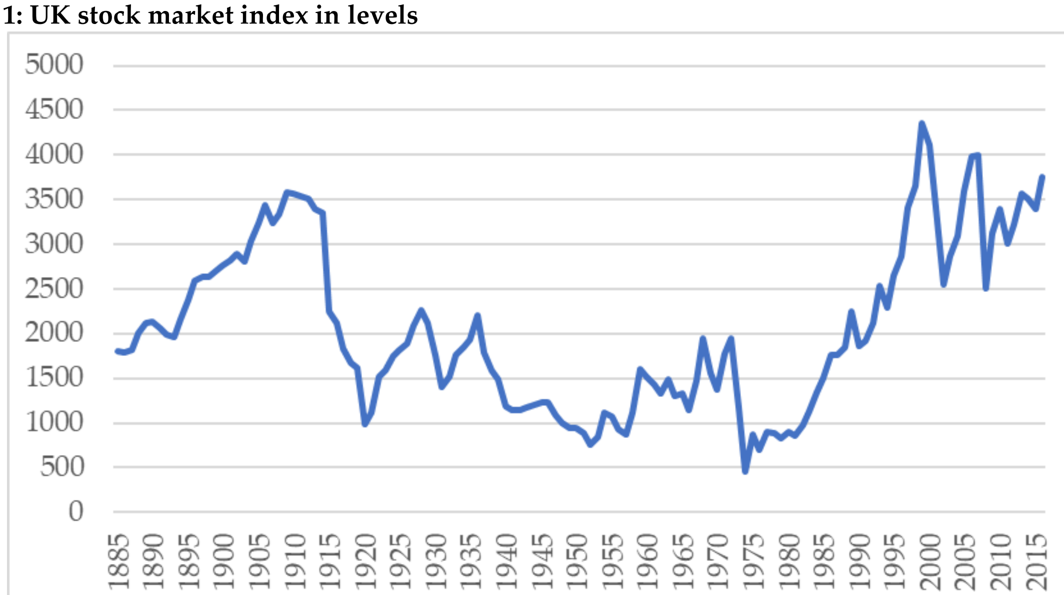
The goal of this section is to present some evidence for the existence of the financial cycle in Britain. To do so, we will first describe the data and the methodology required to tackle the identification issues described in the introduction. A second subsection presents the idea of a British financial cycle and its relation to general economic conditions.

1.1 Data and Methodology

To analyse the financial cycle in Britain from 1885 until 2016, we obtain a series for the stock market index and real domestic credit to the private non-financial sector. We discuss each in turn. For the stock market, we obtain a nominal, annual, market-wide, capitalisation-weighted index, from January 1885 to December 2016, from the Bank of England's (BoE) database "A millennium of macroeconomic data" (Series M13).[2] The series, which is a spliced construction from different data sources, excludes dividend reinvestment.

Consequently, growth rates only reflect capital gains. At each point in time, the index contains a large array of shares available in the market and, as suggested by the different sources, is representative of the British economy. To express the series in real terms, we have used the spliced monthly CPI from the same BoE database (series M6). The index takes the value of 100 in 2015. Figure 1 presents the time-series evolution of the series in levels.

Figure 1: UK stock market index in levels

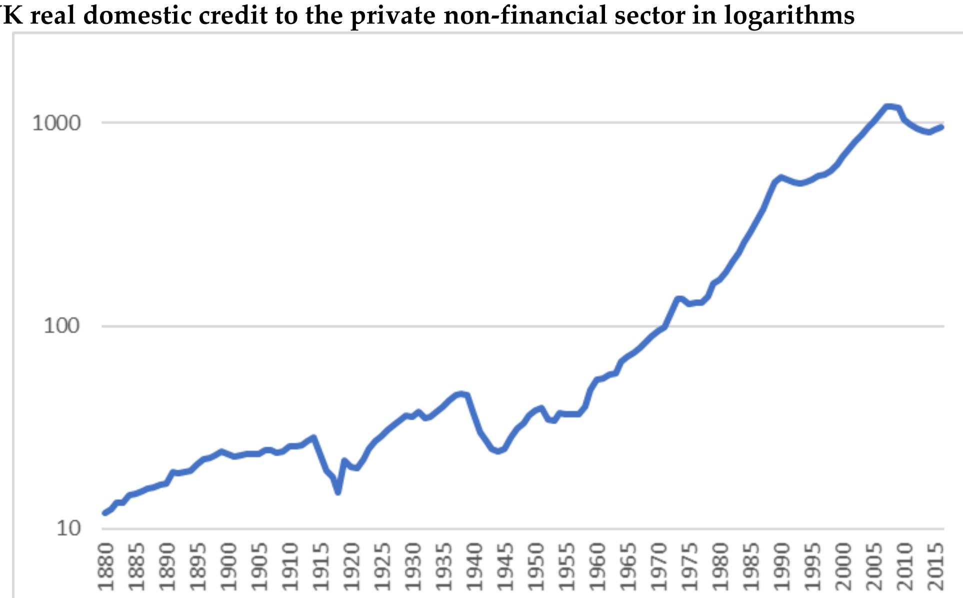


Note: Data from BoE's "A millennium of macroeconomic data".

[2] The series is available online at https://www.bankofengland.co.uk/statistics/research-datasets.

Concerning real credit, we obtain annual nominal credit information from the Jordà, Schularick & Taylor (2017) Macrohistory database (JST), which is available online.[3] The series *tloans* contains total loans to the non-financial private sector in nominal terms expressed in billions of local currency. We deflate it using the CPI series from the same database which contains the consumer price index with index equal 100 for 1990. The series for the United Kingdom runs uninterruptedly from 1880 until 2016, the final year of the database. The series has been criticised as being narrow, since it does not cover the financial sector as a debtor and, after 1973, it omits several new forms of credit beyond commercial loans. However, few alternatives are available. The World Bank, for example, has a series for domestic credit to GDP since the early 1960s for Britain. This series, however, contains the net loans from the financial sector to the government. Since the dynamic and determinants of public debt are different from those of private credit, we refrain from using such alternative series. Statistical characterisation of the series is available upon request. Figure 2 presents the time-series evolution of the logarithmic transformation of the volume of real credit.

Figure 2: UK real domestic credit to the private non-financial sector in logarithms



Note: Data from Jordà, Schularick & Taylor (2017) Macrohistory database

To describe the boom-bust cycle in the stock market and credit aggregate series, we follow the methodology presented by Forero-Laverde (forthcoming). The method exploits the matrix of returns to different time horizons (from 1 to 5 years) to produce three distinct series called Local Bull-Bear Indicators (LBBIs).[4] LBBIS covers short-run (1 year) returns. LBBIM covers medium-run

[3] The full database can be found in http://www.macrohistory.net/data/

[4] We modify the methodology in Forero-Laverde (forthcoming) to accommodate the fact that our series are annual, while the series he uses are of monthly frequency.

returns, between 2 and 3 years. LBBIL covers long-run returns between 4 and 5 years. This measure is useful and relevant because it results in a complete time series, which indicates both the direction and intensity of expansions and contractions measured in standard deviations. Additionally, the three different indicators allow researchers to identify which phases are more persistent in time (appearing in the long-run indicator) against those that only affect short or medium-run returns. To our knowledge, this is the first set of variables that can achieve that without the assumption of orthogonality.[5]

To obtain the different LBBIs, first, we calculate a matrix **R**, of dimensions *t*x*n* where each position $r_{t,n}$ corresponds to $(P_t/P_{t-n}) - 1$, where P_t corresponds to the value of the stock market index or the real credit variable at time *t*. For annual returns, *n* takes consecutive integer values from one to five. In results that are available upon request, we found that all vectors $\mathbf{r_n}$ are time series stationary according to a battery of tests. We then proceed to perform a rolling standardization of each vector $\mathbf{r_n}$ using

$$d_{t,n} = \frac{(r_{t,n} - \mu_{t,n})}{\sigma_{t,n}} \qquad (1)$$

where $\mu_{t,n}$ is obtained as an exponentially weighted moving average for the last 5 observations and $\sigma_{t,n}$ is the contemporaneous volatility (standard deviation) forecast using a GARCH (1,1) model. In this case, each observation $d_{t,n}$ is measured in standard deviations. This rolling standardization serves the purpose of re-expressing returns considering the volatility context at each point in time. After all, a 10% monthly return may seem like a strong boom when monthly volatility is 1% but may seem as a quiet month when volatility is 20%. Additionally, (1) can be interpreted as the risk-adjusted above or below trend growth. This is an added benefit of the methodology as it allows to integrate, in a single measure, characteristics of growth and dispersion.

We then obtain the different LBBIs from the different vectors $\mathbf{d_n}$ as follows:

$$\begin{aligned} \text{LBBIS} &= \mathbf{d_1} \\ \text{LBBIM} &= 0.5(\mathbf{d_2} + \mathbf{d_3}) \\ \text{LBBIL} &= 0.5(\mathbf{d_4} + \mathbf{d_5}) \end{aligned} \qquad (2)$$

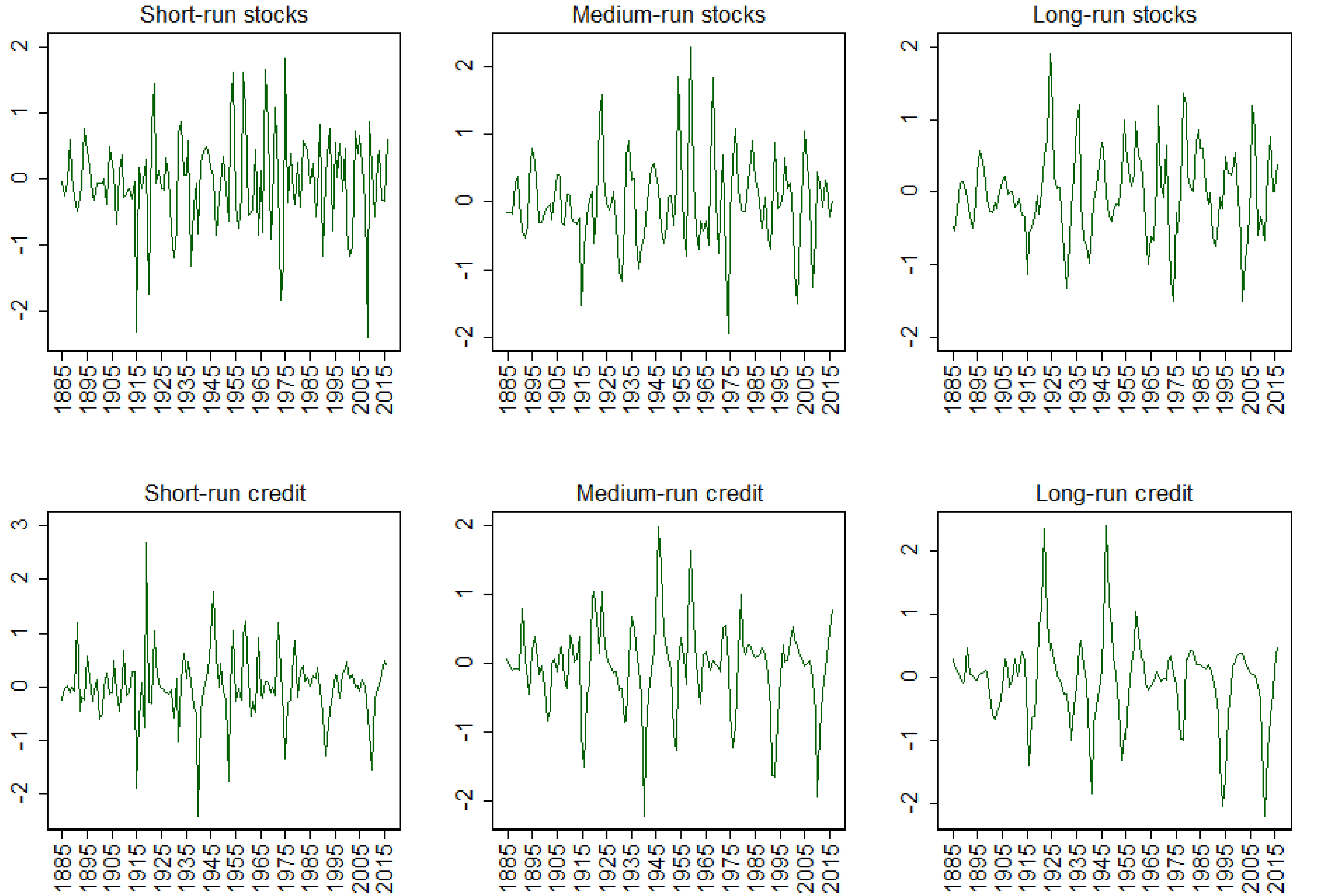
This measure produces a complete time series of similar length to the original, although the first five observations are lost. By construction, LBBIs allow for a more profound analysis as

[5] For further discussion on the statistical assumptions behind different methodologies refer to Forero-Laverde (2016, 2018).

these time series can be used as dependent variables in several econometric applications.[6] It is important to highlight that all series are stationary as attested by a variety of tests. Further statistical characterisation of the series is in the annexe. Figure 3 presents the time series evolution of LBBIs for the stock market (top row) and real credit (bottom row) to different time horizons. The first column from left to right shows the short-run indicator, the central column the medium run indicator and the right-most column shows the long-run indicator.

[6] For the interested reader, Forero-Laverde (2018) presents a discussion of how this measure compares to other methodologies usually employed in this literature: the turning point algorithm of Bry & Boschan (1971) and Pagan & Sossounov (2003), the Hodrick & Prescott (1997) filter and the Band-Pass filter (Christiano & Fitzgerald, 2003).

Figure 3: Local Bull-Bear Indicators for the UK stock market and real credit



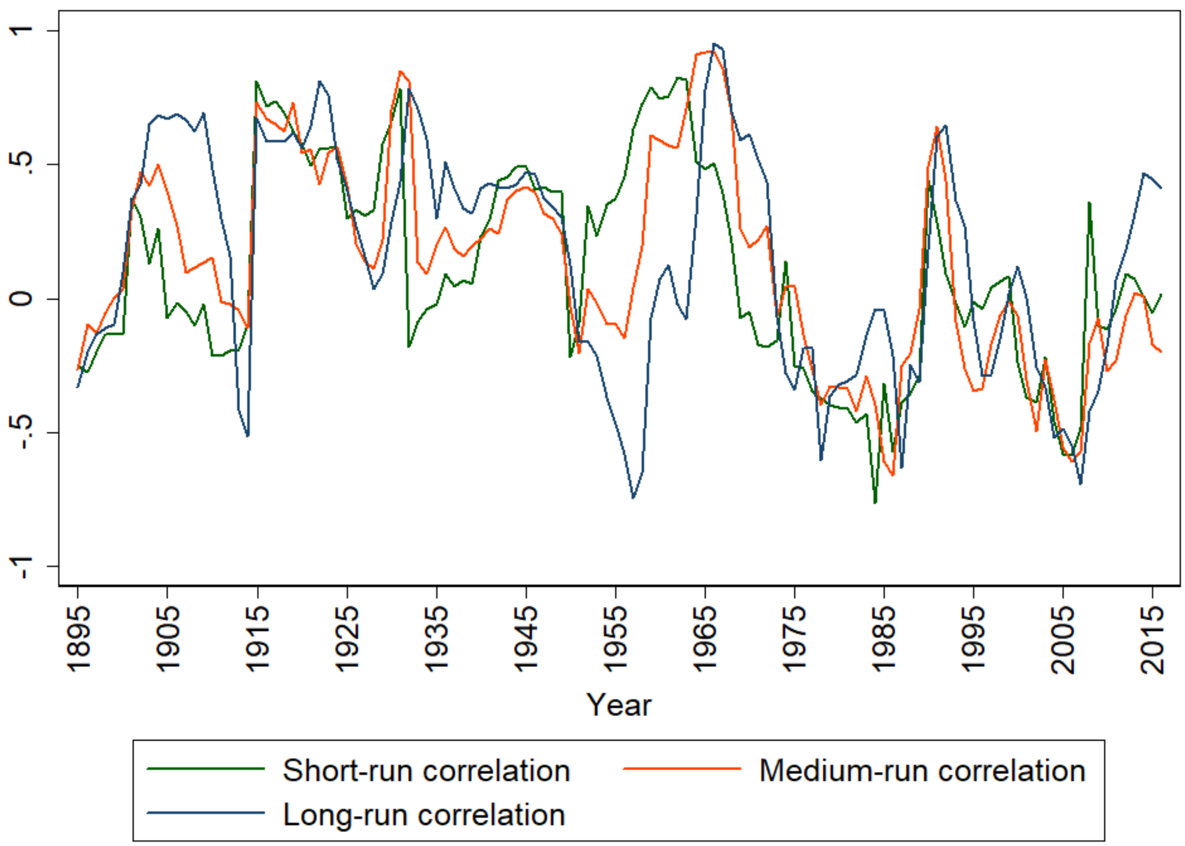
Note: The top row presents the short, medium and long-run Local Bull-Bear indicators for the UK stock market. The bottom row presents the short, medium and long-run Local Bull-Bear indicators for UK's real domestic credit to the non-financial sector. All LBBIS are expressed in standard deviations and measure above or below trend growth.

1.2 . Some Preliminary Evidence of the British Financial Cycle

A first natural exploration of the relationship between the stock market and real credit LBBIs for the UK is to calculate the ten-year rolling pairwise correlation coefficient between the short, medium and long-run indicators. We present the results in Figure 4.

The main finding in the figure is that the relationship between both variables seems to be unstable in time. Interestingly, peaks in the association occur during the late-1960s, in the early 1990s and during the GFC in the late 2000s. Conversely, correlation troughs in the early 1930s, during the 1950s, in the mid-1980s, and before the GFC. From the historiography, we can infer that peaks in correlation seem to be related to periods of economic downturn (like the 1990-93 recession). This is sensible as concurrent divestment in the stock market and a reduction in the demand and supply of credit are common occurrences during recessions (Kindleberger & Aliber, 2005). Conversely, troughs seem to be associated with periods of economic expansions (the recovery from the Great Depression or the golden age of the 1950s).

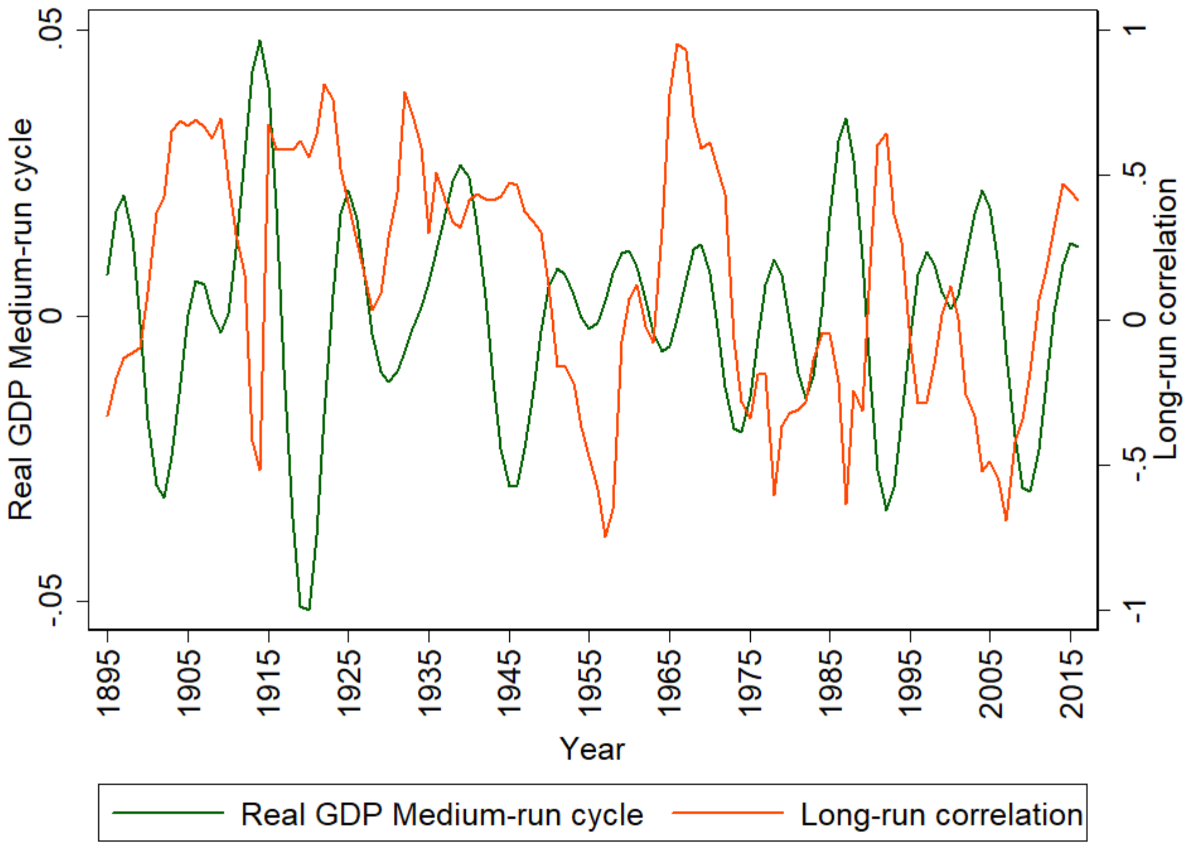
Figure 4: Ten-year rolling correlation between stock market and real credit LBBIs



Note: Simple pairwise correlation between real credit and stock market LBBIs by time horizon. Correlation is calculated using a moving window of 10 observations.

To delve deeper into an intuition of a relationship between the correlation described above and the real economy, we follow the seminal work on the financial cycle by Drehmann et al. (2012). In following their characterisation, we extract the medium run cyclical component of real GDP growth for the UK using the band-pass filter as in Christiano & Fitzgerald (2003). Figure 5 shows the plots for the cyclical component of GDP (green line) and the time-varying correlation between the long-run stock market and real credit LBBIs (orange line).[7]

Figure 5: Real GDP growth cycle to the medium run and correlation between real credit and stock market long-run LBBI



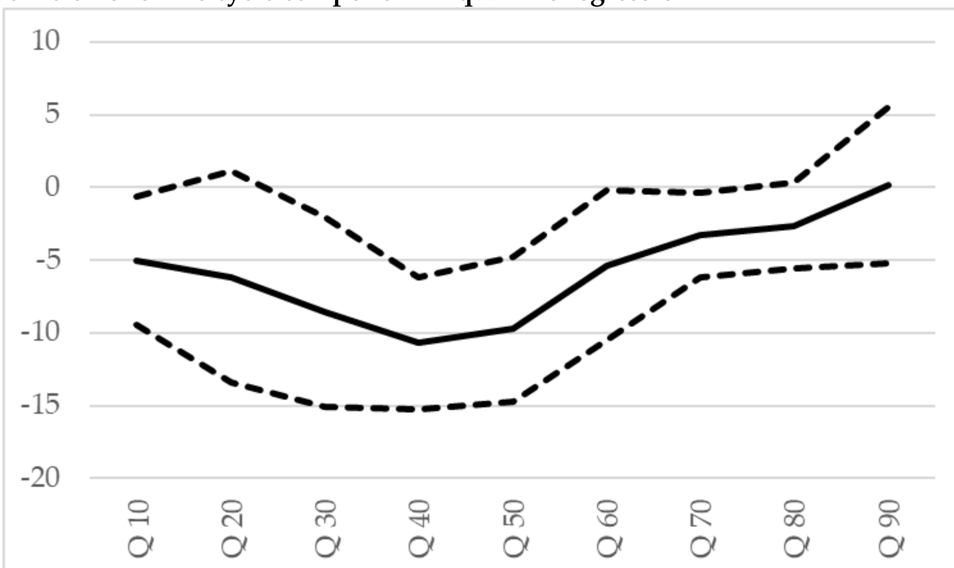
Note: Real GDP growth data taken from the Maddison Project (Bolt et al., 2018). Cyclical component extracted from annual growth rates through the bandpass filter as in Christiano & Fitzgerald (2003) with a bandwidth of 8 to 30 years.

Figure 5 shows that the correlation between long-run LBBIs seems to mirror the cyclical component in GDP growth, which is consistent with our analysis of Figure 4. To provide further evidence about this relationship, we perform quantile regressions where the dependent variable is the ten-year rolling correlation between long-run LBBIs and the independent variable is the medium-run cycle extracted through the band-pass filter. We follow Koenker & Hallock (2001)

[7] Since correlations between LBBIs to every time-horizon seem to track each other closely, we choose to present this experiment using only the correlation between long-run indicators for stocks and real credit.

and run simultaneous quantile regressions by decile. In the following figure, we present the evolution of the coefficient and 95% confidence intervals by quantile.

Figure 6: Coefficients for the cycle component in quantile regression



Note: Quantile regressions using bootstrap standard errors (100 replications). The dependent variable is the rolling correlation between long-run LBBIs for credit and stocks. The independent variable is the cyclical component of real GDP growth extracted through the band-pass filter for frequencies between 8 and 30 years. The continuous line shows the value of the estimator. Dotted lines represent the 95% confidence intervals. The coefficient for the OLS regression is -5.87, significant with 99% confidence, and the confidence interval is [-9.88 -1.85].

The most salient feature from Figure 6 is that the coefficient in the regression is statistically significant for all deciles below the 8th one. This is consistent with part of our initial intuition. The relationship between the real economy and the correlation of LBBIs breaks during economic booms and remains strong and negative during economic busts. Economic contractions are associated with increasing correlations between asset prices and credit. This may be related to depressed stock prices, credit contractions, and reductions in output.

To summarise, in this section we have shown, on the one hand, that the association between stock markets and credit aggregates in the UK is time-varying and unstable as indicated in the Minsky's financial instability hypothesis (Minsky, 1986, 1992; Kindleberger & Aliber, 2005). On the other hand, there appears to be an association between the financial cycle and the real economy, which we can only identify robustly during economic busts.

2. From Financial Repression to Liberalization: Searching for the Break

Following the works of Diaz-Alejandro (1985), Kamisky & Schmukler (2008), and Reinhart (2012) we argue that changes in the regulatory environment, and particularly shifts from financial repression to financial liberalisation and vice versa, alter how asset prices and credit aggregates interact. Following Reinhart (2012):

> *"Financial repression includes directed lending to the government by captive domestic audiences (…), explicit or implicit caps on interest rates regulation of cross-border capital movements, and (…) a tighter connection between government and banks, either explicitly through public ownership of some of the banks or through heavy 'moral suasion'. Financial repression is also sometimes associated with (…) securities transaction taxes (…)"* (p. 38)

In the above definition, we have underlined three elements of interest. First, financial repression takes place when there is an explicit or an implicit cap on interest rates, which can be extended to quantitative restrictions on credit. Second, it occurs in the presence of controls to cross-border capital movements. Finally, we can speak about financial repression in the presence of transaction taxes in the securities market. Consequently, we present a portrayal of British economic history explicitly from the perspective of the ebb and flow of financial repression.

Since the mid-nineteenth century, the classic liberal economic policy in Britain was focused on three pillars: the gold standard, the minimum balanced budget rule (MBBR), and free trade. The underlying idea behind the MBBR was to keep a small state, internal and external balance, and allow market forces to operate (Checkland, 1983). Additionally, the idea of free trade implied the absolute absence of capital controls during the period running up to the 1930s (OECD, 1993). This *laissez-faire* approach to economic policy broke down with the onset of the First World War (1914), with the first symptom being the abandonment of the gold standard (Bordo & Rockoff, 1996; Flandreau & Zumer, 2003). Consequently, we estimate that a first shift from deregulation to financial repression takes the form of a structural break in the relationship between credit and stocks in 1914.

While during the interwar years some attempts were made to return to this consensus—most saliently the interwar gold exchange standard (1925-31)—most attempts failed notoriously. According to Middleton (2014), the beginning of the extended phase of financial repression in the UK is marked by the return to protectionism through tariffs to protect the British industry in 1931-32. Although in 1931, the first round of capital controls was implemented, Urban & Straumann (2012) indicate that these were milder than those imposed by Germany or Japan. Through most of the 1930s, Britain kept commercial ties and trade with the whole Commonwealth under the figure of imperial preference, which indicates that commercial restrictions were partial at best (Eichengreen & Sussman, 2000). However, by 1939, with the advent of the Second World War, exchange controls were entirely in place (OECD, 1993). During the confrontation, economic management was heightened, demand was rationed, while labour, capital and product markets were subject to direct controls (Middleton, 2014).

After the end of the war, during the inconvertible phase of Bretton Woods, the main issues were maintaining the stability of the pound in international currency markets and facilitating the government's debt rollover process (Scott & Walker, 2017). Another relevant point was the low rate of economic growth relative to other developed countries (Allen, 2016). These three features

were the key determinants of the stop-go policies that started in 1951 and lasted until 1965 and that we characterise as a period of 'countercyclical financial repression' to stabilise external imbalances.

According to Scott & Walker (2017), the Conservatives had won the 1951 elections by promising an end to the rationing. Consequently, the tools at their disposal to prevent foreign account imbalances were limited to reducing expenditure and increasing taxes to curtail aggregate demand and economic overheating. Some specific measures at the time were hire-purchase restrictions and purchase taxes that would increase the upfront price on credit purchases. As soon as imbalances were resolved, these stalling measures would be rolled back. From a financial perspective, quantity restrictions on credit were implemented to increase the available funds for public debt rollovers and reduce credit-driven import growth that would hurt balance-of-payments equilibrium (Offer, 2017). Finally, while in 1961, Britain signed the OECD codes of liberalisation that were aimed at eliminating capital controls, it opted out of the agreement from 1966-71 (OECD, 1993).

Financial liberalisation was a lengthy process in Britain. Kaminsky & Smuckler (2008) establish a chronology of financial liberalisation for 27 countries in three different areas: capital account, domestic financial sector, and the stock market. For the UK they indicate that partial liberalisation of the capital account began in 1973 with full liberalisation taking place in 1979. Regarding the domestic financial sector, they dated the full liberalisation in January 1981. For the stock market, they indicate that partial liberalisation began in 1973 and full liberalisation was achieved in January 1981. In what remains of this section we argue that this very lengthy process of liberalisation peaked in the watershed year of 1979.

As discussed in the introduction, the first step towards the end of financial repression was the passage of the Competition and Credit Control (CCC) Bill in 1971 which liberalised the financial system, increased M4 and propelled credit, housing and equity booms (Bordo & Landon-Lane, 2009). According to Braggion & Ongena (2015), the CCC bill of 1971 put in motion a process of increasing competition among financial institutions that were no longer bounded by quantity restrictions or interest rate setting schemes and thus had to participate both in the deposit and loan markets. However, in 1973, the Heath government tried to reign back credit, but it was too-little-too-late, and the effects of the first oil shock pushed the banks that had financed the housing boom close to bankruptcy. It was at that time that the Bank of England rescued the financial system through a 'lifeboat' operation (Offer, 2017). According to Lee (1979), the 1973-74 financial crises was a secondary cause for the passage of the Banking Act in 1979, which formalised the supervision of banks and other deposit-taking institutions. However, what Booth (2015) argues was broader and stronger supervision, and regulation of the financial industry was not associated with the establishment of levies or increases in transaction costs to hinder activity, but rather as a solution to increasing competition and expansion of operations.

Coutts and Gudgin (2015) indicate that the natural step after the elimination of fixed exchange rates in 1971 and the beginning of financial deregulation with the CCC Bill was the full elimination of capital, wage and investment controls in 1979 by the recently inaugurated Thatcher government. Booth (2015) coincides and posits that there was substantial deregulation of the foreign exchange markets that drove economic conditions back to the pre-1939 situation when the movement toward financial repression began. Quinn & Inclan (1997) argue that these liberalisation measures were fostered by a context of favourable economic growth that reduced the needs and demands for protection by the industry. Offer (2017) concurs and indicates that finding oil deposits in the North Sea was a necessary windfall for the stabilisation of the pound, which allowed all these measures to come to fruition. Bellringer & Michie (2014), also argue that these measures exposed the City to international competition for investments. While according to Bordo & Landon-Lane (2013) the rest of the Thatcher revolution included tax cuts on capital income and widespread deregulation of industries, all the measures discussed above signal 1979 as the watershed year in the institutional setup of the UK financial system. Consequently, in what follows, we will test whether this date also marks a structural break in the credit-stock market relationship in Britain.

3. Testing the Relationship: VAR results

To characterise the evolution of the financial cycle for Britain since 1885, we need to understand the joint dynamic behaviour of the stock market and real credit LBBIs. To this end, we will employ a vector autoregression (VAR) model that relates endogenous LBBIs and a set of exogenous control variables to control for general economic conditions.[8] Our analysis in this section is structured as follows. In the first part of the section, we describe the VAR model, perform a full sample estimation, and test for the presence of structural breaks in the relationship in 1914 and 1979. In the final part, we re-estimate the VAR model for the pre and post-break samples and use Granger causality tests to identify whether there is evidence of a changing relationship between the variables which may be driven by the regulatory framework.

A note of caution is pertinent about the Granger causality analysis. If we were to find evidence of stock market movements causing shifts in real credit, then the most direct mechanisms would be that investors are using more-valuable stocks as collateral on new loans, or that companies with increasing equity value see their debt to equity ratio plunge and thus access new credit either to invest in new projects. If we were to find evidence of real credit movements causing shifts in the stock market, the most direct mechanism would be investors taking our loans to finance their stock market investments. Results are restricted to the link

[8] In this section, the references we follow to construct the VAR model are Charemza & Deadman (1997), Lütkepohl & Krätzig (2004), and Pesaran (2015).

between stock markets and real credit and should not be extrapolated to other asset classes such as investment in the housing market. We leave this noteworthy issue for further research.

A generalised VAR model, including exogenous variables, takes the following form:

$$\mathbf{Y_t} = \sum_{j=1}^{P} \mathbf{\Lambda_j} \mathbf{Y_{t-j}} + \mathbf{\Phi} \mathbf{X_t} + \varepsilon_t \tag{3}$$

Where variables in bold denote matrices or vectors. $\mathbf{Y_t}$ is an nx1 vector of endogenous variables, $\mathbf{\Lambda_j}$ is nx1 vector of the coefficients for the j[th] lag in the endogenous variables $\mathbf{Y_{t-j}}$. $\mathbf{X_t}$ is an mx1 vector of exogenous variables and $\mathbf{\Phi}$ is a parameter matrix. The error term, ε_t, is assumed to behave like white noise so we will perform a test for autocorrelation and normality of the residuals. To establish the order of the VAR model (the number of lags p), we follow Lütkepohl & Krätzig (2004) and establish lag order selection statistics based on different information criteria.[9]

For the choice of exogenous variables in $\mathbf{X_t}$ that may be affecting the behavior of stock price and real credit growth, we include several that are standard in the literature. Regarding general economic conditions, we control for economic growth as it alters expectations about future cash flows, alters the investment opportunity set for companies, and the risk appetite of both lenders and borrowers. To do so, we include the percentage change in real GDP per capita.[10] Additionally, we include a measure of investment to GDP as increases in investment should be strongly correlated with the demand for credit (Boudias, 2015). The level of financial development will be critical in determining the liquidity and size of the financial system (King & Levine, 1993). To measure this, we include the changes in M2, a measure of broad money, to GDP. To account for the effect of the price level, we include the domestic rate of inflation as higher domestic inflation levels may reduce the real burden of debt for households and companies affecting both their credit-worthiness and their future cashflows (Magud & Vesperoni, 2015). Another critical determinant of an agent's capacity to acquire new debt has to do with its current debt stock. In that sense, we include a measure of total indebtedness in the economy as total loans to the domestic non-financial sector as a percentage of GDP (Bordo & Meissner, 2012).

Concerning the foreign sector, we control for current account imbalances, by including the overall current balance to GDP since variations in this variable may affect multinational banks and import-export companies differently from those that are mostly of a domestic base (Bahmani-Oskooee & Saha, 2016). In the same line, we follow Jorion (1990), who states that companies (and banks) with sizeable international presence will benefit from openness to the international trade

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[9] The information criteria used include the final prediction error (FPE) (Akaike, 1969), Akaike's information criterion (Akaike, 1974), Schwarz's Bayesian information criterion (Schwarz, 1978) and the Hannan-Quinn information criterion (Hannan & Quinn, 1979).

[10] Unless stated otherwise, all control variables come from Jordà, Schularick & Taylor (2017).

system while domestic companies may suffer from competition from abroad. We include changes in openness to trade, defined as the first difference in imports + exports to GDP, to control for this situation.

To account for international capital flows, we include the evolution of the net capital account to GDP.[11] We expect increases in capital flows to affect stocks in two ways. On the one hand, if the increasing inflows occur via portfolio investment, where foreigners increase their demand for domestic securities, the additional demand will put upward pressure on prices. On the other hand, if inflows occur through foreign direct investment (FDI), the new companies formed and investment projects that are undertaken may increase investors' expectations of future economic growth, and thus increase the valuation of securities. With regards to credit, additional capital inflows in the form of bank borrowing abroad will not show up in the real credit variable, but they may show up if those banks intermediate the credit into more domestic loans to either firms or households.

To account for the effect of exchange rates, we resort to two distinct equilibrium conditions: the purchasing power parity (PPP) and the covered interest rate parity (CIRP).[12] PPP establishes that in the absence of transaction costs and trade barriers, two identical goods in two distinct markets should cost the same amount of money when expressed in the same currency. In that sense, the critical determinant of the exchange rate in this model is the differential of inflation rates between the domestic and foreign economies. On the other hand, CIRP establishes that under free capital flows and no transaction costs (zero bid-offer spread), the nominal exchange rate, the domestic and foreign interest rates are jointly set to eliminate arbitrage opportunities. The nominal exchange rate is such that no risk-free profit can be obtained by borrowing abroad (domestically), selling (buying) the foreign currency domestically, investing at the local (foreign) interest rate and using the proceeds to pay the loan in foreign (domestic) currency. Under this model, the critical determinant of the nominal exchange rate is the differential of interest rates. We summarise these relationships in equation (4).[13]

$$\mathrm{FX}_{\mathrm{Nominal}} = f[(r_{\mathrm{d}} - r_{\mathrm{f}}), (\pi_{\mathrm{d}} - \pi_{\mathrm{f}})] \tag{4}$$

Where r_{d} is the domestic interest rate, r_{f} is the foreign interest rate, π_{d} is the domestic inflation rate, π_{f} is the foreign inflation rate.

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[11] Data for the net capital account to GDP comes from Mitchell's (2013) International Historic Statistics 1750-2010. We obtain the net capital account from the identity: net capital account + net current account + net changes in reserves = 0. We thank Barry Eichengreen for this suggestion.

[12] We prefer not to include the exchange rate directly but two of its drivers. This choice has to do with the fact that inflation, interest rate differentials and exchange rates are highly correlated.

[13] Data for the interest rate and inflation differentials is obtained from Jordà, Schularick & Taylor Macrohistory database (2017). We always define the foreign rate to be the one from the United States which is the largest developed economy not included in our database.

A first issue has to do with the underlying assumptions in (4). Both PPP and CIRP require the law of one price to function correctly, which optimally occurs when there are no transaction costs and in the presence of free capital flows. This does not mean, however, that permanent deviations from these two equilibria are sustainable in time if capital controls are established. If the exchange rate is fixed, and the capital account is closed, as was the case during Bretton Woods, a large inflation differential would make imports cheap and exporters loose competitiveness. A sustained increase in the interest rate differential, could hinder domestic economic activity, reduce the number of viable investment projects for domestic companies, restrict access to credit and aggregate demand, and drive down the competitiveness of the export sector. Persistent long-run deviations in the differentials would bring forth a permanent payment imbalance via the current account which, under the Articles of the Agreement, would have probably been grounds for a change in the level of the peg (one-time devaluation). In that sense, we expect the determinants of the nominal exchange rate to affect the stock price and credit levels under any configuration of capital controls and exchange rate regimes.

Finally, following Rey (2015), Miranda-Agrippino & Rey (2015), and Passari & Rey (2015) we control for the existence of a global financial cycle that may be driving the British cycle by including LBBIs for the stock market and real credit in the United States.[14] The following table includes the first estimation of the VAR model, including all exogenous variables and the optimal number of lags according to the pre-estimation information criteria described above.

[14] To tend to the issue of multicollinearity among the different exogenous variables we calculated the condition numbers of their correlation matrices. In all cases the condition number is below three, while the regular rule of thumb is that multicollinearity becomes a worrisome issue for condition numbers above 20 (Greene, 2017).

Table 1: Full sample estimation of VAR model including all exogenous variables

VAR equations	Short-run		Medium-run		Long-run	
	Stocks	*Credit*	*Stocks*	*Credit*	*Stocks*	*Credit*
Panel A: Endogenous						
LBBI Stocks lag 1	-0.0492	**.1198***	**.5607*****	0.0682	**.806*****	**.1434***
LBBI Stocks lag 2	**-.2669*****	-0.0487	**-.4606*****	-0.0493	**-.4258*****	**-.1842***
LBBI Stocks lag 3					**.2212****	**.1857****
LBBI Stocks lag 4					**-.3145*****	-0.0736
LBBI Real credit lag 1	**-.2279****	**-.1296***	**-.187***	**.607*****	**-.2068****	**.7852*****
LBBI Real credit lag 2	-0.1255	-0.0163	0.0453	**-.2219*****	**.2762****	-0.11
LBBI Real credit lag 3					-0.0464	0.0472
LBBI Real credit lag 4					-0.096	**-.1895****
Panel B: Exogenous						
Trend	**.0071****	**.0049****	**.0052****	**.0037****	0.0022	0.0004
Loans to GDP	**-1.069*****	**-.8963*****	**-.7429*****	**-.5863*****	**-.4114****	**-.3205***
Inflation rate	-2.667	1.254	-1.479	**1.751***	0.6987	1.138
Change in real GDP per capita	1.712	0.1608	2.27	-0.1239	**3.211****	-1.622
Change in investment to GDP	-6.736	**12.55*****	-1.958	**7.473****	-1.476	**7.155****
Change in openness to trade	-0.0532	**2.516***	0.9249	0.2997	-0.1214	-1.518
Change in financial development	**5.953****	**7.061*****	**4.093****	**5.137*****	**3.134****	1.135
Overall current balance to GDP	**7.639****	3.357	3.73	2.479	3.017	0.3596
Capital account to GDP	**6.638***	1.227	2.715	-0.4816	2.591	-0.5499
Short term rate diferential (domestic-foreign)	-0.0136	-0.008	-0.0146	-0.0021	-0.0249	**.0379***
Inflation differential (domestic-foreign)	-0.7332	**-8.901*****	-1.776	**-6.605*****	-1.328	**-5.747*****
Global credit cycle (US LBBI to time horizon)	0.041	0.0076	-0.0354	0.103	-0.0014	**.1283****
Global stock market cycle (US LBBI to time horizon)	-0.0066	-0.0011	-0.0709	0.043	**-.208*****	0.0722
Constant	**-13.42****	**-9.151****	**-9.807****	**-7.051****	-4.271	-0.6522
R squared	0.2967	0.61	0.5193	0.7637	0.6585	0.7786
Chi squared	52.72	195.5	135	404.1	237.2	432.5

Note: Lag order selection is optimal for the short-run using the AIC, FPE and likelihood ratio criterions, for the medium-run using the LR, FPE, AIC, SBIC and HQ information criteria; for the long-run using the HQ information criteria. Higher lag orders in the long-run specification, as suggested by LR, AIC, FP and HQ resulted in at least one of the lags being statistically insignificant. Statistically significant results beyond 90% significance are highlighted in bold. Significance * 10%, ** 5%, *** 1%.

We present post-estimation statistics in Table 2.

Table 2: Post-estimation statistics full sample

VAR equations		**Short-run**		**Medium-run**		**Long-run**	
		Stocks	*Credit*	*Stocks*	*Credit*	*Stocks*	*Credit*
Panel A: Wald lag exclusion statistics							
Lag 1	Individual	**0.06**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**
	Joint	**0.02**		**0.00**		**0.00**	
Lag 2	Individual	**0.00**	0.64	**0.00**	**0.02**	**0.00**	**0.08**
	Joint	**0.01**		**0.00**		**0.00**	
Lag 3	Individual					0.11	0.11
	Joint					0.08	
Lag 4	Individual					**0.00**	**0.03**
	Joint					**0.00**	
Panel B: Autocorrelation of errors (P values for Lagrange multiplier test)							
Lag 1		0.66		0.55		0.02	
Lag 2		0.95		0.62		0.09	
Lag 3		0.08		0.59		0.03	
Conclusion		**No autocorrelation**		**No autocorrelation**		**No autocorrelation**	
Panel C: Eigenvalue stability condition							
Conclusion		**Satisfied**		**Satisfied**		**Satisfied**	
Panel D: Likelihood ratio test for a structural break in 1914 (null is no break)							
Statistic		**119.72**		**146.76**		**245.75**	
P-value		**0.00**		**0.00**		**0.00**	
Panel E: Likelihood ratio test for a structural break in 1979 (null is no break)							
Statistic		**97.30**		**76.04**		**161.86**	
P-value		**0.00**		**0.00**		**0.00**	

Note: Panel A presents the Wald Test for lag exclusion where the null is that the lags are statistically equal to zero in each equation individually and then jointly. Panel B applies the Lagrange multiplier test for autocorrelation in the residuals as in Godfrey (1989). We present the p-values first three lags in the test and the conclusion of the test up to six lags. Panel C presents the eigenvalue stability condition of the VAR that tests that all eigenvalues of the matrix of endogenous coefficients lie within the unit circle (have modulus smaller than 1) as in Glaister (1993). Panel D and E present a likelihood ratio test for a known structural break in the VAR model estimated for 1914 and 1979, respectively following Bai (2000). The null hypothesis is that there is no structural break.

From Table 2, we know that the error is well-behaved and that the VAR structure fulfils the stability condition so that any given shock will not become an explosive process but rather fade out in time. Additionally, as argued above there is evidence of a structural break in the VAR structure to every time horizon in 1914 and 1979, indicating that the regulatory pendulum of stronger regulation and direction of the economy by the state since 1914 and deregulation since 1979 changed the dynamic relationship between stocks and credit.

From Table 1, we know that some of the exogenous variables are statistically insignificant for both credit and stock market equations. Consequently, we re-estimate the model to each time horizon, including only the exogenous variables that are significant with a 90% confidence level in at least one of the two equations. While the number of optimal lags changes in two out of the nine different specifications, we keep the full sample lags to avoid overfitting the model. We also confirm that the structural breaks in 1914 and 1979 are still statistically significant, with over 99.9% confidence to all time horizons.

To investigate the causal relationships between real credit and stock market LBBIs for the UK, we will estimate the VAR model for three different subsamples: the first one from 1885-1914, the second from 1915-79, and the third on from 1980-2016. For each subsample, we use the exogenous variables in the reduced form specification. For the sake of brevity in what follows, we will only present the coefficients for the lags in the endogenous variables. It is noteworthy that in all cases the error is well behaved.

From a theoretical perspective, the first and last subsamples represent periods of financial latitude while the second subsample covers a period of financial repression. Consequently, we will present results by subsample in tables 3-5 and discuss results with regards to whether the regulatory pendulum shifted towards repression or deregulation.

Table 3: VAR estimation results and post-estimation statistics 1885-1914

Sample I: 1885-1914		**Short-run**		**Medium-run**		**Long-run**	
		Stocks	*Credit*	*Stocks*	*Credit*	*Stocks*	*Credit*
Panel A: Endogenous							
LBBI Stocks lag 1		0.1668	**.2492***	**.9466*****	**.3997****	**.6848*****	**.6237****
LBBI Stocks lag 2		-0.2626	0.1642	**-.7308*****	-0.0558	0.0897	-0.4008
LBBI Stocks lag 3						**-.3229****	**.7132****
LBBI Stocks lag 4						0.0992	-0.3699
LBBI Real credit lag 1		-0.1141	**-.5865*****	-0.1223	**.4438****	**-.2914*****	**.4674****
LBBI Real credit lag 2		-0.167	**-.5365*****	0.026	-0.1631	-0.0383	0.1135
LBBI Real credit lag 3						-0.0999	0.1683
LBBI Real credit lag 4						0.0053	-0.0507
R squared		0.3800	0.7135	0.7803	0.4495	0.9315	0.7485
Chi squared		17.16	69.72	99.42	22.86	353.43	77.40
Panel B: Wald lag exclusion statistics							
Lag 1	Individual	0.38	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**
	Joint	**0.00**		**0.00**		**0.00**	
Lag 2	Individual	0.16	**0.00**	**0.00**	0.60	0.79	0.48
	Joint	**0.00**		**0.00**		0.81	
Lag 3	Individual					0.08	0.10
	Joint					0.13	
Lag 4	Individual					0.69	0.37
	Joint					0.71	
Panel C: Autocorrelation of errors (P values for Lagrange multiplier test)							
Lag 1		0.72		0.15		0.93	
Lag 2		0.31		0.17		0.52	
Lag 3		0.29		0.90		0.73	
Conclusion		**No autocorrelation**		**No autocorrelation**		**No autocorrelation**	
Panel D: Eigenvalue stability condition							
Conclusion		**Satisfied**		**Satisfied**		**Satisfied**	
Panel E: Granger causality tests - P values							
Real credit causes stocks		0.56		0.55		**0.00**	
Stocks cause real credit		**0.03**		0.06		**0.01**	

Note: Panel A presents the coefficients for the optimal number of lags of the endogenous variables. Panel B presents the Wald Test for lag exclusion where the null is that the lags are statistically equal to zero in each equation individually and then jointly. Panel C applies the Lagrange multiplier test for autocorrelation in the residuals as in Godfrey (1989). We present the p-values first three lags in the test and the conclusion of the test up to six lags. Panel D presents the eigenvalue stability condition of the VAR that tests that all eigenvalues of the matrix of endogenous coefficients lie within the unit circle (have modulus smaller than 1) as in Glaister (1993). Panel E presents the Granger causality test as in Ganger (1969, 1980, 1988).

Table 4: VAR estimation results and post-estimation statistics 1915-79

Sample I: 1915-1979		**Short-run**		**Medium-run**		**Long-run**	
		Stocks	*Credit*	*Stocks*	*Credit*	*Stocks*	*Credit*
Panel A: Endogenous							
LBBI Stocks lag 1		0.0695	**.2438*****	**.6492*****	0.0636	**.8388*****	**0.0635**
LBBI Stocks lag 2		-.2349**	-.1325*	**-.5193*****	**-.125***	**-.5091*****	-0.0632
LBBI Stocks lag 3						**.399*****	0.0227
LBBI Stocks lag 4						**-.4965*****	0.1142
LBBI Real credit lag 1		-.2897**	**-.1475***	**-.2787***	**.5341*****	-0.1612	**.5866*****
LBBI Real credit lag 2		-0.0129	**-0.01**	0.195	**-.1573***	**.2833****	0.0261
LBBI Real credit lag 3						-0.0682	0.0433
LBBI Real credit lag 4						-0.0907	**-.2486*****
R squared		0.7123	0.4959	0.5147	0.7521	0.7167	0.8097
Chi squared		32.61	112.25	65.76	188.14	151.82	255.26
Panel B: Wald lag exclusion statistics							
Lag 1	Individual	0.07	0.01	0.00	0.00	0.00	0.00
	Joint	0.01		0.00		0.00	
Lag 2	Individual	0.10	0.21	0.00	0.02	0.00	0.87
	Joint	0.15		0.00		0.00	
Lag 3	Individual					0.02	0.91
	Joint					0.10	
Lag 4	Individual					0.00	0.03
	Joint					0.00	
Panel C: Autocorrelation of errors (P values for Lagrange multiplier test)							
Lag 1		0.51		0.84		0.04	
Lag 2		0.92		0.83		0.15	
Lag 3		0.88		0.65		0.18	
Conclusion		**No autocorrelation**		**No autocorrelation**		**No autocorrelation**	
Panel D: Eigenvalue stability condition							
Conclusion		**Satisfied**		**Satisfied**		**Satisfied**	
Panel E: Granger causality tests - P values							
Real credit causes stocks		0.07		0.15		0.31	
Stocks cause real credit		**0.00**		0.22		0.56	

Note: Panel A presents the coefficients for the optimal number of lags of the endogenous variables. Panel B presents the Wald Test for lag exclusion, where the null is that the lags are statistically equal to zero in each equation individually and then jointly. Panel C applies the Lagrange multiplier test for autocorrelation in the residuals as in Godfrey (1989). We present the p-values first three lags in the test and the conclusion of the test up to six lags. Panel D presents the eigenvalue stability condition of the VAR that tests that all eigenvalues of the matrix of endogenous coefficients lie within the unit circle (have modulus smaller than 1) as in Glaister (1993). Panel E presents the Granger causality test as in Ganger (1969, 1980, 1988).

Table 5: VAR estimation results and post-estimation statistics 1980-2016

Sample I: 1980-2016		Short-run		Medium-run		Long-run	
		Stocks	*Credit*	*Stocks*	*Credit*	*Stocks*	*Credit*
Panel A: Endogenous							
LBBI Stocks lag 1		-0.1617	**-.1274****	**.5324*****	-0.0139	**.592*****	-0.1811
LBBI Stocks lag 2		**-.4383*****	**.1275****	**-.5865*****	0.1588	**-.5919*****	0.0899
LBBI Stocks lag 3						-0.1625	**.3427****
LBBI Stocks lag 4						**-.247***	**-.2606***
LBBI Real credit lag 1		-0.3835	0.073	-0.3255	**.6457*****	**.3261****	**.945*****
LBBI Real credit lag 2		-0.4816	0.024	0.1093	-0.11	**-.4114****	**-.3439***
LBBI Real credit lag 3						**.4908*****	0.0304
LBBI Real credit lag 4						**-.4633*****	0.0319
R squared		0.3550	0.8567	0.5058	0.8387	0.8668	0.8996
Chi squared		19.27	209.32	35.82	182.02	214.83	295.55
Panel B: Wald lag exclusion statistics							
Lag 1	Individual	0.48	0.03	0.00	0.00	0.00	0.00
	Joint	0.06		0.00		0.00	
Lag 2	Individual	0.01	0.04	0.01	0.14	0.00	0.25
	Joint	0.01		0.01		0.00	
Lag 3	Individual					0.03	0.05
	Joint					0.01	
Lag 4	Individual					0.00	0.14
	Joint					0.00	
Panel C: Autocorrelation of errors (P values for Lagrange multiplier test)							
Lag 1		0.03		0.21		0.05	
Lag 2		0.54		0.53		0.62	
Lag 3		0.01		0.69		0.24	
Conclusion		**No autocorrelation**		**No autocorrelation**		**No autocorrelation**	
Panel D: Eigenvalue stability condition							
Conclusion		**Satisfied**		**Satisfied**		**Satisfied**	
Panel E: Granger causality tests - P values							
Real credit causes stocks		**0.02**		0.31		**0.00**	
Stocks cause real credit		**0.00**		0.28		0.07	

Note: Panel A presents the coefficients for the optimal number of lags of the endogenous variables. Panel B presents the Wald Test for lag exclusion, where the null is that the lags are statistically equal to zero in each equation individually and then jointly. Panel C applies the Lagrange multiplier test for autocorrelation in the residuals as in Godfrey (1989). We present the p-values first three lags in the test and the conclusion of the test up to six lags. Panel D presents the eigenvalue stability condition of the VAR that tests that all eigenvalues of the matrix of endogenous coefficients lie within the unit circle (have modulus smaller than 1) as in Glaister (1993). Panel E presents the Granger causality test as in Ganger (1969, 1980, 1988).

The following table summarises the Granger causality tests presented in tables 3-5

Table 6: Summary of Granger causality tests

Summary of Granger causality tests - Panel E Tables 3-5			
	Short-run	*Medium-run*	*Long-run*
1885 - 1914: Latitude			
Real credit causes stocks	No	No	Yes
Stocks cause real credit	Yes	No	Yes
1915 - 79: Repression			
Real credit causes stocks	No	No	No
Stocks cause real credit	Yes	No	No
1980 - 2016: Latitude			
Real credit causes stocks	Yes	No	Yes
Stocks cause real credit	Yes	No	No

Note: Taken from Panel E in tables 3-5. "Yes" indicates that the null hypothesis of no causality in the Granger sense can be rejected with 95% confidence.

A first interesting result is that in the medium-run specifications we find no evidence of a causal link between stocks and credit in any of the subsamples. This suggests that the medium-run LBBI has little informational content, and will be removed in future versions of this paper.

Secondly, during periods of financial latitude, there is evidence of a chicken-and-the-egg problem in which we can only identify the feedback loop between asset price and credit growth as described by Minsky (1986, 1992). What we know from Granger (1969, 1980) is that the LBBIs for the stock market have some unique information that is useful in predicting the future behaviour of the LBBIs for real credit. The reverse is also true. The causal link from stocks to credit is representative of a fundamental relationship in which increasing asset prices, through the financial accelerator mechanism, allow for larger availability of credit. The link in the opposite direction indicates that it is possible that part of the loanable funds was directed to speculative investment in the stock market. In the case of the classical gold standard period, bidirectional causality is evidenced in the long-run relationship between stocks and credit while in the more recent period this issue is identified only in the short-run relationship between stocks and credit.

This bidirectional causality implies that if policymakers wished to affect both endogenous variables, in theory, they would only need to affect one as the impulse would impinge on the other. It also indicates that a shock to one of the endogenous will reverberate across the model to affect the other. This confirms the idea posited by Kindleberger & Aliber (2005) of self-fulfilling manias and panics: positive shocks to asset prices fuel credit, which concurrently fuels asset prices further. A negative shock to either variable, even a small one, may upend the virtuous cycle into a vicious one ending in a stock market crash or a credit crunch.

Thirdly, during the more recent period, in the long run, we find evidence that credit growth causes stock price growth, but the reverse is not true. This finding is consistent with what is expected to happen under financial liberalisation since Diaz-Alejandro's (1985) "*Good-bye financial Repressions, hello financial crash*". As market forces are allowed to run free, real credit growth can "go to the wilderness" in the sense that, unchecked, it can foster excessive asset price growth and the accumulation of financial imbalances (Borio & Lowe, 2004). While testing for credit-fueled bubbly behaviour in asset prices is beyond the scope of this paper, we do believe that our results point further research in that direction.

The implications of this result for current policy-making are substantial. As indicated in the introduction, credit growth seems to be a good predictor of financial instability, and our findings attest to the possible mechanism through which this occurs. If in a scenario of liberalised financial markets credit booms (busts) can reverberate through the economy up to the point when they lead to asset price expansions (crashes), then regulators and policymakers should include credit growth in their target functions. Furthermore, the fact that the relationship holds for returns up to five years (as those reflected in the long-run LBBI) suggests that as Borio (2006) indicates, the current policymaking horizon for monetary authorities is too short and may be leading to myopic decision-making.

Finally, regarding the period of financial repression (1915-79), we only find evidence for the financial accelerator mechanism in the short run. In the case of Britain, under a scenario of quantity limitations to credit, restrictions on international capital flows, taxes on imports, and high transaction costs for securities trades, it is not surprising that only fundamental drivers could affect credit. As the economy grows, which reflects in the stock market, firm's balance sheets become more robust and, consequently, they become more creditworthy. However, even this fundamental link between variables is broken in the medium and long-run specifications. We argue that this suggests Posen's dictum may be accurate: "In the end, no amount of monetary discipline can substitute for a lack of proper financial regulation and supervision" (2006, p. 121). Further research may be directed toward the optimal level of regulation since too much regulation, namely repression up to the point where the financial accelerator mechanism breaks down, may be suboptimal in terms of output growth as identified in the finance and growth literature (King & Levine, 1993; Levine, 2005; Beck, 2012).

4. Concluding Remarks

This paper aimed to explore the financial cycle, characterised by the joint evolution between credit aggregates and stock market prices, in the UK from 1885 until 2016. To further understand its behaviour, we tested for changes in its behaviour under different regulatory frameworks. To do so, we broke down the period of study between a period of financial latitude (1885-1914), a period of financial repression (1915-79), and a final period of liberalised financial markets (1980-2016) and tested for a structural break in the relationship.

Our findings indicate that the relationship between stock price and credit growth is contingent on whether the economy is experiencing a period of financial repression or latitude. As a case in point, we identified two relevant institutional changes and suggested that they may represent a break in the relationship between stocks and credit. The first one occurred with the advent of the first world war, the end of the classical gold standard period, and the beginning of financial repression that occurred during the interwar years. The second change took place with changes in the British regulatory framework that occurred during the 1970s and that peaked in 1979. We found evidence that these two sets of changes coincide with a structural break in the VAR model proposed in Section 3. Under periods of financial latitude, the relationship between both variables was of bidirectional causality, particularly in the short and long-run specifications. Contrarily, under financial repression, causality seems to run only from the stock market to credit and only in the short-run.

This, for the current context of worldwide deregulation, suggests that we provide evidence in favour of central banks keeping a hands-off approach regarding asset price booms. After all, the variable that seems to be leading the developments in the financial cycle is real credit growth. Consequently, we suggest that research should focus on the efficiency of including the behaviour of credit aggregates in the optimisation function of monetary policymakers. In the words of Kindleberger & Aliber (2005) "A strong case can be made for stricter regulation and supervision of banks to forestall lending in euphoric periods that may end in financial crisis" (p. 224).

An additional finding is that the causal link running from credit to stocks appears to be strong in the long-run specification, under financial deregulation. This suggests, in line with what has been proposed by Borio & Lowe (2004) and Borio (2014a, 2014b), that it may be in the interest of central banks to increase the forecast period for their policymaking function. The current foresight of one or two years may be missing part of the picture and causing myopic decision making.

Further research is necessary in several directions. First, it may be useful to broaden the scope of the dependent variables to include housing prices on the asset side and foreign credit on the liability side. Additionally, one of the hallmarks of the deregulation process has been the rise of a shadow banking sector for which we are unable to account with the definition of credit in this paper. It would be interesting to show whether our results hold in the presence of a broader definition of both variables. Furthermore, one of the issues of this paper is that the choice of dates for the breaks is exogenous. Future versions of this document should include a model that allows for the endogenous determinations of breaks in the VAR relationship. Moreover, we should test whether the structural break also affects the relationship between financial cycle variables and the real economy, as presented in section 1.2. Finally, this is an experiment that can be extended to other countries and institutional settings. Some suggested subjects of study may be developing countries that have undergone substantial changes either in the regulation of their financial sector

(Latin American countries after de the debt crises of the 1980s, for example) or developed countries that have been subject to integration processes such as the members of the Eurozone.

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