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Stock market co-movement, domestic economic policy and the macroeconomic trilemma: the case of the UK (1922–2016)

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This article explores the global cycle hypothesis by testing whether the US stock market serves as an explanatory variable for the evolution of expansions and contractions in the UK stock market from 1922 until 2016. Alternatively, it tests an index that groups the stock markets of advanced economies to identify whether this driving force is international. Second, regarding co-movement with the US, the article explores whether its time-varying nature is contingent on the domestic and international economic policy regimes. I find evidence that there is a strong and contemporaneous co-movement between the US and UK stock markets. Additionally, through a VAR model, I identify that the movements in the UK stock market cause, in the Granger sense, changes in the index for advanced economies up to two years later. Furthermore, in the short-run co-movement between the US and UK stock markets is contingent on the macroeconomic trilemma while, in the long run, both domestic and international policy regimes affect the relationship. A final contribution is the design of a new methodology for describing the evolution of financial time series as risk-adjusted above or below average returns to different time horizons: the Local Bull Bear Indicators (LBBIs).

Keywords: macroeconomic trilemma, stock market, co-movement, Local Bull Bear Indicator

JEL classification: C14, E60, F33, G15, N20, N24

The issue of whether capital market integration explains the evolution of the British stock market is open to debate. On the one hand, Campbell *et al.* (2018), in a study about the UK stock market during the nineteenth century, list among other drivers, wars, revolutions, monetary policy, railway sector news, and financial crises. In a study about integration between the London Stock Exchange (LSE) and the New York

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Stock Exchange (NYSE) from 1825 until 1925, Campbell and Rogers (2017) find little evidence of co-movement between the two markets, despite the gold standard and instantaneous communication across the Atlantic. On the other hand, Goetzmann *et al.* (2005) find that financial markets were highly integrated by the end of the nineteenth century. Similarly, Miranda-Agrippino and Rey (2015), using a database that spans the period 1990–2012, find that a single global factor explains up to 25 per cent of the variance–covariance matrix of risky returns. Additionally, Rey (2015) and Passari and Rey (2015) find that the correlation between the global factor and the VIX index of risk aversion is negative and significant and that it does not depend on the exchange rate regime in place.

Moreover, even if co-movement across markets were to be a relevant driver of stock market indices, this relationship need not be stable in time. First, Obstfeld and Taylor (2004) have shown that the level of integration in international markets follows a U-shaped pattern with peaks during the classical gold standard (1870–1914), troughs during the Bretton Woods system (1944–71), and peaks again in the more recent period (1980–2016).[1] Second, Bordo and Wheelock (2009) suggest that both domestic and international economic policies are of interest in explaining the evolution of expansions and contractions in the stock market.

These conflicting pieces of evidence raise two different but related questions. First, is there a global factor that partly explains the evolution of UK stock prices? To answer this, I explore Rey's (2015) global cycle hypothesis and test whether the US stock market, from which the VIX index is obtained, serves as an explanatory variable for the evolution of expansions and contractions in the UK stock market from 1922 until 2016. In the same vein, I include, alternatively, an index that groups the stock markets of advanced economies to test whether this driving force is an international one or if it is restricted to the integration between the US and UK stock markets. Second, is the co-movement between stock markets affected by domestic or international economic policy, as suggested by Bordo and Wheelock (2009)? To answer this, I test whether the co-movement between the UK and the US stock market has a time-varying nature contingent on both the domestic and international economic policy regimes throughout the period.

Regarding the first question, I find evidence that there is a strong and contemporaneous co-movement between the US and UK stock markets throughout the whole period. Furthermore, I find that the co-movement between the UK and the index of advanced economies peaks with one lag. In the same vein, through a VAR model, I

[1] Haycocks and Plymen (1956) suggest that, even during the Bretton Woods period, capital market integration was relevant. In discussing the effects of the 1949 US recession on the British stock market they indicate that 'These economic events in the United States were given much publicity in this country … It was also reasonable that many individuals would act on the assumption that the recession would spread to this country. Such expectations would account quite well for a substantial fall in share values … [O]ne basic difficulty at the present time is that in assessing future economic conditions in the United Kingdom one must also consider economic conditions in the United States' (p. 335).

identify that the movements in the UK stock market cause, in the Granger sense, changes in the index for advanced economies up to two years later. Consequently, the main contribution to the global cycle debate is failing to accept the hypothesis of a global cycle driving the UK stock market, but rather presenting it as an issue of contemporaneous UK–US stock market integration which leads other advanced economies in the sample. Concerning the second question, I find that in the short run, observing returns of up to one year, co-movement between the US and UK stock market is contingent on the international economic policy regime *à la* Obstfeld and Taylor (2004). However, in the long run, observing returns between 3 and 5 years, I find that co-movement between the UK and the US stock markets is contingent in both the domestic and international policy regimes, as suggested by Bordo and Wheelock (2009). I contribute to the debate about the time-varying nature of the co-movement between US and UK stock markets by showing that it troughs during the 1960s, coinciding with the stop–go policies in the UK, and peaks during the 1970s, during a period that coincides with the first and second oil shocks, and remains positive and statistically significant thereafter. A final contribution is the design of a new methodology for describing the evolution of financial and economic time series as risk-adjusted above or below average returns to different time horizons: the Local Bull Bear Indicators (LBBIs).

Stock markets are interesting because, given their high liquidity particularly in market-based developed financial systems, they quickly reflect changes in impending economic conditions and agents' expectations (Levine 2002; Chen *et al.* 1986). In that sense, they offer researchers more variability than housing or commercial property prices (Borio and Lowe 2002). Moreover, available studies on the long-run history of bull and bear stock markets further motivate them as an exciting subject. Kindleberger and Aliber (2005) note that during a boom period, the reduction in the cost of equity leads to a broadening of the profitable investment opportunity set, and thus to increased investment, while busts lead to debt overhang and reduced profits and may impact the financial sector via loan defaults. This dynamic is reminiscent of the marginal *q* ratio proposed by Tobin and Brainard (1976). Additionally, the UK is of interest for several reasons. First, this study begins at the time that New York was about to surpass London as the wealthiest stock market in the world.[2] According to Campbell and Rogers (2017), while in 1925 the LSE had a market capitalisation of 5.3 billion pounds spread across over 2,381 stocks, the NYSE was a close second with a market capitalisation of 4.7 billion pounds and 548 listed stocks. 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).

[2] An added benefit of the choice of period, 1922–2016, is that it encompasses international regimes from the gold exchange standard up until the post-Bretton Woods period, and domestic regimes that begin with the minimum balanced budget rule and run until the current inflation targeting scheme (Middleton 2014).

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The rest of this article is structured as follows. Section I presents the data and describes the construction of trilemma and domestic policy regimes. Section II discusses the methodology used to describe the boom–bust cycle. Section III presents evidence for the co-movement between the stock markets in the UK and the US, and between the UK and the advanced economies stock markets. Section IV explores the time-varying nature of the co-movement of the UK and the US stock market, and tests for its contingency on the different policy regimes. Section V highlights the contributions of this study and offers concluding remarks.

I

Data for the UK stock market correspond to a nominal, monthly, market-wide, capitalisation-weighted index, from January 1917 to December 2016, from the Bank of England's (BoE) database 'A millennium of macroeconomic data' (series M13).[3] The series, which is a spliced construction from different data sources discussed in Part A1 of the online appendix, excludes dividend reinvestment. Consequently, growth rates reflect only capital gains. At each point in time the index contains a large array of shares available in the market and, as suggested by Haycocks and Plymen (1956, 1964) and several sources, is representative of the British economy. To express the series in real terms, I have used the spliced monthly CPI from the same BoE database (series M6). The index takes the value of 100 in 2015.

Data for the US stock market correspond to the nominal S&P index taken from Shiller (1989, 2000).[4] It is a monthly series from Standard and Poor's Composite Stock Price index. 'The series was taken from Standard and Poor's Statistical Service *Security Price Index Record*, various issues, from tables entitled "Monthly Stock Price Indexes – Long Term"' (Shiller 1989, p. 444). The index covered 90 companies between 1926 and 1957. From then on, the S&P500 index was introduced. Both the S&P90 and the S&P500 exclude dividends and, consequently, growth rates reflect only capital gains. Both indices covered companies from a broad array of sectors aiming at representing the broad behaviour of the stock market. The railroad sector was replaced by the transportation sector in 1976. Similarly, the financial sector was included in 1976. To express the series in real terms, I have used the Consumer Price Index-All Urban Consumers provided by Shiller and taken from the US Bureau of Labor Statistics. It takes a value of 100 in 1983. The index is expressed in real terms where 100 = 31 December 2015. Further detail on the series is presented in Part A1 of the online appendix.

A third stock market index for other advanced economies was calculated using the nominal stock market indices and CPIs for 15 advanced economies from the

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

[4] At the time of writing, the database was last updated in September 2018 and is available at www.econ.yale.edu/~shiller/data.htm

Macrohistory Database by Jordà, Schularick and Taylor (2017).[5] All stock market indices in the database exclude dividend payments and, consequently, growth rates represent only capital gains. I calculated the real annual growth rate for each index and then constructed the return of an equally weighted portfolio. From this portfolio, I obtained a real Other Advanced Economies (OAE) index with value 100 in 1922.[6] As I will use this series to confirm the robustness of the results obtained when using the US stock market index, I have excluded the United States index from the portfolio. Figure 1 presents the time series evolution of the three indices in logarithms. A statistical characterisation of each of the series can be found in Part A2 of the online appendix.

In what follows I will discuss the characterisation of the different policy regimes, bearing in mind that while the separation between domestic and international economic policy may be a useful theoretical construct, it is not an empirical reality. From a macroeconomic perspective, they are both intertwined and must bear some internal consistency. I will tend to this interaction in the econometric specification presented in Section IV.

Trilemma regimes

To portray the evolution of international economic policy, I will use the framework of the macroeconomic trilemma, formalised by Obstfeld and Taylor (1997), which states that fixed exchange rates, open capital accounts and independent monetary policies are incompatible, and thus policymakers are forced to choose two out of the three desirable goals (Obstfeld, Shambaugh and Taylor 2005). Bordo and James (2015) show that rarely will a country choose one of the corners (the pure trilemma solutions); instead it will try to locate somewhere between the corner positions. Moreover, Aizenman, Chinn and Ito (2010, 2013) find that this framework is a tie that binds both developed and developing economies since the end of World War II. Obstfeld, Shambaugh and Taylor (2004) find similar results for the interwar period. I will refer to the different ways in which countries resolve this impossible trinity as a trilemma regime.

The usual portrayal in the literature defines five broad trilemma regimes: gold exchange standard (1925–38), pre-convertible Bretton Woods (1944–58), convertible

[5] At the time of writing, the third release of the Macrohistory database is available online at www.macrohistory.net/data/. The 15 advanced economies are Australia, Belgium, Canada, Denmark, France, Finland, Germany, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden and Switzerland.

[6] Alternatively, I calculated the weights using two different methodologies. First, I obtained factor loadings from a dynamic factor model. Second, I used real GDP from the Maddison Project Database (Bolt, Inklaar, de Jong and van Zanden 2018) to calculate annual weights of each stock market growth rate. Results using the three weighting methods are qualitatively similar. Using GDP associated weights presumes that the size and relevance of a given stock market is directly correlated to the size of the economy without accounting for the fact that financial system in the sample countries may be either bank-based (France, Germany) or market based (Australia, Canada) (Levine 2002; Allen and Gale 2000; Amable 2003; Veysov and Stolbov 2012). Thus, I chose to keep the simpler calculation.

Figure 1. *Evolution of the real stock market indices in logarithms from 1917 until 2016*
Note: Data for the UK from the Bank of England database 'A millennium of macroeconomic data'. Data for the United States from Shiller (1989, 2000). Data for other advanced economies from Jordà, Schularick and Taylor (2017). Data begin in January 1917. When implementing the methodology presented in Section II, the first five years of data are lost. Consequently, further analysis covers the period starting in January 1922.

Bretton Woods (1959–71), inflationary post-Bretton Woods (1972–82) and the Great Moderation (1983–2015).[7] However, this periodisation is too blunt to reflect the particular nuance of British economic history. Consequently, I follow the approach by Klein and Shambaugh (2015), who define four different states of the world, our trilemma regimes, as the interaction between capital control and exchange rate regime dummies: closed pegs, open pegs, closed floats and open floats.

On the one hand, I construct an annual dummy series of capital controls using several sources that present data for the UK. On the other hand, to define the exchange rate regime, I follow the methodology in Shambaugh (2004). The author studies the exchange rate between a given currency and a base currency, defined as that to which the country is pegged or is more likely to peg its exchange rate. He allows for hard pegs (a ± 2% band) and soft pegs (a ± 5% band). All remaining periods are treated as floating exchange rates. To transform this series into a binary sequence, I can either treat all pegs as fixed exchange rates, a lax definition of the peg, or apply a strict definition where only hard pegs register as fixed exchange rates.

In Part A3 of the online appendix, I present a discussion of the different sources employed in the construction of the capital control and exchange rate series. Additionally, I compare both our lax and strict exchange rate classifications with others available in the literature and find that the strict classification coincides with the updated version of Shambaugh (2004) in over 98 per cent of the period.[8] Consequently, to keep comparability with other studies, I will define the four different trilemma regimes like the ones resulting from the interaction of capital control and strict exchange rate dummies. Figure 2 presents the time series evolution of the four trilemma regimes contingent on the different definitions of the peg.

Table 1 showcases the number of years the UK spent in each trilemma regime according to the strict definition of the peg. Values in parentheses correspond to the same classification using the lax definition of the peg.

Regarding the evolution of exchange rates, the strict classification suggests there were three periods of hard pegs for the British pound. The first period is associated with the reestablishment of currency convertibility into gold between April 1925 and September 1931. The second period, as argued by Urban and Straumann (2012), occurred in 1935–7, when the UK pegged its currency to gold even though convertibility was not implemented. The third period corresponds to the post-war fixed exchange rate regime as per the Bretton Woods accords of 1944. During the period, the pound suffered two one-time devaluations in 1949 and 1967. The first one was aimed at easing the restraints posed by the shortage of US dollars in the international monetary system, while the second one aimed to deal with balance-of-payments deficits (Roberts 2013; Neal 2015). The fall of Bretton

[7] In this periodisation I follow the works of Bordo and Schwartz (1999), Obstfeld and Taylor (2004), Fatas *et al.* (2009) and Urban and Straumann (2012).

[8] A version of the classification, updated until December 2014, is available online. It can be found at www2.gwu.edu/~iiep/about/faculty/jshambaugh/data.cfm

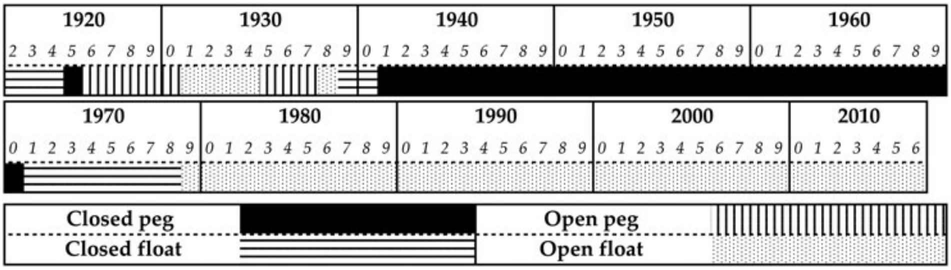

Figure 2. *Trilemma regimes using the strict definition of the peg, 1922–2016*
Note: Trilemma regimes are calculated from the interaction of exchange rate and capital control regimes. A description of the sources and the methodology for constructing the series is available in Part A3 of the online appendix.

Table 1. *Observations by trilemma regime*

		Exchange rate	
		Peg	*Float*
Capital account	*Closed*	31 (34)	13 (10)
	Open	8 (32)	43 (19)

Note: Values (in parenthesis) correspond to the number of years in each trilemma regime under the strict (lax) definition of the peg.

Woods was precipitated by monetary expansion and wartime fiscal deficit in the US coupled with high interest rates in Germany, which made investors expect a revaluation of the mark and hence increased the flow of funds from the US to Europe. On 15 August 1971, President Nixon suspended convertibility causing the dollar to become a fiat currency with the stroke of a pen (Kindleberger and Aliber 2005).[9]

Concerning the evolution of capital controls, two waves of financial repression occurred between 1922 and 2016, the first during the period after World War I until 1925, and the second from the onset of World War II until 1979. With the return of the UK to the gold exchange standard exchange controls were eliminated (Bordo and Schwartz 1999). While, after the suppression of convertibility in 1931 the UK implemented few protectionist measures, these were weak, and imperial preference was maintained with Commonwealth countries (Urban and Straumann 2012). It was not until the onset of World War II (1939) that the second wave of capital controls emerged, and lasted for four decades. Capital controls during the period were

[9] Periods such as the short-lived entry of the UK into the European Monetary System between 1990 and 1992 do not appear under the strict definition of a peg. When using the lax definition, this and other episodes show up as there is much larger variability in the exchange rate regime in the period after 1971, as can be seen in Part A3 of the online appendix.

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how policymakers reconciled the need to use monetary policy to attend to domestic issues and the challenges of keeping a fixed exchange rate as had been agreed under Bretton Woods (OECD 1993; Eichengreen 2008). Taylor (2013) confirms that the Bretton Woods period was the most restrictive era for capital flows since 1870.

Domestic policy regimes

In terms of domestic economic policy regimes I follow Middleton (2014), who identifies an era characterised by the Minimal Balanced Budget Rule (MBBR; 1922–38); a period of wartime demand management (1939–50); the period of stop–go policies (1951–65); a phase of expanded Keynesianism (1966–78); the Thatcher–monetarist era (1979–92); and the current inflation targeting consensus (1993–2016).[10]

Minimal Balanced Budget Rule (MBBR)

From the mid-nineteenth century onwards, the classic liberal economic policy in Britain was focused on three pillars: the gold standard, the Minimal Balanced Budget Rule (MBBR) and free trade. The underlying idea behind the MBBR is to keep a small state, internal and external balance, and to allow market forces to operate. Extending this period until 1938 conveys that this was the model to which policymakers wanted to return after World War I and explains their insistence in returning to the gold standard at pre-war parity (Checkland 1983). Additionally, it was a period where international cooperation was essential, as highlighted by institutions and accords such as the Bank for International Settlements or the British Economic Conference of 1932 (Cendejas *et al.* 2017).

Wartime demand management (WDM)

With the advent of World War II, Britain entered an era of wartime demand management and industrial protectionism, which were in place to avoid excess demand in the face of rearmament. As fiscal leverage and unemployment policies were implemented, the government came to have a stabilisation function. During the war, economic controls resurfaced: demand was rationed while labour, capital and product markets were subject to direct controls (Middleton 2014). Middleton (1989) found that deficit-finance did not become popular until the early 1950s because there was fear that expenditure would explode once the fiscal discipline imposed by a balanced budget was relaxed.

Stop–go policy (SGP)

After the end of the war, the main issues were maintaining the stability of the pound in international currency markets, facilitating the government's debt rollover process, and increasing economic growth relative to other developed economies (Allen 2016; Scott and Walker 2017). From a financial perspective, quantity restrictions

[10] Literature on British economic policy during the twentieth century is abundant. Relevant long-run studies are, for example, Crafts and Woodward (1991) and Floud, Humphries and Johnson (2014).

on credit were imposed in order to increase the available funds for public debt rollovers and reduce credit-driven import growth, which would hurt balance-of-payments equilibrium (Offer 2017). From a macroeconomic perspective, whenever growth and employment accelerated, prices and wages increased, leading to balance-of-payments deficits as retailers shifted their sales from foreign to domestic markets (Middleton 1989). According to Scott and Walker (2017), the tools to prevent foreign account imbalances were reducing expenditure and increasing taxes to curtail aggregate demand (stop phase). As the balance of payments returned to positive territory, domestic pressure for stronger growth and higher employment would increase, motivating a reduction in taxes and expanded government expenditure (go phase) (Middleton 1989, 2014).

Expanded Keynesianism (Keynesianism Plus KePl)

During the expanded Keynesianism period, the trade-off faced by policymakers was between low unemployment and price stability. This period is characterised by the mounting dissatisfaction with the stop–go policies of the past and looming inflation pressures after the oil shock of 1973. Consequently, this is a phase of economic experimentation: enhanced demand management, incomes policy and strategic planning (Pemberton 2000). Both the Heath (Conservative) and Wilson (Labour) governments implemented monetary and fiscal latitude, which led to increases in inflation, peaking at 25 per cent in 1975 (Minford 2015). Bordo and Landon-Lane (2013) indicate that the passage of the Competition and Credit Control (CCC) Bill in 1971, which liberalised the financial system and ended the price-setting bank cartel, propelled credit, housing and equity booms. In 1973, the Heath government had to rein 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 (Offer 2017).

Thatcherism–monetarism (ThM)

The excessive inflation of the 1970s and the failure to honour the post-war agreement of growth and employment led to a resurgence of conservatism and the ascent of Margaret Thatcher. This period is characterised by a reduction in the government's size and scope (Middleton 2014). In her first year in office as prime minister, the additional income from recently found oil deposits in the North Sea stabilised the pound and allowed for the elimination of credit restrictions (Offer 2017). The rest of the Thatcher revolution included tax cuts on capital income, deregulation of industries, and a monetary policy *à la* Volcker, designed to curtail inflation (Bordo and Landon-Lane 2013). While by 1983 the broad economy was thriving, unemployment increased, and certain sectors were particularly hard-hit (Minford 2015). Regarding capital markets, in 1983 an agreement was struck between the government and the LSE to eliminate fixed commissions for trades three years in the future at the latest. This, according to Bellringer and Michie (2014), was the *causa proxima* for the 'Big Bang' of 1986, which propelled the City to become, arguably, the most significant financial centre in the world. However, by the end of the Thatcher government in

Table 2. *Dating of trilemma and domestic policy regimes*

Panel A. Trilemma regimes		Panel B. Domestic policy regimes	
Closed peg	1925, 1941–70	Minimum Balanced Budget Rule	1922–38
Open peg	1926–30, 1936–37	War-time demand management	1938–50
Closed float	1922–24, 1939–40, 1971–78	Stop-go policy	1951–65
		Keynesianism plus	1965–78
Open float	1931–34, 1938, 1979–2016	Thatcherism–Monetarism	1979–92
		Inflation targeting	1993–2016

1990, the economy was sliding into the longest recession since the Great Depression (1990–3) (Minford, 2015).

Inflation targeting (IT)

The end of the recession in 1993 and the implementation of inflation targeting represent a return to the post-war consensus of economic growth, stability in prices and low unemployment. This regime, according to Mishkin (2008), has five defining traits: first, public announcements of a medium-run target for inflation; second, price stability as the primary mandate for monetary policy; third, data-driven use of policy instruments; fourth, a transparent policy-making strategy; finally, accountability for the central bank in meeting inflation goals. Importantly, on 8 October 1992, the chancellor of the exchequer, Norman Lamont, set an inflation target of 1–4 per cent for the first time in UK history (Benati 2008). Subsequently, in February 1993, the Bank of England produced its first inflation report, and in 1997, the Brown government declared the central bank to be independent (Minford 2015). This period also coincides with major international crises, financial innovation, and capital flight to Europe and the US, where investors were looking for a haven (James 2014).

To conclude this section, Table 2 summarises the domestic and international economic policy regimes that will be used in Section IV.

II

To describe expansions and contractions in the different stock market indices, I have developed a new methodology that produces Local Bull Bear Indicators (LBBIs). The method exploits the matrix of returns to different time horizons (from 1 to 60 months) to produce three distinct LBBIs, each to a different time horizon: LBBIS covers short-run returns, from one month to one year; LBBIM covers medium-run returns, from 18 to 36 months; LBBIL covers long-run returns, from 42 to 60 months. This measure is useful and relevant because it results in a monthly 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

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that affect only short or medium-run returns. In what follows I present a schematic description of the construction of LBBIs for monthly series and leave the more technical details for the online appendix.[11]

Let $\mathbf{R}$ be a matrix of dimensions txn where each position $r_{t,n}$ corresponds to $(P_t/P_{t-n}) - 1$, where P_t corresponds to the value of the index at time t. For monthly returns, n takes consecutive integer values from one to 12 months (short run), then every six months from 18 to 36 (medium run), and from 42 to 60 (long run). I then proceed to perform a rolling standardisation of each vector $\mathbf{r_n}$ using

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

where $\mu_{t,n}$ is obtained as an exponentially weighted moving average for the last 60 observations and $\sigma_{t,n}$ is the contemporaneous standard deviation obtained from fitting a GARCH (1,1) model.[12] In this case, each observation $d_{t,n}$ is measured in standard deviations. This rolling standardisation serves the purpose of re-expressing returns considering the volatility context at each point in time. After all, a 10 per cent monthly return may seem like a strong boom when monthly volatility is 1 per cent but may seem as a quiet month when volatility is 20 per cent. Additionally, (1) can be interpreted as the risk-adjusted above or below trend return. This is an added benefit of the methodology as it allows to integrate, in a single measure, characteristics of profitability and risk.

I then aggregate the different vectors $\mathbf{d_n}$ into three matrices $\mathbf{D_{short}}$ of dimensions (tx12), $\mathbf{D_{medium}}$ of dimensions (tx6), and $\mathbf{D_{long}}$ of dimensions (tx6). The different LBBIs are obtained from

$$\begin{aligned} \text{LBBIS} &= \boldsymbol{\omega}'_{\mathbf{short}}\mathbf{D_{short}} \\ \text{LBBIM} &= \boldsymbol{\omega}'_{\mathbf{medium}}\mathbf{D_{medium}} \\ \text{LBBIL} &= \boldsymbol{\omega}'_{\mathbf{long}}\mathbf{D_{long}} \end{aligned} \tag{2}$$

[11] In Part A4 of the appendix, I offer a detailed description of the construction of LBBIs for monthly and annual time series. In Part A5, I compare my results for the UK stock market with those obtained using other usual methodologies in the literature. In Part A6, I present a full dating of expansions and contractions for the UK stock market and include measures of amplitude, duration and severity by phase.

[12] The idea presented in equation (1) resembles the measure proposed by Le Bris (2018), where he analyses crashes in different time series relative to the volatility context at the time. LBBIs are different in several regards. First, rather than using moving standard deviations and averages, I use time-varying means and measures of dispersion that account for return and volatility clustering, common characteristics in financial time series. Second, this measure produces a complete time series of equal length to the original, while Le Bris (2018) refers only to stock market crashes. This allows me to provide a full dating and characterisation of expansion and contraction episodes in the UK stock market, as presented in Part A6 of the online appendix. Third, unlike Le Bris (2018), I do not need to make assumptions about agent's risk aversion preferences nor regarding the role played by changing levels of leverage in the evolution of stock prices.

Where each vector **ω** corresponds to the weights assigned to each vector in the corresponding **D** matrix. Weights are obtained from the maximum likelihood estimation of factor loadings in an orthogonal common factor analysis with a single unobserved factor that best explains the variance-covariance matrix of each matrix **D**. For LBBIs to be interpretable as standard deviations, I re-scale the factor loadings linearly so that they add up to one and can be treated as weights. In Part A7 of the online appendix, I present a statistical characterisation of the LBBIs for the three stock market indices discussed at the beginning of this section.

III

The first aim of this article is to contrast the global cycle hypothesis posited by Passari and Rey (2015), who, in a study covering 1990–2012, indicate that

> risky asset prices (equities, corporate bonds) around the world are largely driven by one global factor. This global factor is tightly negatively related to the [Chicago Board Options Exchange Volatility Index] VIX. (p. 681)

To perform the ideal experiment to test for the existence of the global cycle since 1922, data for the VIX index since the interwar years would be needed. However, the series is only available from the Chicago Board Options Exchange (CBOE) from 1990 onwards because it originates from the implied volatility of plain vanilla call and put options on the S&P500 index, which have only been traded for a few decades (CBOE 2014). Nevertheless, the VIX index is a function of, among other things, the expected dividend growth rate and the volatility of the stock market index, where it covaries negatively with the former and positively with the latter. The relationship between the expected growth rate in dividends, volatility and LBBIs mirrors the one with the VIX. On the one hand, LBBIs increase with the expected dividend growth rate, as it affects the numerator in a dividend discount model and increases the current level of the index. On the other hand, LBBIs are decreasing in volatility as it affects the numerator in (1). Consequently, I expect the correlation between the VIX index and LBBIs for the US stock market to be negative. A discussion of the relationship between LBBIs and the VIX index is offered in Part A8 of the online appendix.

Passari and Rey (2015) argue further that the link they have found for the VIX can also be established using the VSTOXX, which is the European equivalent, the VFTSE extracted from the London Stock Exchange FTSE index and the VNKY, which reflects market fear in the Japanese stock market. Therefore, I use the LBBIs obtained for the OAE index presented in Section I to test whether its relationship with the UK stock market resembles that with the US stock market. This is tantamount to testing whether there is a common cycle across all advanced economies or if it only concerns co-movement between the US and the UK.

To contrast these competing hypotheses, I follow Stuart (2017), who uses Gordon's dividend discount model to indicate that variations in stock market prices

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Table 3. *Trend and unit root tests for the control variables*

Variable	Trend	ADF statistic	Conclusion
Δ loans to GDP	No	−5.216	I(0)
Δ log GDP	Yes	−4.225	I(0)
Δ short-term interest rate	No	−8.556	I(0)
Δ dividend yield	No	−13.045	I(0)

Note: Trend tests whether the coefficient for a linear trend is statistically significant with 95 per cent confidence in an OLS regression against the variable. Critical values for the Augmented Dickey-Fuller (1979, 1981) test without (with) a trend: 1% -3.521 (-4.053), 5% -2.896 (-3.456), 10% -2.583 (-3.154). The null hypothesis is the series has a unit root.

are a function of the risk-free rate, the risk premium and the growth rate of dividends. Therefore, as controls, I employ yearly data for the dividend yield and the market short-term interest rate.[13] Additionally, I control for the level of domestic credit to the private non-financial sector as a percentage of nominal GDP, and the logarithm of GDP. The dividend yield is obtained from Global Financial Data while all remaining series are obtained from Jordà, Schularick and Taylor's Macrohistory Database (2017). The first differences of the series are included in the model to ensure stationarity, which I test for in Table 3.

Since LBBIs inherit strong autoregressive properties from the original returns in matrix **R**, I include the first lag of the UK LBBI for all specifications such that the error term of the regression behaves as white noise according to Bartlett's test (1955). I ran the regressions with Newey-West (1987) standard errors to one lag. Results are included in Table 4.

The main takeaway from the table is that, to all time horizons, the model that maximises the adjusted R-squared and minimises the BIC criterion is the one that includes the control variables and the LBBIs for the US stock market. In all cases, under this model, the coefficient for the US LBBI is positive and statistically significant beyond 99 per cent confidence. Since it is possible that market synchronisation occurs only during calm periods but breaks down during large booms or busts, as a robustness check, I ran quantile regressions, by decile, for model II. While results are presented in Part A9 of the online appendix, I find that the coefficient for the US LBBIs is statistically the same under both regressions, indicating that the relationship is not contingent on the type of phase markets are going through.

A second takeaway from Table 4 is the statistical insignificance of the coefficient for the OAE index, with 95 per cent confidence, in all specifications. In model III in the short run, the coefficient has significance with 90 per cent confidence, but it disappears once I control for both OAE and US LBBIs in model IV. This raises doubts

[13] To obtain annual LBBI series for the UK and US stock market I take the datum for December each year.

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Table 4. *Regressions using different measures of co-movement across markets*

	Short-run LBBI UK				Medium-run LBBI UK				Long-run LBBI UK			
	Model I	Model II	Model III	Model IV	Model I	Model II	Model III	Model IV	Model I	Model II	Model III	Model IV
Constant	−0.0415	−0.0313	−0.0532	−0.0337	−0.1062	−0.0020	−0.1247	−0.0040	−0.1126	0.1137	−0.1471	0.1514
Trend	−0.0003	−0.0016	−0.0004	−0.0016	−0.0006	−0.0017	−0.0006	−0.0017	0.0001	−0.0021	0.0005	−0.0025
Δ dividend yield	**−.2543⋆⋆**	**−.1693⋆**	**−.2179⋆**	**−.1633⋆**	−0.2765	−0.2035	−0.2734	−0.2035	−0.2225	−0.1675	−0.2198	−0.1654
Δ short-term interest rate	−0.0606	**−.0897⋆**	−0.0865	−0.0943	−0.0919	**−.1264⋆**	−0.1131	**−.1279⋆**	0.0280	0.0129	0.0233	0.0150
Δ loans to GDP	**−4.521⋆⋆**	**−3.592⋆⋆**	**−4.499⋆⋆**	**−3.598⋆⋆**	**−5.023⋆⋆⋆**	**−3.636⋆⋆⋆**	**−5.1⋆⋆⋆**	**−3.649⋆⋆⋆**	−3.8760	−2.5590	**−4.708⋆**	−1.9320
Δ log GDP	−1.0130	−0.2030	−1.0040	−0.2109	0.5822	0.6209	0.6482	0.6261	0.5020	−0.2021	0.6290	−0.3323
First lag of LBBI UK	−0.0095	−0.0094	−0.1013	−0.0271	**.4846⋆⋆⋆**	**.3536⋆⋆⋆**	**.4089⋆⋆⋆**	**.3481⋆⋆⋆**	**.5911⋆⋆⋆**	**.4048⋆⋆⋆**	**.5073⋆⋆⋆**	**.4462⋆⋆⋆**
LBBI USA		**.4728⋆⋆⋆**		**.4672⋆⋆⋆**		**.358⋆⋆⋆**		**.3564⋆⋆⋆**		**.4131⋆⋆⋆**		**.4414⋆⋆⋆**
LBBI OAE			**.1857⋆**	0.0358			0.1871	0.0151			0.2233	−0.1442
Observations	93	93	93	93	93	93	93	93	93	93	93	93
BIC (OLS)	209.5	**184**	212.1	188.4	261	**243.8**	264.4	248.3	294.2	**275.7**	297.3	279.6
Adj-R2 (OLS)	0.241	**0.4445**	0.2481	0.4385	0.3714	**0.4968**	0.372	0.4908	0.354	**0.4898**	0.3562	0.4872

Note: Model I is the baseline only using control variables. Model II includes the LBBI for the US stock market. Model III includes the LBBI for the OAE index. Model IV includes both LBBIs for the US and OAE indices. All regressions run using Newey West standard errors. Confidence: ⋆ 90%, ⋆⋆ 95%, ⋆⋆⋆ 99%.

that the US is proxying for a global cycle. An alternative possibility is that the co-movement between markets does not occur contemporaneously but rather with lags. Consequently, I ran the same specifications for models II and III as in Table 4 including the variable of interest (LBBIs for the US and OAE respectively) in leads and lags. Results for the coefficients of interest and the BIC criterion of each model are presented in Figure 3.

The figure shows that the best fit for the model that includes the LBBIs for the US occurs when the variable is included contemporaneously. This is also the specification when the value of the coefficient is maximum. This indicates that the co-movement between the US and the UK is strongest contemporaneously. Contrarily, the best fit for the model that includes the LBBIs for OAE occurs when the variable is included with one lead. This is also the specification when the coefficient peaks to every time horizon.[14] This suggests that while the US and UK are integrated contemporaneously, they are driving the behaviour of the stock markets in the other advanced economies. To confirm this hypothesis, I use a VAR model between the UK and OAE LBBIs, including control variables as in the primary specification. Table 5 shows the coefficients for the endogenous variables, post-estimation statistics and the results of the Granger (1969, 1980) causality test. Lag selection criteria suggest that the short-run model requires including only the first lag in the endogenous variables, while for the medium and long-run specifications the inclusion of two lags is appropriate.

Results in Table 5 indicate that the error acts as white noise, which allows endogeneity issues to be precluded. For the interested reader, results for the Hausman specification test for endogeneity of the OAE LBBIs as presented in Part A13 of the online appendix. Results indicate that LBBIs for OAE are non-endogenous variables. Furthermore, Table 5 shows 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, evidence of Granger causality confirms that some unique information in the LBBIs for the UK is useful in predicting the behaviour of the OAE LBBIs.

The different econometric specifications in this section indicate that while there is a contemporaneous co-movement between the US and the UK stock markets, this cannot be characterised as a global cycle. Rather, evidence suggests that the co-movement between the US and the UK is driving the behaviour of the stock market in other advanced economies one year in advance in the case of the short run and two years in advance in the case of the medium and long-run specifications.

[14] It is possible that the pull effect from the UK is stronger on less developed markets. To test this, I recalculated the evolution of the coefficients of OAE in the bottom row of Figure 3 after breaking up the components of the index into two groups according to their market capitalisation throughout the twentieth century. In Part A10 of the statistical appendix, I describe how the groups were constructed and show that the confidence bands for the coefficient of the high and low capitalisation OAE indices constantly overlap. Thus, results in Figure 3 are robust to the construction of the OAE index.

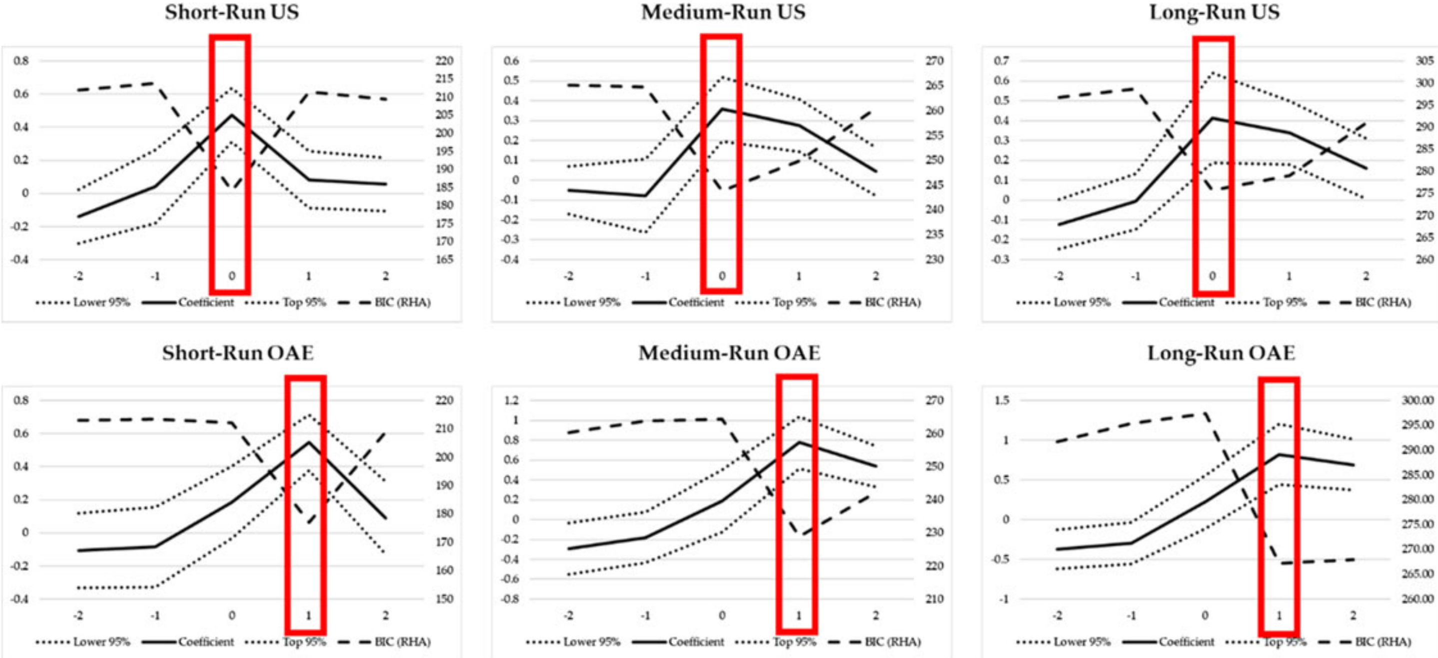

Figure 3. *Evolution of the coefficients of the US and OAE LBBIs as a function of leads and lags*

Note: X-axis indicates the number of leads (positive) or lags (negative) of the variable of interest. The top row shows the coefficient for the US LBBIs and the bottom row shows the coefficient for the OAE LBBIs. All regressions include control variables as in Table 4.

Table 5. *VAR post-estimation statistics and Granger causality test*

VAR equations		Short-run		Medium-run		Long-run	
		UK	*OAE*	*UK*	*OAE*	*UK*	*OAE*
		Panel A: Endogenous					
LBBI UK Stocks lag 1		0.0122	**.4556*****	**.5115*****	**.2818*****	**.6437*****	**.2073*****
LBBI UK Stocks lag 2				−0.1540	**−.1384*****	−0.1359	−0.0745
LBBI OAE Stocks lag 1		−0.0851	**.1508***	0.1638	**.8147*****	0.1448	**.9156*****
LBBI OAE Stocks lag 2				**−.299***	**−.3451*****	**−.3863***	**−.3483*****
R squared		0.2949	0.4940	0.4553	0.7328	0.4482	0.7500
Chi squared		38.9	90.8	77.7	255.1	75.5	279.0
		Panel B: Wald lag exclusion statistics					
Lag 1	Individual	0.75	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Joint	**0.00**		**0.00**		**0.00**	
Lag 2	Individual			0.06	**0.00**	0.08	**0.00**
	Joint			**0.00**		**0.00**	
		Panel C: Autocorrelation of errors (P values for Lagrange multiplier test)					
Lag 1		0.994		0.72		0.08	
Lag 2		0.995		0.73		0.10	
Lag 3		0.752		0.37		0.35	
Conclusion		No autocorrelation		No autocorrelation		No autocorrelation	
		Panel D: Eigenvalue stability condition					
Conclusion		Satisfied		Satisfied		Satisfied	
		Panel E: Granger causality tests - P values (Null is no causality)					
OAE causes UK		0.45		0.20		0.13	
UK Causes OAE		**0.00**		**0.00**		**0.00**	

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 hypothesis 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 (1991). Panel D presents the eigenvalue stability condition of the VAR that tests that all eigenvalues of the matrix of endogenous coefficients have modulus smaller than one, as in Glaister (1993). Panel E presents the Granger causality test under the null hypothesis of no causality, as in Granger (1969, 1980, 1988).

IV

The second aim of this article is to test whether the relationship between the US and UK LBBIs is contingent on the trilemma or domestic policy regimes described in Section I. To tackle this issue, I perform Chow (1960) tests for structural breaks in the coefficient for the US LBBI, against the null of no breaks, using the basic specification for model II in Table 4. Table 6 presents the different hypotheses tested and the results.

Results show there is evidence of a break in the coefficient by trilemma regime in the short-run specification and of a joint break by trilemma and domestic policy regimes in the long-run regressions. While these results employ the trilemma regimes using the strict definition of the peg, results are robust to using the lax definition of the peg as shown in Part A11 of the online appendix. The lack of evidence of a break for the medium run specification allows its exclusion from the analysis since medium-run (2–3-year) co-movement between the UK and US is positive and statistically significant regardless of any of the regimes in place. Results for the short and long-run regressions are presented in Part A12 of the online appendix.

Short-run results

Figure 4 presents the coefficients and 95 per cent confidence interval for the interaction of the US LBBIs and the different trilemma regimes.

Results show that the coefficients for the US LBBI are statistically significant under all trilemma regimes except for the closed float. While coefficients under pegged exchange rates are statistically indifferent, it is clear from the figure that under the open float regime co-movement between the US and UK is higher than under the closed peg regime. This story is consistent with the idea posited by Obstfeld and Taylor (2004), who indicate that under Bretton Woods (closed peg) financial integration troughed and that under the current regime (open float) financial integration is peaking.

Long-run results

Table 7 presents the coefficients for the interaction of policy regimes, trilemma regimes and the LBBI for the US stock market. The final row (column) offers the unconditional coefficients that result from the interaction of US LBBIs and domestic policy (trilemma) regimes.

In the table, there is at most one statistically significant coefficient by column when looking only at the coefficients for the interactions between policy and trilemma regimes. The exception occurs under the stop–go policy regime that has a statistically insignificant coefficient. This result is expected as the period 1951–65 is one of the more restrictive, with highest government intervention in recent British economic history. Figure 5 presents the evolution of the coefficients for the interactions of the US LBBIs and their confidence intervals using only the statistically significant coefficients for each period. For 1951–65, I use the coefficient for the stop–go

Table 6. *Chow test for structural breaks in the US LBBI coefficients by regime*

	Hypothesis I: There is no break by trilemma regime		
Horizon	*Short*	*Medium*	*Long*
Statistic	**2.69**	2.03	1.19
P-value	**0.05**	0.12	0.32
	Hypothesis II: There is no break by domestic policy regime		
Horizon	*Short*	*Medium*	*Long*
Statistic	1.37	1.38	1.70
P-value	0.24	0.24	0.14
	Hypothesis III: There is no joint break by trilemma and domestic policy regime		
Horizon	*Short*	*Medium*	*Long*
Statistic	1.04	1.33	**2.34**
P-value	0.42	0.24	**0.02**

Note: Each panel contains a Chow test for structural breaks in the coefficient for the LBBI for the US under different regimes. The null hypothesis is that there is no break.

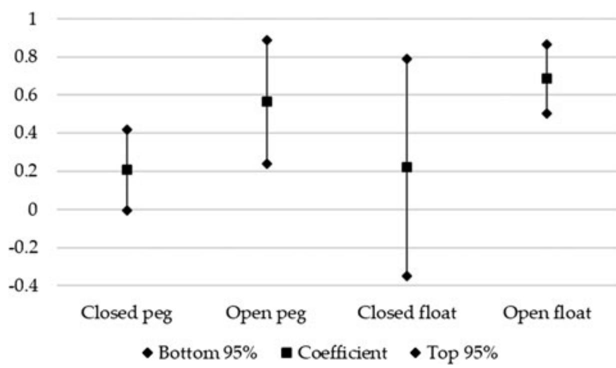

Figure 4. *Short-run coefficients for US LBBIs by trilemma regime*
Note: Data taken from the full regressions presented in Part A12 of the online appendix.

policy. The MBBR period is broken in two as the closed peg took place between 1926 and 1930 and between 1935 and 37 (recall Table 2). I assign both periods the same coefficient.

The figure shows there are two peaks in the coefficient. The first one occurred in 1941–50 when wartime demand management and the closed peg concurred. While the closed peg is the most restrictive regime, as argued by Obstfeld and Taylor (2004), during the first few years of the regime World War II was still taking place and was rapidly followed by the creation of institutions such as the International Bank for Reconstruction and Development (1944) and the implementation of the Marshall

Table 7. *Coefficients for the interaction of US LBBI, domestic policy and trilemma regimes*

	MBBR *(1922–38)*	WDM *(1939–50)*	SGP *(1951–65)*	KePl *(1966–78)*	ThM *(1979–92)*	IT *(1993–2016)*	Uncond. TR
Closed peg		**0.8812★★★**	0.0938	0.1185			0.2246
Open peg	**0.7815★★★**						0.7317★★★
Closed float	0.4081	−8.8105		**1.3689★★★**			0.4659
Open float	0.0632				**1.079★★★**	**0.6724★★★**	.4367★★
Uncond. DPR	0.3113★★	0.6614★★★	0.1076	0.5136	1.077★★★	0.6426★★★	

Note: Confidence ★ 90%, ★★ 95%, ★★★ 99%.

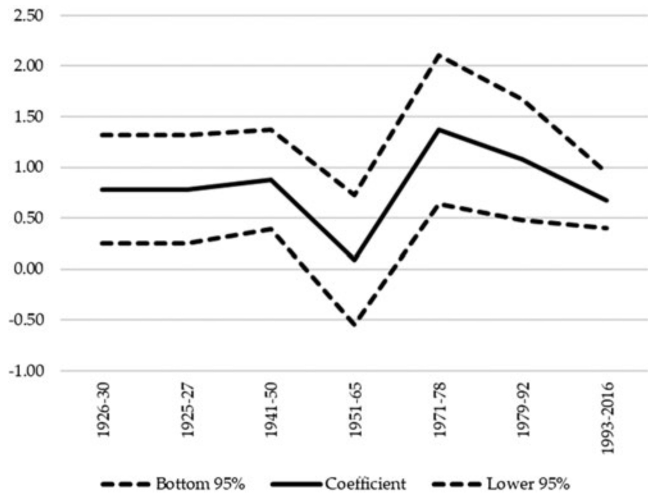

Figure 5. *Evolution of the coefficients for US LBBI by trilemma and domestic policy regimes*

Plan (1948) (Neal 2015). Generally, the events associated with the reconstruction of Europe after the war may explain the subtle increase in the coefficient from the previous period, particularly due to the investment flows from the US.

The second peak occurs in 1971–8, when the expanded Keynesianism policies coincide with the closed flexible trilemma regime. This raises two puzzling issues, which will be tackled in turn. On the one hand, the co-movement between the US and UK occurs under closed capital accounts. This implies that the mechanism is not necessarily related to capital flows. The historical context during the 1970s is one of extreme volatility in international capital markets, particularly around the time of the oil shocks (1973, 1979). Since LBBIs are capturing risk-adjusted above or below trend returns, I argue that this extreme synchronisation during the period has to do with the risk component of capital markets. As argued by Borio (2014) and Passari and Rey (2015), risk perceptions and valuations have become global, which would explain the spike in the coefficient.

On the other hand, it is surprising that, after this peak, the coefficient follows a downward trend. It was during the Thatcher–monetarist period that the Big Bang occurred (1986) and since then information technology, company internationalisation and international flows of funds have had an unparalleled increase. However, this puzzle is moot once the size of the coefficients is taken into account. During the 1970s, the coefficient is 1.37, which implies that if the LBBI for the US falls one standard deviation, the UK market will react with a fall over 30 per cent larger. If this value of the coefficient were to remain stable in time at that level, it would suggest that the LBBI for the UK should be more volatile than the one for the US. In Part A7 of the online appendix, I show that the standard deviation of both long-run LBBIs is 1.23. Additionally, even though the coefficient does decrease, it remains close to unity during the Thatcher years and decreases to 0.67 during the inflation-targeting period. This value of 0.67 is still over 50 per cent above the full sample coefficient of 0.41 that I found in the long-run specification of model II in Table 4. This suggests that co-movement between stock markets is over 50 per cent stronger during the more recent period than during the full sample average and only nuances the findings by Obstfeld and Taylor (2004)

V

The goal of this article was twofold. First, I wished to contrast the global cycle hypothesis posited by Rey (2015) and Passari and Rey (2015), who indicate that the global cycle explains over 25 per cent of the variance–covariance matrix of risky returns and is negatively related to the VIX index of risk aversion. Second, I tested whether the time-varying nature of the co-movement between the US and the UK stock market was contingent on the domestic policy and trilemma regimes in place, as suggested by Bordo and Wheelock (2009). To do so, the first methodological contribution of this article was the design of the Local Bull Bear Indicators, which re-express financial time series as above or below average risk-adjusted returns.

Regarding the first question, I find that while there is a strong contemporaneous co-movement between the US and UK stock market, this regularity does not hold for the co-movement between the UK and an index covering the stock market of 15 advanced economies. On the contrary, I find that the UK leads the evolution of the index for other advanced economies one or two years in advance depending on whether the specification covers the short, medium or long run.

Concerning the second question, I find that short-run co-movement is best explained by the trilemma regime in place, while, for the long-run relationship, the interaction between domestic policy and trilemma regimes is relevant, as suggested by Bordo and Wheelock (2009). The findings offered suggest that Obstfeld and Taylor's (2004) hypothesis of a peak in market co-movement during the recent open float period requires nuance. Apparently, global shocks to risk aversion, such as the oil shocks in the 1970s, induce periods of extreme and abnormal co-movement between the US and the UK, which make the coefficient for more recent period seem small. Even if the association between both stock markets has been weakening since the ascent of Margaret Thatcher as prime minister, the value of the coefficient for the current period is well above its full sample average. Further research could focus on using higher-frequency data to test for this effect during specific episodes.

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References

AIZENMAN, J., CHINN, M. D. and ITO, H. (2010). The emerging global financial architecture: tracing and evaluating new patterns of the trilemma configuration. *Journal of International Money and Finance*, **29**, pp. 615–41.

AIZENMAN, J., CHINN, M. D. and ITO, H. (2013). The 'impossible trinity' hypothesis in an era of global imbalances: measurement and testing. *Review of International Economics*, **21**(3), pp. 447–58.

ALLEN, F. and GALE, D. (2000). *Comparing Financial Systems*. Cambridge, MA: MIT Press.

ALLEN, W. A. (2016). The British attempt to manage long-term interest rates in 1962–1964. *Financial History Review*, **23**(1), pp. 47–70.

AMABLE, B. (2003). *The Diversity of Modern Capitalism*. Oxford: Oxford University Press.

BARTLETT, M. S. (1955). *An Introduction to Stochastic Processes with Special Reference to Methods and Applications*. Cambridge: Cambridge University Press.

BELLRINGER, C. and MICHIE, R. (2014). Big Bang in the City of London: an intentional revolution or an accident? *Financial History Review*, **21**(2), pp. 111–37.

BENATI, L. (2008). The 'Great Moderation' in the United Kingdom. *Journal of Money, Credit, and Banking*, **40**(1), pp. 121–47.

BOLT, J., INKLAAR, R., DE JONG, H. and VAN ZANDEN, J. L. (2018). Rebasing 'Maddison': new income comparisons and the shape of long-run economic development. Maddison Project working paper 10.

BORDO, M. D. and JAMES, H. (2015). Capital flows and domestic and international order: trilemmas from macroeconomics to political economy and international relations. NBER Working Papers 21017. Cambridge, MA: National Bureau of Economic Research.

BORDO, M. D. and LANDON-LANE, J. (2013). Does expansionary monetary policy cause asset price booms? Some historical and empirical evidence. NBER Working Papers 19585. Cambridge, MA: National Bureau of Economic Research.

BORDO, M. D. and SCHWARTZ, A. J. (1999). Monetary policy regimes and economic performance: the historical record. In *Handbook of Macroeconomics*, vol. 1A. Amsterdam: Elsevier Science.

BORDO, M. D. and WHEELOCK, D. C. (2009). When do stock market booms occur? The macroeconomic and policy environments of twentieth century booms. In J. Atack and L. Neal (eds.), *The Origins and Development of Financial Markets and Institutions: From the Seventeenth Century to the Present*. Cambridge: Cambridge University Press.

BORIO, C. (2014). The financial cycle and macroeconomics: what have we learnt? *Journal of Banking & Finance*, **45**, pp. 182–98.

BORIO, C. and LOWE, P. (2002). Asset prices, financial and monetary stability: exploring the nexus. BIS Working Papers 114. Bank for International Settlements.

CAMPBELL, G. and ROGERS, M. (2017). Integration between the London and New York Stock Exchanges, 1825–1925. *Economic History Review*, **70**(4), pp. 1185–1218.

CAMPBELL, G., QUINN, W., TURNER, J. D. and YE, Q. (2018). What moved share prices in the nineteenth-century London stock market? *Economic History Review*, **71**(1), pp. 157–89.

CBOE (2014). *Cboe Volatility Index – VIX®*. Retrieved from CBOE – Institutional White Papers: www.cboe.com/institutional/white-papers

CENDEJAS, J. L., MUÑOZ, F.-F. and FERNANDEZ-DE-PINEDO, N. (2017). A contribution to the analysis of historical economic fluctuations (1870–2010): filtering, spurious cycles and unobserved component modeling. *Cliometrica*, **11**(1), pp. 93–125.

CHAMBERS, D. (2009). Gentlemanly capitalism revisited: a case study of the underpricing of initial public offerings on the London Stock Exchange, 1946–86. *Economic History Review*, **62**(S1), pp. 31–56.

CHECKLAND, S. (1983). *British Public Policy 1776–1939: An Economic, Social, and Political Perspective*. Cambridge: Cambridge University Press.

CHEN, N. F., ROLL, R. and ROSS, S. A. (1986). Economic forces and the stock market. *The Journal of Business*, **59**(3), pp. 383–403.

CHOW, G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica*, **28**(3), pp. 591–605.

CRAFTS, N. and WOODWARD, N. (eds.). (1991). *The Brtish Economy Since 1945*. Oxford: Oxford University Press.
DICKEY, D. A. and FULLER, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, **74**, pp. 427–31.
DICKEY, D. A. and FULLER, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, **49**(4), 1057–72.
EICHENGREEN, B. (2008). *Globalizing Capital: A History of the International Monetary System*. Princeton, NJ: Princeton University Press.
FATAS, A., KANNAN, P., RABANAL, P. and SCOTT, A. (2009). Lessons for monetary policy from asset price fluctuations. In IMF (ed.), *World Economic Outlook*. Washington, DC: International Monetary Fund.
FLOUD, R., HUMPHRIES, J. and JOHNSON, P. (eds.). (2014). *The Cambridge Economic History of Modern Britain,* vol. II. Cambridge: Cambridge University Press.
GLAISTER, S. (1993). *Mathematical Methods for Economists*. Cambridge: Blackwell.
GODFREY, L. G. (1991). *Misspecification Tests in Econometrics: The Lagrange Multiplier Principle and Other Approaches*. Cambridge: Cambridge University Press.
GOETZMANN, W. N., LI, L. and ROUWENHORST, K. G. (2005). Long-term global market correlations. *Journal of Business*, **78**(1), pp. 1–38.
GRANGER, C. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, **37**(3), pp. 424–38.
GRANGER, C. (1980). Testing for causality: a personal viewpoint. *Journal of Economic Dynamics and Control*, **2**, pp. 329–52.
GRANGER, C. (1988). Some recent development in a concept of causality. *Journal of Econometrics*, **39**(1–2), pp. 199–211.
HAYCOCKS, H. W. and PLYMEN, J. (1956). Investment policy and index numbers. *Journal of the Institute of Actuaries*, **82**, pp. 333–90.
HAYCOCKS, H. W. and PLYMEN, J. (1964). The design, application, and future development of the 'Financial Times'–Actuaries Index. *Journal of the Institute of Actuaries*, **90**(3), 267–324.
JAMES, H. (2014). International capital movements and the global order. In L. Neal and J. G. Williamson (eds.), *The Cambridge History of Capitalism,* vol. II. Cambridge: Cambridge University Press.
JORDÀ, Ò., SCHULARICK, M. and TAYLOR, A. M. (2017). Macrofinancial history and the new business cycle facts. In M. Eichenbaum and J. A. Parker (eds.), *NBER Macroeconomics Annual 2016*. Chicago: University of Chicago Press.
KINDLEBERGER, C. P. and ALIBER, R. (2005). *Manias, Panics, and Crashes: A History of Financial Crises*. Hoboken, NJ: John Wiley.
KLEIN, M. W. and SHAMBAUGH, J. C. (2015). Rounding the corners of the policy trilemma: sources of monetary policy autonomy. *American Economic Journal: Macroeconomics*, **7**(4), pp. 33–66.
LE BRIS, D. (2018). What is a market crash? *Economic History Review*, **71**(2), pp. 480–505.
LEVINE, R. (2002). Bank-based or market-based financial systems: which is better? *Journal of Financial Intermediation*, **11**, pp. 398–428.
MIDDLETON, R. (1989). The rise and fall of the managed economy. In A. Digby and C. Feinstein (eds.), *New Directions in Economic and Social History*. London: Palgrave Macmillan.
MIDDLETON, R. (2014). Economic policy and management, 1870–2010. In R. Floud, J. Humphries and P. Johnson (eds.), *The Cambridge Economic History of Modern Britain,* vol. II: *1870 to the Present*. Cambridge: Cambridge University Press.
MINFORD, P. (2015). What did Margaret Thatcher do for the UK economy? *British Politics*, **10**(1), pp. 31–40.
MIRANDA-AGRIPPINO, S. and REY, H. (2015 [revised 2018]). US monetary policy and the global financial cycle. NBER Working Papers 21722. Cambridge, MA: National Bureau of Economic Research.
MISHKIN, F. S. (2008). Can inflation targeting work in emerging market countries? In C. M. Reinhart, C. A. Végh and A. Velasco (eds.), *Money, Crises, and Transition: Essays in Honor of Guillermo A. Calvo*. Cambridge, MA: Massachusetts Institute of Technology.
NEAL, L. (2015). *A Concise History of International Finance*. Cambridge: Cambridge University Press.

NEWEY, W. K. and WEST, K. D. (1987). Hypothesis testing with efficient method of moments estimation. *International Economic Review*, **28**(3), pp. 777–87.

OBSTFELD, M., SHAMBAUGH, J. C. and TAYLOR, A. M. (2004). Monetary sovereignty, exchange rates, and capital controls: the trilemma in the interwar period. *IMF Economic Review* (supplement 1), pp. 75–108.

OBSTFELD, M., SHAMBAUGH, J. C. and TAYLOR, A. M. (2005). The trilemma in history: tradeoffs among exchange rates, monetary policies, and capital mobility. *Review of Economics and Statistics*, pp. 423–38.

OBSTFELD, M. and TAYLOR, A. M. (1997). The Great Depression as a watershed: international capital mobility over the long run. NBER Working Papers 5960. Cambridge, MA: National Bureau of Economic Research.

OBSTFELD, M. and TAYLOR, A. M. (2004). *Global Capital Markets: Integration, Crisis and Growth*. Cambridge: Cambridge University Press.

OECD (1993). *Exchange Control Policy*. Centre for Co-operation with the European Economies in Transition. Paris: Organisation for Economic Co-operation and Development.

OFFER, A. (2017). The market turn: from social democracy to market liberalism. *Economic History Review*, **70**(4), pp. 1051–71.

PASSARI, E. and REY, H. (2015). Financial flows and the international monetary system. *Economic Journal*, **125**(584), 675–98.

PEMBERTON, H. (2000). Policy networks and policy learning UK economic policy in the 1960s and 1970s. *Public Administration*, **78**(4), pp. 771–92.

REY, H. (2015). Dilemma not trilemma: the global financial cycle and monetary policy independence. NBER Working Paper Series 21162. Cambridge, MA: National Bureau of Economic Research.

ROBERTS, R. (2013). 'Unwept, unhonoured and unsung': Britain's import surcharge, 1964–1966, and currency crisis management. *Financial History Review*, **20**(2), pp. 209–29.

SCOTT, P. M. and WALKER, J. T. (2017). The impact of 'stop-go' demand management policy on Britain's consumer durables industries, 1952–65. *Economic History Review*, **70**(4), pp. 1321–45.

SHAMBAUGH, J. C. (2004). The effect of fixed exchange rates on monetary policy. *Quarterly Journal of Economics*, **119**(1), 301–52.

SHILLER, R. (1989). *Market Volatility*. Cambridge, MA: MIT Press.

SHILLER, R. (2000). *Irrational Exhuberance*. Princeton, NJ: Princeton University Press.

STUART, R. (2017). Co-movements in stock market returns, Ireland and London 1869–1929. *Financial History Review*, **24**(2), 167–84.

TAYLOR, A. M. (2013). External imbalances and financial crises. In S. Claessens, M. A. Kose, L. Laeven and F. Valencia (eds.), *Financial Crises: Causes, Consequences, and Policy Responses*. Washington, DC: International Monetary Fund.

TOBIN, J. and BRAINARD, W. C. (1976). Asset markets and the cost of capital. Cowles Foundation Discussion Papers 427. New Haven, CT: Cowles Foundation for Research in Economics.

URBAN, S. and STRAUMANN, T. (2012). Still tied by golden fetters: the global response to the US recession of 1937–1938. *Financial History Review*, **19**(1), pp. 21–48.

VEYSOV, A. and STOLBOV, M. (2012). Financial system classification: from conventional dichotomy to a more modern view. MPRA Working Papers 40613. Retrieved from https://mpra.ub.uni-muenchen.de/40613/1/MPRA_paper_40613.pdf

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