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Article

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GENERALIZED FINANCIAL CYCLE THEORY FROM THE MINSKY'S PERSPECTIVE: UK 1270–2016

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Abstract. Our study aims to bridge the gap between contemporary studies on financial cycles and the financial instability hypothesis in the form of a Minsky cycle (Minsky, 1963). Paper contribution range from explored causality links (financial cycles cause business cycles) to the empirical estimation of the Minsky moment. We use Braitung and Candelon (2006) Granger causality test and discrete threshold model (Hansen, 2005) to the link between financial and business cycles in the UK from 1270–2016. Financial and business cycles relation varies over time with contemporary financial cycles being longer to their historical versions. Financial cycles lead business cycles. Business cycles are an economy reaction to them and change in the Minsky moment. Minsky moment has a statistically significant impact on main growth determinants – population, export, technology. Policymakers should look for the Minsky moment when setting up a new economic policy to assure it will be an effective one.

Keywords: financial cycles, financial instability hypothesis, Minsky cycle, discrete threshold regression, spectral Granger causality, business cycles.

JEL Classification: G1, G01, E32, C58.

Introduction

The financial crisis of 2008 once again turned to focus on Minsky's financial instability hypothesis and "financial" business cycles. Contemporary research of Drehmann et al. (2012, 2013), Borio (2014), Borio et al. (2018) on financial cycles provide sound empirical evidence that such oscillatory behaviour of financial origins exists. Body of literature on financial cycles concentrate on different methods to find a more robust and valid methodology for measuring financial cycles. Methods for measuring financial cycles range from univariate turning points Claessens et al. (2012), univariate band-pass filter Drehmann et al. (2012), univariate spectral analysis Aikman et al. (2015), multivariate spectral analysis Hiebert et al. (2014), multichannel singular spectrum analysis Škare and Porada-Rochoń (2019). Overall

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empirical analysis shows that financial cycles are longer in relation to the business cycles (on average twice as long as business cycles). Financial variables behind the financial cycles focus on three main determinants – house price index, credits and credits share in the GDP. Individual and overall oscillatory behavior in these three financial variables determines the oscillatory nature of the financial cycle. Financial cycles differ among various countries supporting the empirical evidence Schüller et al. (2015) of multiple unit cycles over universal cycle fit. A comprehensive empirical study of Škare and Porada-Rochoń (2019) and also Porada-Rochoń (2019) provide evidence that financial cycles exhibit different duration dependence in various countries. Parallel to the studies on measuring financial cycles, other studies look at the level of synchronization between financial and business cycles Oman (2002), Borio and Drehmann (2011), Borio et al. (2017), Braun and Larrain (2005). Studies show a high level of synchronization between financial and business cycles. Non-performing loans have also an important role in the financial-business cycles relationship as studied in Kjosovski et al. (2019).

Behind a single business cycle, we can find evidence of an underlying financial cycle (Minsky's supercycle) Palley (2011). Minsky (1963, 1972, 1975, 1978, 1982, 1986, 1991, 2016) believes that economies are governed by business cycles which in turn are a reflection of inherent financial instability within the financial system and thus the economy. He did not put forward the idea of the existence of the financial cycle, but instead, the idea of a "Minsky's cycle" in the form of the financial instability hypothesis. As pointed in Palley (2011), Minsky's financial instability hypothesis can be viewed as a form of "generalized" financial cycle theory. That is, however, right from a broad point of view. First, a generally accepted financial cycle theory is still missing. Second, Minsky's financial instability hypothesis is first to connect the inherently unstable nature of the financial market with real economic activity fluctuations. Because he relates financial conditions with the business cycles, we can look at his financial instability hypothesis as a theory of origin behind financial cycles phenomena. Third, contemporary studies focus just on measuring financial cycles and how they relate to fluctuations in economic activity. In the same time, fluctuations on the financial markets (behind or originating from the financial instability hypothesis) are empirically assessed through oscillatory nature identification on housing and money markets. The financial cycle is a complex phenomenon that still misses the generalized theory behind its nature. We still miss a relevant study on the true nature of financial cycles and its theoretical explanation. Close attention should be also placed on a new measure the intrinsic value and price bubble of Internet-based finance stocks (Zhao et al., 2018).

In his studies, Minsky still is only one trying to look at finance phenomena from a more sophisticated point of view. However, as simple as his idea of the financial system as inherently unstable is, although caused by many complex links, he did not search for financial cycles. He was trying to answer the same old question generation of economists try to; how the system works? Minsky tried to explain how the system works through the financial instability hypothesis. That brings us to another ultimate issue, correlation vs causation. Do financial cycles triggers business cycles? If so, how and what about the mechanism of propagating financial cycles? To answer this question first, we must establish the correct Granger causality link between financial and business cycles. Is the inherent instability of economic

activity (business cycles) to cause fluctuations in financial markets (financial cycles)? Or it is vice versa? If we allowed for the possibility of bidirectional (mutual) Granger causality, what possible explanations we could offer in that case. What if the two conditional systems (financial cycles and business cycles) do not interact but are artificially mutually Granger-causal by a third one (shadow system – inequality or poverty cycles?). In our study, we plan to provide practical answers to all these questions. For this purpose, we will use linear and non-linear Granger causality tests. Our previous study on financial cycles shows they differ across countries and group of countries (developed, developing, transitional). Banking stability is also important determinant in the Minsky's momentum and this is particularly true for transitional economies (Kubiszewska, 2019).

Consequently, financial cycles can't be explained solely by looking at the dynamic of real estate and money markets. Determinants outside these two must also influence the dynamics of the financial cycles causing a non-universal fit across countries. Using Minsky's logic, if Minsky's cycle is behind the business cycles, differences in financial cycles among countries will cause business cycles to differ as well. We believe Minsky's theory of financial instability hypothesis is a solid ground toward a generalized theory of financial cycles. However, our previous research suggests there is more to explain financial cycles in full Škare (2010). Before proclaiming that is the Minsky's cycle in the form of financial cycles to cause business cycles, we must check for the potential third hidden system causing both financial and business cycles. For this purpose, we will use spectral Granger causality test and spectral analysis. Our results show that financial and business cycles do move together, and financial cycles lead business cycles in the long run. In the medium term, the two become coincident (phase synchronization close to zero). The same holds for the short run. Spectral coherence squared representing R^2 in time domain notation reach 0.80 in the long run and 0.20 in the medium term. In the short run, financial and business cycles are closely connected with the R^2 between 0.90–1.0 during 4–5 and 2–3 years.

Using a long time-series data on the UK financial and real economic activity from 1270–2016 (Bank of England), we will test the validity of the financial instability hypothesis against the UK financial cycle. Our study results show that financial and business cycles move together tightly (see Škare and Porada-Rochoń (2019) and also Porada-Rochoń (2019)) and that Minsky's cycle can serve as a generalized theory for the financial cycles. However, our results also show that not always (different periods) Minsky's theory can provide theoretical background behind financial cycles. In this paper, we check for other potential determinants that can explain financial cycle dynamics in the UK. To set up a generalized theory behind financial cycles, we must explore endogenous and exogenous movement within them. The financial crisis of 2008 teaches us that government and central banks through monetary policy and regulations can bend financial cycles (at least for some time) postponing the "Minsky momentum". The solvency problem referred to by Minsky is not the same from his perspective when researching the issue and today with unconventional monetary policy in place. Solvency issue has a significant effect on interest margin dynamics as presented in the study of Bustos-Contell et al. (2019).

The structure of the paper is as follows. After introducing the financial cycles issue, we review the dynamics of financial and business cycles in the UK from 1270 to 2016 in sec-

tion one. Section two displays causality and persistence modeling framework with financial and business Cycles, Minsky Momentum for UK elaborated in section three followed by conclusion.

1. Financial and business cycles dynamics in the UK 1270–2016

Figure 1 shows the interaction between the financial and business cycles in the UK from 1270 to 2016. We can observe that both cycles move close together, pointing to an obvious correlation and possible causation between them. We can also observe that both financial and business cycles pattern change over time, supporting the thesis that financial cycles differ across countries and time. Studies on the causes and conditions of jumps in the financial and business cycles pattern are still missing. The data on financial and business cycles in the UK for 1270–2016 lead us to future research trying to understand the individual nature of the financial cycles. We must not look at them from the “universal” view as in the case of the business cycles (similar characteristics across countries and time). From Figure 1, we can also conclude two series are related since we find a non-random distribution in their phase differences. In the long run, financial cycles lead the business cycle, and in the medium term, they move together (phase difference zero).

Business cycles over time in the UK shows an entirely different dynamic. During 1270–1369 we isolate a five years cycles with high volatility (pronounced amplitudes). Over the next century, from 1370 to 1469 business cycles in the UK register longer amplitudes with a seven years length and still pronounced amplitudes). The period from 1470 to 1569 displays the appearance of a moderate six-year cycle while from 1570 to 1669, we can trace a more prolonged, quite pronounced 12 years business cycle. Business cycles in the UK show a longer duration (14 years) from 1670 to 1769 with moderate amplitudes. After this period, business cycles become shorter (7 years) but again with more substantial phase volatility from 1870 to

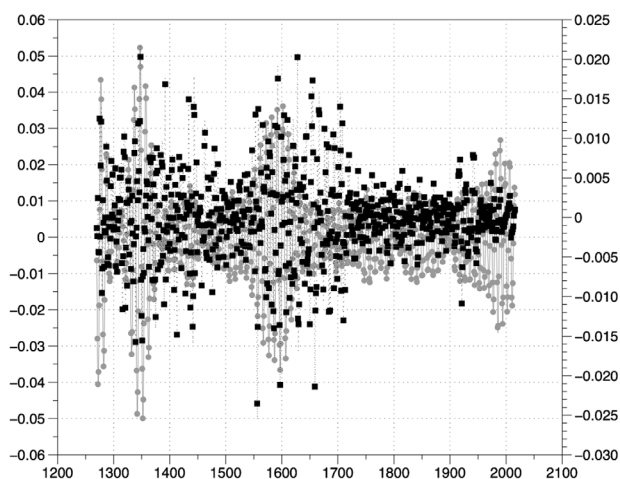


Figure 1. Financial and business cycles dynamics in the UK 1270–2016
(source: authors' calculation)

1969 business cycle shown increasing trend lasting on average 12 years. During 1970 to 2016 business cycle show high amplitudes were lasting from 5 to 14 years.

Same altering dynamics in length and volatility we can observe in the financial cycles in the UK from 1270 to 2016. During the earliest period, from 1270 to 1369 financial cycles in the UK show an average duration of 12–16 years with large volatility swings. Housing and financial markets dynamics from 1370 to 1469 stabilize exhibiting less volatility with an average cycle duration between 9 to 12 years (see Figure 2).

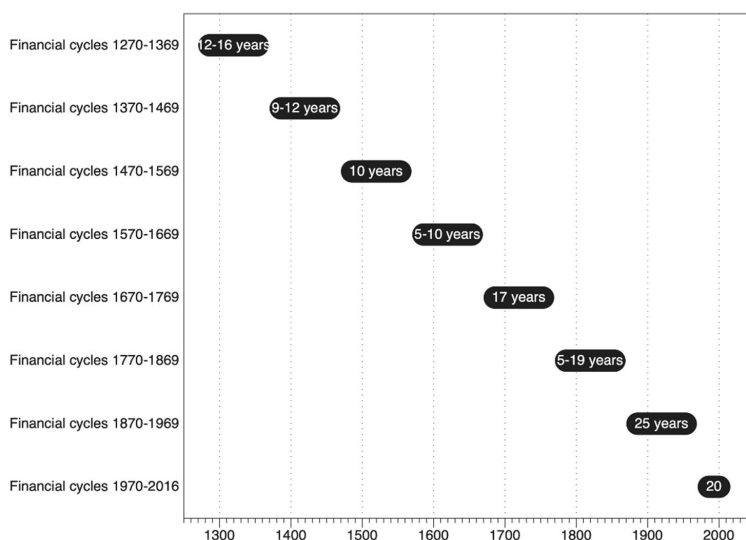


Figure 2. Financial cycles duration in the UK 1270–2016 (source: authors' calculation)

Financial cycles in the UK during the 16th-century show medium volatility and last on average 5 to 10 years. Next century witness longer financial cycles (1670–1769) lasting 17 years on average with medium volatility in financial series. Volatility on housing and credit markets falls during 1770–1869 with an average length of the financial cycles of 5–19 years. Lower amplitudes on the housing and credit markets also hold during 1870–1969 with prolonged financial cycles duration – 25 years on average. In the last sample period (1970–2016) we see financial cycles turn on volatility once again lasting on average 20 years (including the 2008 financial crisis).

We can see from Figure 3 that a high degree of coincidence between financial and business cycles in the UK over the observed period exist. We can conclude that whenever a business cycle (grey box) is present a financial (black box), one is as well. That is a fact which still does not reveal the causality link between financial and business cycles. Also, we can observe that our data support other studies on financial cycles referring to them as “medium-term” cycles being much longer to the business cycles. Our results support this fact except for the 1570–1669 period when average business cycles were more extended than the financial cycle. We can observe that both financial and business cycles pattern change with time. They last longer, and the ratio between financial and business cycles change as well. During 1270–1369 financial cycle was two to three times longer to the business cycles. However, this

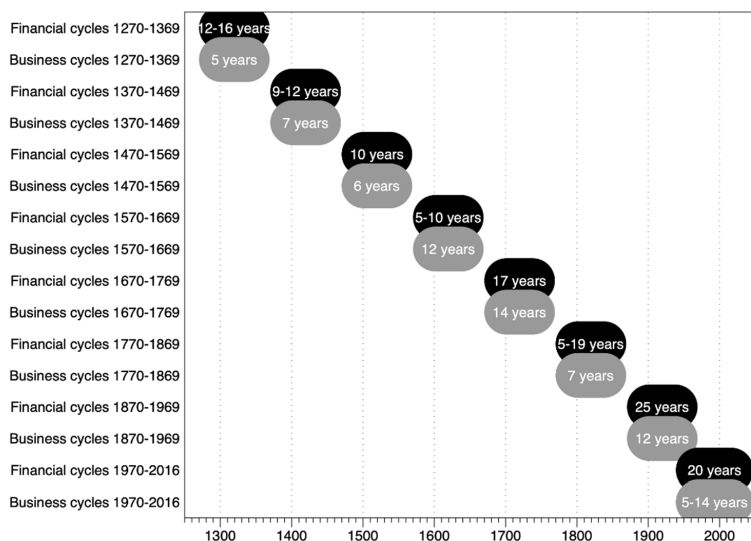


Figure 3. Financial and business cycles synchronisation in the UK 1270–2016 (source: authors' calculation)

ratio changes over time, leading us to the conclusion that financial cycles nature is inherently variable. Thus, financial cycles do not have a uniform distribution across time and region as generally is the case with the business cycles. So one size does not fit all financial cycles in time and space.

After providing evidence of the coincidence between financial and the business cycles, we proceed with the spectral Granger causality analysis to unravel the causality relationship between the two.

2. Causality and persistence in financial cycles in the UK

Previously we observed that both financial and business cycles are persistent over time. For a fact, both cycles survived over a long period of 8 centuries, and they were both present – so financial cycles are a fact and not random shocks in financial time series data. To explore the causality between financial and business cycles in the Granger sense, we use spectral Granger causality model of the form Geweke (1984):

$$x_t = c_1 + \sum_{j=1}^p \alpha_j x_{t-j} + \sum_{j=1}^p \beta_j y_{t-j} + \sum_{j=1}^p \delta_j z_{t-j} + e_t, \quad (1)$$

where: x_t – cause variable; y_t – effect variable; z_t – lagged values of additional variables.

Using the test in the form of Breitung and Candelon (2006)

$$x_t = c_1 + \sum_{j=1}^p \alpha_j x_{t-j} + \sum_{j=1}^p \beta_j y_{t-j} + \sum_{k=p+1}^{p+d_{\max}} \alpha_k x_{t-k} + \sum_{k=p+1}^{p+d_{\max}} \beta_k y_{t-k} + e_t, \quad (2)$$

a modified Wald test for frequency domain tests with p – lag order; d_{\max} – the highest order of integration in the system.

To test for the spectral Granger causality, we use STATA Granger causality test (bgcausality) developed by Tastan (2015). Table 1 shows the test results of the spectral Granger causality test.

Table 1. Spectral Granger causality test results (financial cycles impact business cycles) (source: authors' calculation)

Matrix list	R(w) frequency	Test stat	P-value
R1	0.01	3.0994131	0.21231027
R2	0.02	3.1011469	0.2121263
R3	0.03	3.1040426	0.21181939
R4	0.04	3.1081093	0.21138913
R48	0.48	6.1712824	0.04570072
R63	0.63	14.147393	0.0008471
R69	0.69	6.8846608	0.03199005

From Table 1, we can see that financial cycles Granger cause business cycles at the statistical test significance of 5% in the frequency range of 0.48 to 0.69. Translated to the time domain, financial cycles Granger cause business cycles within 9–13 years period, that is in the medium term. Our test results prove previous study results that we must look for the financial cycles in the medium term. It is in the medium term that financial cycles significantly influence (Granger cause) business cycles as we can see from Table 1 and Figure 4.

Figure 4 supports the data from the Table 1 showing the impact of financial cycles (spectral Granger causality) on business cycles in the medium term (between 0.48 to 0.69 frequencies) above 5% statistical significance threshold (bold in Table 1). In the short run (less than nine years) and long run (more than 13 years), financial cycles do not Granger cause business cycles at statistically significant levels.

We apply the same test to check how business cycles affect financial cycles in the UK over the same period (see Table 2 and Figure 5).

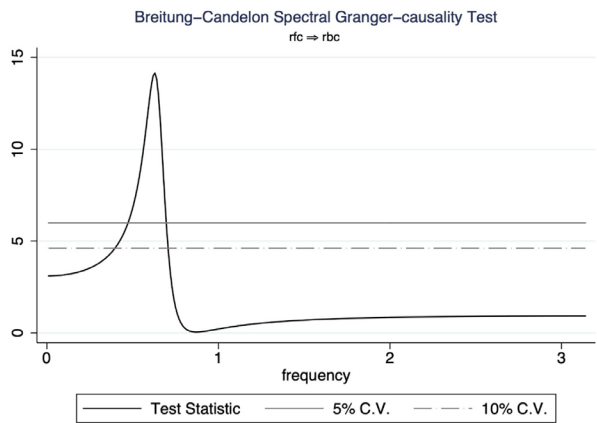


Figure 4. Spectral Granger causality test for financial cycles impact on business cycles in the UK 1270–2016 (source: authors' calculation)

From Table 2, we can see business cycles do not Granger cause financial cycles in the UK in the short or the long run. That fact strongly supports the Minsky instability hypothesis and the Minsky cycle since business cycles do not Granger cause financial cycles. It is a reversed situation, as stated in Minsky’s theory. Financial cycles arise from the inherent instability in its self- dynamics, speculative behavior within the financial system. Figure 4 supports this thesis.

Table 2. Spectral Granger causality test results (business cycles impact financial cycles) (source: authors’ calculation)

Matrix list	R(w) frequency	Frequency	P-value
r1	0.01	3.9500019	0.13876118
r2	0.02	3.9499034	0.13876802
r3	0.03	3.949739	0.13877942
r4	0.04	3.9495087	0.1387954
r48	0.48	3.8523539	0.14570417
r63	0.63	3.7414183	0.1540144
r69	0.69	3.6714624	0.15949684

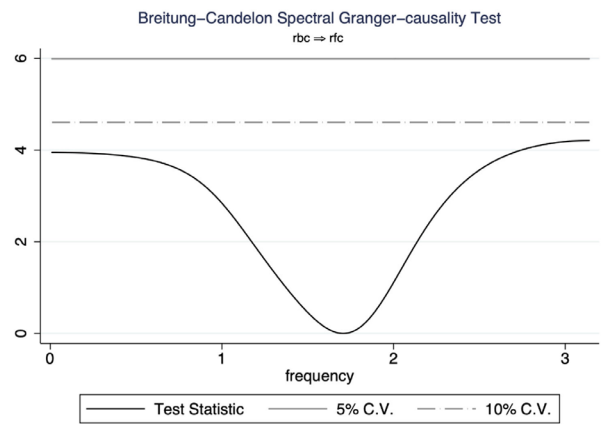


Figure 5. Spectral Granger causality test for business cycles impact on financial cycles in the UK 1270–2016 (source: authors’ calculation)

As we can see from Figure 5, there is no statistically significant impact of the business cycles on financial cycles in the short and long run in the UK. Behind a single business cycle, we can find a financial cycle but not conversely. We show the empirical test and results for the existence of the financial cycles in the UK and its connection to the business cycles. What we are still missing is the theory behind the financial cycles we explore in the next section.

3. Financial cycles, business cycles and Minsky moment

Palley (2011) explore the theory of financial cycles through the lens of the basic Minsky’s cycle and its extended version Minsky’s supercycle. Minsky’s basic cycle can be described in standard three stages; stage one – hedge finance (financial tranquillity), stage two – speculative fiance (financial fragility), stage three – Ponzi finance (financial bust). The financial instability hypothesis invokes different elements: psychological, cultural, institutional, economic, systemic. To find an empirical relationship between different stages of the Minsky’s cycle, we use the data on the financial cycles we construct for the UK from 1270–2016. We define the Minsky cycle through the Minsky’s moment, which in turn is defined by the credit to GDP growth ratio. It is the dynamics between the credit cycle and the GDP cycle to define the Minsky moment. To give an empirical form to the Minsky moment, we use the discrete threshold regression model Tsay (1989), Tong (1983), Hansen (2005) of the form (using annual data, see Table 3):

$$\begin{aligned} y_t &= X_t' \beta + Z_t' \delta_1 + \epsilon_t && \text{if } -\infty < q_t < \gamma_1; \\ y_t &= X_t' \beta + Z_t' \delta_2 + \epsilon_t && \text{if } \gamma_1 \leq q_t < \infty, \end{aligned}$$

(3)

where: y_t – log differenced real GDP for the UK from 1270 to 2016 – real GDP dynamic is different for different values of the Minsky moment (higher the moment more drastic the change in the real GDP); pop_t – log differenced population in England (millions); $export_t$ – log differenced composite break-adjusted measure of Export volumes, 2013 prices; $dind_t$ – industry sectoral real output, index 1700 = 100; Minsky moment – threshold variable (the difference between credit and real GDP growth rates).

Data sources we use in the study are from Thomas and Dimsdale (2017), Clark (2010).

Table 3. Minsky discrete threshold regression model (source: authors’ calculation)

Variable	Coefficient	Std.error	T-stat	Prob.
MINSKY(−7) < 4.469023 – 331 obs				
LDPOP	0.305161	0.115089	2.651523	0.0082
LDEXPORT	0.019029	0.010294	1.848557	0.0650
LDIND	0.665505	0.037561	17.71782	0.0000
C	−0.001120	0.018000	−0.062196	0.9504
4.469023 <= MINSKY(−7) – 259 obs				
LDPOP	−0.657074	0.335188	−1.960314	0.0504
LDEXPORT	0.053115	0.012849	4.133681	0.0000
LDIND	0.782708	0.044937	17.41799	0.0000
C	−0.007530	0.017671	−0.426137	0.6702
Non-Threshold Variables				
LRGDP(−1)	−0.188724	0.027874	−6.770713	0.0000
LRGDP(−2)	0.189318	0.028046	6.750375	0.0000
R-squared 0.566921		Durbin-Watson stat 2.274052		
Adjusted R-squared. 0.560201				

The threshold variable (Minsky moment) split the sample into two regions with each sub-sample representing one regime with different sets of coefficients. A non-threshold variable is the lagged (2 lags) growth rate of the real GDP in the UK. Table 3 shows the results of the TAR model estimation.

From Table 3, we can see that the estimated Minsky moment dividing the sample into the two regions is equal to 4.47%. The 4.47% represents the divergence in percentage points between the credit growth rate and the real GDP growth rate referring to the Minsky moment. Variables that we isolate having a significant impact on the real GDP in the UK are population, export, industry sector growth. In the sub-sample, with the threshold variable Minsky moment $< 4.47\%$ population, export and industrial growth have a positive and statistically significant impact on the real GDP. For a unit (1%) increase in the population, the real GDP rise by 0.30 percentage points. Impact of the export on the real GDP is positive but significantly lower to the population impact. A percentage point increase in the export volume results in 0.02 percentage points increase in the UK real GDP. The most significant impact on the UK real GDP is coming from the growth of the industrial sector. For a percentage increase in the industry sector real output UK registers an increase of the 0.67 percentage points in the real GDP. Other variables not included in the model (constant) show a negative impact on the UK real GDP. What is happening with the UK real GDP when we include the Minsky moment in the model? We can see that now the population impact on the UK real GDP becomes negative. For a percentage increase in the population, the UK real GDP drops by -0.66 percentage points. Such conditions reflect the fact of the ageing population with household switching from net savers to dis-savers. Another possible explanation is the slowing growth of the population because of the Minsky moment (risk aversion and anxiety in the older population resulting from the fear of future financial instability). With increasing liquidity in the economy, exporters increase the export volume (1% increase) affecting the real GDP by 0.05 percentage points increase. The effect is now much more significant when Minsky moment is $\leq 4.47\%$. Under quantitative easing and liquidity rising a percentage increase in the industrial sectoral output increase the UK real GDP by 0.78 percentage points. It is a significant increase of 0.78 percentage points compared to the 0.67 percentage points when a Minsky moment is $< 4.47\%$. The impact of the other variables (not included in the model) changing with the Minsky moment remains negative and slightly higher. We can see that the TAR model offers an excellent fit to the data with the adjusted R square of 0.56, which is respectable since we fit data over eight centuries with the Minsky moment. The empirical visualization of the financial and business cycles under Minsky moment in the UK from 1270 to 2016 is provided in Figure 6.

From Figure 6, we see the financial instability hypothesis and the Minsky cycle offer a solid theoretical ground as the generalized theory behind financial cycles. Stages of the financial cycle follow the stages of the Minsky's cycle.

Differently from the general expectation, it is the financial cycle to cause the business cycle. At the lower limits of the Minsky moment, the credit growth rate is below the output growth rate. Under conditions of financial stability (low liquidity constraints), inflation expectation is stable, and business confidence is moderate. Under such conditions, economic

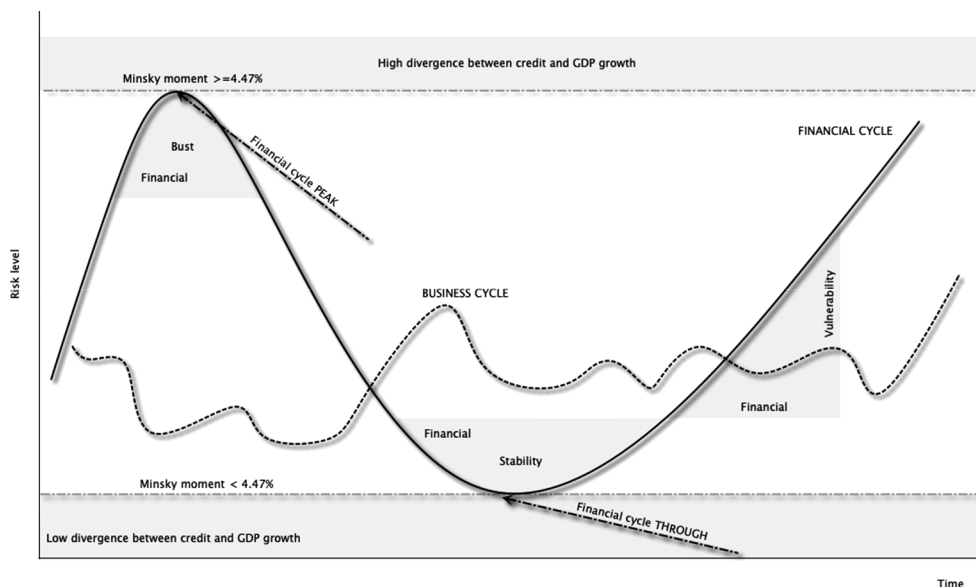


Figure 6. Financial and business cycles under Minsky moment (source: authors' design)

agents' expectations push the credit supply up. The financial sector (if not strictly controlled by the central bank) increases the credit supply affecting the liquidity safety buffer in enterprises. Firms engage in activities not financed through the regular financial flow building unsustainable debt dynamics. Increasing financial conditions in the economy backed by "financial euphoria" give rise to the boom period in the economy. Credit growth rates increase significantly beyond the output growth rates resulting in rising Minsky moment. Businesses and consumers encouraged by favourable economic developments in the face of increasing liquidity (and the legal constraints that make it possible) continue to build up debt. With the rise in corporate and consumer borrowing, debt growth has been backed by credit growth. Credit growth surpasses output growth bringing the Minsky moment to the threshold level of 4.47%. Beyond 4.47% debt level becomes unsustainable meeting the inflexion point and credit supply drying up. Speculative bubble explodes followed by a financial burst resulting in the financial cycle downturn. Financial cycle directly impacts the business cycle directing the output dynamics in future.

Conclusions

Our study tries to explore the nature of the financial cycles in UK history, relation with the business cycles, develop the theory behind the financial cycles. Taking into account the long data span for the UK, we were able to explore the changing nature of the financial cycles and level of synchronization with the business cycles.

Financial cycles show a variable nature, their duration and amplitudes vary with time, so no generalized form of the financial cycles exists. Therefore, financial cycles vary over time and within/across countries.

The level of synchronization between financial and business cycles also vary over time. Contemporary financial cycles are longer to their historical counterparts and last longer compared to the business cycles.

Minsky's theory and financial instability hypothesis take booms in the business cycles as a starting point, not looking at the causality direction. Our empirical results show that financial cycles lead business cycles with a statistically significant Granger causality link. The feedback link between business and financial cycles is not present.

Therefore, financial cycles are not a consequence of the business cycles, rather the opposite. Behind every business cycle, we can find financial cycles. On the other hand, we see financial cycles in the UK economic history with no underlying business cycles. Financial cycles show to have an inherited nature that should be studied separately from the business cycles.

Minsky's financial instability hypothesis still holds, but we should look within inherent forces in the elements of the financial cycle and not directly to the business cycles. Turning points in the financial cycles reflect the Minsky moment, which in our study finally gets a number behind. Minsky moment for the UK from 1270 to 2016 is above 4.47% (threshold level). Financial stability phase (on a Minsky cycle) and through point on the financial cycles range within -1.45 to 2.00% level (Minsky moment). With the Minsky moment beyond 2.00% , we enter the financial vulnerability phase on the Minsky cycle and expansion phase on the financial cycle. We reach the peak on the financial and the Minsky cycles when Minsky moment is above 4.47% . The financial bust is imminent and economic downturn already on the road. Liquidity and solvency conditions have a significant impact on the financial cycles and should be studied in more details in future studies.

Financial conditions of all economic units in the spirit of the financial instability hypothesis drive economic dynamics, but what drives change in the financial conditions? According to our results, for sure it is not business cycles but something else.

Main growth determinants (population, export, industrialization) impact change with the Minsky moment. Growth determinants are a function of the Minsky moment and financial cycles. Since financial conditions have a direct impact on primary growth sources, the output is affected as well. That is particularly interesting in the case of population. Change in the Minsky moment directly affect how population dynamics impact economic growth. At a lower level of the Minsky moment, the population dynamics impact on economic growth is significant and positive. With the Minsky moment going above 4.47% threshold, the impact of the population becomes negative.

Above results have important implications and significance for the policymakers. Central banks should monitor the Minsky's moment more closely and set up monetary policy accordingly (inflation and interest rates targeting policy) to control the Minsky's momentum. Government (fiscal) policy should also be designed with a Minsky's momentum in mind when setting output and unemployment targets to design efficient economic policy. Minsky cycles and linked changes in the financial conditions strongly affect growth determinants. Success in designing an effective economic policy without taking into the account this empirical fact is not probable. Future studies should concentrate on more countries in the search for the Minsky moment and extend the threshold model with liquidity and solvency variables. Our

study result are limited by the data availability (long time series data) and one case country study (only UK) to check the paper results against other countries (cross-country and cross-time robustness check).

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Author contributions

MPR and MS conceived the study and were responsible for the data collection, design and development of the data analysis and as well as for data interpretation. MPR wrote the first draft of the article.

Disclosure statement

Authors declare they do not have any competing financial, professional, or personal interests from other parties.

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