Do the Business Cycles and Financial Cycles Move Together in Turkey?

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Abstract. In this paper, we analysed the relationship between the financial and business cycles for the Turkish economy. The quarterly data covers from 2002:Q1 to 2017:Q1. In the paper, we employed HP filter, the concordance index method and dynamic conditional correlation method in order to capture the characteristics of the relationships of the cycles. Our empirical findings showed that the financial and business cycles are highly synchronized in Turkey as found by many economists. The results also indicate that the credit volume cycle is leading the GDP cycle while the GDP cycle is lagging the BIST100 cycle. These findings imply that financial variables have strong impact on real economic activities in Turkey. Therefore, policymakers should pay attention to the financial issues in order to stabilize the economic developments.

Keywords: Synchronization, HP filter, business cycle, financial cycle, CI, DCCs.

1   Introduction

Many economists such as Avouyi-Dovi and Matheron, 2005; Besomi, 2006; Christiano, Motto and Rostagno, 2010; Adrian, Estrella and Shin, 2010; Woodford, 2010; Egert and Sutherland, 2012; Claessens, Kose and Terrones, 2012; Borio, 2014 argue that there are cyclical patterns in both financial and economic series. The importance of the cyclical patterns comes into being in economic activities since they are considered as the indicators of aggregate economic activities.

Although there is a theoretically consensus on that there exists synchronization between financial and business cycles, we may not say that it is clearly true empirically. Debates over financial cycles have focused on the role of financial issues in both developed and emerging economies. There are two main arguments for explaining the role of financial issues. On the one hand, asset prices diverged improperly from the economic realities, which may lead to a bubble. The probability of the explosion of this bubble may lead to a lower level of investments, which decreases the financing opportunities and a may cause recession problems. On the other hand, changes in stock prices and credit conditions may affect economic activities by affecting prices of the goods and services in the economies. It means that financial developments may have strong impacts on the real economic activities.

The main reason we focused on Turkish economy can be explained via the following words. First of all, the Turkish economy is an important emerging economy. After having the banking crisis in 2001, Turkey reorganized its banking system and reshaped the structure of financial system. Following this period, it rapidly grew up until the global financial crisis. Following the global crisis, its financial structure weakened and the current account deficit and the foreign debt stock rose sharply. In this period, the most important risk for the Turkish economy was that the changing structure of the finance of the current account deficit. It shifted from long-term investments to short-term investments. This development increased the risk perception of the foreign investors. Some economists such as Claessens, Kose and Terrones (2012) among others argued that the growth rate has negatively been affected by these developments. Moreover, the risk perception of banks also increased after the global economic crisis. Because of that the total credit volume provided by the banks stayed flat until the end of global financial crisis, when various difficulties arose to finance new investments. Therefore, it seems to be better to analyse the relationship between the financial and business cycles in order to capture whether there is a relationship between these variables.

In order to capture business cycles, economists generally use gross domestic product, industrial production index and household consumption variables. But for financial cycles, there is no consensus which variable is better to capture financial developments. In the literature, the credit volume and BIST indexes are used for capturing financial cycles. As a method, the Hodrick-Prescott (1997) filter (HP filter) and Bry and Boschan (1971) algorithm (BB algorithm) method (among others) are employed in order to capture the cycles. Since there is no big difference with the method, we will follow the literature and employ HP filter in order to get the business and financial cycles. In this study we will try to answer the following questions: (1) Is there any synchronization between the financial and business cycles? and (2) Which one is leading or lagging? (3) Is there any structural change of the relationship between business and financial cycles?

The paper is organized as follows. Section 2 reviews the related theory and the literature part. Section 3 gives some information on the empirical methodology. Section 4 provides the data and empirical results and Section 5 concludes the paper.

2   Literature

Economists are increasingly concentrating on the importance of financial cycles in macro models. It is clear that many economists focused on these concepts in the past. For example, Keynes (1936) investigated the relationship between macroeconomic and financial issue during the Great Depression in addition to Fisher (1933). In recent years, this topic is increasingly under investigation by many economists such as Adrian Estrella and Shin (2010), Christiano, Motto and Rostano (2010), Egert and Sutherland (2012), Claessens, Kose and Terrones (2012), Borio, Disyatat and Juselius (2013) among others.

The emergence of global financial crisis leads many economists to remember the effects of financial variables on macroeconomic variables. Although there is a consensus on that the financial variables have impact on macro variables, there is no consensus on what the financial cycle is. Therefore, we first need to capture financial cycle and then understand the link between the cycles of financial and business.

There is a consensus on the definition of the concept of financial cycle. It should be noted that two key empirical findings have emerged from recent studies that sought to characterize the financial cycle. First, the financial cycle is best described by the behaviour of credit and property prices. The second is that it has a much lower frequency than the traditional business cycle. Claessens, Kose and Teroones (2011a) analysed the financial cycles for 21 OECD countries and tried to capture the frequency, duration, amplitude and slope of financial cycles. Egert and Sutherland (2012) also investigated the main characteristics of financial and business cycles and measured the degree of synchronization between these cycles in OECD countries. Borio (2014) and Drehmann, Borio and Tsatsaronis (2012) contributed to the literature by trying to detect the core empirical features of financial cycles for better modelling strategies.

In order to understand the effect of financial developments on macroeconomic variables, we need to look at the theoretical explanations. We know that the banks and capital markets influence the economic activity. The mechanism works through the lending channel and balance sheet channel. There is a positive correlation between bank credit cycles and the business cycle. Therefore, this pro-cyclical feature of the banking sector may boost the real cycle as found by Asea and Blomberg (1998) who indicated that the bank credits affect the real business cycle. Schularick and Taylor (2009) found that the financial system creates an unstable economy through endogenous credit booms. Ayuso, Perez and Saurina (2004) indicated that the demand for, and supply of, bank credits oscillates over the cycle, because credit demand is connected with production and investments. The vast numbers of related studies try to provide empirical results for a better understanding of the link between financial and macroeconomic issues. Avouyi-Dovi and Matheron (2005) investigated the synchronization of stock prices, real activity and the interest rate on the business cycle some developed countries and found no better relationship between stock prices and the level of real activity in the business cycle frequency in France, Germany, the UK or Italy, but a strong relationship did exist in the USA. Borio, Disyatat and Juselius (2013) indicated that financial issues play an important role in the waves of the business cycle. Their empirical findings on data in the USA, UK and Spain showed that for financial cycle information, the behaviour of credit and property prices could be used to explain a substantial part of the cyclical

movements in output. Ng (2011) explored the role of financial cycle measures to forecast the output GDP growth rate and concluded that including financial cycles in the estimation equations promotes the forecasting performance for the short horizons. Christiano, Motto and Rostagno (2010) focused whether financial market shocks affect business cycle fluctuations for Europe and the USA. They released that the financial developments are important factors in order to explain the changes in the macroeconomic variables. Using quarterly data for more than forty countries, Claessens, Kose and Terrones (2011b) analysed interactions between business and financial cycles and found that there is a strong relationship between the cycles. Harding and Pagan (2002a, 2002b, 2006) proposed cycle dating algorithms and a concordance index calculation method to determine the level of synchronization. Candelon et al. (2008) tailored the generalized method of moments (GMM) to measure the cyclical stock market synchronization. Giannone, Lenza and Reiichlin (2009) and Morgan, Rime and Strahan (2004) developed business cycle synchronization measures. Kang (2011) investigated the lead-lag relationships in international business cycles. Kalemli-Ozcan, Papaioannou and Peydro (2009) tried to explain the effect of financial integration on the degree of business cycle synchronization by using a panel of twenty developed countries. Unlike traditional cross-sectional studies, their results indicated that a higher degree of financial integration leads to less synchronized output cycles. Claessens, Kose and Terrones (2011a) studied the synchronizations of financial cycles within and across countries. Artis, Chouliarakis and Harischandra (2011) contributed to the literature by analyzing business cycle co-movements for 25 advanced and emerging economies including Turkey. Avouyi-Dovi and Matheron (2005) measured the concordance between financial and business cycles. Gachter, Riedl and Ritzberger-Gründwal (2012) investigated the business cycle synchronization in the Euro area and analysed the effect of the global economic crisis in 2008 on the synchronization pattern of business cycle synchronization.

There are a large number of papers written on the synchronization of the business and financial cycles. But it is scant for the Turkish economy. Turkish economy either investigated in panel data concept or the data were insufficient. Duval et al. (2014) investigated the business cycle synchronization in developed and developing countries and found that trade intensity affects the business cycle synchronization. Using a wavelet methodology, Akkoyun, Doğan and Günay (2014) analysed the business cycle synchronization of the Turkish economy with the Euro zone and the USA and found evidence in favour of that the correlation between the Turkish-Euro zone and Turkish-USA cycles increased after the banking crisis. Akyar (2016) investigated the possible synchronizations of financial and business cycles and found that the financial and business cycles are highly synchronized in Turkey. The results also indicate that while the credit volume cycle is the leading factor of the GDP cycle, the GDP cycle leads from the BIST 100 cycle in Turkey.

3   Methodology

The time series data has three components: a seasonal component, a trend-cycle component and a remainder component which is called cycle. In order to get the cycles, the trend is subtracted from the data. There are several kinds of filtering methods such as Baxter-King band-pass filter and Christiano-Fitzgerald bandpass filter but we use the most commonly used method called Hodrick-Prescott filter since it has the easy usage and comparability of the results between similar studies. Additionally, it should be noted that the selection of the filtering method does not have significant effect on the findings according to Massman and Mitcell (2004).

According to the HP filtering theory, the trend component (τ) should be removed from the series (y) in order to get the cyclical component (c). In this method, the trend part of the data can be obtained by solving the following minimization formulation.

$$\min_{\tau_t}\left\{\sum_{t=1}^{T}c_t^2 + \beta\sum_{t=2}^{T}\left[\left(\tau_t - \tau_{t-1}\right) - \left(\tau_{t-1} - \tau_{t-2}\right)\right]^2\right\} \tag{1}$$

In this formula, cyclical component reflects $c_t = y_t - \tau_t$ and in the model, β coefficient is the smoothing parameter which penalizes the variability in the trend. Although β is 1600 for many studies

for quarterly data, we instead used 98 value following Alp, Başkaya, Kılınç ve Yüksel (2011).[1] Some previous empirical studies investigating the business cycles fitted the turning points of the cycles. The best known method for capturing this task was developed by Bry and Boschan (1971). In this study, authors searched for the maximum and minimum points over the period for the series used in the paper. Harding and Pagan (2002a) extended the BB method tailored the quarterly version. In this paper, we use this algorithm to determine the turning points of the financial and business cycles. According to this algorithm, our series has a local maximum at time t, if the following conditions are provided (Claessens et al., 2011a). After determining the upper and lower points, the contraction and expansion phases for our variables can easily be defined.

$$\left(y_t - y_{t-1}\right) > 0, \left(y_t - y_{t-2}\right) > 0, \left(y_{t+1} - y_t\right) > 0 \ and \left(y_{t+2} - y_t\right) > 0 \tag{2}$$

We employed the concordance index developed by Harding and Pagan (2006) between the cycles. The concordance index shows the average number of periods in which two variables (a and b) emerge at the same time of the cycle. It can be obtained as follows;

$$CI_{ab} = \frac{1}{T}\sum_{t=1}^{T}\left[S_t^a S_t^b + \left(1 - S_t^a\right)\left(1 - S_t^b\right)\right] \tag{3}$$

In this equation, S_t^a equals 1 if the a is in expansion at time t and equals 0 otherwise. Similarly, S_t^b equals 1 if the b is in expansion at time t and equals 0 otherwise. The value of CI ranges from 0 to 1 and is equal to 1 if the variables are always in the same phase. Adversely, it will be equal to 0 if their phases are not the same. The relationship between the cycles will not be expected to be same during the time. Therefore, we expect a time varying relationship between the cycles. One of the most popular models currently used to determine the time varying correlations between the variables is DCC model developed by Engle (2002). The main advantage of the model is that the number of parameters to be estimated stays limited in the data. Therefore, we will employ this model to get the changing dynamics of the relationship between the cycles. The formulation can be seen as follows. The details of the method can be found from the paper of Seo, Park and Yu (2009) because of scarce space.

$$\omega_{ij,t} = \frac{\delta_{ij,t}}{\left(\delta_{ij,t}\delta_{jj,t}\right)^{1/2}} \tag{4}$$

In this equation, $\delta_{ij,t}$ is the i–j th element of Q which represents the unconditional variance matrix of u_t and $\omega_{ij,t}$ is the time varying element of estimated variable.

4   Data and Findings

In this study, we used quarterly data of gross domestic product, household consumption total credit volume and BIST-100 index ranging from 2002:Q1 to 2017:Q1. Total credit volume is the total of the credit volume provided by the commercial banks to the households during a year. The BIST 100 (January 1986=1) is an index of share prices quoted on the National Market of the Borsa Istanbul (BIST), a market capitalization weighted price index covering 100 highly liquid companies. All the data retrieved from the data delivery system of the CBRT. GDP and household consumption variables are helped to capture the business cycles while the total credit volume on the private sector by the deposit money banks and the BIST-100 Index are needed for to get the financial cycles. All variables are seasonally adjusted via Tramo-Seats method and logarithmic growth values are used in the paper. The descriptive statistics are shown in Table 1.

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[1] Alp, Başkaya, Kılınç and Yüksel (2011) estimated a smoothing parameter for Hodrick-Prescott filter for the Turkish economy's business cycles by using Turkish real gross domestic product data for 1987:1-2007:3 periods. They compared the business cycle characteristics associated with optimally estimated smoothing parameter values with those associated with of 1600, which is frequently-used for quarterly data. Their findings suggested that optimal choice of the smoothing parameter for the Turkish economy is 98 rather than 1600. Since the business cycle characteristics are sensitive to the parameter choice, we have chosen that parameter in our estimations.

Table 1. Descriptive statistics of the variables under investigation

	Mean	Median	Std. Dev.	Skewness	Kurtosis
GDP	0.8812	1.0915	2.2611	-0.8141	3.8878
Household Consumption	0.8125	1.0004	2.2925	-0.3434	2.6527
BIST-100	5.2563	5.0024	19.5465	0.3652	4.9658
Credit Volume	8.0699	8.2585	5.0119	-0.2896	3.4751

By employing HP filter, we gathered the cycles of the data. Additionally, we captured the turning points of the cycles from expansion to recession vice versa. Then we calculated the CI of the cycles using methodology mentioned before. CI matrix has been shown in Table 2. Cycles are shown in Figure 1. Turning points are not listed in the text.

Table 2. CI matrix values

	GDP	Household Consumption	BIST-100	Credit Volume
GDP	1			
Hou. Cons.	0.8021	1		
BIST-100	0.5994	0.7225	1	
Credit Vol.	0.8005	0.5968	0.5543	1
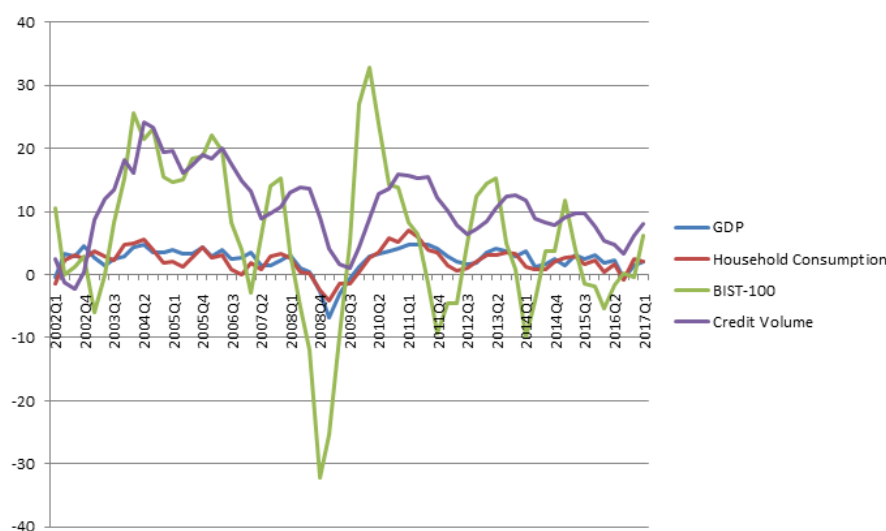
Figure 1. Cycles of GDP, household consumption, BIST-100 and credit volume

We estimated the degree of synchronization and found that it ranges from 0.4951 to 0.8624. As expected, the synchronization between GDP and its component of household consumption is quite high. The CI value of 0.8624 reveals that 86.24% of the time, these cycles are in the same phase. Conversely, the smallest CI value is calculated as 0.4951 between the cycles of the credit volume and BIST-100 index. Other CI values are 0.5541, 0.6522, 0.7024 and 0.7519 for GDP-Credit volume, GDP-BIST-100, household consumption-credit volume and household consumption-BIST100, respectively. The finding suggests that the GDP and credit volume cycles are highly synchronized.

After having the estimation results of the DCC model, the DDCs of the cycles are shown in Figure 2. The GDP and the household consumption cycles are found to be positive and strong. The strength of the synchronization indicates rising trend between the 2003:Q3 and the 2008:Q3. The relationship between the GDP and credit volume cycles was also positive. A similar structure was observed in the relationship between household consumption and the credit cycles. If we analyse the dynamic

conditional correlations between GDP-BIST100, household consumption-BIST100 and the credit volume-BIST100 cycles, we observe a weak relationship with a correlation coefficient between 0.10-0.40 until the end of 2008. After 2008, even this weak relationship was broken and the correlations were reduced to almost 0.10 levels. As known from the theory, consumption expenditures have the biggest share among the GDP components. The main determinant of the household consumption is the disposable income. Since the total consumer credits have ability to increase the disposable income of the households, it may have impact on the GDP cycle as found our estimation. On the other hand BIST100 index can be as a leading variable for the GDP cycle since it may change in the short-run. But it takes some to be changed for the GDP cycle since it may change in the relatively long period.
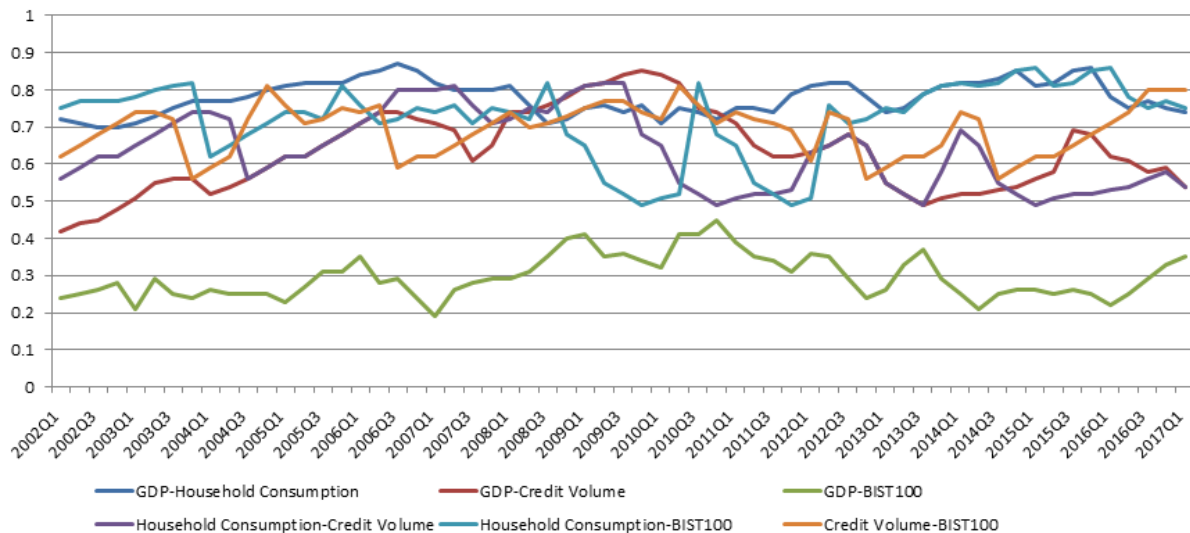

Figure 2. DCC values of the cycles

A most significant condition observed in Figure 2 is the effect on the relationships between the cycles of the 2008 global crisis. The global crisis was one of the most important break points in the relationships of the business and financial cycles. The significant point which we should pay attention to here is that the correlations between all of the cycles decreased after the crisis period. In other words, the relationships among the cycles broke after the crisis period. The results from the findings imply that the relationship between credit cycle and the real business cycle had been improved especially since the global financial crisis. There are two reasons behind this result. The first one is that the Central Bank of the Republic of Turkey (CBRT) started to implement a different monetary policy just following the global financial crisis in order to secure financial stability in addition to price stability. They constantly started to monitor and affect the credit volume and this variable became one of the most important variables for achieving monetary stability. The second one is that the structure of the capital movements has changed toward to the emerging economies as well as to Turkey. Before the global financial crisis, the share of the FDI flows was higher in total capital flows in Turkey. But after the crisis, the share of the FDI has decreased since the speed of privatization has decelerated, political tensions has increased, among others. Since it is more likely that the FDI flows may increase credit volume by decreasing interest rates (by expanding the credit facilities), we can provide an explanation to softening the relationship between credit cycle and the real business cycle since the global financial crisis. After the global financial crisis, the share of the portfolio investments in total capital flows has raised in Turkey, especially since 2009. Since it is clear that this kind of speculative movements will tend to have more returns in the short-run, they will pour in BIST rather than banking sector. Hence, there emerges negative relationship between credit volume cycle and BIST 100 cycle in the periods speculative flows are higher than FDI flows.

5   Conclusion

The role of financial variables on real economic activity has been discussed extensively in the literature. These studies are mostly oriented to the relationships between business and financial cycles. The relationship between cycles might be crucial especially for emerging economies, due to several reasons as well as developed countries. Therefore, in this study we investigated the synchronization between business and financial cycles for Turkish economy. Log growth of GDP, household consumption, credit volume and BIST 100 index are used in the text in quarterly based, covering from 2002:Q1 to 2017:Q1. We employed HP filter to obtain business and financial cycles. To investigate the link between business and financial cycles, we calculated the CI values. We also estimated the time varying DCCs. Our findings indicate that the synchronization degree between financial and business cycles is quite high in Turkey and average 72.4% business and financial cycles are in the same phase. Additionally, we found that the GDP cycle is the lagging factor of the credit volume cycle. Moreover, the time varying conditional correlations show that the relationship between the GDP cycle and the credit volume cycle is positive and strong. This finding suggests that credit volume cycle has greater impact on GDP cycles that means economy policies have impact on GDP cycles. The results also indicated that the DCCs for GDP-BIST100 and the household consumption-BIST100 cycles existed, which indicates that the relationship between these cycles is weak. The global crisis that occurred at the end of 2008 was found to be the most important break point for the time varying relationships. After this date, the DCCs suddenly decreased and followed a more stable pattern, until the end of the investigated period.

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