

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

Bekir Tamer Gökcalp

Independent Researcher and Deputy Manager at Odeabank, Turkey
Email: bt.gokalp@gmail.com

Abstract. In this paper, we analyzed 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 (CI) method and dynamic conditional correlation (DCC) method in order to capture the main features of the interactions between the financial and business cycles. Our empirical findings showed that these cycles are immensely synchronized in the Turkish economy as found by many economists. The finding also revealed that the credit cycle is leading the business cycle while the business cycle is lagging the BIST100 cycle. These findings imply that financial variables have the 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 Woodford, 2010 and Bekiros et al, 2015 among others¹ 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 theoretical 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 concentrated on the functions of financial issues in developed, developing and emerging countries. In order to explain the impact of financial debates, we see there exists two major arguments. On the one hand, asset prices diverged improperly from the economic basis, which may cause asset prices to rise. The probability of the explosion of this rise may cause a lower level of investment expenditures because of a rise in financing costs and then we may see a recession in the economies. On the other hand, the goods and services prices may be affected by the changes in credit fluctuations and share prices. 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 at the beginning of 2001, the Turkish economy has changed the structure of both the banking and the financial system. Following this period, it rapidly grew up until the global financial crisis. Following the global crisis, its financial structure weakened and the deficit of current account rose sharply as well as the foreign debt stock. 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 banking institutions has risen afterwards of the global financial crisis. Because of that the nominal amount of the total credit volume did not change up to the time of the global financial crisis where several problems emerged to

¹ For more information, please see: Avouyi-Dovi and Matheron, 2005; Christiano, Motto and Rostagno, 2010; Adrian, Estrella and Shin, 2010; Egert and Sutherland, 2012; Borio, 2013

finance new investment opportunities. Therefore, it seems to be better to analyze the relationship between the fluctuations of economic and financial activities so as to understand the dynamics of 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 reply whether there are any co-movements between the financial and economic activities and which one is leading or lagging. Additionally, we search for whether there is any structural change the relationship between financial and economic activities

The paper is structured as follows. Section 2 focus on theory and the literature review. Section 3 gives some information on the methodology. Section 4 introduces the data and presents the empirical results. Lastly, Section 5 summarizes the findings.

2 Literature Review

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. Since the beginning of Classical economics, the relationship between macro variables and financial developments became important even in the period of Great Depression. In recent years, this topic is increasingly under investigation by many economists such as Egert and Sutherland (2012), Claessens, Kose and Terrones (2012), Borio, Disyatat and Juselius (2013) and Akar (2016) 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 the 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 seems a consensus regarding the definition of the concept of the financial cycle. It should be noted that the characteristics of the financial cycle can be expressed by two key empirical findings. First, the property prices and the credit volume behaviour have potential to describe the cycle of the financial developments. The second is that the frequency of the financial cycle is much less than the business cycle. Claessens, Kose and Terrones (2012) analysed the financial cycles for 21 OECD countries and tried to capture the main characteristics of the financial cycles (such as duration, frequency, slope and amplitude). Egert and Sutherland (2012) also searched for the basic features of business and financial movements and tried to measure the magnitude of the comovements between mentioned cycles in all OECD economies. Bordo and Helbling (2011) provided important information about the main empirical characteristics of the financial movements.

In order to understand the relationship between the financial issues and macro 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 two channels: The first one is the lending channel and the second is the balance sheet channel. There is a positive correlation between bank credit cycles and the business cycle. Since the pro-cyclical characteristics of the banking sector has potential to affect 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 an economy may become unstable because of the financial system through endogenous credit expansions. Kose, Prasad and Terrones (2003) indicated that the financial cycle is affected by the demand and supply the bank credits. As known, the credit demand has strong impact on both investments expenditures of the firms and production level. Many related studies found various empirical results in favor of the connections of financial issues on macro variables. Avouyi-Dovi and Matheron (2005) searched for the synchronization of the prices of the stocks and the real interest rate on the fluctuations of the economic activities for some developed countries. Findings revealed that there is the relationship between the business cycle and stock prices is not strong in Germany, Italy, France and the UK, but strong in the USA. Borio, Disyatat and Juselius (2013)

indicated that financial issues have an impact on the waves of the real economic activities. Their findings regarding the UK, USA and Spain revealed that the substantial parts of the cyclical movements of the business cycles can be best described by the behavior of the property prices and the credit volume. Ng (2011) searched for the role of the financial movements on the growth rate of the economies and reached that the forecast performance of the models has been improving especially in the short-run when the financial cycles are included to the models. Christiano, Motto and Rostagno (2010) focused on the effect of financial shocks on the business cycle fluctuations for the USA and the Europe. They released that the developments in the financial side of the economy are the main factors in order to dig the changes in the macro variables. Using quarterly data for more than forty countries, Claessens, Kose and Terrones (2012) searched for the effect of the business cycle on the financial cycle and found that there is a strong relationship between the cycles. Harding and Pagan (2006) suggested an algorithm and a calculation method namely concordance index (CI) in order to capture the degree of comovement. In order to measure the cyclicity of the stock market, Camacho et al. (2008) estimated a model via the generalized method of moments (GMM). On the other hand, Morgan, Rime and Strahan (2004) and Giannone, Lenza and Reichlin (2009) built a different measurement for the business cycle comovement. Differently, Kang (2011) tried to estimate the lead and lag relationship between the cyclical movements. Kalemli-Ozcan, Papaioannou and Peydro (2009) searched for the relationship between the degree of real business cycle and the financial cycle by employing a panel for some industrialized countries. Their findings captured different results in comparison to the counterparts: the higher degree in financial integration the lower synchronization in business cycle. There are several papers focused on the synchronizations of financial cycles such as Claessens, Kose and Terrones (2012), Artis, Chouliarakis and Harischandra (2011), Avouyi-Dovi and Matheron (2005), Barreto and Hughes (2004) and Imbs(2004). Their findings are inconclusive: some of them found strong positive relationship while the other found negative of weak synchronization.

There are a large number of papers written on the synchronization of the business and financial cycles. But it is scant for Turkey. Duval et al. (2014) focused on the synchronization of the business cycles 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 comovement of the Eurozone the USA as well as the Turkish economy. They have found evidence in favour of strong synchronization between the Turkish economy and Eurozone, and the Turkish economy and USA business cycle. Akar (2016) investigated the possible synchronizations of financial and business cycles and found that the business and the financial cycles have strong synchronization in Turkey. The findings also revealed that the lead and lag relationship is different in country's economy: the GDP cycle leads from the BIST-100 cycle but the credit volume cycle is the leading factor of the GDP cycle.

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 (BK) and Christiano-Fitzgerald (CF) band-pass filters but we use the most commonly used method called Hodrick-Prescott filter. As known, the HP filter has some positive sides such as the easy usage. Moreover, the results can be compared with the similar studies. Additionally, it should be noted that the choice of the filtering method does not affect the findings as Massman and Mitchell (2004) indicated.

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 can be obtained by the following minimization formulation.

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

In this formula, cyclical component reflects $c_t = y_t - \tau_t$ and in the model, β a coefficient is a 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).² Some previous studies investigating the business cycle fluctuations fitted the turning points of the business cycles. Bry and Boschan (1971) developed a method which is one of the best-known methods for capturing them. In this study, authors searched for the max and min levels in the period under investigation in the paper. Harding and Pagan (2006) extended their method and tailored the quarterly frequency. In this paper, we use this algorithm to determine the max and min points of the cycles. Regarding this algorithm, we determined that our series have the local maximum at t the time, under the conditions provided below (Claessens et al., 2012). After determining the upper and lower points, we determined the contraction and expansion periods by using the following condition.

$$(y_t - y_{t-1}) > 0, (y_t - y_{t-2}) > 0, (y_{t+1} - y_t) > 0 \text{ and } (y_{t+2} - y_t) > 0 \quad (2)$$

We employed the CI which is developed by Harding and Pagan (2006) between the cycles. The CI 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;

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

In this equation, S_t^a equals 1 if the a is in expansion period at the time t and equals 0 otherwise. Similarly, S_t^b equals 1 if the b is in expansion period at the time t and equals 0 otherwise. The value of CI ranges from 0 to 1 and is equal to 1 when the variables are 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 at the time. Therefore, we expect a time-varying relationship between the cycles. In order to capture the time-varying performance, we employed dynamic conditional correlation (DCC) model which is developed by Engle (2002). The main advantage of the model is that the number of parameters to be estimated stays restricted 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) and Akar (2011) because of scarce space.

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

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 an estimated variable.

4 Data and Findings

In this study, we used quarterly data of the gross domestic product, BIST-100 index and household consumption total credit volume 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. In order to get the financial cycles, we used BIST-100 Index and the total credit volume (the total credit volume is the credit taken by the private sector from the

² 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. For a different methodology, you can also see Çiçek and Akar (2013 and 2014), Çiçek (2012) and Çiçek et al (2011).

deposit banks). All variables are seasonally adjusted via a Tramo-Seats method and logarithmic growth values are used in the paper. The descriptive statistics are shown in Table 1. □

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

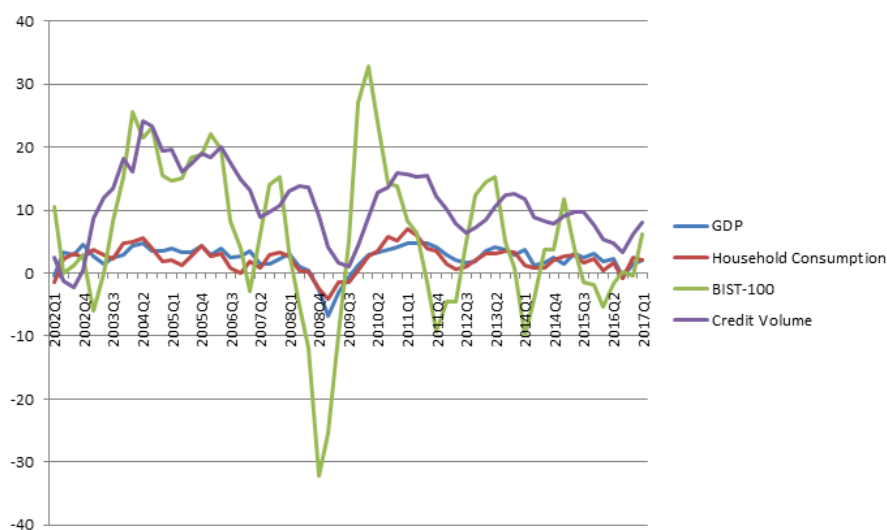


Figure 1. Cycles of GDP, household consumption, BIST-100 and credit volume

We estimated the degree of synchronization and found that it takes the value between 0.4951 and 0.8624. As can be guessed, the comovement between the synchronization between the gross domestic product and its component of consumption expenditure is quite strong. The CI value that we found as 0.8624 reveals that the cycles of GDP and the consumption expenditure stay in the same phase in 86.24% of the time. 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 the synchronization of the credit volume and GDP, the BIST-100 index and the GDP and lastly BIST-100 index and the consumption expenditure, respectively. The finding concludes that the comovement between the credit volume cycles and the gross domestic product is quite strong as found by Akar (2016).

Another contribution of the paper is to calculate the dynamic conditional correlations (DCCs) of the variables under investigation. Figure 2 displays the DCC values of the cycles. As expected, the dynamic conditional correlation between the gross domestic product GDP and the consumption expenditure cycles are found to be positive and strong. The strength of the synchronization indicates rising trend between 2003: Q3 and 2008: Q3. Similarly, dynamic correlation values between the credit volume and the real output cycles have the positive sign. As can guess, the dynamic relationship between the credit volume and the consumption expenditure component of the real output was similar. Through Figure 2, one can see that the dynamic correlations between the cycles under investigation were strong and ranges from 0.20 to 0.80. The most stable values belong to GDP and the credit volume cycles. The dynamic correlation between the real output and the BIST-100 index was the weakest one. 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 the ability to increase the disposable income of the households, it may have the 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.

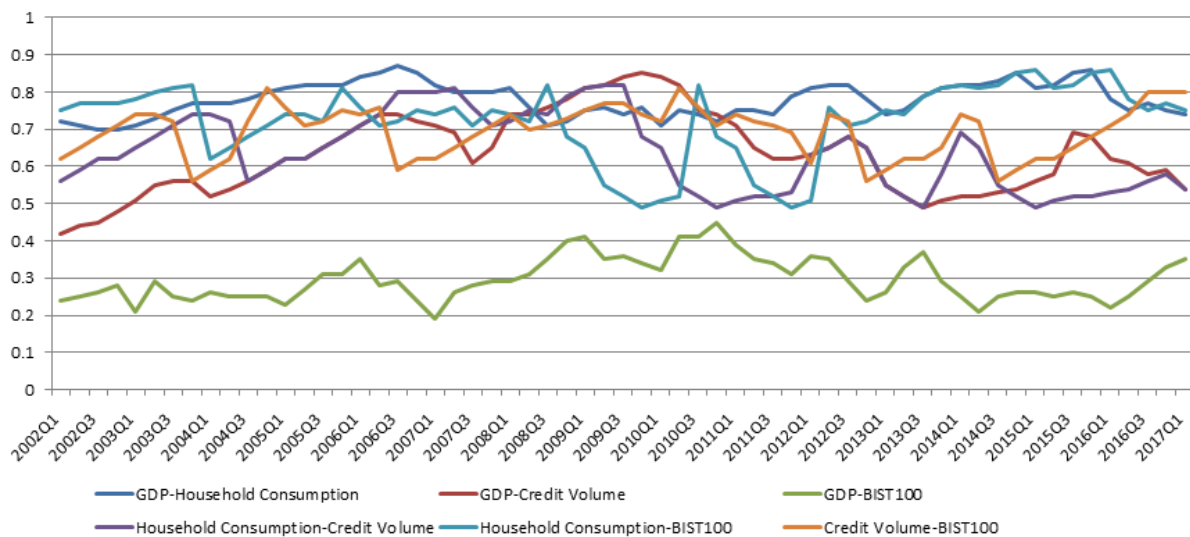


Figure 2. DCC values of the cycles

Figure 2 gives us more information about the behavior of the correlation between the cycles. In this part we try to find the main reason behind the changes in the DCC values. As known, there is an important economic situation emerged in the world: global financial crisis which may cause a structural break on the relationship between the cycles. When we look at the DCC values of GDP and the household consumption expenditure, we see that it was almost 0.7 before the financial crisis. After the crisis it decreased to 0.5 but then turned into the previous level, even higher. The result indicates that the relationship between real business cycle and the consumption expenditure got strong. Another interesting finding belongs to the relationship between the real GDP and the credit volume index. The DCC values increased from 0.4 to 0.85 between 2002:Q1 and 2010:Q3 but then steadily decreased until the period under investigation. The one of the main reasons behind it as indicated by Akar (2016), the Central Bank of the Republic of Turkey (CBRT) implemented a new policy regime since October 2010. In this new regime, the CBRT employs different policy rates in an unconventional interest rate corridor (Akar and Çiçek, 2016). By doing this, the CBRT steadily monitors and tries to affect the volume of credit. Another important element might be the direction of the capital movements. As known, the capital flows decelerated to Turkey which made Turkish economy to be more vulnerable to the economic developments. Since the capital movements directly affect the credit facilities, it is normal it to affect the DCC values between the real output and the credit volume index cycles.

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, this paper investigates the synchronization between financial and business cycles for Turkish economy. Log growth of real output, consumption expenditure, BIST 100 index and credit volume index are used in the text in quarterly based, covering from 2002:Q1 to 2017:Q1. In order to get the cycles under investigation, we have employed HP filter which provided a comparison with previous papers. The concordance index values helped us to capture the links the cycles under investigation. We also estimated the time-varying DCCs. Our findings indicated that the comovement between the cycles of the GDP and the financial variables are strong in Turkey and the cycles of GDP and the consumption expenditure stays in the same phase in 86.24% of the time. Moreover, the DCC values indicated that the dynamic correlation between the credit volume and the real output cycles is positive and noticeable. This finding suggests that credit volume cycle has greater impact on GDP cycles that means economy policies have impact on GDP cycles.

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