

The Synchronization of Financial and Business Cycles in Saudi Arabia

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ABSTRACT

Financial cycles have become vividly tracked and analyzed by regulatory authorities to avoid the buildup of excessive systemic risks in the financial system that could hamper economic growth. However, fiscal policy usually pays an exclusive attention to business cycles; which might leave fiscal outcomes vulnerable to financial sector dynamics. We investigated financial and business cycles in Saudi Arabia over the period (1970Q1- 2016Q4). The results of the BBQ cycle dating algorithm revealed that the duration of financial upturns (downturns) are longer than that for economic expansions (contractions) in means, also both the amplitude and the slope for upturns (downturns) are higher than those for expansions (contractions) in means. Moreover, financial cycle episodes are more frequent than business cycle episodes. Finally, we found empirical evidence that financial (credit) conditions are crucial for economic stability. Fiscal policy can play an important role in fostering economic growth going forward through the implementation of a countercyclical policy that allows for the accumulation of fiscal buffers and releasing them during periods of an economic slowdown, the setup of early warning systems for business and financial cycles, and the introduction of fiscal rules to limit the scope for a procyclical fiscal stance.

Keywords: Financial Cycles, Business Cycles, BBQ Algorithm, Amplitude, Procyclicality.

1-Introduction:

Financial and macroeconomic stabilities are deemed as two sides of the same coin due to the feedback loops between them. The global financial crisis, which began September 2008, emphasized the fact that macroeconomic stability per se is important but not sufficient for a healthy economy. Financial stability is crucial to avoid the buildup of excessive systemic risks in the financial system that could hamper economic growth.

Business cycles have gained a considerable attention by monetary authorities and economic planners in the pre-crisis period due to the recognized effect of output gap on inflation and macroeconomic outlook. At the same time, financial cycles have become vividly tracked and analyzed by regulatory authorities based on the fact that they could jeopardize the real economy.

The importance of the financial sector in the economy has been extensively mentioned in the literature, mainly by channeling economic resources from savers to investors through banking and nonbanking financial institutions. However, credit booms are usually associated with the buildup of risks and vulnerabilities should be managed to avoid potential detrimental effects during busts.

Fiscal policy stance takes into consideration business cycles when evaluating public revenues and for planning of public spending. Financial cycles should be taken into account by both fiscal and monetary policies, as the exclusive focus on business cycles exposes fiscal outcomes to financial sector dynamics which are above and beyond business cycle fluctuations. Hence, fiscal policy reaction functions should account for the states of both business and financial cycles.

Macro-prudential policies are a key ingredient of the regulatory toolkit for financial stability. The objectives of Macro-prudential policies include: ensuring the resilience of the financial system, and limiting the buildup of systemic financial risks. Macro-prudential policies focus on the interaction between the financial institutions, markets, infrastructure and the wider economy. For example, through the build-up of countercyclical capital buffers in boom times with a view to enable banks to withstand and limit losses in downturns. Another goal of Macro-prudential policymaking would be to ensure that systemically important institutions which are “Too- Big- to -Fail” are subject to more prudential requirements and supervision than smaller players as the failure of such institutions would have serious consequences to the financial system and the economy as a whole (Gadanecz and Jayaram, no date, pp.1-3)

Macro-prudential policies focus on the system as a whole rather than its individual components (Borio, 2003, p.2). Crucially, the effectiveness of Macro-prudential policies depends on an ongoing assessment of financial cycles to identify the episodes that mimic the buildup of system-wide risks.

Macro-prudential policies by nature are distinct from capital flow management measures which have been applied by many emerging market economies in the past decade for Macro-prudential purposes. A key difference from other policies is that Macro-prudential tools are mainly targeting particular sectors whereas other policies are typically applied uniformly across the system (Gadanecz and Jayaram, pp.1-3), also Macro-prudential policies take into consideration both cross sectional and time dimensions to fill the gaps in micro-prudential policies which focus on individual institutions or components of the system on a standalone basis, regardless of the relative size of the institution and its importance in the financial system as a whole.

Macro-prudential policies have a set of tools that could be used. Policy tools can target banks' capital requirements (countercyclical capital buffers, dynamic provisions, sectoral capital requirements), their liquidity (countercyclical requirements), or the asset side of their balance sheet (loan -to- value and debt-to-income ratios). Some liquidity-based instruments, such as haircuts and margins, can also be applied to specific markets. The choice of appropriate tools and the timing of implementation of Macro-prudential policies depend on the type of vulnerabilities that needs addressing, financial conditions and the objective of each instrument.

The state of both economic and financial conditions affects the effectiveness of monetary transmission mechanisms over time. Although monetary transmission channels have distinctive effects on the real economy, there are also possible interlinkages between the channels through which they may magnify or counteract the influence of other channels in the monetary transmission process. Abildgren (2012, pp.38-39) Emphasized the existence of a significant and long-lasting negative impact on real GDP following an exogenous shock to the banking sector's write-down ratio; which confirms the intuition that shocks to the financial sector are amplified to the real sector.

Cevik, and Teksoz (2012, pp.18-19) investigated the transmission of monetary shocks in GCC economies through various channels, empirical findings comprises: output shocks have a long-lasting impact on consumer price inflation as domestic prices react, on average, positively to supply shocks in Qatar, Saudi Arabia, and the “synthetic” GCC, while this transmission channel appears to be weaker in Bahrain, Kuwait, and Oman. Bank lending to the private sector is vulnerable to supply side shocks in all GCC countries, meanwhile Saudi Arabia and the United Arab Emirates seemed to exhibit a greater degree of responsiveness relative to other Gulf countries. The bank lending channel is significant for all GCC countries, where central banks respond contemporaneously to innovations in the policy rates that constitute a reaction to foreign monetary shocks (e.g. changes in the U.S. Federal Reserve's monetary policy stance), which implies the relative importance of the bank lending channel.

The detection of financial cycle phases of booms and busts is important to let regulatory authorities ensure financial stability and limit risk exposures ex ante. Thus, the analysis of financial cycles is crucial to understand their characteristics, determinants as well as their interactions with business cycles.

Once financial cycles are identified, a policy response needs to be at least neutral with respect to financial cycles or at most help moderate macroeconomic volatility associated with them by adopting a countercyclical stance. From a fiscal perspective, fiscal policy should lean against the wind and eliminate the debt bias associated with financial cycles as public debt increases during booms are usually more than reductions during busts.

There is a set of policies that fiscal authority can use to mitigate the effect of financial cycles on the economy, these tools include: the estimation of the structural fiscal balance should account for the financial cycle ups and downs, the implementation of fiscal rules (expenditure, revenue, budget balance and debt rules) can limit the procyclicality of fiscal policy and provide a room for maneuver in bad times through the accumulation of fiscal buffers in good times.

As far as we know, no empirical studies have investigated the features of financial and business cycles in Saudi Arabia, the contribution of this paper will fill this gap as follows: **First:** Exploring the features of financial as well as business cycles in Saudi economy in terms of frequency, duration, amplitude and slope. **Second:** Assessing the degree of synchronization between financial and business cycles. **Third:** Evaluating the relationship between the duration of cyclical episodes in the real sector and the synchronization of business and financial cycles. **Fourth:** Investigating the effect of financial (credit) cycles on the real economy.

The rest of the paper is organized as follows: **Section Two: *Fiscal Procyclicality and Financial Cycles*:** introduces the nexus between fiscal policy and financial cycles. **Section Three: *Fiscal procyclicality and Financial Stability in Saudi Arabia: Stylized Facts*:** provides stylized facts and figures on fiscal policy and financial stability in Saudi Arabia in order to highlight the importance of investigating the features of business and financial cycles. **Section Four: *Econometric Analysis*:** introduces data elaboration, methodology used in empirical analysis and key findings. **Section Five: *Conclusion*:** includes the main findings of empirical analysis and policy implications.

2- Fiscal Procyclicality and Financial Cycles:

Fiscal policy is deemed to be procyclical whenever it is expansionary in booms and contractionary in recessions. Such behavior raises macroeconomic volatility, depresses investment in real and human capital, hamper growth, and harm the poor (Manasse, 2006, p.4). That's why fiscal policy should be more countercyclical.

The Great Recession has seen renewed the importance of fiscal policy as a countercyclical instrument, owing to the large output losses and employment costs of the crisis as well as the limited power of monetary policy when interest rates are at the zero-lower-bound.

Ayuso-i-Casals et al (2007, pp.691-692) confirmed that fiscal rules could be associated with more countercyclical fiscal policy, conditional on their properties in terms of flexibility, the availability of escape clauses, cyclically-adjusted targets, the timeframe needed for assessing the compliance with the rule. Moreover, they concluded that numerical fiscal rules could be useful devices to ensure better policies, but careful attention should be devoted to the way they are designed. Guerguil, Mandon and Tapsoba (2016, p.27) evaluated the impact of different types of fiscal rules on the procyclicality of fiscal policy using propensity scores-matching techniques, for an unbalanced panel of 167 countries over the period (1990–2012). They concluded that budget balance rules are associated with countercyclical changes in overall spending and in investment spending. The effects were mixed for expenditure rules, as the introduction of the latter is associated with countercyclical changes in overall spending, but with procyclical changes in investment spending. Debt rules did not seem to have an effect on the cyclical behavior of public spending.

Ignoring the impact of asset prices on fiscal accounts encourages procyclical fiscal policies as revenues in good times will be considered as permanent and lead to expenditure increases or tax cuts. Also, the lack of an adequate

and precise dating of the underlying financial cycle will leave the structural fiscal position overestimated leading to inadequate fiscal buffers when windfall revenues are gone.

The detrimental effect of financial crises on fiscal indicators occurs via several channels as follows: **First:** Bailout fiscal costs incurred by the government to avoid the failure of important financial institutions and purchases of bad assets to recapitalize institutions will lead to an increase in public debt. **Second:** Output and employment losses will lead to a reduction in tax revenues and an increase in expenditures on the other hand, hence an increase in the primary fiscal deficit. **Third:** The collapse in asset prices, in particular, can play a key role, Eschenbach and Schuknecht (2004, pp. 314–346) found that around (30–40) percent of the deterioration in fiscal balances that took place in the United Kingdom and Sweden in the early 1990s was attributable to asset price effects, especially in the real estate market. **Fourth:** The exchange rate channel transmits the effects of the financial cycle to fiscal debt, as busts are usually associated with the depreciation of domestic currency, which leads to the accumulation of foreign debt burden in case of a heavy reliance on foreign debt and currency mismatch problems. **Fifth:** The response of fiscal policy may lead to a further deterioration in the fiscal position. If the increase in public spending is not effective in stimulating economic activity when the negative effect of financial busts on economic growth is somewhat persistent, hence the fiscal stimulus may not be easily paid back in subsequent years.

The setup of Early warning systems (EWSs) for financial cycles is a prerequisite for using Macro-prudential instruments countercyclically. EWSs are important to enable the ex-ante detection of either potential exuberance or distress within the financial system. The buildup of such systems necessitates the identification of the best-fitted financial cycle measure that captures fluctuations in credit, housing and equity prices. Al-Darwish et al. (2014) confirmed that the monetary authority in Saudi Arabia (SAMA) has an adequate Macro-prudential toolkit, but these tools have not been used countercyclically.

Claessens, Kose and Terrones (2011, pp.13-18) investigated the features of financial and business cycles for a panel of 44 countries for the period (1960Q1- 2007Q4). Concerning the duration and the slope of financial cycles vis-a-vis business cycles, they concluded that both upturns and downturns of financial cycles tend to be longer and more violent than recoveries and recessions for the business cycles. Also, cycles in output and credit appeared to be the most highly synchronized, with a median (mean) synchronization of 0.81 (0.78). Moreover, advanced countries typically display a higher degree of synchronization between cycles in output and credit or house prices than emerging markets do due to the existence of developed financial markets where fluctuations in credit and house prices are more important for the real economy.

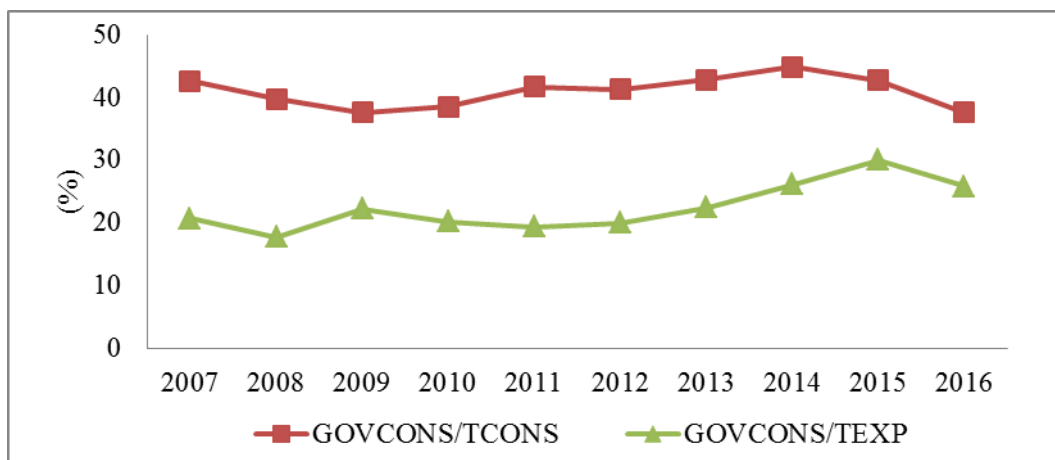
3- Fiscal procyclicality and Financial Stability in Saudi Arabia: Stylized Facts:

Government plays an important role in Saudi economy, where the share of government in total final consumption (GOVCONS/TCONS) and total expenditures on GDP (GOVCONS/TEXP) over the period (2007-2016) recorded an average of about 40.9 percent and 22.4 percent, respectively (Figure 1); which reflects the size of government and the role of fiscal policy in the economy.

The Saudi economy has witnessed an economic slowdown as a result of the persistent low world oil prices, as annual real GDP growth rate recorded 1.7 percent in 2016 compared to 4.1 percent in 2015. Also, GDP growth in the non- oil sector recorded 0.6 percent and 0.1 percent for government and private sectors, respectively (Figure 2). Hence, the response of fiscal policy was supposed to be countercyclical to avoid exacerbating the detrimental effect of oil prices on growth, it is evident that both real and nominal world oil prices have been persistently declining starting from 2013 onwards (Figure 3).

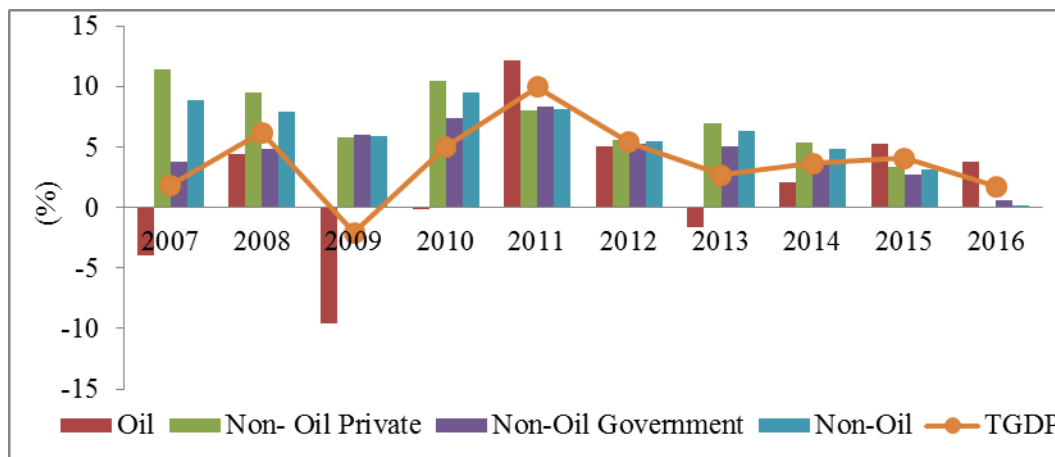
That's why it is important to investigate the degree of fiscal procyclicality, we noticed that the fiscal stance has become more procyclical over the period (2014Q1:2016Q4)¹ (Figure 4). On this backdrop, it would be beneficial to conduct an in depth analysis for business and financial cycles in Saudi economy to have a thorough understanding of their features, besides the exploration of the degree of synchronization between business and financial cycles as well.

Figure (1): The Share of Government Consumption in both Total Consumption and Total Expenditures on GDP in Saudi Arabia (2005-2014)



Source: Saudi Arabian Monetary Authority, Annual Statistics 2017.

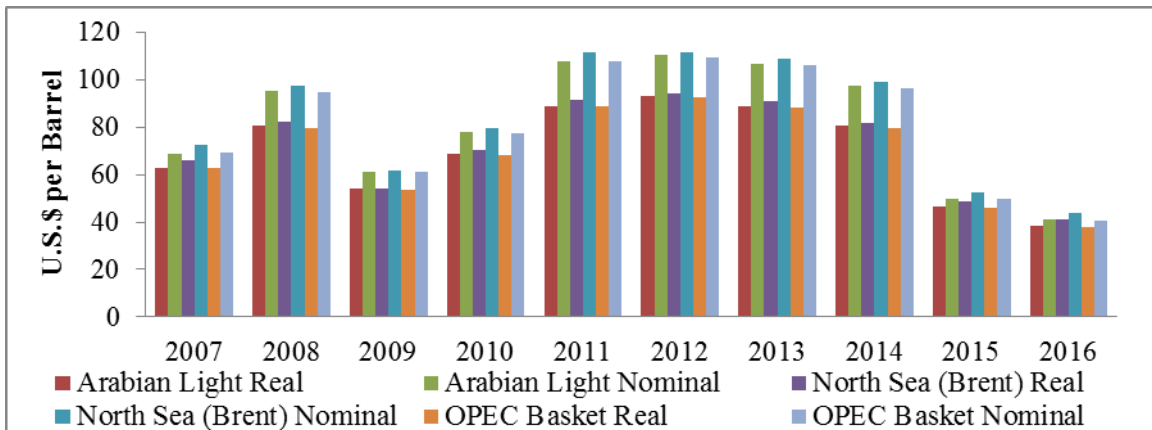
Figure (2): Real GDP Growth Rates By Sector (2007-2016)



Source: Saudi Arabian Monetary Authority, Annual Statistics 2017.

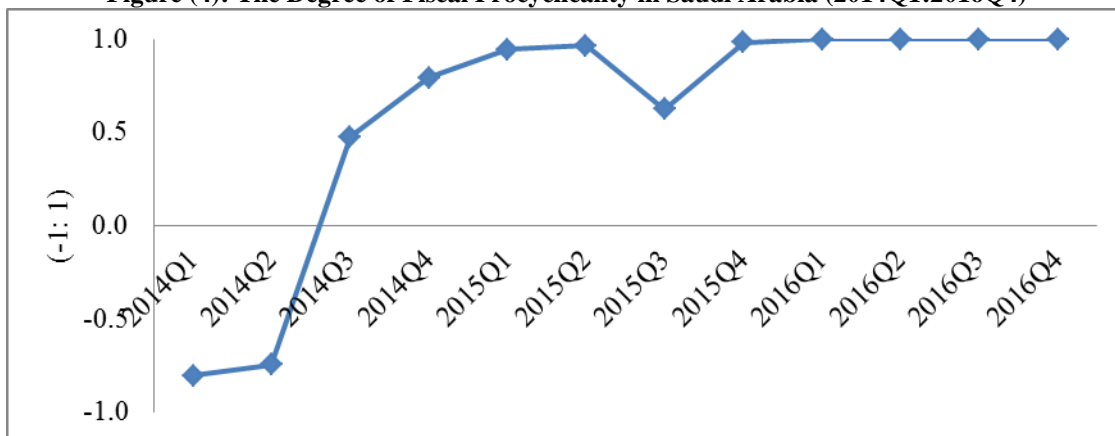
Figure (3): Real and Nominal World Oil Prices (2007-2016)

¹ We estimated an indicator for fiscal procyclicality as a four-quarter rolling window correlation coefficient between the cyclical component of government expenditure and the cyclical component of GDP in real terms, where the cyclical components for both series have been derived using the Hodrick Prescott filter.



Source: Saudi Arabian Monetary Authority, Annual Statistics 2017.

Figure (4): The Degree of Fiscal Proccyclicity in Saudi Arabia (2014Q1:2016Q4)



Source: Author's Calculations.

As for financial stability, it is noteworthy that the Saudi banking system continues to show strong resilience, despite the headwinds stemming from slower economic growth given the persistently low world oil prices. SAMA continues to ensure strict compliance with the measures put forth by the Basel Committee on Banking Supervision. Additional capital measures help ensure that risks stemming from linkages to the other sectors of the economy, as well as risks emanating from banks that have a disproportionately strong presence in the domestic banking system are thoroughly accounted for. In this regard, SAMA has issued guidance relating to domestic systemically important banks that has been put in place for 2016 (SAMA, 2017).

Bank Credit in 2016 continued to slow down, as credit growth rate during 2016 was 2.2 percent, implying a marked slowdown from the 12.6 percent average growth rate over the preceding four years. As for the corporate sector, Banks' credit has begun to taper off in 2016, with a growth rate of around 1.3 percent compared to 11.6 percent in 2015. However, there has been an increase in the Non-Performing Loan (NPL) Ratio for the majority of Corporate Sectors especially for Commerce and Construction activities which recorded the highest NPL rates across all sectors in 2016, nonetheless NPLs in the banking system have only marginally increased to 1.4 percent (SAMA, 2017).

The Banking System has sufficient provisions that ensure the ability to contain any further asset deterioration. Total Provisions as a ratio to NPLs increased to 177 percent for 2016. The provision guidelines mandated by SAMA has ensured that the banking system built up healthy buffers to cover any potential downside shocks to their loan portfolio (SAMA, 2017).

4- Econometric Analysis:

This section will answer four main questions as follows: **First:** Do financial cycles differ from business cycles in Saudi economy in terms of frequency, duration, amplitude and slope? **Second:** To what extent, financial and business cycles are synchronized? **Third:** Is there a link between the duration of cyclical episodes in the real sector and the degree of synchronization between business and financial cycles in Saudi Arabia? **Fourth:** Do financial (credit) cycles have a considerable effect on the real economy?.

4-1- Data and Variables:

We will use two variables in our empirical analysis of business and financial cycles in the Saudi economy. The first variable of interest is the real bank credit to the private sector, which will be used to assess the financial (credit) cycle, this measure has been extensively used by several empirical cross-country studies on credit dynamics. In the case of business cycles, real GDP will be used as the best available measure to track economic activity.

Data employed in empirical analysis of business and financial cycles are obtained from the Saudi Arabian Monetary Authority (SAMA), Annual Statistics 2017, also the GDP deflator (2010=100) has been used to derive real bank credit to the private sector. However, data are only available for these variables on an annual basis. That's why we used interpolation methods in order to derive the quarterly series for both real GDP and real bank credit to the private sector following other empirical studies such as (Cevik, and Teksoz, 2012, p.16), whereby the quadratic-match sum method has been used. The time period covered in our analysis of business and financial cycles ranges between (1970Q1- 2016Q4).

In order to answer the fourth question regarding the effect of financial (credit) cycles on the real economy, we used data for two sets of variables, the first set is for domestic variables and the second one comprises variables on the global economy. Domestic variables includes real GDP (constant 2010 US\$), consumer price index (CPI) (2010=100), real effective exchange rate (REER), domestic three-month interest rate. Foreign variables includes the U.S. real GDP (constant 2010 US\$), U.S. short term interest rate and nominal world oil prices (OPEC Basket). Data sources for these variables were the World Bank, world development indicators database for domestic and foreign real GDP, consumer price index (domestic inflation), data on the U.S. Short terms interest rates are from the OECD database, while data for the remaining variables have been obtained from SAMA annual statistics. A complete dataset for these variables is only available over the period (2000-2016) in an annual frequency, hence we used interpolation methods to derive quarterly data. The quadratic-match sum method has been used to derive quarterly data for domestic and foreign real GDP. On the other hand, the cubic-match last method has been used to derive quarterly data for REER, CPI, domestic and foreign interest rates as well as world oil prices. All series have been seasonally adjusted and expressed in logarithms, except for interest rate series.

4-2- Econometric Methodology:

We will use two methodologies to answer the questions mentioned earlier; the first methodology is the BBQ cycle dating algorithm, whereby we will use the results in answering our first three questions, while the second methodology is the Vector Autoregression (VAR) model which will be used to assess the effect of financial cycles on the real economy. Both methodologies will be explained briefly hereunder.

4-2-1- BBQ Cycle Dating Algorithm:

Numerous econometric methodologies have been proposed in the literature to analyze the characteristics of business cycles. In order to identify business and financial cycles, we will use the BBQ dating algorithm, developed by Bry and Boschan (1971), which focuses on changes in levels of a particular variable to identify turning points; hence, it enables us to identify periods of upturns (expansions) and downturns (contractions) for financial (economic) activity.

An alternative methodology could be to consider how economic activity fluctuates around a trend, and then to identify a "growth cycle" as a deviation from this trend, like the approach used in Hodrick Prescott Filter. Other

approaches are also available, it is worth mentioning that Harding and Pagan (2002) compared the performance of a Markov Switching (MS) model and BBQ algorithm for cycle analysis and concluded that the BBQ methodology is preferable because the MS model depends on the validity of the underlying statistical framework (Claessens, Kose and Terrones, 2011, p. 10).

We will use the BBQ methodology to identify turning points in the log-level of a series. A complete business cycle comprises of two phases, the contraction or recession phase (from peak to trough) and the expansion phase (from trough to the next peak). Financial cycles closely follow that of business cycles. We will call the recovery phase of a financial (business) cycle the upturn (expansion) and the contraction phase as a downturn (contraction).

We will define the features of financial and business cycles in terms of the frequency, duration, amplitude, and the slope of the cycle, where:

- **Frequency:** the frequency of a downturn (upturn) refers the proportion of time in which a country is in a contraction (expansion) relative to the sample period considered.
- **Duration:** the duration of a downturn, D_c , is the number of quarters within which a certain variable moves from a peak to the next trough. Likewise, the duration of an upturn, D_u , is the number of quarters it takes for a particular variable f_t to reach its previous peak after the trough.
- **Amplitude:** The amplitude of a downturn, A_c , measures the change in a variable of interest f_t from a peak (f_0) to the next trough (f_k), i.e., $A_c = f_k - f_0$. The amplitude of an upturn, A_u , measures the change in f_t from a trough to the next peak. Where the amplitude is expressed in percentage terms.
- **Slope:** the slope of a financial downturn is the ratio of the amplitude to the duration of the downturn. Likewise, the slope of an upturn is the ratio of the change of a variable from the trough to the next peak divided by its duration. Thus, the slope measures the violence of a given cyclical phase as it takes into account the pace of changes in the variable of interest.

The degree of synchronization between business and financial cycles will be evaluated using the concordance index developed by Harding and Pagan (2002, pp. 1681-1690). The index, CI_{xy} for variables x and y is defined as:

$$CI_{xy} = (1/T) \sum_{t=1}^T \{C_t^x \cdot C_t^y + (1 - C_t^x) \cdot (1 - C_t^y)\} \quad (1)$$

Where:

$C_t^x = \{0, \text{if } x \text{ is in a recession phase at time } t; 1, \text{if } x \text{ is in an expansion phase at time } t\}.$

$C_t^y = \{0, \text{if } y \text{ is in a recession phase at time } t; 1, \text{if } y \text{ is in an expansion phase at time } t\}.$

In equation (1), both C_t^x and C_t^y are binary variables, whose values change depending on the phase of the cycle of the underlying series. Given that T denotes the number of time periods in the sample, the concordance index provides a measure of the proportion of time the two series representing financial and business cycles are in the same phase. The series are considered as perfectly procyclical (countercyclical) if the concordance index is equal to unity (zero).

It is evident that for a single country, the concordance index expressed by equation (1) gives us an overall quantitative measure of the synchronization between business and financial cycles. That's why we propose using the following hybrid equation to have a time varying measure that reflects the degree of synchronization between business and financial cycles over the sample period considered.

$$CI(xy)_t = \{C_t^x \cdot C_t^y + (1 - C_t^x) \cdot (1 - C_t^y)\} \quad (2)$$

Where, variables have the same definitions, but the value of this index at any data point would be either one or zero, where a unity value means the coincidence of cycle phases for both business and financial cycles in this data point and vice versa.

4-2-2- Vector Autoregression (VAR) Model:

We will use a vector autoregression model to investigate the effects of financial (credit) cycles on the real economy in Saudi Arabia under a monetary transmission mechanisms framework. The endogenous variables included in the model are real GDP (y_t), consumer prices (p_t), domestic credit (m_t), domestic nominal short-term interest rate (s_t) and the real effective exchange rate (x_t), as expressed by the following vector:

$$Y_t = [y_t \ p_t \ m_t \ s_t \ x_t] \quad (3)$$

In addition to the aforementioned endogenous variables, we have a vector of exogenous variables to account for other factors related to the world economy which affect the system. Exogenous variables are nominal world oil prices (op_t), U.S. real GDP (y_t^*), and the U.S. nominal short-term interest rate (s_t^*), which could be expressed by the following vector:

$$X_t = [op_t \ y_t^* \ s_t^*] \quad (4)$$

It is worth mentioning that variables were ordered in the model as in equations (3 & 4). We will use the domestic credit gap instead of domestic credit itself, the latter has been used by Cevik, and Teksoz (2012, p.15), but we used credit gap to assess the effects of credit cycles on the real economy explicitly. The credit gap variable included in our model was calculated as the relative deviation of the actual values of bank credit to the private sector from its trend, using the Hodrick Prescott Filter.

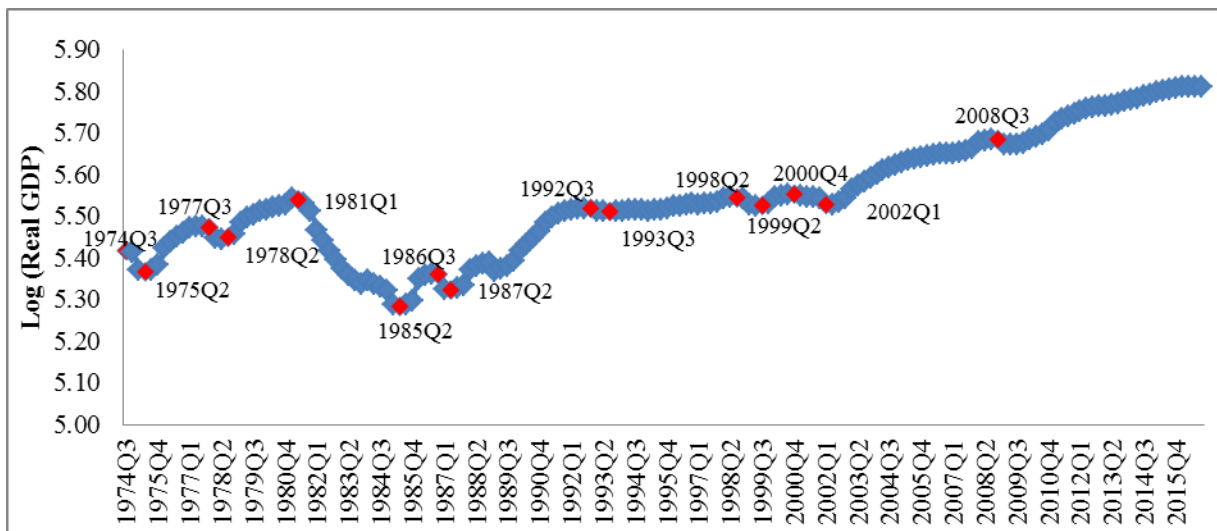
All variables were tested for stationarity using the Augmented Dickey Fuller (ADF) unit root test, and then they entered the model in their stationary states. Also, lag length criteria were used to determine the appropriate lag length for the model, and diagnostic tests were used to ensure the reliability of our empirical results.

4-3- Empirical Results:

4-3-1- Features of Business and Financial Cycles:

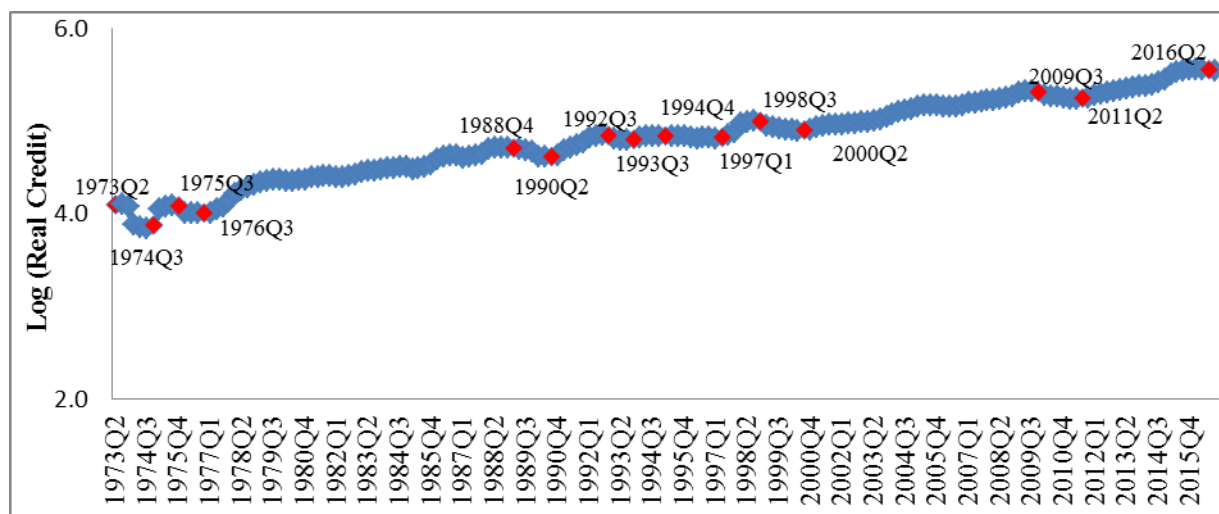
The BBQ cycle dating algorithm has been used to identify turning points in both business (real GDP) and financial (credit) cycles, which can be easily visualized in figures (5 & 6), respectively. The features of business and financial cycles will be compared hereunder according to duration, amplitude, slope and the frequency.

Figure (5): Turning Points in Real GDP Series (1970Q1- 2016Q4)



Source: Author's Calculations.

**Figure (6): Turning Points in Real Bank Credit to the Private Sector Series
(1970Q1- 2016Q4)**



Source: Author's Calculations.

As for business cycles, the duration of economic expansions ranges between (5 to 26) quarters, while it ranges between (3 to 17) quarters for contractions; implying that it takes a longer time for real GDP to reach a peak after a trough compared to the period within which it can move from a peak to the next trough. Moreover, the duration of a business cycle ranges between (10 to 31) quarters. The amplitude of a business cycle ranges between (6.7 to 57.1) for economic expansions and (-0.7 to -45) for contractions; which reflects the range of potential fluctuations in real GDP over the business cycle. The slope of a business cycle ranges between (0.4 to 4) and (-0.2 to -2.9) for expansions and contractions, respectively (Table 1). The means and the medians of the aforementioned indicators could be beneficial to compare between the characteristics of business cycle episodes, it is evident from (Table 3) that the duration of expansions is longer than that for contractions, and also both the amplitude and the slope for expansions are higher than those for contractions. It is noteworthy that the frequency of contraction episodes is relatively higher than that for expansions, with an average of around 68 percent and 22 percent for them, respectively (Table 3).

As for financial cycles, the duration of financial upturns ranges between (4 to 49) quarters, while it ranges between (4 to 9) quarters for downturns; which means that it takes a longer time for real bank credit to the private sector to reach a peak after a trough compared to the period within which it can move from a peak to the next trough. Moreover, the duration of a financial cycle ranges between (9 to 53) quarters. The amplitude of a financial (credit) cycle ranges between (10.7 to 423) for upturns and (-7.4 to -44) for downturns; which reflects the range of potential fluctuations in real credit over the financial cycle. The slope of a financial cycle ranges between (2.1 to 18.4) and (-0.8 to -8.8) for both upturns and downturns, respectively (Table 2). Besides the min-max values for the previously mentioned indicators, means and medians could be adequate for comparison purposes; where it is noticed in (Table 3) that the duration of upturns are longer than that for downturns, also both the amplitude and the slope for upturns are higher than those for downturns. It is noteworthy that the frequency of downturn episodes is relatively higher than that for upturns, with an average of around 72 percent and 24 percent for them, respectively (Table 3).

So far we have outlined the within-cycle differences for both business and financial cycles, it would be important to highlight the differences between business and financial cycles in terms of the aforementioned criteria. The duration of financial upturns (downturns) are longer than that for economic expansions (contractions) in means. Also, both the amplitude and the slope for upturns (downturns) are higher than those for expansions (contractions) in means.

Moreover, it is evident also from (Table 3) that financial cycle episodes are more frequent than business cycle episodes.

Table (1): Features of Business Cycles (1970Q1- 2016Q4)

Dates			Duration (Quarters)			Amplitude		Slope	
Peak1	Peak2	Trough	Contraction	Expansion	Cycle	Contraction	Expansion	Contraction	Expansion
1974Q3	1977Q3	1975Q2	3	9	12	-0.7	28.5	-0.2	3.2
1977Q3	1981Q1	1978Q2	3	11	14	-6.5	25.1	-2.2	2.3
1981Q1	1986Q3	1985Q2	17	5	22	-45.0	19.9	-2.6	4.0
1986Q3	1992Q3	1987Q2	3	21	24	-8.6	57.1	-2.9	2.7
1992Q3	1998Q2	1993Q3	4	19	23	-1.8	8.0	-0.4	0.4
1998Q2	2000Q4	1999Q2	4	6	10	-4.4	6.7	-1.1	1.1
2000Q4	2008Q3	2002Q1	5	26	31	-5.6	43.3	-1.1	1.7

Source: Author's Calculations.

Table (2): Features of Financial Cycles (1970Q1- 2016Q4)

Dates			Duration (Quarters)			Amplitude		Slope	
Peak1	Peak2	Trough	Downturn	Upturn	Cycle	Downturn	Upturn	Downturn	Upturn
1973Q2	1975Q3	1974Q3	5	4	9	-44.0	73.4	-8.8	18.4
1975Q3	1988Q4	1976Q3	4	49	53	-17.7	423.0	-4.4	8.6
1988Q4	1992Q3	1990Q2	6	9	15	-22.1	71.7	-3.7	8.0
1992Q3	1994Q4	1993Q3	4	5	9	-10.3	10.7	-2.6	2.1
1994Q4	1998Q3	1997Q1	9	6	15	-7.4	55.5	-0.8	9.2
1998Q3	2009Q3	2000Q2	7	37	44	-20.8	163.0	-3.0	4.4
2009Q3	2016Q2	2011Q2	7	20	27	-15.8	106.5	-2.3	5.3

Source: Author's Calculations.

Table (3): General Features of Business and Financial Cycles in Saudi Arabia (1970Q1- 2016Q4)

Indicator	Business Cycles (Means)		Business Cycles (Medians)	
	Expansion	Contraction	Expansion	Contraction
Frequency	0.22	0.68	-	-
Duration (quarters)	14	6	11	4
Amplitude	26.9	-10.4	25.1	-5.6
Slope	2.2	-1.5	2.3	-1.1
Cycle (quarters)	19		22	

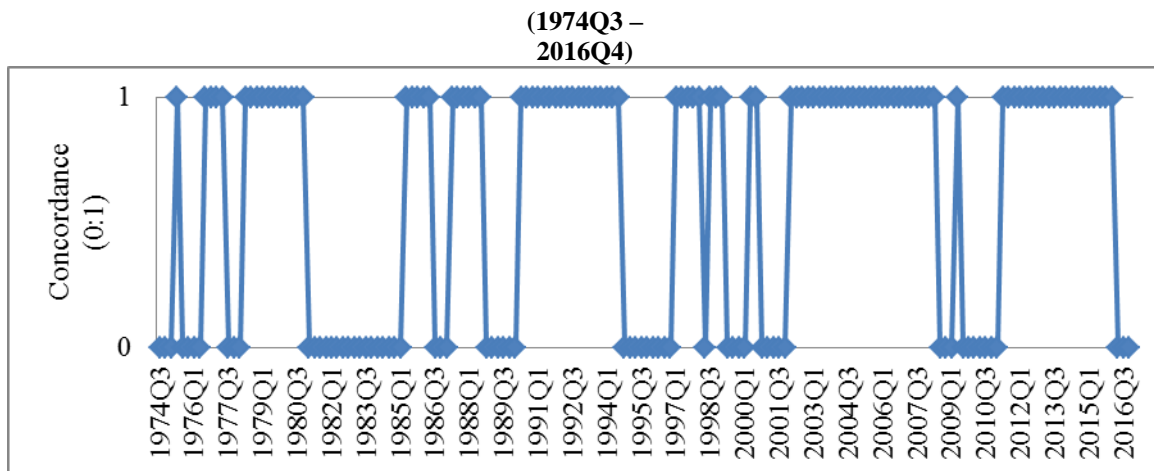
Indicator	Financial Cycles (Means)		Financial Cycles (Medians)	
	Upturn	Downturn	Upturn	Downturn
Frequency	0.24	0.72	-	-
Duration (quarters)	19	6	9	6
Amplitude	129.1	-19.7	73.4	-17.7
Slope	8	-3.6	8	-3
Cycle (quarters)	25		15	

Source: Author's Calculations.

In order to answer the second question of interest regarding the degree of synchronization between business and financial cycles in Saudi Arabia, we used the concordance index expressed by equation (1) and results revealed that the index equals 0.60; which means that cycles in output and credit are typically in the same phase about 60 percent of the time.

As mentioned earlier, the concordance index expressed by equation (1) gives us an overall quantitative measure regarding the degree of synchronization between business and financial cycles. That's why we used the hybrid index expressed by equation (2) to have a time varying measure that reflects the degree of synchronization between business and financial cycles over the sample period considered. It is evident from (Figure 7) that business and financial cycles in Saudi Arabia have been synchronized to a considerable degree over the period (1974Q3 – 2016Q4), albeit cycles are not perfectly synchronized.

Figure (7): The Synchronization of Business and Financial Cycle Episodes

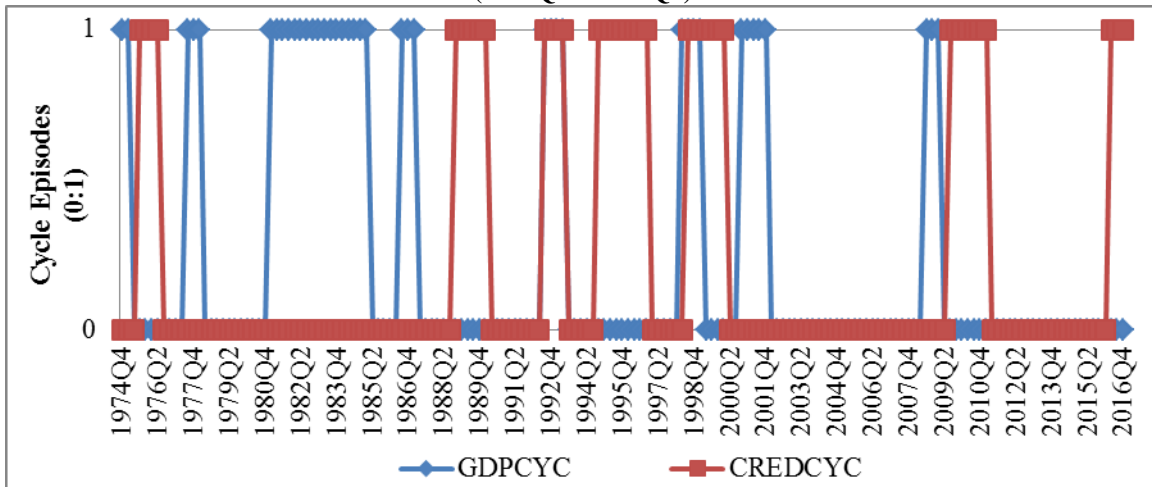


Source: Author's Calculations.

In order to answer the third question of interest regarding the link between the duration of cyclical episodes in the real sector and the degree of synchronization between business and financial cycles in Saudi Arabia, we investigated the relationship between the duration of cyclical episodes for the real sector (GDPCYC) and the degree of synchronization between business (GDPCYC) and financial (CREDCYC) cycles. It is easily visualized from (Figure 8) that contractions accompanied with financial downturns tend to be longer and deeper than other contractions; which emphasize the idea that a higher degree of synchronization between financial and business cycles accentuates the duration of economic contraction episodes; which could be explained by the idea that contractions associated

with one type of a financial downturn are often accompanied with stress in other financial markets as contractions associated with credit crunches will coincide with substantial drops in both house and equity prices; hence any shocks to the financial sector are transmitted to the real sector.

Figure (8) : The Relationship between the Duration of Cyclical Episodes in the Real Sector and the Synchronization of Business and Financial Cycles (1974Q3 – 2016Q4)



Source: Author's Calculations.

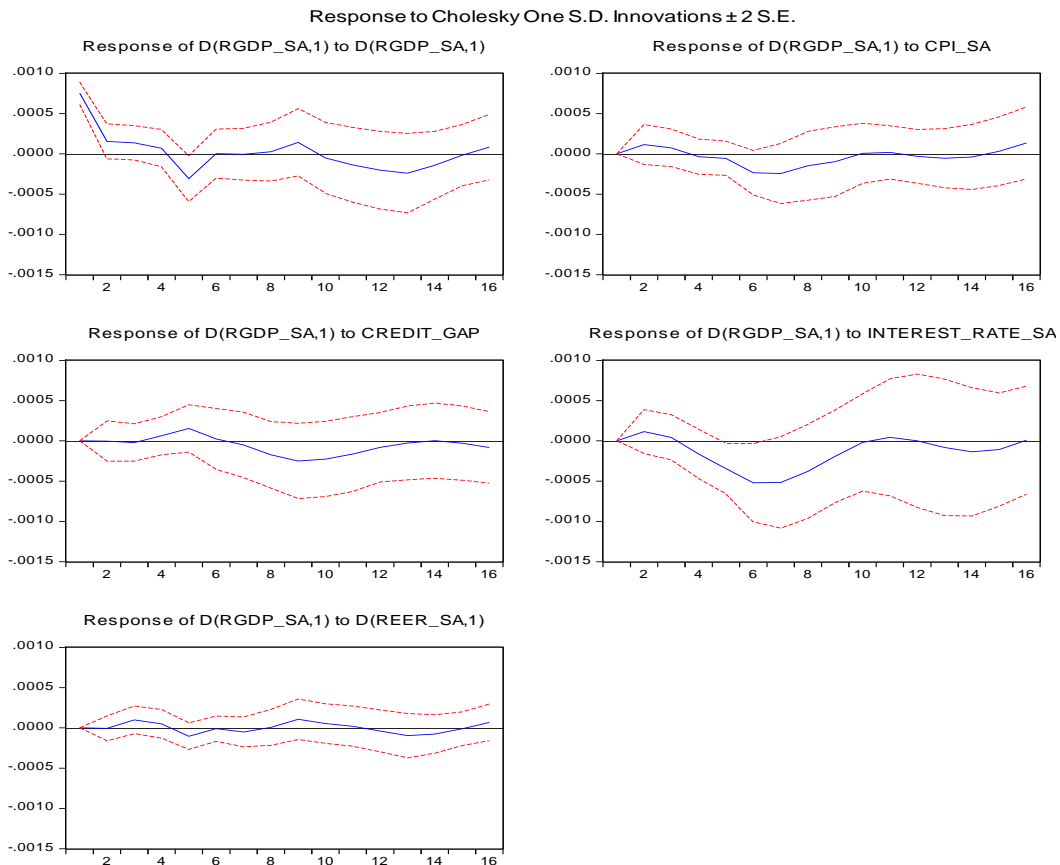
4-3-2- Effects of Financial Cycles on the Real Economy:

The Lag Length of the (VAR) model was determined using both Akaike information criterion and Schwarz information criterion, hence we used five lags. Impulse response functions were used to easily visualize the response of real GDP to shocks in credit gaps; hence evaluating the effect of financial cycles on the real economy.

It is evident from figure (9) that a positive shock to domestic credit gap can have a positive effect on real GDP, which means that financial upturns (downturns) are expected to have a positive (negative) effect on the real economy. Also, the forecast error variance decomposition for real GDP confirms the importance of financial conditions for economic stability, where in a four-year window about 9.6 percent of the variance in real GDP's forecasting errors is attributed to disturbances in domestic credit gap (Table 4).

It is noteworthy that diagnostic tests were used to ensure that the model does not suffer from serial correlation, heteroscedasticity, normality and stability problems. The results of these tests are summarized in table (5).

Figure (9): Impulse Responses of Real GDP to Different Shocks



Source: Author's Calculations.

Table (4): Forecast Error Variance Decomposition for Real GDP

Period	S.E.	D(RGDP_SA,1)	CPI_SA	CREDIT_GAP	INTEREST_RATE_SA	D(REER_SA,1)
1	0.000754	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.000786	95.73908	2.121186	0.001318	2.132973	0.005448
3	0.000809	93.29829	2.828044	0.065549	2.294072	1.514042
4	0.000833	88.70782	2.840262	0.655498	6.017521	1.778902
5	0.000972	75.17557	2.419072	3.002766	16.96579	2.436798
6	0.001127	55.86625	6.134379	2.275955	33.90458	1.818838
7	0.001266	44.32223	8.570457	1.970583	43.53674	1.599986
8	0.001341	39.54545	8.855994	3.436740	46.73312	1.428697
9	0.001392	37.74447	8.693231	6.415053	45.24007	1.907176
10	0.001412	36.80182	8.448209	8.783930	43.97252	1.993521
11	0.001429	36.84899	8.263617	9.889322	43.03017	1.967904
12	0.001447	37.94353	8.112006	9.953854	41.99666	1.993959
13	0.001473	39.25152	7.959757	9.630164	40.80520	2.353359
14	0.001489	39.34094	7.862449	9.430157	40.79780	2.568648
15	0.001493	39.10492	7.859099	9.405936	41.07129	2.558758
16	0.001506	38.77863	8.537907	9.551220	40.41064	2.721601

Cholesky Ordering: D(RGDP_SA,1) CPI_SA CREDIT_GAP INTEREST_RATE_SA D(REER_SA,1)

Source: Author's Calculations.

Table (5): Diagnostic Tests for VAR Model

Test	Null Hypothesis	Test Statistic	p.value
VAR Residual Serial Correlation LM Tests	no serial correlation at lag order h	29.41998	0.2467
VAR Residual Heteroskedasticity Test	no hetroskedasticity problem	864.1044	0.2747
VAR Residual Normality Tests (Jarque Berra)	residuals are multivariate normal	86.79844	0.0000
VAR Stability Test (Roots of Characteristic Polynomial)	VAR satisfies the stability condition	No root lies outside the unit circle	

Source: Author's Calculations.

5- Conclusion:

Financial and macroeconomic stabilities are deemed as two sides of the same coin due to the feedback loops between them. The global financial crisis, which began September 2008, emphasized the fact that macroeconomic stability per se is important but not sufficient for a healthy economy. Financial stability is crucial to avoid the buildup of excessive systemic risks in the financial system that could hamper economic growth.

Financial cycles have become vividly tracked and analyzed by regulatory authorities responsible for financial stability and Macro-prudential policies. However, fiscal policy usually pays an exclusive attention to business cycles; which in turn might leave fiscal outcomes exposed to financial sector dynamics that are beyond business cycle fluctuations.

This paper tries to fill the gap in empirical analysis on business and financial cycles in Saudi economy. As far as we know, no empirical studies have investigated the features of financial and business cycles in Saudi Arabia, the contribution of this paper is fourth fold as follows: **First:** Exploring the features of financial as well as business cycles in Saudi economy in terms of frequency, duration, amplitude and slope. **Second:** Assessing the degree of synchronization between financial and business cycles. **Third:** Evaluating the relationship between the duration of cyclical episodes in the real sector and the synchronization of business and financial cycles. **Fourth:** Investigating the effect of financial (credit) cycles on the real economy.

We used two methodologies to answer our research questions; the first methodology was the BBQ cycle dating algorithm, whereby we used the results in answering our first three questions, while the second methodology was the Vector Autoregression (VAR) model which was used to assess the effect of financial cycles on the real economy.

The main findings of the paper could be summarized as follows:

- Government plays an important role in Saudi economy, where the share of government in total final consumption and total expenditures on GDP over the period (2007-2016) recorded an average of about 40.9 percent and 22.4 percent, respectively; which reflects the size of government and the role of fiscal policy in the economy.
- The fiscal stance in Saudi economy has become more procyclical over the period (2014Q1:2016Q4) despite the economic slowdown which resulted from the persistent low world oil prices.
- The duration of economic expansions is usually longer than that for contractions; also both the amplitude and the slope for expansions are higher than those for contractions.
- The duration of financial (credit) upturns are longer than that for downturns, also both the amplitude and the slope for upturns are higher than those for downturns.
- The duration of financial upturns (downturns) are longer than that for economic expansions (contractions) in means, also both the amplitude and the slope for upturns (downturns) are higher than those for expansions (contractions) in means. Moreover, financial cycle episodes are more frequent than business cycle episodes.
- Output and credit are typically in the same phase about 60 percent of the time, albeit cycles are not perfectly synchronized.

- Economic contractions accompanied with financial downturns tend to be longer and deeper than other contractions; which emphasize the idea that a higher degree of synchronization between financial and business cycles accentuates the duration of economic contraction episodes.
- Financial upturns (downturns) are expected to have a positive (negative) effect on the real economy. Moreover, financial conditions are crucial for economic stability.

From the aforementioned results, we can conclude that the Macro-prudential measures implemented by the monetary authority to tighten credit growth during an economic slowdown are intuitive and reasonable for risk management purposes that ensure the surveillance of the banking system. However, fiscal policy can play an important role in fostering economic growth through the implementation of a countercyclical policy that allows for the accumulation of fiscal buffers during expansions and releasing them during periods of an economic slowdown. Paying attention to the synchronization of financial and business cycles is important when forecasting the structural fiscal balance, in addition to the setup of early warning systems for business and financial cycles. In this context, the implementation of fiscal rules could be beneficial for commitment and transparency and the avoidance of a procyclical fiscal stance. Finally, fiscal policy reaction functions should account for both business and financial cycles.

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