The dynamic response patterns of output to credit: the case of Saudi Arabia

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Abstract: This paper examines the dynamic relationships between output and credit in the Kingdom of Saudi Arabia for the sample period 1971–2012 using annual data. The study uses the VECM in which the non-oil private real GDP and real credit are included as endogenous variables. The estimated VECM provides empirical evidence suggesting roughly the weak involvement of the banking sector in the economic activity. However, the residual patterns suggest a possible specification error that can be attributed to wrong functional form or excluding some relevant variables. To avoid this potential problem the government spending and several dummy that may reflect the major developments in the credit behaviour are incorporated in the model. The estimated new VECM yields empirical evidence suggesting the importance government spending and credit in driving the economic activity. In addition, the model shows a better explanatory power.

Keywords: stationary; vector error correction model; credit; shifts in credit behaviour; cointegration; specification error; output-credit nexus; Saudi Arabia.

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1 Introduction

Despite the large amount of empirical work conducted on the dynamic dependence patterns between credit and economic development, the relationship between these two variables continues to be the subject of considerable lively controversy among researchers (Sangjoon, 2101; Disbudak, 2010). In these studies, researchers use to make a clear distinction between 'supply-leading' and 'demand following' responses. According to supply-leading approach, the financial sector leads the real sector and induces economic growth by channelling scarce resources from surplus spending units to deficit spending units or investors. Thus, development of financial sector is expected to precede the development of the real sector. In contrast, the proponents of demand-following approach argue that lack of financial growth is a symptom of a lack of demand for financial services, and thus real sector of the economy leads the level of financial development (Shen and Lee, 2006).

The policy implication of supply leading approach is that in order to promote economic growth, bank credit can play an essential role in creating productive capacities and generating new technologies. This argument is basically based on the theory of financial repression which states that financial repression can be blamed for negative economic growth in countries that are less financially liberalised and positively with growth in countries that are more financially liberalised. Therefore, liberal economists suggest that abolishing interest rate is a necessary policy in both developing and developed countries. They also recommend to improve and to deepen financial structure to have a stabilised and strong economy. Furthermore, Arestis and Basu (2008) and Ang and McKibbin (2007) argue that the role of financial institutions in developed countries is very different from the one they play in developing countries.

The purpose of this study is to examine the dynamic response patterns of output to credit in Saudi Arabia for the sample period 1971–2012, where data are available. The banking sector in Saudi Arabia has been criticised in many empirical studies for its insignificant involvement in driving the development mechanism. Espinoza et al. (2010) show that the loan to deposit ratio for Saudi Arabia is low as compared to other Gulf Cooperation Council (GCC) countries. Saudi Arabia's ratio in 2008 is around 87% as compared to around 139% for Oman, 132.4% for Bahrain, 96.5% for Kuwait, and 86.4% for Qatar. UAE is found to have the lowest loan to deposit ratio which is around 84%. With respect to the penetration level measured in terms of deposit to GDP ratio in 2008, this ratio stood at around 47% for Saudi Arabia compared to 90.8% for UAE, 61.1% for Bahrain, 58.3% for Kuwait, 54.4% for Qatar, and 30.9% for Oman. These figures reflect roughly the weak involvement of the banking sector in the economic activity, although the Saudi Arabia's banking system is found to be among the safest in the world (Almazari and Almumani, 2012).

Several empirical studies were conducted to examine the factors behind the weak bank credit-economic growth nexus (Yuliya et al., 2007; Viral et al., 2011). These studies suggested evidence showing that the weak relationship is basically attributed to the structure of the banking sector, the banking regulations, monetary policy, and cultural and religious factors. In addition to these studies, the Standard & Poor's study, also, provided evidence supporting the hypothesis that banking sector in Saudi Arabia is likely to be the biggest beneficiary from the various regulatory steps conducted by the government to enhance economic activity.

In this study, we will be limiting our attention to specification errors in the vector of error correction model (VECM) used to examine the relationship between credit and economic growth.

That is, the 'omission of relevant variables' in the analysis generates inconsistency and bias in estimating the effects of variables, though a reduction in the variance of the estimator. This study proposes a set of dummy variables that reflect the major developments and restructuring of Saudi banking sector. These developments basically include restructuring of the banking sector, the banking regulations, monetary policy, and cultural and religious factors.

Over the last four decades, the banking sector in the Kingdom has witnessed major developments and structural shifts that may have impact on the credit behaviour. The first major development was the period up to 1980. In the beginning of the 1970s, the government began to encourage foreign banks to open branches within the Kingdom to keep pace with the significant increases in credit demand to finance major projects of infrastructure and industry. During the period 1976–1980, the Saudi Government started to promote a policy of converting foreign banks' branches into publicly traded companies with the participation of Saudi nationals. This policy was basically designed to enhance participation of Saudi investors in the rapidly expanding banking sector, and to promote formation of banking habits among population.

The second development in the Saudi banking sector was witnessed in the 1980s period. During this period, SAMA in cooperation with the Ministry of Finance implemented several measures to ensure the stability of the financial sector to overcome the prolonged economic downturn due to collapse of the oil market in mid-80s.

Another important development which adversely affected the banking sector was the challenge faced the banking sector from the invasion of Kuwait by Iraq in August 1990, which resulted in rapid increases in customer withdrawal of domestic deposits to be converted into foreign currency and transferred abroad. During post-war era, there was a rapid growth in the deposits of the banking system and banks' domestic loans and advances of about 20% and 90%, respectively, during the period 1990–1995.

The restructuring of the banking system has continued over the period 1996–2005. This represents another important development that could have significant effect on the relationship between credit growth nexus. During this period, the number of baking institutions increased rapidly as a result of the decision of the GCC Prime Ministers to permit reciprocal opening of their banking markets to their institutions. In addition, the banking system took the advantage of investments in new technologies by the introduction of a Real Time Gross Settlement Electronic Fund Transfer System (RTGSEFTS).

Since the beginning of 2008, most banks in Saudi Arabia have launched a fast-developing Islamic banking, either through a separate Islamic window or a subsidiary. Moreover, the division between the Islamic banks and conventional banks is reducing as many banks have a large chunk of their deposits as non-interest bearing which positively affected its spreads. The growth of the Islamic investment avenues are expected to strongly motivate investors to invest their money in these instruments.

Section 2 presents a brief review of literature. Section 3 presents the econometric methodology that will be employed. Section 4 presents the empirical results. Section 5 presents conclusions and directions for future research.

2 Literature review

Despite the extensive literature on the role of credit on economic growth, empirical studies conducted by applied econometricians have not reached a consensus and remained heterogeneous and controversial (Norman and Romain, 2006). Based on the technique and data employed, these studies can be divided into two groups. The studies used time-series for a specific country in general generate contradictory results with those of the cross-country studies. A study by Bloch and Tang (2003) explains these contradictory results for several reasons. First, using averages of the key variables by cross-country studies simply ignores how these variables interact over lengthy periods. Second, the cross-country studies make the simplistic assumption that each economy has a stable growth path. Third, the cross-country approach gives all countries, either small or large, an equal weight since they are assumed to be homogeneous. Fourth, there may be sample selection bias in the cross-country studies. Fifth, even if a significant causal relationship is observed in a large sample of countries, it represents only an average relationship, which may or may not apply to individual countries in the sample.

Favara (2007) examined the empirical relationship between financial development and economic growth. He provided empirical evidence suggesting that cross section and panel data instrumental variables regressions reveal evidence confirming that financial development and economic growth are correlated but financial development does not cause economic growth. Moreover, he provided evidence showing that the credit-growth relationship is quite heterogeneous across countries and that there is no clear indication that finance spurs economic growth.

Saci et al. (2009) conducted an empirical study focusing exclusively on a sample of developing countries and using proxies for financial development variables to capture both banking sector, such as credit to the private sector and liquid liabilities and stock market effects on economic growth. The study showed empirical evidence supporting a positive and significant relationship between stock market variables and economic growth. On the other hand, they provided evidence showing negative and significant relationship between the standard banking sector variables, and economic growth.

Vazakidis and Adamopoulos (2009) examined the relationship between credit development and economic growth for Italy, using annual data for the period of 1965–2007. They showed that economic growth has a direct positive effect on credit development, taking into account the negative effect of inflation rate on credit market development. They also showed that economic growth spurs credit market development at times of low inflation rates.

Mishra et al. (2009) examined the credit market development and the direction of causality that may exist between credit market development and the economic growth in India using annual data for the period of 1980–2008. They presented evidence supporting two ways causation running between credit market development and economic growth.

Disbudak (2010), thoroughly investigated the relationship between credit market development and economic growth for Turkey over the period of 1961–2008 using an ARDL-Bounds testing approach. The researcher investigated the relationship between bank credit and economic growth in the short run and long run. It is found that bank credit increases economic growth both in the short and the long run until 2002 after which the impact is reversed. The impact of inflation on economic growth is negative for the whole period.

Acaravci et al. (2007) addressed the empirical relationship between financial development and economic growth for Turkey using quarterly data over the period of 1986:1–2006:4. They tested the long-run and short-run causal relationship between financial development and economic growth carrying out VECM and VAR framework. They do not find any evidence of a long-run causal relationship between financial development and economic growth. However, their results show a one-way causality from financial development to the economic growth in the short-run.

Ramlogan et al. (2009) attempted to assess the impact of commercial bank credit on economic development using annual data for Trinidad and Tobago over the sample period 1970–2008. They employed a vector error correction model to firstly assess the relationship between credit and investment, and secondly to determine the casual directionality of the relationship (if any). The model found that overall, credit and growth tends to demonstrate a 'demand following' relationship. However, further analysis revealed a 'supply leading' relationship between credit and growth within key sectors of the non-oil economy.

Lewis-Bynoe et al. (2008) attempted to identify the determinants of credit booms in the Caribbean and to establish whether or not those credit booms led to sustained economic growth in the region using panel data. They identified three key groups of variables that made some contribution to the development of credit booms; macroeconomic developments, macroeconomic policy and external shocks. The authors established that in the case of the Caribbean, macroeconomic developments were one of the main contributors to credit booms. They also established that loose monetary policy and liberalisation of the capital account play a significant role in the development of credit booms. More importantly, the authors concluded that credit booms can be detrimental to an economy, particularly when such booms finance high risk investments.

3 The methodology

To examine the finance-growth nexus, the dynamic relationship between non-oil private real gross domestic product (Y_{1t}) and real domestic credit (Y_{2t}) is examined. All variables are measured in real magnitude (1999 = 100) and logarithmic form. In examining the effects of domestic credit on real GDP, we estimate the regression model

$$Y_{1t} = \beta_0 + \beta_1 Y_{2t} + e_t \tag{1}$$

There are many plausible reasons why economic time series data used in the present study may contain stochastic trends. Assuming stationarity when that is false might yield spurious regression that is associated with inconsistent and less efficient ordinary least squares (OLS) parameter estimates if non-stationary variables are not cointegrated (Kao, 1999; Granger et al., 2001). The distortion here implies that most of the statistics calculated from the regression involving the non-stationary time-series data do not follow the standard distributions. Thus, the significance of the test is overstated and a spurious regression result is obtained (Alkhatib and Mishal, 2006).

The stationarity properties of the data are empirically investigated using the Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1981) test. This test can be carried out by testing the presence of unit roots in time series-data in the regression model

$$\Delta Y_t = \delta\theta Y_{t-1} + \sum_i^n \phi_i \Delta Y_{t-i} + \eta_t \tag{2}$$

where Δ is the first-difference operator, Y_t is the series under consideration, η_t is a stationary random error, δ, θ, and ϕ_i's are parameters to be estimated. The hypothesis of non-stationarity is rejected when θ is significantly negative. Here n must be selected large enough to ensure that η_t is a white noise. In this study, the Akaike Information Criterion (AIC) (Akaike, 1969) is used to determine the appropriate lag length n that will be enough to ensure the stationarity of the error term η_t. The AIC is defined as

$$AIC = T * \ln(ESS / T) + 2k \tag{3}$$

where T is the sample size, ESS is the sum of squared errors of the regression equation (1), and k is the number of parameters, $k = n + 2$.

Once a unit root has been confirmed for each data series, the question is whether there exists some long-run equilibrium relationship among the variables (Y_{1t}, Y_{2t}). While the theory of cointegration reveals a long-run equilibrium relationship among the endogenous variables. An important issue in econometrics has been the need to integrate short-run with long-run equilibrium.

Cointegration tests are carried out using the method proposed by Johansen (1988). The Johansen method applies the maximum likelihood procedure to examine the presence of cointegrating vectors in non-stationary time series. Following Hendry and Juselius (2000), a two dimensional (2 × 1) vector autoregressive model with Gaussian errors can be expressed by

$$Y_t = \varphi_1 Y_{t-1} + \varphi_2 Y_{t-2} + \ldots + \varphi_k Y_{t-k} + \mu + \varepsilon_t \tag{4}$$

where $t = 1, 2, \ldots, T$, $Y_t = (Y_{1t}, Y_{2t}, Y_{2t})$, and $\varepsilon_t \approx$ i.i.d. $N(0, \Lambda)$. The covariance matrix of the error process, Λ, and the parameters φ_1, φ_2, φ_k, and μ are to be estimated. By taking first differencing on the vector level, the model in error correction form is

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \ldots\ldots + \Gamma_{k-1} \Delta Y_{t-k+1} - \Pi Y_{t-1} + \mu + \varepsilon_t \tag{5}$$

where $\Gamma_i = -(I - \varphi_1 - \varphi_2 - \text{----} \varphi_i)$ are short-run parameter matrices, $\Pi = (I - \varphi_1 - \varphi_2 - \text{-----} - \varphi_k)$ and the sub-index k is the lag-length. The matrix Π conveys information about the long-run relationship among Y_{1t}, Y_{2t} and Y_{3t}. Testing for cointegration involves testing for the rank of the Π matrix by examining whether the eigenvalues of Π are significantly different from zero. Three possible conditions exist:

a the Π matrix has full column rank, implying that Y_t is stationary in level to begin with

b the Π matrix has zero rank, in which case the system is a traditional first-differenced VAR

c the Π matrix has rank r such that $0 < r \leq 1$, implying that there exist r linear combinations of Y_t that are cointegrated.

If the condition (c) prevails, then the Π matrix can be decomposed into two $2 \times r$ matrices, α and β, such that $\alpha\beta' = \Pi$. The loading matrix α represents the error correction parameters, which can be interpreted as speed of adjustment, while the vectors of β represent the r linear cointegrating relationships such that $\beta' Y_t$ is stationary.

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Following Johansen (1988) and Johansen and Juselius (1990), the likelihood ratio will be used for testing the number of cointegrating vectors (or the rank of Π). The likelihood ratio statistic for the trace test is

$$LHR = -TT\sum_{i=1+r}^{p-2} Ln\left(1-\hat{g}_i\right) \tag{6}$$

where $\hat{g}_{r+1}$ …… $\hat{g}_p$ are the estimated $(p - r)$ smallest eigenvalues, and r is the number of cointegrating equations. Given that there are two variables in the model, there can be a maximum of one cointegrating vector. The null hypothesis to be tested is that there are at most r cointegrating vectors. That is, the number of cointegrating vectors is less than or equal to r, where r is 0 or 1. In each case, the null hypothesis is tested against the general alternative of $r + 1$ cointegrating vectors. Thus, the null hypothesis $r = 0$ is treated against the alternative that $r = 1$.

Since cointegration tests are very sensitive to the choice of lag length used in carrying out such tests, the Schwarz Criterion (SC) (Schwarz, 1978) will be used to select the optimal number of lags required in estimating the cointegration test. The SC is defined as follows.

$$SC = Ln\Omega_n^2 + \frac{nLn(N)}{N} \tag{7}$$

where Ω_n^2 is the maximum likelihood estimator of the residual variance obtained from a model with lag length n, that is $\Omega_n^2 = \frac{SSE_n}{N}$, N is the sample size, and n is the number of lags selected to numerically minimise SC in equation (7).

Engle and Granger (1987) showed that if two non-stationary variables (Y_{1t} and Y_{2t}) are cointegrated, the error-correction model is conducted for determining the causality. The error correction model is as follows.

$$\Delta LY_{1t} = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i}\Delta LY_{1t-1} + \sum_{j=1}^{n} \alpha_{2j}\Delta LY_{2t-j} + \gamma_1 EC_{1t-1} + \upsilon_{1t} \tag{8}$$

$$\Delta LY_{2t} = \beta_0 + \sum_{i=1}^{q} \beta_{1i}\Delta LY_{1t-1} + \sum_{j=1}^{r} \beta_{2j}\Delta LY_{2t-j} + \gamma_2 EC_{2t-1} + \upsilon_{2t} \tag{9}$$

where Δ is the first difference operator, and are white noise terms, and EC_{it-1} (i = 1, 2) is the error-correction term (lagged one period) derived from long-run cointegrating relationship to capture the long-run dynamics. The inclusion of these terms, which must be stationary if the variables are cointegrated, differentiates the error-correction model from the standard Granger causality test. The Granger tests involve tests on the significance of α_2's and β_2's conditional on the selected lag lengths m, n, q and r.

On the basis of error-correction models in (8) and (9), unidirectional causality from Y_{2t} to Y_{1t} is implied if not only the estimated coefficients on the lagged ΔY_{2t} variables in equation (8) are statistically different from zero as a group, but also the coefficient on the error correction term in equation (8) is significant, and if the set of estimated coefficients on the lagged ΔY_{1t} variables in equation (9) are not statistically different from zero. Similarly, Y_{1t} causes Y_{2t} if the estimated coefficients on the lagged ΔY_{1t} variable in equation (9) are statistically different from zero as a group, the coefficient on the error correction term in equation (9) is significant, and if the set of estimated coefficients on

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the lagged ΔY_{2t} variables in equation (8) are not statistically different from zero. Finally, feedback between Y_{2t} and Y_{1t} would exist if the set of estimated coefficients on the lagged ΔY_{2t} variables in equation (8) were statistically significant as a group and the set of estimated coefficients on the lagged ΔY_{1t} variables in equation (9) were also statistically significant as a group, and also the coefficients of error correction terms in both equations are significant.

However, it may be worth noting that the Saudi economy has witnessed several shifts in output, credit behaviour and even government spending during the sample period studied. Omitting these shifts from the model may have a relationship with both the dependent variable and one or more of the independent variables (omitted-variable bias). To overcome this potential problem, the VECM is modified to include government spending and a set of dummy variables reflecting the shifts in the Saudi economy. To consider these shifts, the real government spending (G) is included as an important exogenous variable affecting the behaviour of the economy. The government spending is also measured in real magnitude (1999 = 100) and logarithmic form. As it will be clearly shown in the next section, a set of dummy variables will be included to reflect the major structural changes in the behaviour of economy, and in particular the behaviour of bank credit.

4 The empirical findings

The finding that many macro time series may contain a unit root has spurred the development of the theory of non-stationary time series analysis. Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary, or I(0), linear combination exists, the non-stationary (with a unit root), time series are said to be cointegrated. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship between the variables. For example, income and bank credit are likely to be cointegrated. If they were not, then in the long-run output might drift above or below credit. The VECM specification restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing a wide range of short-run dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments

The study is carried out by using the VECM of Engle and Granger (1987). The VECM technique specifies the short-run dynamics of each variable in the system, and in a framework that anchors the dynamics to long-run equilibrium relationships suggested by economic theory. Breitung and Wulff (1999) showed that models based on a vector error correction model that explicitly estimate co-integrating relationships (if any) and unit roots are consistent and asymptotically optimal.

The first step in the empirical analysis begins with testing for stationarity. Non-stationarity of time series is an important problem as it tremendously impacts the way in which data should be treated. Non-stationary data cannot be analysed with traditional econometric techniques as in case of non-stationarity some basic model assumptions are not met and correct reasoning on relationships between non-stationary time-series is impossible.

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The most popular test of non-stationarity (unit root) is the ADF test with null hypothesis of non-stationarity. The most commonly forms (intercept, and intercept and trend) of the test are used to examine for stationarity of the time series. The lag length has been automatically based on AIC at maximum lag length equals 4. As shown in Table 1, it is obvious that with the exception of government spending (G), the test provides evidence supporting non-stationarity for real GDP (Y_1) and real credit (Y_2). The next step in testing for stationarity is to carry out the ADF with intercept and intercept and trend test on differenced non-stationary series in level. The same test is also carried out when the first difference series of (Y_1 and Y_2) are used. The test provides evidence supporting the stationarity of Y_1 and Y_2 at the usual significance levels. This result suggests that that cointegration tests between (Y_1 and Y_2) can be carried out since both variables are integrated of the same order I(1).

Table 1 ADF unit root test statistics

Exogenous: intercept					
Variable (level)	*Lag length*	*ADF-statistic*	*ADF critical statistics*		*AIC*
			1%	*5%*	
Y_1	3	1.139	–3.616	–2.941	–4.087
Y_2	2	–1.828	–3.610	–2.939	–3.610
G	1	–4.521	–4.521	–2.935	–0.404
Exogenous: intercept and linear					
Variable (level)	*Lag length*	*ADF-statistic*	*ADF critical statistics*		*AIC*
			1%	*5%*	
Y_1	3	–0.889	–4.219	–3.533	–4.099
Y_2	2	–2.476	–4.212	–3.530	–1.110
G	1	–4.064	–4.199	–3.524	–0.381
Exogenous: intercept					
Variable (level)	*Lag length*	*ADF-statistic*	*ADF critical statistics*		*AIC*
			1%	*5%*	
Y_1	0	–2.951	–3.605	–2.937	–1.889
Y_2	2	–4.173	–3.616	–2.941	–1.035
Exogenous: intercept and linear trend					
Variable (level)	*Lag length*	*ADF-statistic*	*ADF critical statistics*		*AIC*
			1%	*5%*	
Y_1	2	–10.703	–4.219	–3.533	–4.128
Y_2	2	–4.241	–4.219	–3.533	–1.005

Notes: All variables are in log forms. Y_1 = non-oil private real GDP, Y_2 = real banking outstanding credit, and G = real government spending. RE = real credit, RGTS= real government spending.

The second step in this analysis is to carry out the cointegraion test to examine for the existence of long run relationship between non-stationary endogenous variables (Y_1 and Y_2). The cointegration test based on Johansen and Juselius (1990) approach is presented

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in Table 2 under four different cointegration specifications using 1 and 2 lag length intervals. As shown in Table 2, the trace test suggests evidence supporting the cointegration between Y_1 and Y_2 in seven out of eight cases, confirming the long run relationship between non-oil private real GDP and the banking outstanding credit balances.

Table 2 Results from cointegration trace test based on Johansen-Juselius approach

Lag	*Hypothesised no. of CE(s)*	*Trace test*			*Cointegration test specification*
		Trace-statistic	*5% critical*	*1% critical*	
1	None	10.136	11.440	15.690	Assume no deterministic trend in data: no intercept or trend in CE or test VAR
	At most 1	0.158	3.840	6.510	
2	None*	14.762	12.530	16.310	
	At most 1	0.219	3.840	6.510	
1	None**	41.515	19.960	24.600	Assume no deterministic trend in data: intercept (no trend) no intercept in VAR
	At most 1	8.933	9.240	12.970	
2	None**	52.940	19.960	24.600	
	At most 1	9.212	9.240	12.970	
1	None**	36.099	15.410	20.040	Allow for linear deterministic trend in data: intercept (no trend) in CE and test VAR
	At most 1	3.054	3.760	6.650	
2	None**	43.195	15.410	20.040	
	At most 1	3.668	3.760	6.650	
1	None**	45.766	25.320	30.450	Allow for linear deterministic trend in data: intercept and trend in CE – no trend in VAR
	At most 1	10.055	12.250	16.260	
2	None**	50.538	25.320	30.450	
	At most 1	10.824	12.250	16.260	

Finally, the VECM is carried out to examine for the impact of real credit on private real GDP. The VECM was estimated with lag intervals 1, 2 and 3. The analysis in this study is limited to a lag length 1 for two reasons. The first is that no significant improvement is observed in the explanatory power of the VEC M with lag intervals 2 and 3. The second is that the minimum AIC is obtained at lag length 1. The results of the VECMfor lags 2 and 3 will be made available upon request to the author. With each lag interval, three VECMswere estimated. The VECM1 model is restricted to the endogenous variables (Y_1 and Y_2) in addition to constant term C as exogenous variable. The estimated model shows that bank credit turns out to have a positive impact on output which is statistically significant at the 5% level. The results presented in Table 3 show that the EC coefficients of equations (8) and (9) are significant and have negative signs implying that the series cannot drift too far apart and convergence is achieved in the long run. The estimated values of (R^2 = 0.805) suggest that the VECM equation 8 has very good explanatory power while the equation (9) has moderate strength (R^2 = 0.445) to explained respective dependent variable.

We, also, believe that government spending represents an important argument which may affect the relationship between the endogenous variable. Therefore, the government spending (G) is incorporated in the VECM2 as an exogenous variable to reflect the role of government on the relationship between the endogenous variables in the VEC model.

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The government spending turns out to have an impact on output which is statistically significant at the 1% level. The only radical change is seen in the estimates of the constant which turned out to be negative and significant at the 1% level in equation (8), and to negative but insignificant in equation (9). The remaining estimates almost remain unchanged, while the coefficient of determination R^2 increased by (0.05) in both equations. Finally, we return to the estimated (VECM3) with the dummy variables that are reflecting the shifts in the behaviour of the Saudi Economy in general and the behaviour of credit in particular. The most important thing to be mentioned is that the value of coefficient determination R^2 climbed to 0.93 in equation (8), and to 0.82 in equation (9), supporting the impact of these shifts on the credit behaviour. Another important noticeable change can be seen in the dramatic decline in the EC coefficient in equation (8), while the coefficients of the endogenous variables remain unchanged.

The VEC3 model is estimated in which government spending and six dummy variables are incorporated as exogenous variables. The first dummy variable is D_1 = {1 for 1973–1974, 0 otherwise). This dummy variable included to reflect the 1973 oil crisis started in October 1973 when the members of organisation of Arab Petroleum Exporting Countries (OAPEC) proclaimed an oil embargo. By the end of embargo in March 1974, the price of oil had risen from $3 per barrel to nearly $12. The dramatic increases in oil price have led to large fiscal and external surpluses and output has increased. This dummy variable turns out to positively affect the behaviour of output at the 1% level. The second dummy variable is D_2 = {1 for 1976, and 0 otherwise}. This dummy is to count for the uncertainty in the banking sector arose from the decision taken by the Saudi Government that all international banks operating in the Kingdom should become incorporated as local banks with majority Saudi shareholdings. The boom in oil revenues in the mid-1970s led to sharp rise in demand for banking products and service which the existing banks found difficult to cope with. The government quickly recognised the need for larger and more sophisticated banks. It also observed that capital invested in the banking sector was insufficient and inhibited banks from investing in branch networks, implementing new technology and training human resources. This decision is found to have adverse effect which is statistically significant at the 1% level for both output and credit. This result is very consistent with the expected result.

The third dummy variable is D_3 = {1 for 1986 and 0 otherwise). In the first half of 1986 crude oil prices fell to about $12 a barrel, back to their level of 1974. This adverse supply shock appears to have an impact which is negative but statistically insignificant at the usual significance level.

The fourth dummy variable is D_4 = {1 for 1990 and 0 otherwise) is included to stand for the considerable economic impact of the 1990 war, as *Saudi* economy grew only marginally through the *1990s* and in real terms actually fell in some years. The negative coefficient in equation (9) actually reflects the impact of uncertainty and instability in the banking sector due to the war.

The fifth dummy variable is D_5 = {1 for 2004 and 2005, 0 otherwise}. During this period most banks in the Kingdom have launched Islamic banking products, either through a separate Islamic window or a subsidiary. Islamic banking is turning into a fast-developing, highly-profitable banking product. In addition, Saudi Arabia's financial regulator SAMA has been active in liberalising the sector and has licensed a number of GCC-foreign banks to establish their presence in the Saudi market. It is clear that the launch of Islamic banking plays an important role in changing positively the attitude of

customers toward credit. Finally, the dummy variable D_6 = {1 for 2008 and 2009, 0 otherwise) is included to stand for the world financial crisis witnessed in the period 2008–2009. This collapse turns out to have negative but insignificant effect on output behaviour. This supports the idea that due to the structure of Saudi economy, its sound economic conditions, prudent and conservative supervisory framework, countercyclical fiscal and banking system policies, and other macroeconomic reasons, Saudi Arabia was not materially affected by the global financial crisis.

Table 3 Vector of error correction model estimates

	Lag interval = 1					
	VECM1		*VECM2*		*VECM3*	
	D(Y1)	*D(Y2)*	*D(Y1)*	*D(Y2)*	*D(Y1)*	*D(Y2)*
EC	–0.307**	–0.518**	–0.433**	–0.589**	–0.063	–0.343**
	–6.359	–4.406	–7.647	–3.812	–1.673	–3.864
$D(Y_1(-1)$	0.217*	–0.638*	0.041	–0.824**	0.358**	–0.441*
	2.098	–2.521	0.414	–3.017	4.052	–2.122
$D(Y_2(-1))$	0.155*	0.357*	0.158*	0.377*	0.115*	0.212
	2.260	2.128	2.653	2.317	2.392	1.881
C	0.034*	0.117**	–1.649**	–1.040	–1.128**	–1.399
	2.650	3.768	–4.146	–0.959	–2.916	–1.539
Ln(G)	-----	-----	0.137**	0.094	0.093**	0.123
			4.227	1.068	2.946	1.661
D_1	-----	-----	-----	-----	0.335**	0.102
					6.604	0.860
D_2	-----	-----	-----	-----	–0.175**	–0.560**
					–3.761	–5.135
D_3	-----	-----	-----	-----	–0.058	–0.088
					–1.356	–0.874
D_4	-----	-----	-----	-----	–0.027	–0.312**
					–0.661	–3.206
D_5	-----	-----	-----	-----	–0.002	0.258**
					–0.050	3.566
D_6	-----	-----	-----	-----	–0.051	0.071
					–1.557	0.910
	Summary statistics					
R^2	0.805	0.445	0.857	0.490	0.932	0.819
Adj. R^2	0.789	0.399	0.840	0.432	0.908	0.757
F-statistic	49.643	9.625	52.346	8.423	39.521	13.166
AIC	–2.654	–0.870	–2.911	–0.905	–3.351	–1.643
SC	–2.485	–0.701	–2.700	–0.694	–2.886	–1.178

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5 Conclusions and directions for future research

This study has investigated the dynamic response patterns of credit-growth in Saudi Arabia for the sample period 1971-2012, using annual data. In this paper, we explore the relationship between private real GDP (Y_1) and real credit (Y_2) using the VECM approach. The VECM was modified to include a set of exogenous variables that may affect the relationship between the endogenous variables. The exogenous variables include the government spending and a set of dummy variables that stand for credit developments and shifts in the Saudi economy.

The ADF test provided results confirming the non-stationarity of real GDP and real credit, and the stationarity of government spending. The Johansen-Juselius model revealed evidence supporting the existence of cointegration between real GDP and real credit.

The estimated VEC model showed empirical evidence revealing that bank credit turns out to have a positive impact on output which is statistically significant at the 5% level. The government spending appears to have an impact on real GDP which is statistically positive and significant at the 1% level of significance. This result is in line with most of the literature on the effects of government expenditures on growth.

With respect to the effect of dummy variables on the economic growth, the VEC model revealed evidence confirming a positive and significant relationship between oil price and economic growth. This result confirms the fact that oil exports have the greatest effect on economic growth (Alodadi and Benhin, 2015).

The study also observed that the credit growth has been hardly hit in two periods as a result of the uncertainty arose from the decision taken by the Saudi Government that all banks operating in the Kingdom should become incorporated as local banks with majority Saudi shareholdings in 1976, and the uncertainty resulted from the invasion of Iraq to Kuwait in 1990. On the other hand, the credit growth showed positive and significant response during periods when Saudi Arabia had launched Islamic banking products, either through a separate Islamic window or a subsidiary.

The results also showed that the EC coefficients of equations (8) and (9) are significant and have negative signs implying that the series cannot drift too far apart and convergence is achieved in the long. However, when the VEC model estimated with the set of dummy variables counting for the impact of shifts in the behaviour of credit, the EC coefficients turn out to be negative in both equation, but significant at 1% level in the credit equation. This result implies that the series cannot drift too far apart and convergence is achieved in the long.

The collateral regime for real estate and movables in Saudi Arabia seems to be obsolete, and does not help banks to channel funds into construction and manufacturing sectors. Therefore, credit to these sectors does not spur investment and stimulate economic growth. To overcome this potential barrier, the Saudi Arabia is strongly advised to identify conditions and challenges facing financial system, and to review laws and regulation that could facilitate access to funds while preserving the stability of the financial sector.

A future research that distinguishes between stock and flow effects of credit on growth and between the uses of credit into ‘non-financial business and consumption’ and ‘financial and real estate’ credit may provide better information about the credit-growth

nexus. Nonlinearities in the credit-growth relation could also be explored in different settings.

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References

Acaravci, A., Ozturk, I. and Acaravci, S. (2007) 'Finance – growth nexus: evidence from Turkey', *International Research Journal of Finance and Economics*, Vol. 11, No. 1, pp.30–40.

Akaike, H. (1969) 'Fitting autoregressive models for prediction', *Annals of the Institute of Statistical Mathematics*, Vol. 21, No. 1, pp.243–247.

Alkhatib, S. and Mishal, Z. (2006) 'The finance-growth relationship: the case of Jordan 1972–2002', *Journal of Economic & Administrative Sciences*, Vol. 22, No. 5, pp.36–50.

Almazari, A. and Almumani, M. (2012) 'Measuring profitability efficiency of the Saudi national banks', *International Journal of Business and Social Science*, Vol. 3, No. 14, pp.176–185.

Alodadi, A. and Benhin, J. (2015) 'Long term economic growth in oil-rich Saudi Arabia: what is the role for non-oil sectors?', *Economic Issues*, Part 1, Vol. 20, No. 1, pp.109–130.

Ang, J.B. and McKibbin, W.J. (2007) 'Financial liberalization, financial sector development and growth: evidence from Malaysia', *Journal of Development Economics*, Vol. 84, No. 1, pp.215–233.

Arestis, P. and Basu, S. (2008) 'The role of finance and credit in economic growth development', in Dutt, A.K. and Ros, J. (Eds.): *International Handbook of Development Economics*, Vol. 1, Edward Elgar, Northampton.

Bloch, H. and Tang, S.H.K (2003) 'The role of financial development in economic growth', *Progress of Development Studies*, Vol. 3, No. 3, pp.243–251.

Breitung, J. and Wulff, C. (1999) *Nonlinear Error Correction and the Efficient Market Hypothesis: The Case of German Dual-Class Shares*, SFB 373 Discussion papers 1999, 67, Humboldt University of Berlin, Interdisciplinary Research Project 373: Quantification and Simulation of Economic Processes.

Dickey, D. and Fuller, W.A. (1981) 'Likelihood ratio statistics for autoregressive time series with a unit root', *Econometrica*, Vol. 49, No. 4, pp.1057–1072.

Disbudak, C. (2010) 'Analyzing the bank credit-economic growth nexus in Turkey', *European Journal of Economics, Finance and Administrative Sciences*, Vol. 23, No. 1, pp.34–48.

Engle, R.F. and Granger, C.W.J. (1987) 'Co-integration and error correction: representation, estimation and testing', *Econometrica*, Vol. 55, No. 2, pp.251–276.

Espinoza, R., Prasad, A. and Williams, O. (2010) *Regional Financial Integration in the GCC*, IMF Working Paper, WP/10/90/.

Favara, G. (2007) *An Empirical Reassessment of the Relationship between Finance and Growth*, National Centre of Competence in Research Financial Valuation and Risk Management Working paper No. 396.

Granger, C.W.J., Hyung, N. and Jeon, Y. (2001) 'Spurious regression with stationary series', *Applied Economics*, Vol. 33, No. 7, pp.899–904.

Hendry, D.F. and Juselius, K. (2000) 'Explaining cointegration analysis: part I', *Energy Journal*, Vol. 21, No. 1, pp.1–42.

Johansen, S. (1988) 'Statistical analysis of cointegration vectors', *Journal of Economic Dynamics and Control*, Vol. 12, Nos. 2–3, pp.231–254.

Johansen, S. and Juselius, K. (1990) 'Maximum likelihood estimation and inference on cointegration – with application to the demand for money', *Oxford Bulletin of Economics and Statistics*, Vol. 52, No. 2, pp.169–210.

Kao, C. (1999) 'Spurious regression and residual-based tests for cointegration in panel data', *Journal of Econometrics*, Vol. 90, No. 1, pp.1–44.

Lewis-Bynoe, D., Howard, S. and Moore, W. (2008) *Determinants of credit booms in the Caribbean*, Working paper, Central Bank of Barbados.

Mishra, P.K., Das, K.B. and Pradhan, B.B. (2009) 'Empirical evidence on Indian stock market efficiency in context of the global financial crisis', *Global Journal of Finance and Management*, Vol. 1, No. 2, pp.149–157.

Norman, L. and Romain, R. (2006) 'Financial development, financial fragility, and growth', *Journal of Money, Credit and Banking*, Vol. 38, No. 4, pp.1051–1076.

Ramlogan, A., Mitchell-Ryan, T. and Daryl, C. (2009) *An Assessment of the Impact of the Sectoral Distribution of Commercial Bank Credit on Economic Growth and Development in Trinidad and Tobago*, Central Bank of Trinidad and Tobago Working paper.

Saci, K., Giorgioni, G. and Holden, K. (2009) 'Does financial development affect growth?', *Applied Economics*, Vol. 41, No. 13, pp.1701–1707.

Sangjoon, J. (2012) 'Financial development and output growth: a panel study for Asian countries', *Journal of East Asian Economic Integration*, Vol. 16, No. 1, pp.97–115.

Schwarz, G. (1978) 'Estimating the dimension of a model', *Annals of Statistics*, Vol. 6, No. 2, pp.461–464.

Shen, C-H. and Lee, C-C. (2006) 'Same financial development yet different economic growth: why?', *Journal of Money, Credit & Banking*, Vol. 38, No. 1, pp.1907–1944.

Vazakidis, A. and Adamopoulos, A. (2009) 'Credit market development and economic growth', *American Journal of Economics and Business Administration*, Vol. 1, No. 1, pp.34–40.

Viral, A., Imbs, J. and Sturgess, J. (2011) 'Finance and efficiency: do bank branching regulations matter?', *Review of Finance*, Vol. 15, No. 1, pp.328–344.

Yuliya, D., Ostergaard, C. and Sorensen, B. (2007) 'US banking deregulation, small business, and interstate insurance of personal income', *Journal of Finance*, Vol. 26, No. 6, pp.2763–2801.

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