

Memon, Iqra Aslam; Jabeen, Hummaira

## Article

# Monetary condition index and its changing transmission on macro-economic variables

Arab Economic and Business Journal

## Provided in Cooperation with:

Holy Spirit University of Kaslik

*Suggested Citation:* Memon, Iqra Aslam; Jabeen, Hummaira (2018) : Monetary condition index and its changing transmission on macro-economic variables, Arab Economic and Business Journal, ISSN 2214-4625, Elsevier, Amsterdam, Vol. 13, Iss. 2, pp. 111-124, <https://doi.org/10.1016/j.aebj.2018.10.001>

This Version is available at:

<https://hdl.handle.net/10419/246220>

### Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

### Terms of use:

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*



<https://creativecommons.org/licenses/by-nc-nd/4.0>

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.elsevier.com/locate/aebj](http://www.elsevier.com/locate/aebj)

# Monetary condition index and its changing transmission on macro-economic variables

Iqra Aslam Memon <sup>a,\*</sup>, Hummaira Jabeen <sup>b</sup>

<sup>a</sup> Mehran University of Engineering & Technology, Jamshoro 76062, Pakistan

<sup>b</sup> Isra University, Hala Road, Hyderabad 71000, Pakistan

## ARTICLE INFO

### Article history:

Received 11 September 2017

Received in revised form

28 September 2018

Accepted 1 October 2018

### Keywords:

Monetary condition index

Monetary policy

Economic condition

CPI

GDP

## ABSTRACT

It has been known with time that no single transmission mechanism is enough to understand the monetary policy stance of that country. The objective of this paper is combine two transmission channel, interest rate and exchange rate so as to construct monetary condition index (MCI) for the gulf countries, namely Bahrain, Iraq, Kuwait, Oman, Qatar, Kingdom of Saudi Arabia and United Arab Emirates, so as to forecast its impact on CPI and GDP and to suggest policymakers regarding the monetary policy of the gulf countries. For this purpose, the paper applies Principal Component Analysis and Vector Auto-Regression method to construct MCI and to analyze its impulse response on CPI and GDP. This paper concludes that MCI can be used as an indicator to predict CPI and GDP of Bahrain and Qatar in long run and as an indicator to predict the GDP of Oman in medium and long run but it cannot be used as an indicator to predict CPI and GDP of Kuwait and KSA. Furthermore, this paper also concludes that strong monetary policy is needed to strengthen their economic condition.

© 2018 The Authors. Production and hosting by Elsevier B.V. on behalf of Holy Spirit University of Kaslik. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

Monetary Condition Index (MCI) pioneered by the Bank of Canada in late 1980s, combines the weighted average of short term interest rate and exchange rate to assess the monetary policy of the country (Hyder & Khan, 2007), because interest rate and exchange rate are the channels of transmission mechanism of the monetary policy which can affect the rate of inflation (Qayyum, 2002). The change in interest rate changes the investing and spending behaviour of the firms and individual which in turn affect the GDP. On the other hand, change in exchange rate changes the relative price of domestic and foreign goods which in turn affect

Peer review under responsibility of Holy Spirit University of Kaslik.



Production and hosting by Elsevier

\* Corresponding author.

E-mail address: [iqra.aslam.92@gmail.com](mailto:iqra.aslam.92@gmail.com) (I. Aslam Memon).

<http://dx.doi.org/10.1016/j.aebj.2018.10.001>

2214-4625/© 2018 The Authors. Production and hosting by Elsevier B.V. on behalf of Holy Spirit University of Kaslik. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

the spending behavior of the individual and firm. Appreciation of currency lowers the price of imported goods whereas depreciation of currency increases the price of imported goods (Qayyum, 2002). On the whole, both interest rate and exchange rate can affect the inflation. Increase in any one of it, can lowers the growth and inflationary pressures and decrease in any one can increase the economic growth and the inflationary pressures (Kodra, 2011). That's why changes in index can indicate the tightening and loosening of monetary conditions (Osborne-Kinch & Holton, 2010). An increase in MCI results in tightening of monetary condition whereas a decrease in MCI loosens the monetary condition (Poon, 2010). Moreover, the more open the economy, the more important is exchange rate in determining the monetary conditions (Joiner, 2006).

MCI can be used as an operational target, as an indicator or as monetary policy rule (Batini & Turnbull, 2000). In case of MCI working as an operational target, domestic and foreign economic conditions can be taken into account to derive the desired MCI level so that it is consistent with the inflation target (Osborne-Kinch & Holton, 2010). Second, as an indicator of inflation, it tracks the movement of interest rate and exchange rate (Poon, 2010) and depicts whether central bank has loosen and tighten their monetary policy (Şiklar & Doğan, 2015). Last, in order to correct the deviation of inflation and output, MCI can rearrange interest rate so that it can move in parallel with the exchange rate (Batini & Turnbull, 2000).

Knowing such a strong place of MCI in economic watch, objective of this study is to construct MCI for the gulf countries. Reason of this choice are many. First of all, being a strong component of world's economy such instruments are not available for gulf countries. They are based on traditional single instrument. If we look at economic conditions of the gulf countries, interesting facts do come in front of us. Regarding the economic condition of Gulf Countries, Gulf Cooperation Council (GCC) countries account for 47% of proven world oil reserve which produce about 20% of all world oil and controls 36% of world oil export (as cited in Alqattan & Alhayky, 2016). GCC countries have 23.4% of world natural gas reserve at their disposal which produces 7.9% of world natural gas (AlKholifey & Alreshan, 2010). The GCC countries are heavily depended on hydrocarbon export (International Monetary Fund, 2012) so the fall in oil price have negative impact, resulting in: huge export losses, slower growth, weak fiscal and external position, and tight monetary and financial condition (International Monetary Fund, 2016).

The overall GDP of GCC countries has risen to 7.5% in 2011, which is highest since 2003 and oil production has increased by 10% so GCC economies are growing at a strong pace after 2009 global financial crisis. In GCC countries inflation is caused by food and rental prices. In 2011, CPI inflation was also under control and was less than 5% (International Monetary Fund, 2012).

The GCC countries aim to establish a currency union. Except for Kuwait, the rest of the Gulf Countries have pegged their currency with the US Dollar (Khan, 2009). It means that if dollar's value drop against major currencies than GCC pegged currency will have lower purchasing power and from 2001, dollar has been losing its value (Ziaei, 2013). The Gulf Countries economic situation varies over the past years and need to develop monetary policy for its smooth functioning.

As Iraq is not part of Gulf Cooperation Council, so regarding the economic condition of Iraq, it is second biggest producer of oil after KSA (Al-Basri & Al-Sebahi, 2013) but it utilizes the income it receive from oil to wage war, reconstruct its infrastructure and to keep its people alive and has no income left to make foreign investments (Seznec, 2008). From 2003, oil sector has dominated the Iraq's economy. However, the contribution of oil sector to total GDP has declined from 70% in 2004 to 43% in 2011 and 47% in 2012 (Al-Basri & Al-Sebahi, 2013).

After knowing such an important place of gulf countries at global level, MCI is constructed at country level for Bahrain, Iraq, Kuwait, Oman, Qatar, Kingdom of Saudi Arabia (KSA), and United Arab Emirates (UAE) and for checking predictive power of MCI; it is being utilized for forecasting inflation and growth.

The methodology used in this paper is Principal Component Analysis (PCA) and Vector Auto-Regression Model (VAR). To construct MCI for each country, PCA is applied to the Interest Rate and Exchange Rate of each Gulf Country. Then, vector Auto-Regression model is applied for forecasting exercise. In this whole exercise, normalized variables are taken and variables are being normalized using Phillips-Perron Unit Root Test. In this study annual data is being used.

In the light of results it is found that MCI can be used as an indicator to predict CPI and GDP of Bahrain and Qatar in long run and MCI can be used as indicator to predict the GDP of Oman in medium and long run but it cannot be used as an indicator to predict CPI and GDP of Kuwait and KSA.

This paper suggests policymakers regarding the monetary policy of the gulf countries. It also suggests policymakers that instead of using either interest rate or exchange rate to develop monetary policy of a country, MCI can be used in long-run prediction of CPI and GDP of the Bahrain, Qatar, and in medium and long-run prediction of GDP for Oman.

This paper will benefit policymakers in understanding the tight and loose monetary condition experienced by gulf countries. It will also facilitate them to consider whether to embed MCI in their monetary policy or not. It also opens an opportunity for researchers to research further on the topic of MCI and Gulf Countries as none has been done before.

Section 2 of this paper reviews the literature on MCI. Section 4 discusses the method used in this paper to construct MCI. Section 5 constructs MCI and analyses the results. Section 6 conclude this paper and make suggestions for policymakers.

## 2. Literature review on MCI

This study would bridge literature on monetary condition index.

Between 1950s and 1960s, Central Banks considered fixed exchange rate system as main framework for implementing monetary policy (Hataiseree, 1998) and for many years, short term interest was the operational target of monetary policy (Kesriyeli and Koçaker, 1999). So the central banks headed by the Bank of Canada combine interest rate and exchange rate and constructed

MCI in order to measure the stance of monetary policy and its efficiency (as cited in [Yaaba, 2013](#)). Over the years, MCI has been widely used by banks, organizations and firms. The Central banks of Canada, New Zealand, Norway and Sweden uses MCI in the conduct of monetary policy; organizations like International Monetary Fund (IMF) and Organizations for Economic Co-operation and Development (OECD) constructs MCIs to evaluate the monetary policies and firms like Goldman Sachs and JP Morgan publishes MCI in order to determine the monetary condition of different countries ([Ericsson, Jansen, Kerbeshian, & Nymoan, 1998](#)). However, with time it has been criticized and appreciated for its use.

MCI is the weighted combination of both interest rate and exchange rate and the ratio of the two represent their relative importance ([Qayyum, 2002](#)). In case of small open economy like Turkey, studies conducted by [Şıklar and Doğan \(2015\)](#) and [Kesriyeli and Koçaker \(1999\)](#) constructed MCI using two different methods and arrived on a different opinion regarding the importance of interest rate and exchange rate in Turkey. [Şıklar and Doğan \(2015\)](#) uses time varying framework and Kalman Filter algorithm to construct MCI using data from 1999 to 2013 and concluded that interest rate has more impact on monetary condition than exchange rate, whereas [Koçaker \(1999\)](#) uses price equation to construct MCI using data from 1988 to 1999 and concluded that exchange rate is driving force in price adjustment process in Turkey and has more weight compared to interest rate in short run. Another studies conducted on small open economy of Pakistan by [Khan and Qayyum \(2007\)](#), [Hyder and Khan \(2007\)](#) and [Qayyum \(2002\)](#) also uses different methodology and reached a similar conclusion to that of Turkey. [Khan and Qayyum \(2007\)](#) uses IS-Phillips curve and The Bernanke and Mihov Overall Measure to conclude that in Pakistan supply shocks are dominant and exchange rate has more impact than the interest rate on the economy whereas [Hyder and Khan \(2007\)](#) uses Johansen's co integration techniques to arrive on the conclusion that out of fourteen Pakistan has eight tight and six soft periods of monetary condition and interest rate is more dominant than exchange rate channel in times of inflation and [Qayyum \(2002\)](#) uses Full Information Maximum Likelihood Method of Johansen to conclude that the monetary condition ratio for small open economy of Pakistan is 2.79:1 and in order to effect on the rate of inflation, one point movement in interest rate is equivalent to 2.79 point movement in nominal exchange rate. Both countries of small open economy, Turkey and Pakistan, applied different method to construct MCI and reached a mixed conclusion regarding importance of interest rate to exchange rate in their economy.

As [Qayyum \(2002\)](#) explains the ratio of exchange rate to interest rate for Pakistan, [Kodra \(2011\)](#) explains the ratio for Albania and concluded that MCI ratio for Albania is 3.8:1, which means that 1 percent increase in interest rate can offset by 3.8 percent point fall in exchange rate. The MCI ratio suggest how much is needed by one variable to offset another.

Regarding MCI being used as an indicator of monetary policy, multiple studies reached on similar conclusion. [Yaaba \(2013\)](#) constructed MCI for Nigeria and concluded that MCI aligns with the policy direction of Central Bank of Nigeria and it can serve as a lead indicator of monetary policy stance for the Bank. An MCI for India concluded that it provides more information regarding monetary policy stance in India than the individual use of its variables and, thus, can be used as an indicator of monetary policy in India ([Kannan, Sanyal, & Bhoi, 2006](#)). Furthermore, both [Dennis \(1997\)](#) and [Economics Department at Reserve Bank \(1996\)](#) constructed MCI for New Zealand and they both concluded that MCI represent a stance of monetary condition better then either of its variable alone can. From the above discussion, it can be considered that MCI can be used as an indicator.

Whereas, some authors have supported it being used as indicator alongwith some criticism regarding it. [Benazi \(2012\)](#), estimated MCI for Croatia and concluded that it should only be used as an indicator for monetary policy and not as a technical instrument on which monetary policy decisions are made. [Osborne-Kinch and Holton \(2010\)](#) constructed MCI from 1999 to 2009 for Euro Area, UK, and US and supported the idea that MCI is easy to construct and can be used as a timely indicator but due to uncertainty regarding its estimation and intpretation it should not be used as the only way to assess the monetary policy conditions. Discussing the general overview about MCI, [Costa \(2000\)](#) concluded that due to limitations MCI should not be used as an operational target for monetary policy but it can be used as an synthetic indicator for monetary stance. Despite it use being limited, it can be summarized that MCI can be used as an indicator for monetary policy.

Besides MCI being used as indicator, it can also be used for various purposes. A research conducted by [Gottschalk \(2001\)](#) on Euro Area from 1980 to 2000 concluded that a careful analysis of business cycle fluctuation is required for MCI to be used as a forecasting tool, and intpretation of MCI depend on the specific shocks effecting the economy. [Esteves \(2003\)](#) also supported that MCI can be considered as useful indicator for forecasting and simulation purposes. A study on Mainland China reached a conclusion that changes in MCI suggest that its monetary stance has been more tightened than loose from 1994 to 2004 ([Peng & Leung, 2005](#)). Furthermore, MCI observed for South Africa from 1994 to 2003 suggest that its monetary condition has been varied from time to time and it should be used as part of analytical tool by the monetary authorities ([Knedlik, 2005](#)). And MCI for Canada concluded that MCI is an useful concept and a practical tool but it must be used with care ([Freedman, 1994](#)). Thus, MCI can be used to suggest monetary stance, for forecasting purposes, and also as partical and analytical tool by monetary authorities.

Lastly, MCI can be constucted as Augmented MCI and as Dynamic MCI. [Poon \(2010\)](#) constructed an augmented monetary condition index (AMCI) of small open economy of Phillipines from 1982 to 2004 using Unrestricted Error Correction Model (UECM) and AutoRegression Distributed Lag (ARDL) Bounds Test. He concluded that after 1990s, AMCI results align well with the inverse movement of the real GDP growth. Regardig dynamic MCI, [Christophe and Gregory \(2008\)](#), [Esteves \(2003\)](#), and [Batini and Turnbull \(2000\)](#) reached on a similar conclusion. In comparison between Long-term MCI, Standard MCI and Dynamic-Weght MCI for G7 countries (United Kingdom, Germany, Canada, United-States, France, Japan, and Italy), [Christophe and Gregory \(2008\)](#) concluded that Dynamic-Weighted MCI is better than the other two, and international institution and central banks should consider it as an indicator for economic activities. Furthermore, the comparison between static and dynamic MCI for Portuguese economy, [Esteves \(2003\)](#) concluded that dynamic MCI can provide a better explanation for the stance of Portuguese economy. Lastly a survey on UK from 1984 to 1999 by [Batini and Turnbull \(2000\)](#) suggested that due to shortcomings of MCI, dynamic MCI should be used instead

and it can serve as an indicator for monetary stance and inflation but it cannot be used as an operational target for policy. No constructive conclusion can be drawn regarding augmented MCI but it can be derived that dynamic MCI can also be used as an indicator.

Despite of the criticism, literature is affirmative about the use of MCI for the monetary policy stance. Diverse literature is available on construction and use of MCI but none has covered Gulf area. This gap in literature will be filled by this study using PCA method and forecasting exercise using VAR model.

### 3. Methodology

Principal Component Analysis (PCA) is used to construct MCI of each gulf countries. Principal Component Analysis uses linear combinations of the variables to model the variance structure of a set of observed variables. It may be used in subsequent analysis or in interpreting the components. The first component of PCA represents the maximum deviation of the unit-length linear combination of the original variables. The second or following principal components maximize deviation amidst unit-length linear combinations (Inc., 2015).

For the multivariate analysis, principal component analysis is believed to be oldest and widely used method, firstly employed by Preason (1901) later on developed by Hotelling (1933). In its simplest form, it can be written as follows:

$$I_t = X_T W \quad (1)$$

where  $x_t$  = the  $1 \times N$  element row vector of data at time  $t$ ; the eigenvector-eigenvalue decomposition of the variance-covariance matrix  $X_T X_T'$  is produced for a set of weights referenced by the  $N \times 1$  vector  $W$  corresponding to the eigenvector associated with the largest eigenvalue of this matrix. These weights are used to construct a weighted sum of the  $x_t$  at each point in time for index formation.

Then Vector Auto-Regression (VAR) model is applied to generate the impulse response of MCI on CPI and GDP for each country for next 10 years. VAR is applied because it forecast interrelated time series and analyzes the dynamic impact of random disturbance among a group of variables. The equation of VAR is as follows:

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + C x_t + \epsilon_t \quad (2)$$

where  $y_t = (y_{1t}, y_{2t}, \dots, y_{kt})'$  is the endogenous variables vector  $K \times 1$ ,  $x_t = (x_{1t}, x_{2t}, \dots, x_{dt})'$  the exogenous variables vector  $d \times 1$ ,  $A_1, \dots, A_p$  are  $k \times k$  lag coefficients matrices which are to be estimated,  $C$  is a  $k \times d$  exogenous variable coefficients matrix to be estimated,  $\epsilon_t = (\epsilon_{1t}, \epsilon_{2t}, \dots, \epsilon_{kt})$  is a  $k \times 1$  white noise innovation process, with  $E(\epsilon_t) = 0$ ,  $E(\epsilon_t \epsilon_t') = \sum \epsilon_s$ , and  $E(\epsilon_t \epsilon_s) = 0$  for  $t \neq s$  (Inc., 2015).

The impulse response traces a response to a shock on a variable which not only affect that variable but affect all other endogenous variable via dynamic lag structure of the VAR. In this paper, the impulse response traces the effect of MCI on the CPI and GDP (Inc., 2015).

#### 3.1. Data

In order to construct MCI and to assess its impact on monetary policy stance, four variables, Interest Rate, Exchange Rate, Consumer Price Index and Gross Domestic Product are used. In case of Bahrain, Kuwait, Oman and Qatar interest rate is lending rate percent per annum and in case of Iraq and KSA interest rate is the central bank policy rate, percent per annum. No interest rate was found for UAE. Data for Bahrain and KSA consist of real effective exchange rate and for Iraq, Oman, Qatar and UAE, nominal effective exchange rate is used. In case of Kuwait average exchange rate of Kuwait Dinar against U.S. Dollar is used. For GDP of all gulf countries, real index is used and for CPI, all items index is used. Due to unavailability of interest rate for UAE, it is excluded from the study. Exchange Rate, CPI, and GDP of all GCC countries are logged and interest rate is calculated as percentage differenced.

Yearly data is gathered but the time period of each country is different. For Bahrain MCI and its impact is calculated from 1986 to 2014, for Iraq 2004-2011, for Kuwait 1986-2015, for Oman 2000-2015, for Qatar 1980-2015, and for KSA 1999-2016.

### 4. Results

#### 4.1. Unit Root Test

In order to check the stationarity of each variable of each country, Phillips-Perron Unit Root Test is applied. The null hypothesis is rejected at 1% or 5% level significance at level, 1st difference or 2nd difference (see appendices for detail).

The PP method ensures that serial correlation have no impact on the asymptotic distribution of the test statistic as it, first, estimates the non-augmented Dickey-Fuller test equation and, then, modifies the  $t$ -ratio of the  $\alpha$  correlation. The equation of PP is as follows:

$$(t_{\alpha}) = t_{\alpha} \left( \frac{\gamma_0}{f_0} \right)^{1/2} - \frac{T(f_0 - \gamma_0)(se(\hat{\gamma}))^2}{2f_0^{1/2}s} \quad (3)$$

where  $\hat{\gamma}$  is the estimate,  $t_{\alpha}$  is the t-ratio of  $\infty$ ,  $se(\hat{\gamma})$  coefficient standard error,  $s$  standard error of the test regression,  $\gamma_0$  the consistent estimate of the error variance in Dickey-Fuller equation,  $f_0$  estimator of the residual spectrum at frequency zero (Inc., 2015).

Two choices are required while performing PP test. First is the spectral estimation method and second is whether to select intercept, trend and intercept or none, out of these three options. This paper chooses the Default (Barlett kernel) as the spectral estimation method and included trend and intercept in its test equation (Inc., 2015).

So the variables of each country is stationary either at level, or at 1st difference, or at 2nd difference. Table 1 summarizes the variables used in each of the six Gulf Country alongwith the level of stationarity at which the null hypothesis is rejected.

#### 4.2. Principal component analysis

In order to construct MCI for each country, their respective log exchange rate and percentage change interest rate are weighted via principal component. The PCA of each gulf country is from Figs. 1-6.

#### 4.3. Vector auto-regression model

In order to generate an impulse response of MCI on CPI and GDP of the respective gulf countries, vector auto-Regression model is applied. The lag of all the gulf countries, except for Iraq is 2. Due to the small sample size of only 8 observations, the lag of Iraq is 1.

##### 4.3.1. Bahrain

According to Fig. 7, the MCI of Bahrain varies from 1987 to 2014. The negative MCI in 1992 suggest loose monetary condition, followed by the tight monetary condition in 1993. Bahrain also experience tight monetary condition in 2002, when its MCI reaches its peak. The remaining years suggest moderate monetary policy.

Fig. 8 applies impulse to generate response about whether MCI can predict the CPI and GDP up to next 10 years and the graph suggest that MCI cannot predict CPI and GDP in short run but it can in long run.

**Table 1 – Variables and transformation.**

Country	Period	Variables	Stationarity
Bahrain	1986-2014	Consumer Price Index, All items, Index	1st difference at 5%
		Gross Domestic Product, Real, Index	1st difference at 1%
		Interest Rates, Lending Rate, Percent per annum	Level at 1st %
Iraq	2004-2011	Real Effective Exchange Rate, based on Consumer Price Index, Index	1st difference at 1%
		Consumer Price Index, All items, Index	Level at 5%
		Gross Domestic Product, Real, Index	Level at 5%
		Interest Rates, Central Bank Policy Rate, Percent per annum	1st difference at 1%
Kuwait	1986-2015	Nominal Effective Exchange Rate, Trade Partners by Consumer Price Index, Index	2nd difference at 5%
		Consumer Price Index, All items, Index	2nd difference at 1%
		Gross Domestic Product, Real, Index	1st difference at 1%
		Interest Rates, Lending Rate, Percent per annum	Level at 5%
Oman	2000-2015	Average Exchange Rate of Kuwait Dinar Against U.S. Dollars (Fils)	1st difference at 1%
		Consumer Price Index, All items, Index	2nd difference at 1%
		Gross Domestic Product, Real, Index	2nd difference at 1%
		Interest Rates, Lending Rate, Percent per annum	1st difference at 1%
Qatar	1980-2015	Nominal Effective Exchange Rate, Trade Partners by Consumer Price Index, Index	1st difference at 5%
		Consumer Price Index, All items, Index	2nd difference at 1%
		Gross Domestic Product, Real, Index	1st difference at 1%
		Interest Rates, Lending Rate, Percent per annum	Level at 5%
Kingdom of Saudi Arabia	1999-2016	Nominal Effective Exchange Rate, Trade Partners by Consumer Price Index, Index	2nd difference at 1%
		Consumer Price Index, All items, Index	2nd difference at 1%
		Gross Domestic Product, Real, Index	2nd difference at 1%
		Interest Rates, Central Bank Policy Rate, Percent per annum	1st difference at 5%
		Real Effective Exchange Rate, based on Consumer Price Index, Index	1st difference at 1%

Bahrain

Principal Components Analysis  
Sample (adjusted): 1987 2014  
Included observations: 28 after adjustments  
Balanced sample (listwise missing value deletion)  
Computed using: Ordinary correlations  
Extracting 2 of 2 possible components

---

Eigenvalues: (Sum = 2, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	1.112458	0.224916	0.5562	1.112458	0.5562
2	0.887542	---	0.4438	2.000000	1.0000

---

Eigenvectors (loadings):

Variable	PC 1	PC 2
B_IR	-0.707107	0.707107
B_ER	0.707107	0.707107

---

Ordinary correlations:

	B_IR	B_ER
B_IR	1.000000	
B_ER	-0.112458	1.000000

**Fig. 1 – MCI for Bahrain.**

Iraq

Principal Components Analysis  
Sample (adjusted): 2006 2011  
Included observations: 6 after adjustments  
Balanced sample (listwise missing value deletion)  
Computed using: Ordinary correlations  
Extracting 2 of 2 possible components

---

Eigenvalues: (Sum = 2, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	1.195952	0.391904	0.5980	1.195952	0.5980
2	0.804048	---	0.4020	2.000000	1.0000

---

Eigenvectors (loadings):

Variable	PC 1	PC 2
I_IR	-0.707107	0.707107
I_ER	0.707107	0.707107

---

Ordinary correlations:

	I_IR	I_ER
I_IR	1.000000	
I_ER	-0.195952	1.000000

**Fig. 2 – MCI for Iraq.**

#### 4.3.2. Iraq

As shown in Fig. 9, the MCI for Iraq shows cycle of loose monetary stance followed by tight monetary stance from 2006 to 2011. It shows a peak of tight monetary condition in 2007 and a peak of loose monetary condition in 2010.

Due to small sample size, the impulse of Iraq cannot be generated.

#### 4.3.3. Kuwait

The MCI of Kuwait from 1987 to 2015, shown in Fig. 10, illustrates loose monetary condition in 1987, followed by tight monetary condition, as shown by the increase in MCI in 1989. It loosens up, as shown by the fall in MCI. Afterward the monetary condition of Kuwait has been same, except for fall in MCI in 2003, followed by rise in 2005 and then decline in 2008.

Fig. 11 generates an impulse for Kuwait for the next 10 years and it suggests that MCI cannot predict CPI and GDP in short and long run. CPI has been opposite of MCI most of the time.

Oman

Principal Components Analysis  
Sample (adjusted): 2002 2015  
Included observations: 14 after adjustments  
Balanced sample (listwise missing value deletion)  
Computed using: Ordinary correlations  
Extracting 2 of 2 possible components

---

Eigenvalues: (Sum = 2, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	1.268364	0.536728	0.6342	1.268364	0.6342
2	0.731636	—	0.3658	2.000000	1.0000

---

Eigenvectors (loadings):

Variable	PC 1	PC 2
O_IR	0.707107	-0.707107
O_ER	0.707107	0.707107

---

Ordinary correlations:

	O_IR	O_ER
O_IR	1.000000	
O_ER	0.268364	1.000000

Fig. 3 – MCI for Kuwait.

Oman

Principal Components Analysis  
Sample (adjusted): 2002 2015  
Included observations: 14 after adjustments  
Balanced sample (listwise missing value deletion)  
Computed using: Ordinary correlations  
Extracting 2 of 2 possible components

---

Eigenvalues: (Sum = 2, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	1.268364	0.536728	0.6342	1.268364	0.6342
2	0.731636	—	0.3658	2.000000	1.0000

---

Eigenvectors (loadings):

Variable	PC 1	PC 2
O_IR	0.707107	-0.707107
O_ER	0.707107	0.707107

---

Ordinary correlations:

	O_IR	O_ER
O_IR	1.000000	
O_ER	0.268364	1.000000

Fig. 4 – MCI for Oman.

#### 4.3.4. Oman

The MCI of Oman, shown in Fig. 12, displays the downward and upward trend from 2002 to 2015, indicating that monetary condition of Oman is not stable.

Fig. 13 predicts an MCI response to CPI and GDP for the next 10 years and it suggests that MCI can predict GDP in medium and long run but it cannot predict CPI for Oman neither in short run nor in long run

#### 4.3.5. Qatar

According to Fig. 14 which captures Qatar's monetary condition from 1982 to 2015, explains that Qatar experience loose monetary condition in 1986, followed by tight monetary condition in 1987. It varies from tight to lose till 1995 and afterward, it has been tight mostly with ease in monetary condition from time to time.

Fig. 15 estimates the response to CPI and GDP in short and long run and overall, it determines that MCI can predict CPI and GDP in long run but not in short run.



Qatar

Principal Components Analysis  
Sample (adjusted): 1982 2015  
Included observations: 34 after adjustments  
Balanced sample (listwise missing value deletion)  
Computed using: Ordinary correlations  
Extracting 2 of 2 possible components

---

Eigenvalues: (Sum = 2, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	1.102715	0.205430	0.5514	1.102715	0.5514
2	0.897285	---	0.4486	2.000000	1.0000

---

Eigenvectors (loadings):

Variable	PC 1	PC 2
Q_IR	-0.707107	0.707107
Q_ER	0.707107	0.707107

---

Ordinary correlations:

	Q_IR	Q_ER
Q_IR	1.000000	
Q_ER	-0.102715	1.000000

**Fig. 5 – MCI for Qatar.**

Kingdom of Saudi Arabia

Principal Components Analysis  
Sample (adjusted): 2001 2016  
Included observations: 16 after adjustments  
Balanced sample (listwise missing value deletion)  
Computed using: Ordinary correlations  
Extracting 2 of 2 possible components

---

Eigenvalues: (Sum = 2, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	1.008839	0.017678	0.5044	1.008839	0.5044
2	0.991161	---	0.4956	2.000000	1.0000

---

Eigenvectors (loadings):

Variable	PC 1	PC 2
S_IR	0.707107	-0.707107
S_ER	0.707107	0.707107

---

Ordinary correlations:

	S_IR	S_ER
S_IR	1.000000	
S_ER	0.008839	1.000000

**Fig. 6 – MCI for Kingdom of Saudi Arabia.**

#### 4.3.6. KSA

In case of KSA from 2001 to 2016, Fig. 16 illustrates that, it has soft monetary condition till 2014. In 2015, monetary condition was tight but it did ease up in 2016.

Fig. 17 captures an impulse response of MCI to CPI and GDP for the next 10 years and according to graph CPI, GDP and MCI are extremely volatile so the MCI cannot predict CPI and GDP neither in short nor in long run.

## 5. Analysis and discussion

The MCI and its response on CPI and GDP suggest that for Bahrain and Qatar, MCI can predict CPI and GDP in long run. For Iraq, due to small sample size, MCI was not able to generate an impulse response. For Kuwait and KSA, MCI cannot predict CPI and GDP in short and long run. For Oman, MCI can predict GDP in medium and long run

Summarizing, gulf countries need strong monetary policy and MCI can be used as an indicator for Bahrain and Qatar to predict movements of CPI and GDP in long run and in case of Oman, it can only to predict GDP.

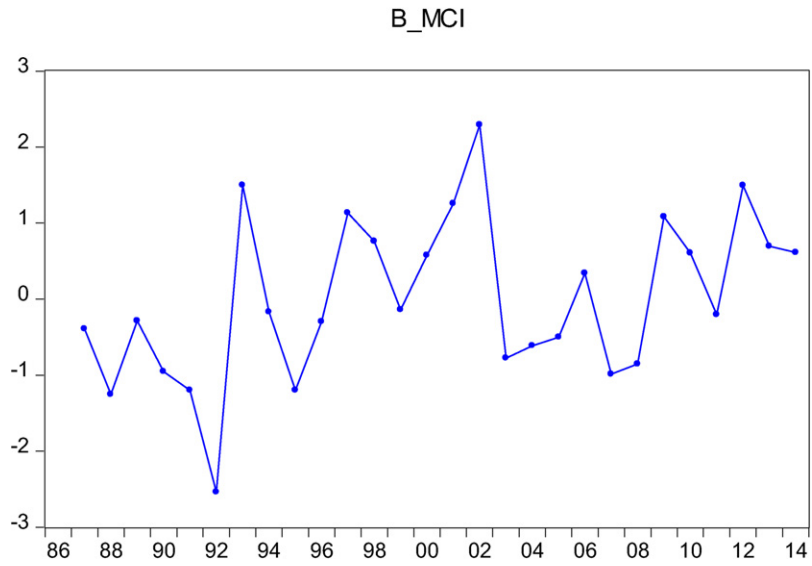


Fig. 7 – Bahrain MCI.

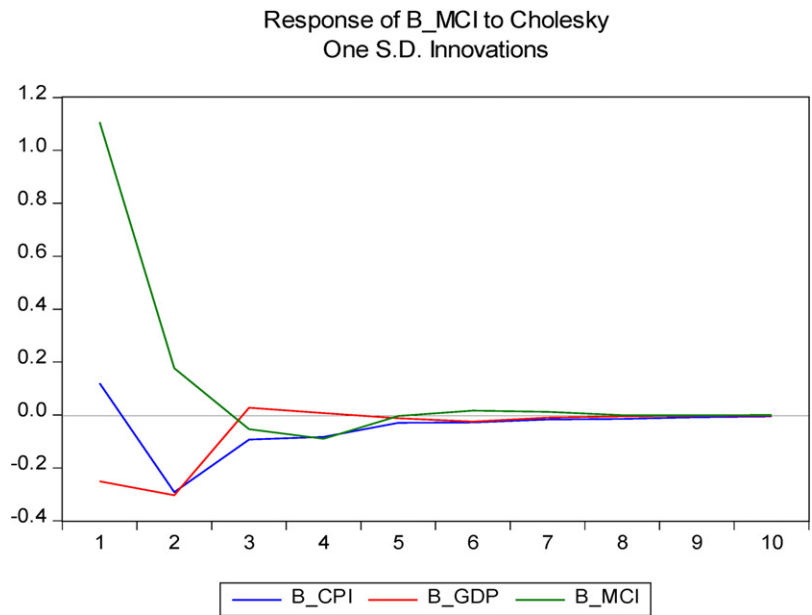


Fig. 8 – MCI response to CPI and GDP.

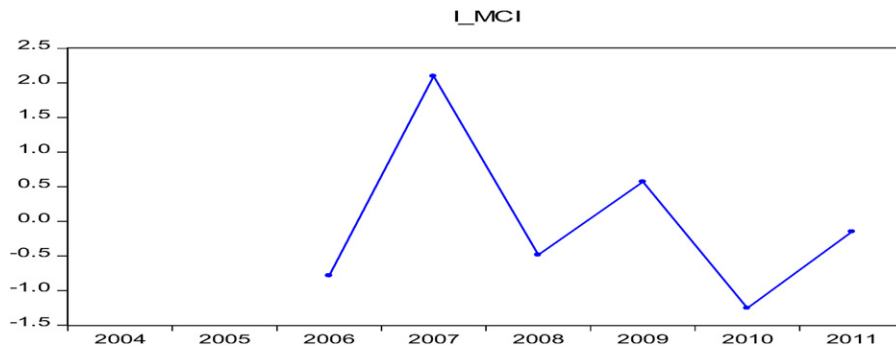


Fig. 9 – Iraq's MCI.

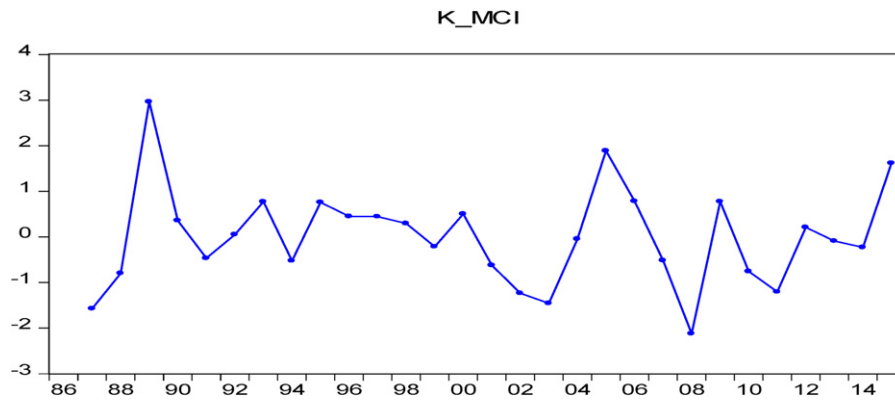


Fig. 10 – Kuwait's MCI.

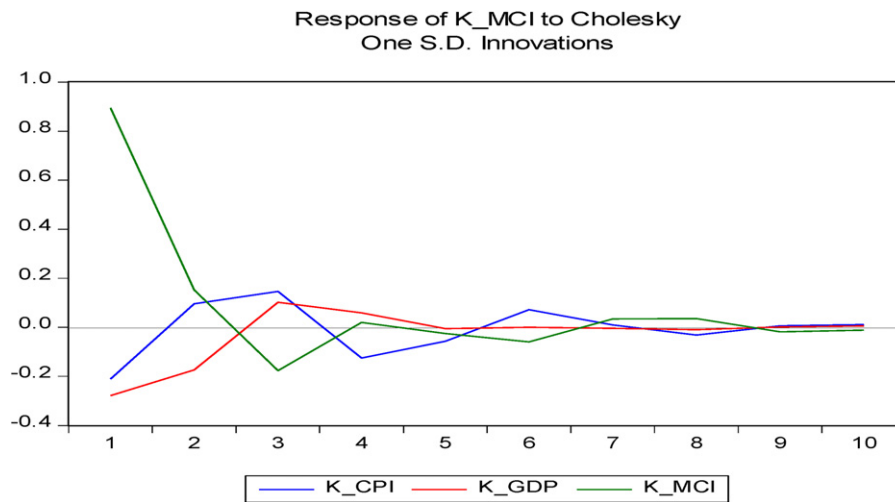


Fig. 11 – MCI response to CPI and GDP.

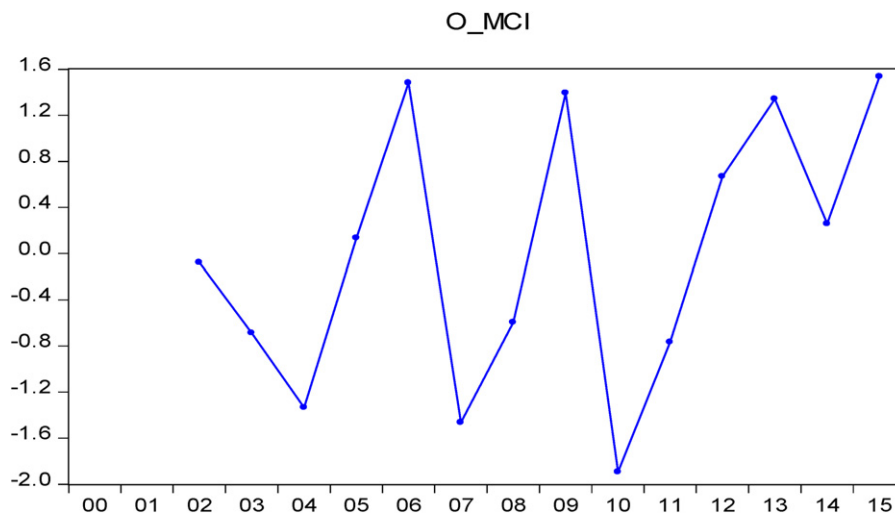


Fig. 12 – Oman's MCI.

Response of O\_MCI to Cholesky  
One S.D. Innovations

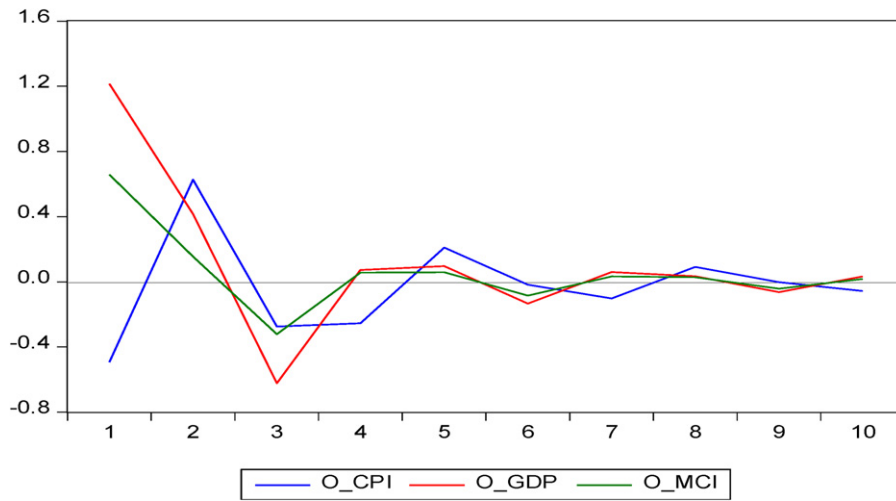


Fig. 13 – MCI response to CPI and GDP.

Q\_MCI

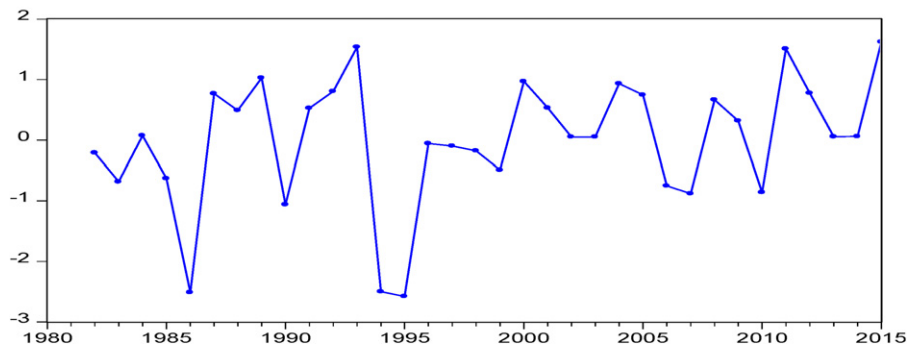


Fig. 14 – Qatar's MCI.

Response of Q\_MCI to Cholesky  
One S.D. Innovations

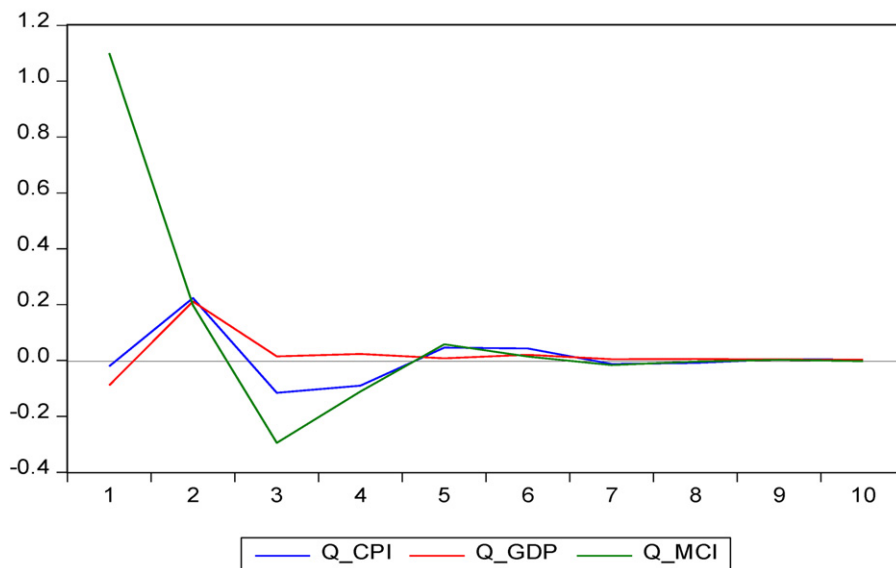


Fig. 15 – MCI response to CPI and GDP.

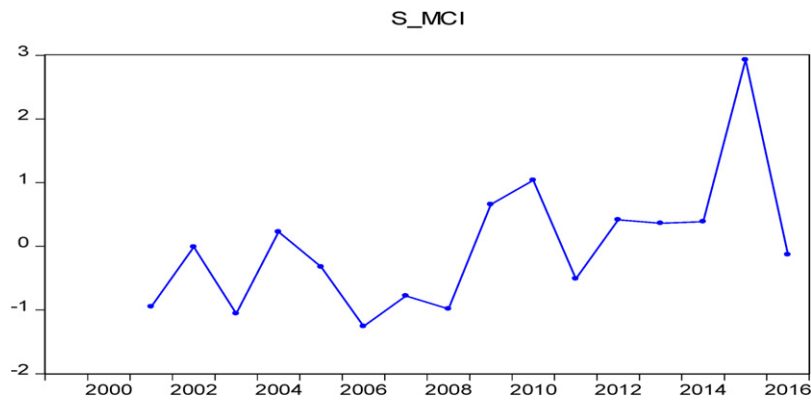


Fig. 16 – KSA’s MCI.

Response of S\_MCI to Cholesky One S.D. Innovations

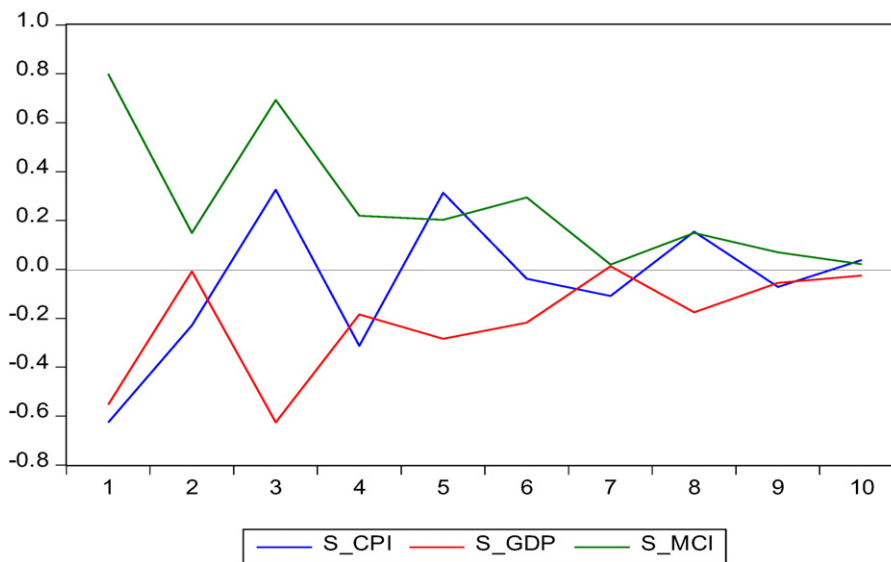


Fig. 17 – MCI response to CPI and GDP

## 6. Conclusion

The objective of this paper was to combine the interest rate and exchange rate to construct MCI for Gulf countries namely, Bahrain, Iraq, Kuwait, Oman, Qatar, Kingdom of Saudi Arabia (KSA), and United Arab Emirates (UAE) so as to forecast its impact on CPI and GDP and to examine whether it can be used as an indicator for Gulf countries or not. Principal Component Analysis (PCA) is applied to construct the respective MCI for each Gulf Country. Then, Vector Auto-Regression model is applied to generate an impulse response of MCI on CPI and GDP of the respective Gulf Countries. All variables were stationary using Phillips-Perron Unit Root Test. The yearly data collected for each country varies because data available for each country varied. For Bahrain, the data collected is from 1986 to 2014, for Iraq it is 2004- 2011, for Kuwait 1986-2015, for Oman 2000-2015, for Qatar 1980-2015, and for KSA 1999-2016. Due to unavailability of interest rate for UAE, it was excluded from the study. The result showed that for Bahrain and Qatar, MCI can predict CPI and GDP in long run. For Iraq, due to small sample size, MCI was not able to generate an impulse response. For Kuwait and KSA, MCI cannot predict CPI and GDP in short and long run. For Oman, MCI can predict GDP in medium and long run but not it’s CPI.

For policymakers, this paper suggest that instead of using either interest rate or exchange rate to develop monetary policy of a country, MCI can be used as an indicator to predict inflation and GDP in long run for Bahrain and Qatar. For Oman, MCI can only be used as indicator to predict the GDP.

Furthermore, it helps policymakers in understanding the tight and loose monetary condition experienced by gulf countries. It will also facilitate them to decide whether to embed MCI in their monetary policy or not. It also opens an opportunity for researchers to research further on the topic of MCI and Gulf Countries as none has been done before.

This paper faces limitations as only annual data was available, and of monthly data for some variables was not available. The interest rate for UAE was not available due to which, it cannot be included in the study and the sample size for Iraq was so small that its impulse response on CPI and GDP could not be generated. Furthermore, the availability of data for each country differs, that's why the time period covered for each country is different. Data need to be available for future study on this subject.

Fur future studies, comparative analysis can be conducted among the MCI of the Gulf countries and with other countries, or MCI impact on economy and other sector can be examined.

---

## Uncited references

Abed, Nuri, & Behrouzi, 2003, Bentour & Razzak, 2010, Cevik & Teksoz, 2012, Eltony, 1999, Espinoza & Prasad, 2012, Frankel, 2003, Laabas et al., 2002, Marzovilla, 2014, Middle Eastern Department, 2003, Mlodkowski, 2015, Nakibullah, 2011, Ossman & Frencillo, 2014, Ozlu, 2006, Razzak, 2008, Rizvi and Masih, 2014, Sassoon, 2016 and Sturm et al., 2008.

---

## REFERENCES

- Abed, George T., Nuri, Erbas S., & Behrouzi, Gueram (2003). *The GCC Monetary Union: Some Considerations for the Exchange Rate Regime*. Middle Eastern Department, IMF Working Paper WP/03/66.
- Al-Basri, Kamal Field, & Al-Sebahi, Mudhar (2013). *The political economy of Iraq: Will oil burn out democracy?* Milan, Italy: ISPI Analysis No. 198.
- AlKholifey, Ahmed, & Alreshan, Ali. (2010). *GCC monetary union*, IFC Bulletin No 3217-51.
- Alqattan, Abdulrahman Adnan, & Alhayky, Ahmed (2016). Impact of oil prices on stock markets: Evidence from Gulf Cooperation Council (GCC) Financial Markets. *Amity Journal of Finance* 1-8.
- Batini, Nicoletta, & Turnbull, Kenny (2000). *Monetary Conditions Indices for the UK: A Survey*. Bank of England. External MPC Unit Discussion Paper No. 1. ISSN:1748-6203.
- Benazi, M. (2012). Monetary conditions index for Croatia. *Economic Research - Ekonomiska Istrazivanja*, 25(SE 1), 47-64.
- Bentour, E. M., & Razzak, W. A. (2010). *Real Interest Rates, Bubbles and Monetary Real Interest Rates, Bubbles and Monetary*. Brussels, Belgium: Economics and Econometrics Research Institute Research Paper Series No 03/2010, ISSN: 2031-4892.
- Cevik, Serhan, & Teksoz, Katerina (2012). *Lost in Transmission? The effectiveness of monetary policy transmission channels in the GCC countries*. IMF Working Paper, Middle East and Central Asia Department WP/12/191.
- Christophe, Blot, & Gregory, Leveuge (2008). *Are MCIs Good Indicators of Economic Activity? Evidence from the G7 Countries*. <hal-00973056>.
- Costa, S. (2000). *Monetary Conditions Index*. Banco de Portugal/Economic bulletin97-106.
- Dennis, R. (1997). *A measure of monetary conditions*. Reserve bank of New Zealand Discussion Paper Series G97/1.
- Economics Department (1996). Summary indicators of monetary condition. *Reserve Bank Bulletin*, 59(3), 223-228.
- Eltony, M. N. (1999). *Oil Price Fluctuations and their Impact on the Macroeconomic Variables of Kuwait: A Case Study Using VAR Model for Kuwait*. Kuwait: Arab Planning Institute WPS9908.
- Ericsson, N. R., Jansen, E. S., Kerbeshian, N. A., & Nymoen, R. (1998). *Interpreting a Monetary Conditions Index in economic policy*, Topics in monetary policy modelling, BIS Conference Papers, Volume 6. Bank for International Settlements: Basle, Switzerland237-254.
- Espinoza, , & Prasad, A. (2012). *Monetary Policy Transmission in the GCC Countries*. IMF Working Paper: WP/12/132.
- Esteves, P. S. (2003). *Monetary Conditions Index For Portugal*. 25-31 Banco de Portugal/Economic bulletin/.
- Frankel, J. (2003). *Iraq's Currency Solution? Tie the Dinar to Oil*. *The International Economy* 54-57.
- Freedman, C. (1994). The use of indicators and of the monetary conditions index in Canada. Frameworks for Monetary Stability: Policy Issues and Country Experiences edited by Tomás J. T. Baliño. Carlo Cottarelli 458-476.
- Gottschalk, J. (2001). *Monetary Conditions in the Euro Area: Useful Indicators of Aggregate Demand Conditions?* Kiel Institute of World Economics: Working Paper No 1037.
- Hataiseree, R. (1998). *The Roles of Monetary Conditions and the Monetary Conditions Index in the Conduct of Monetary Policy: The Case of Thailand under the Floating Rate Regime*. Bank of Thailand Quarterly Bulletin.
- Hyder, Zulfiqar, & Khan, M. M. (2007). *Monetary Conditions Index for Pakistan*. SBP Research Bulletin Volume 3 Number 2165-190.
- Inc., I. G. (2015). *EViews 9 User's Guide*. Irvine CA: IHS Global Inc.
- International Monetary Fund (2012). *Economic Prospects and Policy Challenges for the GCC Countries*. Saudi Arabia: International Monetary Fund.
- International Monetary Fund (2016). *Economic Prospects and Policy Challenges for the GCC Countries*. Riyadh, Saudi Arabia: International Monetary Fund.
- Joiner, A. (2006). *Monetary Condition Indices- Asia*. Economics@ANZ.
- Kannan, R., Sanyal, Siddhartha, & Bhoi, B. B. (2006). *Monetary Conditions Index for India*, Vol. 27, No. 3. Reserve Bank of India Occasional Papers 57-86.
- Kesriyeli, Mehtap, & Koçaker, İlhan (1999). *Monetary Conditions Index: A Monetary Policy Indicator For Turkey*. The Central Bank Of The Republic Of Turkey Research Department Discussion Paper No:9908.
- Khan, M. S. (2009). *The GCC Monetary Union: Choice of Exchange Rate Regime*. Washington DC: Peterson Institute for International Economics Working Paper Series 09-1.
- Khan, Sajawal, & Qayyum, Abdul (2007). *Measures of Monetary Policy Stance: The Case of Pakistan*. Pakistan Institute of Development Economics. Working Papers 2007:39.
- Knedlik, T. (2005). *Estimating the Monetary Conditions Index for South Africa*. Luxembourg: Exchange Rate Econometrics.
- Kodra, O. (2011). *Estimation of weights for the monetary conditions in Albania*. Bank of Albania Working Paper ISBN: 978-99956-42-35-81-20.
- Laabas, Belkacem, & Limam, Imed. (2002). *Are GCC Countries Ready for Currency Union?* Kuwait: Arab Planning Institute Working Paper Series 0203.

- Marzovilla, O. (2014). Economic diversification in GCC countries and the optimality of a Monetary Union. *European Scientific Journal*, 1, 658-675 ISSN 1857-7881.
- Middle Eastern Department (2003). *Iraq: Macroeconomic Assessment*. Washington DC: International Monetary Fund.
- Mlodkowski, P. (2015). Cointegration of monetary policy in GCC countries as measure of economic integration. *European Integration Studies* 198-206.
- Nakibullah, A. (2011). Monetary policy and performance of the oil-exporting gulf cooperation council countries. *International Journal of Business and Economics*, 10(2), 139-157.
- Osborne-Kinch, Jenny, & Holton, Sarah (2010). *A Discussion of the Monetary Condition Index*. Monetary Policy & International Relations Department - Quarterly Bulletin 0168-80.
- Ossman, Ghassan, & Frencillo, Imelda Ladrillo (2014). Macro Economic Indicators in the Kingdom of Bahrain: Measuring Economic Performance for Global Competitiveness. *First Middle East Conference on Global Business, Economics, Finance and Banking*, ISBN: 978-1-941505-16-8. Dubai: Global Business Research Journals & Shri Dharmasthala Manjunatheshwara Institute for Management Development (SDMIMD).
- Ozlu, O. (2006). *Iraqi Economic Reconstruction and Development*. Washington DC: Center for Strategic and International Studies.
- Peng, Wensheng, & Leung, Frank (2005). *A Monetary Conditions Index For Mainland China*. Hong Kong Monetary Authority Quarterly Bulletin 5-15.
- Poon, W.-C. (2010). *A monetary policy rule: The augmented Monetary Conditions Index for Philippines using UECM and bounds tests*. Monash University Business and Economics, Department of Economics, ISSN 1441-5429, Discussion paper 04/10.
- Qayyum, A. (2002). Monetary Conditions Index: A Composite Measure of Monetary Policy in Pakistan. *The Pakistan Development Review* 41:4 Part II 551-566.
- Razzak, W. (2008). *In the Middle of the Heat The GCC Countries Between Rising Oil Prices and the Sliding Greenback*. Kuwait: The Arab Planning Institute, API/WPS 0801.
- Rizvi, A. & Masih, M. (2014). Oil price shocks and GCC capital markets: who drives whom? Munich Personal RePEc Archive, Online at <http://mpra.ub.uni-muenchen.de/56993/>, MPRA Paper No. 56993.
- Sassoon, J. (2016). *Iraq: oil prices and economic management*. Doha, Qatar: MEEA 15th International Conference.
- Seznec, J.-F. (2008). *The Gulf Sovereign Wealth Funds: Myths and reality*. Middle East Policy, Vol. XV No. 298-110.
- Şıklar, İlyas, & Doğan, Burhan (2015). Monetary condition index with time varying weights: An application of Turkish Data. *Business and Economic Research*, 5(1), 117-132.
- Sturm, M., Strasky, J., Adolf, P. & Peschel, D. (2008). *The Gulf Cooperation Council countries economic structures, recent developments and role in the global economy*. Germany: European Central Bank OCCASIONAL PAPER SERIES NO 92.
- Yaaba, Baba N. (2013). Monetary policy rule: A broad monetary conditions. *CBN Journal of Applied Statistics*, 2476-84724(1), 35-53 The Central Bank of Nigeria, Abuja.
- Ziaei, S. M. (2013). Evaluating the Effects of Monetary Policy Shocks on GCC Countries. *Economic Analysis & Policy*, 43(2), 195-215.