Gold dinar for the Islamic countries?

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ARTICLE INFO

ABSTRACT

The Malaysian state of Kelantan has made a historical launch of Gold Dinar and Silver Dirham on 12th August 2010. For the first time in almost 100 years since the fall of the Ottoman Caliphate, a Muslim government introduces Shariah currency. In the eyes of many Muslim scholars, the present interest-based fiat monetary system is flawed as it is incompatible with the objectives of the Islamic law or the Shariah. There have been calls for the resurgence of Islamic Gold Dinar (together with the silver dirham) as it is deemed to be the most appropriate medium of exchange to be used in the Islamic economies. Using data from 1970 to 2007, this paper assesses the empirical desirability of the Organization of Islamic Conferences (OIC) countries to an alternative monetary system (Islamic Gold Dinar) that can potentially enhance the exchange rate stability and credibility. The Structural Vector Autoregression (VAR) method is employed to assess the nature of macroeconomic disturbances among the OIC countries. Specifically, the symmetry in macroeconomic disturbances of the OIC economies is examined as satisfying one of the preconditions for forming an Optimum Currency Area (OCA). In addition, this paper also investigates the output and price responses of OIC countries of the underlying structural shocks used to shed light on the suitability of these countries to form a monetary union. The preliminary findings of this study suggest the lack of broad linkages within the entire OIC, although there exists scope among some smaller clusters for potential monetary integration based on the symmetry of their business cycles.

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1. Introduction

Dinar refers to gold coins used as a medium of exchange by the Muslims from the beginning of Khulafa Rashidun until the end of the Ottoman Khalifate. Dinar (gold coins weighing 4.25 g of gold) and Dirham (silver coins weighing 2.975 g of silver) were in circulation even before the advent of Islam. However, they were continued to be used by the Prophet Muhammad (Peace Be Upon Him).

Economic cooperation through trade has been one of the important agendas of the OIC since its establishment in September 1969. In the late 1990s, the OIC has made a significant move in declaring the target date for the establishment of the Trade Preferential System among the OIC countries (TPS-OIC). TPS-OIC comes into forces on Jan 1st 2009. The recent global financial crisis triggered by the subprime mortgage crisis has caused economic recession in the US, EU, Japan and other developed countries. The OIC Member States' trade with these countries has significantly reduced. The OIC countries are more determined than ever to create greater trade cooperation amongst themselves. Increased intra-OIC trade would serve as a catalyst to overcome the global financial crisis that is hurting the export-dependent economies. Recently, the OIC has initiated the Ten-Year Program of Action which aimed to promote and reinforce trade liberalization within the OIC countries. In addition to

trade integration, the idea of reverting to Islamic Gold Dinar has surfaced in recent years among the Muslim scholars, especially after the Asian Financial crisis in 1997. The former Prime Minister of Malaysia, Dr. Mahathir bin Mohamed proposed the introduction of Islamic Gold Dinar in place of the US dollar for overseas trade settlements in the Muslim world to minimize the dependency on US dollar. While the views on this issue are mixed, there is general agreement that the present monetary system is generally inflationary and has failed to create stability and wealth for nations around the globe. In the eyes of many Muslim scholars, the present interest-based fiat monetary system is flawed as it is incompatible with the objectives of the Islamic law or the Shariah. Gold Dinar is able to fulfill the criteria of Maqasid al-Shariah (the Foundation of Islam) because gold is not affected by the inflation so there is no constant loss on the intrinsic value. On the other hand, fiat money is affected by inflation and depositing fiat-money in conventional banking system will generate riba (interest) which is Haram or forbidden according to Shariah of Islam.

OIC comprises of 56 member countries with a total population of more than 1.5 billion, accounting for 22.3% of the world population. These economies account for close to 67% of the total world oil proved reserves.[1] However, their total GDP is only 7.25% of the world GDP.[2] OIC contains some of the world's poorest countries. They differ widely in terms of their economic structures and stages of development. Per

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[1] Based on CIA — The World Factbook's July 2009 estimates.
[2] Based on World Bank's *World Development Indicators* 2008 database.

capita incomes range from \$496 in Guinea-Bissau to \$63,151 in Qatar at purchasing power parity (refer to Table 1).[3] Approximately 50% of the OIC countries have GDP per capita of below \$2500 per annum. Only one quarter of the 56 countries have per capita incomes of above \$10,000. The OIC country with the highest per capita income is Qatar, followed by UAE, Brunei, Kuwait, Bahrain, Saudi Arabia, Oman, Libya, Gabon, Malaysia, Turkey, Lebanon and Kazakhstan. This study does not include countries with income per capita of below USD\$2500 (see Table 1) to limit the heterogeneity of the group of countries considered for a monetary union.

This study aims to empirically assess the suitability of 24 OIC economies for potential monetary integration on the basis of their symmetry in macroeconomic disturbances, as satisfying one of the preconditions for forming an OCA. The greater the symmetry in underlying shocks among the OIC Economies, the lower the value placed on changes in the exchange rate as an instrument of relative price adjustment and making them better candidates for monetary integration. The scarcity of such published work for OIC countries is emphasized. We should recognize that it is not a threshold question that OIC's business cycle synchronization must pass a certain value in order to satisfy the OCA criteria. In fact, there are no exact empirical standards set for the OCA criteria and researchers can only make their own judgments based on the empirical results. The Euro Area, the first region in the world to adopt a single currency, should be used as the benchmark for any regions who are interested to form a monetary union. Henceforth, the results are compared with the one prevails in the EU region.

The remainder of this article is organized as follows. Section 2 provides the theoretical underpinnings and the review of OCA literature relevant to sub-group of OIC countries. Section 3 highlights the justifications and advantages of the Islamic Gold Dinar system. Section 4 provides an overview of economic integration among the OIC countries. Section 5 describes the methodology and data used in this study. Section 6 provides the empirical findings on the estimation of the underlying structural shocks as well as their sizes and the adjustment speed to shocks. Finally, Section 7 concludes the article with policy recommendations.

2. Theoretical underpinnings and literature review

Under what conditions should this group of OIC countries renounce its individual currencies to advance into a monetary union adopting a single currency (Islamic Gold Dinar)? The traditional framework to address this question was created by Mundell (1961), McKinnon (1963), and Kenen (1967) and later formalized by Bayoumi (1994) and Ricci (1997). Much of the literature focuses on three inter-relationships between the members of a potential OCA. They are: (1) the trade intensity; (2) the similarity of the shocks and cycles; and (3) the degree of factor mobility. The greater the linkages between the countries using any of the three criteria, the more suitable a common currency. Given the theoretical consensus in the area, OCA criteria have been applied extensively, especially in judging the suitability of different European countries for the European Monetary Union (EMU). Since the similarity of shocks captures the interaction between several properties, most of the OCA literatures examine only the business cycle correlations as the satisfying condition of OCA.

The estimation of the incidences of macroeconomic disturbances is inherently empirical. One of the first empirical papers to have dealt with the issue of macroeconomic disturbances through a statistical approach is by Bayoumi and Eichengreen (1993). Applying a variant of the VAR methodology proposed by Blanchard and Quah (1989), Bayoumi and Eichengreen (1993) assessed the nature of macroeco-

Table 1
GDP per capita, PPP (constant 2005 USD).

	2006	2007	2008
Qatar	63,151	NA	NA
United Arab Emirates	51,780	53,386	NA
Brunei Darussalam	48,589	47,949	NA
Kuwait	44,697	45,539	NA
Bahrain	29,195	30,962	32,233
Saudi Arabia	21,372	21,643	22,158
Oman	20,300	21,412	NA
Libya	14,166	14,715	14,970
Gabon	12,933	13,399	13,461
Malaysia	12,213	12,763	13,129
Turkey	11,584	11,973	11,932
Lebanon	9480	10,100	10,877
Iran, Islamic Rep.	9721	10,346	NA
Algeria	7210	7316	7422
Tunisia	6743	7102	7348
Suriname	6301	6562	6835
Albania	6054	6395	6755
Maldives	4739	4983	5169
Jordan	4590	4839	5055
Egypt, Arab Rep.	4530	4762	5011
Syrian Arab Republic	4055	4123	4232
Morocco	3722	3776	3938
Indonesia	3352	3519	3689
Guyana	2604	2744	28,30
Uzbekistan	2121	2290	2455
Pakistan	2270	2348	2344
Yemen, Rep.	2202	2210	2232
Cameroon	1973	1996	2027
Kyrgyz Republic	1763	1898	2025
Sudan	1744	1879	1990
Djibouti	1890	1935	1975
Nigeria	1801	1872	1939
Mauritania	1821	1810	NA
Tajikistan	1562	1659	1761
Cote d'Ivoire	1537	1528	1526
Benin	1319	1336	1361
Gambia, The	1182	1222	1259
Chad	1305	1271	1234
Bangladesh	1123	1178	1233
Comoros	1117	1096	1081
Uganda	966	1016	1077
Burkina Faso	1060	1062	1072
Mali	1013	1017	1043
Afghanistan	904	1023	1019
Guinea	956	952	975
Mozambique	708	742	774
Togo	782	777	767
Sierra Leone	679	702	723
Niger	603	599	631
Guinea-Bissau	489	491	496

Source: World Bank.

nomic disturbances among different groups of countries. The authors measure the importance of asymmetric demand and supply shocks across members of the European Community (EC) and the United States. Their approach emphasized on the needs to distinguish between cross-country correlations of *observed economic variables* (like output and prices) and those of *underlying structural shocks* (demand and supply disturbances originating from shifts in technology, preferences, policy changes, etc.). The underlying structural shocks transmit their influence to the observed economic variables through a complex chain of links, both domestic and international (through trade flows and the transmission via the financial markets). Observed economic variables can display strong international correlations even if the underlying shocks are not interrelated, if the international transmission mechanism is sufficiently strong.[4]

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[3] Due to incomplete data for the year 2008, data for year 2006 and 2007 are also reported.

[4] Canova and Dellas (1993) built a real business cycle model in which trade intensity induced international correlation of business cycles, and tested it on a panel of 10 countries. Their estimates confirmed the existence of such link.

To examine the economic suitability of a monetary union in East Asia, Yuen (2001) applied Blanchard and Quah (1989) and Bayoumi and Eichengreen (1993, 1994 and 1999) structural VAR approach on 12 East Asian countries. The author concluded that three pairs of countries exhibit a common reaction to structural shocks, i.e. Malaysia/Singapore, Japan/Korea and Hong Kong/Taiwan. Compared to Yuen (2001), Bacha (2008) extended the time period and coverage of the countries. His findings agreed with Yuen (2001) where Malaysia/Singapore and Japan/Korea are identified as suitable pairs.

Studies on the topic of the GCC monetary union vary in terms of their approaches. Some rely mainly on descriptive statistics concerning such factors as means, correlations and convergence of interest rates, exchange rates, business cycles and the degree of openness (Laabas and Limam, 2002). So far, these studies have yielded mixed results for the GCC. El Hag (2007), for instance, examined the OCA criteria of degree of openness, factor mobility, commodity diversification, similarity of production flexibility and degree of policy integration. Overall, most of the criteria were not supportive of a monetary union in GCC. Sturm and Siegfried (2005) found that similarities in history, language and traditions make the Gulf countries desirable candidates for a monetary union. In addition, its strong political will towards economic cooperation coupled with evidence of monetary and structural convergence also seemed to favor a monetary union. The Gulf region, however, did not score well in terms of its fiscal convergence and intra-regional trade. Employing a formal procedure, Furceri and Karras (2008) examined the macroeconomic costs and benefits of adopting a common currency of 13 Middle Eastern countries by determining the loss functions of the policies of monetary authorities (the relative weight they assign to price stability and some particular level of the output gap). Their results indicated that the estimated costs and benefits vary substantially across the countries in the sample of 13 countries, with Egypt and Lebanon having a lot to gain (and a lot to lose) and Oman and Saudi Arabia having little to gain (and little to lose) from a common currency.

3. Justifications and advantages of the Islamic gold dinar system

Among the Muslim scholars, the idea of returning to Gold Dinar has re-emerged and become a topic of debate. At least three justifications have been offered to returning to Gold Dinar (Mansor, 2006):

i. The belief that Gold Dinar is part of the Islamic faith (Vadillo, 2002). However, whether Gold Dinar is part of the Islamic faith is inconclusive. Haneef and Barakat (2002) reviewed the fiqhi opinion on the use of gold and silver as money. According to them, there are at least two opinions. One opinion views gold and silver as money obligatory, while the other allows flexibility. That is, the latter admits other forms of money.
ii. The argument that OIC should be less dependent on the USD as an international currency. The former Prime Minister of Malaysia, Dr. Mahathir bin Mohamed proposed the introduction of Islamic Gold Dinar in place of the US dollar for overseas trade settlements in the Muslim world to minimize the dependency on US dollar.[5]
iii. The current fiat and fractional reserve banking system is faulty. It is unjust and inherently unstable. Many blamed the weakness of the currency system for the recurring currency and financial turbulence experienced in recent past. The foundation of the weakness stems from the ability of banks to create money, which allows money supply to grow by default (Meera and Aziz, 2002).

A number of advantages have been offered for returning to Gold Dinar identified by Meera and Aziz (2002):

i. Stable Money
The elimination of money creation/destruction is one of the biggest advantages of the Dinar system. The Dinar could play its role as a store of value much better than the fiat money in an interest-based economy.
ii. Excellent Medium of Exchange
Since gold is priced and revered globally, it is always valued by people of all nations and creed. The dinar could easily play the role of a preferred global currency.
iii. Minimizes Speculation, Manipulation and Arbitrage
The speculative and arbitrage activities that take place in the current system are made possible by the existence of different currencies and the cross exchange rates between them. With Dinar acting like a single currency to eliminate all these exchange rates, speculation and arbitrage will not be possible. This would further strengthen and stabilize the economy.
iv. Business Cycle Effects Minimized
In the Dinar system, each transaction is an exchange within the real sector with actual funds. Unlike the interest-based monetary system with intermediate credit (i.e., credit cards) and virtual transactions, the Dinar system will create a harmonious relationship between the monetary sector and the real sector.
v. Dinar Promotes Trade
A single currency will facilitate trade among the OIC countries, bringing them closer in line with the broad principles of *Ukhwah* (brotherhood). By fostering closer ties among the Muslim nations, the Muslim countries will no longer be as dependant on other non-Muslim countries as they currently are.

4. Economic integration among the OIC countries

In order to integrate themselves politically and economically, the OIC member countries have already established many regional economic co-operation schemes. Some of these are formed with other OIC countries, while others include non-OIC countries. The four regional groupings which comprise only OIC member countries are Arab Maghreb Union (AMU), the Council of Arab Economic Unity (CAEU), the Economic Cooperation Organisation (ECO), and the Gulf Co-operation Council (GCC). Except for GCC, the groundwork for having Islamic Gold Dinar as a single currency for all or at least a group of Muslim countries is far from completion.[6]

The groupings composed of other non-OIC countries include regional integration schemes in Africa: African Economic Community (AEC), the Central African Customs and Economic Union (UDEAC), the Common Market for Eastern and Southern Africa (COMESA), the Cross-Border Initiative (CBI), the East African Community, the Economic Community of Central African States (ECCAS), the Economic Community of West African States (ECOWAS), the Indian Ocean Commission (IOC), the Mano River Union (MRI), and the West African Economic and Monetary Union (WAEMU). Outside of Africa, there exists such cooperation as the Association of South East Asian Nations (ASEAN), the Black Sea Economic Co-operation (BSEC), the Commonwealth of Independent States (CIS), and the South Asian Association for Regional Co-operation (SAARC).

4.1. The Gulf Co-operation Council Monetary Union

GCC was formed on 25 May 1981 to encourage policy coordination, integration and unity among six member states of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates. These six

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[5] However, Mansor (2006) argued that while there is a need to reduce dependence on the US dollar, returning to Gold Dinar is not imperative as there are other international currencies such as the euro that can play that function.

[6] See Mundell (1997).

countries are part of the OIC and they have signed agreement for economic union in 2001, progressing towards establishing a common market and monetary union. The GCC envisioned a single currency in January 2010. All the GCC states, with the exception of Kuwait (which depegged from US dollar in June 2007), have their currencies currently pegged to the US dollar since 2001. Oman, however, dropped out of plans for the Gulf Monetary Union in December 2006. This move was followed by the United Arab Emirates, which pulled out of plans for the Gulf Monetary Union in May 2009.[7]

For the time being, the remaining four other GCC states appear to be committed to pursuing the single currency. Bahrain, Kuwait, Qatar and Saudi Arabia announced the creation of a Monetary Council, a precursor to a united Central Bank, on 15 December 2009. The 2010 deadline would be extended to a date to be determined by the Monetary Council. The first Monetary Council meeting was held on 30 March 2010, chaired by Saudi's Central Bank Governor who serves as the Council's first chairman for a one-year term. Two other meetings were held subsequently in 2010 (in May and August respectively) in preparation for the establishment of a central bank for the member countries of monetary union and for choosing a currency regime.

5. Methodology

This study applies Bayoumi and Eichengreen (1993, 1994 and 1999) approach to isolate the permanent and transitory effects of macroeconomic shocks. Their model is based on the Aggregate Demand-Aggregate Supply framework. They argue that a positive demand shock will increase both price and output in the short run but only price in the long run, while positive supply shocks will increase output and lower price both in the short run and long run. In other words, while supply shocks have long run permanent effects on the level of output, demand shocks only have temporary effects. Both have permanent effects on the level of prices. The procedure used is a modification of Blanchard and Quah (1989), developed by Bayoumi (1992).

The model is represented by an infinite moving average representation of a (vector) of variables, X_t, and an equal number of shocks, ε_t. Using the lag operator L, this can be written as:

$$X_t = A_0\varepsilon_t + A_1\varepsilon_{t-1} + A_2\varepsilon_{t-2} + ... + A_n\varepsilon_{t-n}$$
$$= \sum_{i=0}^{\infty} L^i A_i \varepsilon_t \qquad (1)$$

where the matrices A_i represent the impulse response functions of the shocks to the elements of X. Let X_t (2×1 vector) be made up of Y_t (real GDP) and P_t (CPI) which are both in log-difference form ($\log Y_t - \log Y_{t-1}$); ε_t is the demand and supply shocks. The model defined becomes:

$$\begin{bmatrix} Y_t \\ P_t \end{bmatrix} = \sum_{i=0}^{\infty} L^i \begin{bmatrix} a11_i & a12_i \\ a21_i & a22_i \end{bmatrix} \begin{bmatrix} \varepsilon_{st} \\ \varepsilon_{dt} \end{bmatrix} \qquad (2)$$

ε_{st} and ε_{dt} are independent supply and demand shocks; a_{11i} represents elements in matrix A_i. Since demand shock must cause no change in output in the long run, this implies:

$$\sum_{i=0}^{\infty} a_{11i} = 0 \qquad (3)$$

The model defined above can be estimated using a vector autoregression (VAR). Each element of X_t can be regressed on lagged values of all the elements of X. Using B to represent these estimated coefficients, the VAR equation looks like:

$$X_t = B_1X_{t-1} + B_2X_{t-2} + ... + B_nX_{t-n} + e_t \qquad (4)$$

Using the lag operator:

$$X_t = B_1L X_t + B_2L^2X_t + ... + B_nL^nX_t + e_t$$
$$= [I-B(L)]^{-1}e_t$$
$$= \left[I + B(L) + B(L)^2 + ...\right]e_t \qquad (5),(6)$$
$$= e_t + D_1e_{t-1} + D_2e_{t-2} + D_3e_{t-3} + ...$$

where e_t represents the residuals from the equations in the vector autoregression, i.e., the residuals of the output and price equation, and we label those e_t^y and e_t^p respectively. To recover the structural model from the reduced form model, the residuals from the VAR (e) have to be converted into supply and demand shocks (ε). Note that it is crucial to decompose real GDP growth and inflation shocks because they are combination of supply and demand shocks.

Writing

$$e_t = C\varepsilon_t \qquad (7)$$

where C is a 2×2 matrix of some constants, and ε_t is a 2×1 vector comprising of ε_t^s and ε_t^d which are supply shock and demand shock respectively. In order for matrix C to be uniquely defined, four restrictions need to be imposed. The first two are normalisation of covariance matrix of ε_t^s and ε_t^d. This means variances of both ε_t^s and ε_t^d are equal to one. The third restriction is that ε_t^s and ε_t^d are orthogonal, meaning their covariance is zero. These three restrictions imply that the covariance matrix of ε_t^s and ε_t^d is an identity matrix. The final restriction, which allows the matrix C to be uniquely defined, do those demand shocks have only temporary effects on output.[8] The final restriction implies Eq. (3). In terms of vector autoregression, Eq. (3) can also be written as:

$$\sum_{i=0}^{\infty} \begin{bmatrix} d_{11i} & d_{12i} \\ d_{21i} & d_{22i} \end{bmatrix} \begin{bmatrix} c_{11i} & c_{12i} \\ c_{21i} & c_{22i} \end{bmatrix} = \begin{bmatrix} 0 & \cdot \\ \cdot & \cdot \end{bmatrix}$$

from Eq. (5),

$$X_t = [I-B(L)]^{-1}e_t$$
$$= [I-B(L)]^{-1}C\varepsilon_t$$

where 2×2 matrix $\sum D_i$ is equivalent to a 2×2 matrix $[I-B(L)]^{-1}$ of Eq. (5). In order to calculate for $[I-B(L)]^{-1}$, notice that in the long run at steady state, Eq. (4) becomes:

$$X_t = B_1X_t + B_2X_t + ... + B_nX_t + e_t$$
$$X_t = (I-B_1-B_2-...-B_n)^{-1}e_t$$

Since B_1, B_2,...,B_n are parameters obtained from running a vector autoregressive Eq. (4) with an optimal lag length, matrix $\sum D_i$ can now be calculated. Thus the fourth restriction is:

$$d_{11i} * C_{11} + d_{12i} * C_{21} = 0. \qquad (8)$$

Let's define $\sum_e$ to be a 2×2 covariance matrix of e_t^y and e_t^p and $\sum_e$ to be a 2×2 covariance matrix of ε_t^s and ε_t^d. As a result of restrictions 1 to 3, $\sum_e$ and $\sum_\varepsilon$ are just a 2×2 identity matrix. Then from $e_t = C\varepsilon_t$, we know that e_t is just a linear combination of ε_t. We can thus derive:

$$\sum_e = C \sum_\varepsilon C^T \qquad (9)$$

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[7] This move appeared to be linked to the decision that the monetary council would be located in Saudi Arabia's capital, Riyadh.

[8] This is where Bayoumi's analysis, based on the work of Blanchard and Quah (1989), differs from other VAR models. The usual decomposition assumes that the variables in the VAR can be ordered such that all the effects which could be attributed to (say) either a_t or b_t are attributed to whichever comes first in the ordering. This is achieved by Choleski decomposition (Sims, 1980).

where C^T is a transpose of matrix C. After some matrix multiplications, we obtain the following equations:

$$C_{11}^2 + C_{12}^2 = Var(e_t^y) \tag{10}$$

$$C_{11}C_{21} + C_{12}C_{22} = Cov(e_t^y, e_t^p) \tag{11}$$

$$C_{21}^2 + C_{22}^2 = Var(e_t^p). \tag{12}$$

We now have four equations in four unknowns in (8), (10), (11) and (12), so matrix C can be determined uniquely. Eq. (7) can also be written as:

$$C^{-1}e_t = \varepsilon_t \tag{13}$$

where C^{-1} is the inverse of matrix C. Finally, we can calculate for ε_t^s and ε_t^d directly from Eq. (13).

This study examines the symmetry in macroeconomic disturbances of 24 OIC economies, and the country list is provided in Table 2. Upon isolating the demand and supply shocks, Pearson correlation approach will be employed to calculate the correlation coefficients of these shocks between the OIC countries. The data used in this paper are drawn from the *Penn World Table* 6.3. For each country, growth and inflation were calculated as the change in the logarithm of real GDP and the GDP deflator.[9]

5.1. The Pearson product-moment correlation as a measure of symmetry of shocks

The Pearson Product-Moment correlation or "Pearson correlation" is employed to examine how the countries' underlying structural shocks move together. It is obtained by dividing the covariance (*cov*) of the two series by the product of their standard deviations. The Pearson correlation *Corr (X,Y)* between two random variables X and Y with standard deviations of σ_X and σ_Y is defined as:

$$Corr(X, Y) = \frac{Cov(X, Y)}{\sigma_X \sigma_Y}.$$

The significance (probability) of the correlation coefficient is determined from the *t*-statistics which are reported below the correlation coefficient in Tables 2–5 and 9–12. Basten (2006) outlined three characteristics of the correlation which are worth noting. Firstly, the correlation coefficient does not differentiate between dependent and independent variables and it is entirely symmetric. Secondly, the correlation coefficient is an appropriate measure of only linear but not non-linear relationships. Finally, one must bear in mind that the correlation coefficient does not imply causation. Despite the fact that Pearson correlation does not prove causation, it is still an appropriate measure for the purpose of this study as we are interested in how closely the underlying structural shocks move together.

6. Estimation and results

This study estimates bivariate VARs for each country in the sample to identify supply and demand shocks. The standard Schwarz information criterion was used in determining the optimal lag length. Since most of the models had an optimal lag length of one, the number of lags was set at 1 for all countries to preserve the symmetry of the specification across countries. The Pearson correlation statistics is used to test if the correlation is statistically significant. If the correlation is found to be positive and statistically significant, it is said that shocks are symmetric. However, if the correlation is negative or not statistically significant, the shocks are said to be asymmetric.

6.1. Correlation of supply and demand shocks

The structural VAR approach mentioned earlier is used to estimate the underlying macroeconomic disturbances using data from 1970 to 2007.[10] It is assumed that if the correlation of structural shocks is positive, the shocks are considered to be symmetric, and if negative, they are asymmetric. Results of the two identified supply and demand shocks among the OIC economies are reported in Tables 2 and 3 respectively.

Brunei's supply shocks are found to be highly correlated with those experienced by the following countries: Libya; Malaysia; Maldives; and Saudi Arabia. Its supply shock correlations with other OIC countries are either asymmetric or low (Table 6 summarizes the results for all other countries). While most countries' supply shocks are found to be correlated with at least one other country in the OIC, no symmetric supply shocks are found between Egypt and any other OIC countries. Albania has experienced mainly asymmetric supply shocks or insignificant correlations with the rest of the OIC economies (except with Kuwait). The empirical results show that only subgrouped OIC countries experienced symmetric supply shocks. Table 7 shows that symmetric supply shocks are detected for only three groups of countries. Similarly, symmetric demand shocks prevail only in sub-grouped OIC countries. Demand shocks correlations in Albania with other OIC countries are either asymmetric or low. Overall, the OIC economies have more symmetric demand shocks than the supply shocks.

A similar study of the structural shocks for the European countries before the EMU is conducted using data from 1970 to 1998. While the results in Tables 4 and 5 suggest that symmetric demand shocks prevail in all of the European countries examined in this study, only sub-grouped European countries experienced symmetric supply shocks. For instance, Ireland's supply shocks with the other European countries are mostly asymmetric; supply shocks in Greece are only correlated with Denmark, Germany, Portugal and UK; supply shocks in Norway are only highly correlated with Denmark and Netherlands and not with any other European countries. German supply shocks are only found to be highly correlated with those experienced by the following countries: Austria, Belgium, Denmark, France, Greece, Italy, Netherlands, Portugal, Spain, Switzerland and UK. Its supply shock correlations with other European countries are either asymmetric or low. These results suggest that supply shocks are less symmetric in the European countries than one expects. Overall, the results show that the underlying structural shocks are less symmetric in the OIC economies than in the European countries.

6.2. Size of disturbances

Bayoumi and Eichengreen's (1994) methodology also allows us to estimate the relative size of the disturbances. A country becomes a better candidate of OCA if the underlying shocks are small. Similarly, the faster the adjustment to disturbances, the smaller will be the cost of renouncing the monetary sovereignty. The size of

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[9] Bayoumi and Eichengreen (1993) stated that GDP deflator should be chosen over CPI since it reflects the price of output rather than the price of consumption.

[10] This data set covers a period in which there may have been structural changes to the OIC economies (i.e., Asian financial crisis and the Gulf war). Since only a small percentage of the countries in the sample (namely Indonesia, Iran, Kuwait and Malaysia) were significantly affected by these events, this study does not include the test for possible structural breaks. Nevertheless, this is a possible extension for future research.

Table 2
Correlation of supply shocks among the OIC countries (1970–2007).

	Alb	Alg	Bhr	Bru	Egt	Gb	Gy	Indo	Iran	Jd	Kwt	Lbn	Lbya	M'sia	M'dv	M'co	Om	Qt	SA	Sur	Syria	Tun	Tky	UAE
Albania	1.00																							
Algeria	0.20	1.00																						
	0.23																							
Bahrain	−0.02	0.16	1.00																					
	0.90	0.36																						
Brunei	−0.15	0.34	0.38	1.00																				
	0.38	0.04	0.02																					
Egypt	0.16	−0.10	−0.44	−0.04	1.00																			
	0.35	0.55	0.01	0.82																				
Gabon	0.04	0.07	0.26	0.41	−0.19	1.00																		
	0.81	0.68	0.13	0.01	0.26																			
Guyana	−0.16	−0.35	−0.07	−0.18	−0.15	−0.13	1.00																	
	0.35	0.04	0.69	0.30	0.38	0.44																		
Indo	−0.11	0.03	0.24	0.00	−0.21	−0.10	0.15	1.00																
	0.52	0.88	0.16	0.99	0.22	0.58	0.37																	
Iran	−0.15	0.05	0.11	0.34	0.01	0.46	−0.26	−0.06	1.00															
	0.38	0.79	0.53	0.04	0.96	0.00	0.13	0.73																
Jordan	−0.24	0.06	0.13	0.07	0.04	−0.13	−0.05	−0.09	0.09	1.00														
	0.17	0.73	0.46	0.70	0.83	0.46	0.76	0.60	0.61															
Kuwait	0.57	0.15	0.21	0.02	−0.02	0.02	0.00	0.00	−0.13	0.02	1.00													
	0.00	0.39	0.23	0.92	0.89	0.91	0.98	0.99	0.45	0.89														
Lebanon	−0.15	0.11	−0.21	−0.31	−0.17	−0.46	0.39	−0.05	−0.47	−0.05	−0.06	1.00												
	0.40	0.54	0.23	0.07	0.31	0.00	0.02	0.79	0.00	0.77	0.72													
Libya	−0.03	0.27	0.31	0.60	−0.27	0.32	0.09	0.05	0.01	−0.23	0.11	−0.12	1.00											
	0.87	0.12	0.06	0.00	0.12	0.06	0.58	0.76	0.97	0.18	0.53	0.49												
Malaysia	−0.15	−0.18	0.45	0.25	−0.16	0.07	0.12	0.68	0.07	0.07	−0.01	−0.24	0.09	1.00										
	0.37	0.28	0.01	0.14	0.36	0.67	0.47	0.00	0.69	0.69	0.96	0.16	0.59											
Maldives	−0.05	0.08	0.36	−0.03	−0.47	−0.09	0.16	0.14	−0.23	0.10	0.03	0.18	−0.10	0.22	1.00									
	0.77	0.65	0.03	0.87	0.00	0.61	0.34	0.41	0.17	0.58	0.85	0.31	0.58	0.20										
Morocco	0.03	0.01	−0.01	0.32	0.12	0.21	−0.20	−0.26	0.10	−0.02	−0.26	−0.29	0.28	−0.21	0.00	1.00								
	0.88	0.98	0.95	0.06	0.47	0.21	0.25	0.12	0.57	0.92	0.12	0.09	0.10	0.22	0.99									
Oman	−0.03	0.28	−0.03	0.03	−0.22	0.05	0.03	−0.07	−0.07	0.28	0.06	0.11	0.14	−0.07	0.27	−0.07	1.00							
	0.87	0.10	0.86	0.87	0.20	0.77	0.85	0.70	0.69	0.10	0.72	0.53	0.40	0.70	0.11	0.67								
Qatar	−0.17	−0.02	0.18	−0.03	−0.02	0.02	0.22	0.01	0.06	0.28	0.34	−0.07	−0.08	0.17	0.14	−0.31	0.00	1.00						
	0.32	0.90	0.30	0.86	0.91	0.90	0.20	0.96	0.74	0.09	0.04	0.69	0.63	0.33	0.41	0.07	0.98							
Saudi	−0.17	0.16	0.56	0.19	−0.28	0.33	0.10	0.15	−0.09	0.28	−0.14	−0.06	0.14	0.21	0.23	0.17	−0.01	0.11	1.00					
	0.31	0.34	0.00	0.26	0.10	0.05	0.55	0.38	0.59	0.09	0.41	0.74	0.41	0.22	0.18	0.32	0.96	0.52						
Suriname	−0.05	0.24	0.13	0.01	−0.22	0.05	0.12	−0.06	0.09	0.11	−0.08	−0.09	0.17	−0.10	0.11	0.11	0.25	0.04	0.36	1.00				
	0.78	0.15	0.44	0.96	0.20	0.78	0.50	0.72	0.61	0.53	0.63	0.62	0.31	0.58	0.54	0.51	0.14	0.83	0.03					
Syria	−0.12	0.05	0.02	0.00	0.02	0.05	0.27	−0.17	−0.06	0.42	−0.10	0.06	0.15	−0.25	−0.05	0.05	0.37	0.11	0.30	0.04	1.00			
	0.47	0.75	0.91	0.98	0.92	0.78	0.12	0.32	0.74	0.01	0.58	0.74	0.37	0.13	0.79	0.75	0.03	0.54	0.07	0.80				
Tunisia	0.02	0.32	0.03	−0.02	−0.42	0.03	0.01	−0.06	0.20	0.33	0.16	0.12	0.05	−0.24	0.28	−0.04	0.63	0.13	−0.04	0.03	0.33	1.00		
	0.91	0.05	0.85	0.93	0.01	0.86	0.96	0.71	0.24	0.05	0.35	0.49	0.78	0.16	0.10	0.81	0.00	0.47	0.83	0.87	0.05			
Turkey	−0.14	0.09	0.13	0.02	0.04	0.10	−0.07	0.04	0.18	0.19	0.13	−0.14	−0.16	0.18	0.05	−0.35	0.09	0.30	0.14	0.03	0.25	0.00	1.00	
	0.42	0.62	0.43	0.91	0.80	0.57	0.68	0.83	0.28	0.27	0.43	0.41	0.35	0.30	0.77	0.04	0.59	0.08	0.41	0.86	0.14	1.00		
UAE	0.04	0.20	0.23	0.30	−0.28	0.43	0.19	0.04	−0.02	−0.21	0.01	0.14	0.26	0.26	0.20	−0.16	0.25	−0.04	0.28	−0.07	−0.04	0.10	0.07	1.00
	0.84	0.23	0.18	0.08	0.10	0.01	0.28	0.83	0.92	0.21	0.94	0.40	0.13	0.12	0.23	0.35	0.15	0.81	0.09	0.70	0.82	0.57	0.69	

Table 3
Correlation of demand shocks among the OIC countries (1970–2007).

	Alb	Alg	Bhr	Bru	Egt	Gb	Gy	Indo	Iran	Jd	Kwt	Lbn	Lbya	M'sia	M'dv	M'co	Om	Qt	SA	Sur	Syria	Tun	Tky	UAE
Albania	1.00																							
Algeria	−0.13	1.00																						
	0.44																							
Bahrain	−0.12	0.28	1.00																					
	0.49	0.09																						
Brunei	−0.13	1.00	0.28	1.00																				
	0.44	0.00	0.09																					
Egypt	0.07	0.08	−0.12	0.08	1.00																			
	0.69	0.65	0.47	0.65																				
Gabon	−0.05	0.54	0.42	0.54	0.13	1.00																		
	0.76	0.00	0.01	0.00	0.43																			
Guyana	−0.09	0.34	−0.08	0.34	0.11	0.17	1.00																	
	0.59	0.04	0.63	0.04	0.53	0.31																		
Indo	0.08	0.20	0.45	0.20	0.11	0.46	0.22	1.00																
	0.64	0.23	0.01	0.23	0.52	0.00	0.19																	
Iran	−0.04	0.18	−0.01	0.18	−0.02	0.33	0.13	0.22	1.00															
	0.83	0.30	0.95	0.30	0.93	0.05	0.45	0.20																
Jordan	−0.18	0.20	−0.09	0.20	0.48	0.27	0.22	0.00	−0.06	1.00														
	0.30	0.25	0.58	0.25	0.00	0.12	0.20	0.99	0.71															
Kuwait	−0.03	0.37	0.45	0.37	0.06	0.64	0.14	0.52	0.34	−0.02	1.00													
	0.87	0.03	0.01	0.03	0.74	0.00	0.41	0.00	0.04	0.93														
Lebanon	−0.02	0.04	−0.17	0.04	0.15	−0.02	0.45	0.15	0.21	0.04	−0.09	1.00												
	0.92	0.84	0.32	0.84	0.39	0.89	0.01	0.40	0.21	0.83	0.62													
Libya	−0.20	0.41	0.51	0.41	0.01	0.57	0.18	0.34	0.14	0.00	0.59	0.06	1.00											
	0.25	0.01	0.00	0.01	0.94	0.00	0.30	0.05	0.42	0.99	0.00	0.71												
Malaysia	0.03	0.17	0.40	0.17	0.15	0.68	−0.10	0.57	0.40	0.03	0.44	−0.05	0.40	1.00										
	0.88	0.33	0.02	0.33	0.39	0.00	0.58	0.00	0.02	0.84	0.01	0.76	0.02											
Maldives	−0.12	0.10	0.24	0.10	−0.24	0.23	0.25	0.10	0.28	−0.24	0.40	0.32	0.40	0.30	1.00									
	0.47	0.57	0.17	0.57	0.16	0.18	0.14	0.55	0.09	0.16	0.02	0.06	0.02	0.08										
Morocco	0.06	0.30	−0.10	0.30	0.24	0.44	0.31	0.01	0.21	0.48	0.12	0.30	0.13	0.19	0.23	1.00								
	0.71	0.07	0.58	0.07	0.17	0.01	0.07	0.96	0.22	0.00	0.50	0.08	0.47	0.27	0.17									
Oman	−0.17	0.44	0.55	0.44	0.11	0.69	0.18	0.44	0.37	0.01	0.89	−0.09	0.68	0.53	0.49	0.15	1.00							
	0.31	0.01	0.00	0.01	0.52	0.00	0.30	0.01	0.03	0.93	0.00	0.60	0.00	0.00	0.00	0.39								
Qatar	−0.17	0.37	0.56	0.37	−0.02	0.63	−0.02	0.54	0.16	0.00	0.49	−0.13	0.50	0.62	0.03	0.13	0.51	1.00						
	0.33	0.03	0.00	0.03	0.92	0.00	0.92	0.00	0.35	1.00	0.00	0.44	0.00	0.00	0.84	0.44	0.00							
Saudi	−0.19	0.38	0.37	0.38	−0.01	0.46	0.38	0.41	0.26	−0.10	0.79	−0.03	0.58	0.22	0.31	−0.04	0.76	0.42	1.00					
	0.26	0.02	0.03	0.02	0.94	0.01	0.02	0.01	0.13	0.56	0.00	0.88	0.00	0.19	0.07	0.81	0.00	0.01						
Suriname	−0.06	0.20	0.07	0.20	−0.02	0.19	0.04	−0.03	0.25	0.47	0.18	−0.03	−0.03	0.00	−0.08	0.23	0.00	0.11	0.11	1.00				
	0.72	0.25	0.69	0.25	0.92	0.28	0.84	0.88	0.15	0.00	0.30	0.86	0.86	1.00	0.64	0.17	0.98	0.51	0.52					
Syria	−0.09	0.24	−0.08	0.24	−0.02	0.39	0.16	0.18	0.81	−0.08	0.34	0.18	0.25	0.28	0.11	0.01	0.29	0.19	0.35	0.16	1.00			
	0.58	0.15	0.92	0.15	0.92	0.02	0.34	0.28	0.00	0.63	0.04	0.30	0.15	0.09	0.53	0.95	0.09	0.27	0.04	0.35				
Tunisia	−0.01	0.32	−0.08	0.32	0.18	0.55	0.31	0.12	0.19	0.53	0.28	0.21	0.27	0.27	0.14	0.87	0.28	0.21	0.11	0.22	0.07	1.00		
	0.96	0.06	0.63	0.06	0.29	0.00	0.07	0.49	0.28	0.00	0.10	0.23	0.12	0.12	0.40	0.00	0.09	0.21	0.54	0.20	0.69			
Turkey	−0.03	0.38	0.18	0.38	−0.17	0.51	0.16	0.12	0.09	−0.07	0.29	0.12	0.25	0.25	0.24	0.30	0.29	0.25	0.20	0.06	0.17	0.34	1.00	
	0.86	0.02	0.31	0.02	0.32	0.00	0.34	0.47	0.59	0.68	0.08	0.48	0.13	0.14	0.16	0.08	0.08	0.15	0.24	0.72	0.32	0.05		
UAE	0.06	0.35	0.53	0.35	−0.15	0.20	−0.19	0.29	−0.08	−0.23	0.10	−0.06	0.23	0.23	0.01	−0.04	0.12	0.56	0.13	0.03	−0.10	−0.15	0.23	1.00
	0.73	0.03	0.00	0.03	0.37	0.24	0.27	0.08	0.65	0.17	0.55	0.71	0.18	0.17	0.97	0.80	0.47	0.00	0.45	0.84	0.55	0.39	0.18	

Table 4
Correlations of supply shocks among the European countries (1970–1998).

	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Nethld	Norway	Portugal	Spain	Sweden	Switz	UK
Austria	1.00															
Belgium	0.39	1.00														
	0.05															
Denmark	0.51	0.62	1.00													
	0.01	0.00														
Finland	0.18	0.20	0.21	1.00												
	0.37	0.32	0.30													
France	0.55	0.79	0.66	0.24	1.00											
	0.00	0.00	0.00	0.23												
Germany	0.58	0.67	0.74	0.06	0.69	1.00										
	0.00	0.00	0.00	0.78	0.00											
Greece	0.03	0.27	0.49	0.31	0.27	0.52	1.00									
	0.88	0.18	0.01	0.12	0.17	0.01										
Ireland	−0.23	−0.03	−0.28	0.29	−0.05	−0.15	0.03	1.00								
	0.24	0.87	0.16	0.14	0.79	0.47	0.87									
Italy	0.63	0.80	0.69	0.23	0.85	0.72	0.17	−0.16	1.00							
	0.00	0.00	0.00	0.26	0.00	0.00	0.40	0.44								
Netherland	0.35	0.77	0.52	0.03	0.69	0.66	0.17	−0.23	0.77	1.00						
	0.07	0.00	0.01	0.86	0.00	0.00	0.41	0.24	0.00							
Norway	0.01	0.22	0.32	−0.06	−0.15	0.31	0.18	−0.13	0.15	0.35	1.00					
	0.97	0.28	0.10	0.78	0.44	0.11	0.38	0.52	0.46	0.07						
Portugal	0.66	0.62	0.58	0.24	0.75	0.72	0.43	−0.13	0.73	0.54	−0.12	1.00				
	0.00	0.00	0.00	0.23	0.00	0.00	0.03	0.51	0.00	0.00	0.56					
Spain	0.44	0.75	0.38	0.30	0.63	0.49	0.13	0.13	0.62	0.49	−0.02	0.70	1.00			
	0.02	0.00	0.05	0.13	0.00	0.01	0.50	0.52	0.00	0.01	0.94	0.00				
Sweden	−0.01	0.42	0.37	0.55	0.41	0.29	0.27	0.09	0.43	0.29	0.07	0.20	0.29	1.00		
	0.94	0.03	0.06	0.00	0.03	0.14	0.18	0.65	0.02	0.15	0.72	0.32	0.14			
Switzerland	0.43	0.56	0.10	0.16	0.55	0.38	−0.12	0.17	0.58	0.55	−0.06	0.50	0.54	0.01	1.00	
	0.02	0.00	0.63	0.43	0.00	0.05	0.54	0.40	0.00	0.00	0.78	0.01	0.00	0.95		
UK	0.24	0.22	0.55	0.44	0.49	0.44	0.57	−0.04	0.33	0.32	−0.09	0.51	0.26	0.30	0.02	1.00
	0.22	0.27	0.00	0.02	0.01	0.02	0.00	0.83	0.09	0.10	0.67	0.01	0.19	0.13	0.94	

demand and supply shocks reported in Table 9 is measured by the standard deviations of the underlying shocks. The size of the supply shocks is comparatively larger for such oil producing countries as Lebanon, Kuwait, and UAE. The average size of supply and demand shocks is 0.08 and 0.14 respectively for the OIC economies (Table 8). It is evident that OIC economies have experienced

Table 5
Correlations of demand shocks among the European countries (1970–1998).

	Austria	Belgium	Denmk	Finland	France	Germany	Greece	Ireland	Italy	Nethld	Norway	Portugal	Spain	Sweden	Switz	UK
Austria	1.00															
Belgium	0.93	1.00														
	0.00															
Denmark	0.88	0.89	1.00													
	0.00	0.00														
Finland	0.87	0.82	0.79	1.00												
	0.00	0.00	0.00													
France	0.89	0.91	0.88	0.80	1.00											
	0.00	0.00	0.00	0.00												
Germany	0.97	0.94	0.91	0.84	0.91	1.00										
	0.00	0.00	0.00	0.00	0.00											
Greece	0.79	0.69	0.77	0.81	0.71	0.76	1.00									
	0.00	0.00	0.00	0.00	0.00	0.00										
Ireland	0.87	0.88	0.83	0.78	0.89	0.86	0.71	1.00								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
Italy	0.79	0.80	0.77	0.67	0.83	0.82	0.66	0.83	1.00							
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
Netherland	0.96	0.94	0.91	0.82	0.89	0.98	0.74	0.89	0.79	1.00						
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
Norway	0.80	0.77	0.78	0.83	0.77	0.79	0.76	0.83	0.73	0.82	1.00					
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
Portugal	0.81	0.82	0.80	0.81	0.90	0.78	0.68	0.80	0.75	0.78	0.78	1.00				
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
Spain	0.86	0.82	0.78	0.84	0.83	0.81	0.76	0.88	0.83	0.81	0.77	0.80	1.00			
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Sweden	0.76	0.81	0.82	0.83	0.85	0.78	0.69	0.83	0.85	0.77	0.80	0.83	0.86	1.00		
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Switzerland	0.86	0.88	0.88	0.73	0.84	0.92	0.67	0.74	0.70	0.91	0.63	0.67	0.67	0.69	1.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
UK	0.55	0.61	0.59	0.55	0.70	0.55	0.56	0.80	0.67	0.59	0.63	0.62	0.66	0.70	0.50	1.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	

Table 6
Country Pairs with symmetric supply shocks.

Albania	Kuwait
Algeria	Brunei; Oman; Tunisia
Bahrain	Brunei; Libya; Malaysia; Maldives; Saudi Arabia
Brunei	Algeria; Bahrain; Gabon; Iran; Libya; Morocco; UAE
Egypt	Nil
Gabon	Brunei; Iran; Libya; Saudi Arabia; UAE
Guyana	Lebanon
Indonesia	Malaysia
Iran	Brunei; Gabon
Jordan	Saudi Arabia; Syria; Tunisia
Kuwait	Albania; Qatar
Lebanon	Guyana
Libya	Bahrain; Brunei; Gabon; Morocco
Malaysia	Bahrain; Indonesia
Maldives	Bahrain; Tunisia
Morocco	Brunei; Libya
Oman	Algeria; Syria; Tunisia
Qatar	Kuwait; Turkey
Saudi Arabia	Bahrain; Gabon; Suriname; Syria
Suriname	Saudi Arabia
Syria	Jordan; Oman; Saudi Arabia; Tunisia
Tunisia	Algeria; Jordan; Maldives; Syria
Turkey	Qatar
UAE	Brunei; Gabon; Saudi Arabia

Table 8
Size of supply and demand shocks.

	Aggregate demand disturbances	Aggregate demand disturbances
Albania	0.077	0.102
Algeria	0.041	0.091
Bahrain	0.079	0.070
Brunei	0.069	0.183
Egypt	0.030	0.144
Gabon	0.096	0.157
Guyana	0.043	0.116
Indonesia	0.044	0.184
Iran	0.060	0.193
Jordan	0.053	0.088
Kuwait	0.180	0.215
Lebanon	0.250	0.245
Libya	0.087	0.155
Malaysia	0.047	0.088
Maldives	0.079	0.119
Morocco	0.058	0.085
Oman	0.070	0.203
Qatar	0.069	0.129
Saudi Arabia	0.059	0.153
Suriname	0.058	0.206
Syria	0.085	0.156
Tunisia	0.041	0.077
Turkey	0.055	0.148
UAE	0.170	0.068
Average	0.079	0.141
Europe (1970–1998)		
Austria	0.019	0.009
Belgium	0.020	0.012
Denmark	0.008	0.010
Finland	0.023	0.024
France	0.013	0.013
Germany	0.027	0.008
Greece	0.035	0.032
Ireland	0.024	0.032
Italy	0.021	0.018
Netherlands	0.017	0.013
Norway	0.012	0.024
Portugal	0.026	0.029
Spain	0.018	0.018
Sweden	0.018	0.017
Switzerland	0.022	0.017
UK	0.015	0.028
Average	0.020	0.019

larger demand shocks compared to supply shocks (except for the three countries which experienced the largest supply shocks). In comparison with the EU countries before the EMU, OIC countries experienced four times larger supply shocks and seven times larger demand shocks on average (refer to Table 9).

6.3. The adjustment process to supply and demand shocks

While the supply shocks of two countries (which are of the same size) may move in the same direction and be correlated, the effects of the shocks on outputs and prices in these two countries may be different. In other words, the output and prices may respond differently to symmetric disturbances. Countries that are hit by the same disturbance may end up in totally different situations and country-specific policies would be needed to correct the disequilibrium. This section compares how the OIC countries adjust to demand and supply disturbances. Following (Frenkel and Nickel, 2005), the correlation coefficients of impulse responses of output and prices to disturbances are calculated between countries.

Tables 9 and 10 show the correlation coefficients between the adjustment paths following a one unit supply shocks. Overall, the impulse response of output to the supply shocks is very similar between the OIC countries and they are all significantly positive. On the other hand, Albania, Kuwait, Lebanon, Oman and Suriname seem to have significantly different response of prices to the supply shocks than most the OIC countries. Results in Tables 11 and 12 reveal that the responses of output and prices to demand shocks are less symmetric overall, although some countries do have fairly high correlation coefficients with a least some of the OIC countries.

7. Conclusion

This paper employs the Structural VAR approach proposed by Bayoumi and Eichengreen (1993, 1994, 1999) to identify the struc-

Table 7
Group of countries with correlated supply shocks.

Group 1	Brunei, Gabon and UAE
Group 2	Brunei, Gabon and Iran
Group 3	Jordan, Tunisia and Syria

tural shocks among the OIC economies, as a preliminary way of examining the desirability of the OIC economies to an alternative exchange rate arrangement (a monetary union) that can potentially enhance the exchange rate stability and credibility in these Islamic economies. The theory of OCA postulates that the costs of relinquishing the exchange rate instrument are relatively high if the underlying shocks are asymmetric and if there are very different responses to shocks.

In comparison with the EU countries, the underlying structural shocks in OIC are less symmetric with a larger size on average. The correlations of supply shocks suggest that it is less feasible for the entire OIC to form a currency union. However, the results do imply that some sub-groups among some OIC countries with highly symmetrical permanent supply shocks are better candidates for a currency union. The examination of adjustment paths of the OIC countries to supply and demand shocks points to several similarities and differences between countries. Overall, the impulse response of output to supply shocks is more similar between the countries compared to that of the demand shocks. While the impulse response of output to the supply shocks is highly symmetric, a fairly asymmetric response of prices to supply shocks is observed for Albania, Kuwait, Lebanon, Oman and Suriname. The variation of correlation coefficients between countries also appears to be fairly high in terms of the response of output and

Table 9
Correlation of Impulse response functions to supply shocks impulse response of output.

	Alb	Alg	Bhr	Bru	Egt	Gb	Gy	Indo	Iran	Jd	Kwt	Lbn	Lbya	M'sia	M'dv	M'co	Om	Qt	SA	Sur	Syria	Tun	Tky	UAE
Albania	1.00																							
Algeria	0.73	1.00																						
	0.00																							
Bahrain	0.87	0.82	1.00																					
	0.00	0.00																						
Brunei	0.92	0.45	0.63	1.00																				
	0.00	0.05	0.00																					
Egypt	0.66	0.69	0.92	0.41	1.00																			
	0.00	0.00	0.00	0.07																				
Gabon	0.98	0.81	0.95	0.82	0.77	1.00																		
	0.00	0.00	0.00	0.00	0.00																			
Guyana	0.98	0.81	0.95	0.82	0.77	1.00	1.00																	
	0.00	0.00	0.00	0.00	0.00	0.00																		
Indo	0.78	0.78	0.98	0.52	0.98	0.88	0.88	1.00																
	0.00	0.00	0.00	0.02	0.00	0.00	0.00																	
Iran	0.93	0.84	0.99	0.72	0.86	0.98	0.98	0.95	1.00															
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00																
Jordan	0.90	0.84	1.00	0.66	0.89	0.97	0.97	0.97	1.00	1.00														
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00															
Kuwait	0.96	0.52	0.75	0.98	0.53	0.90	0.89	0.65	0.82	0.77	1.00													
	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00														
Lebanon	0.72	0.99	0.75	0.48	0.61	0.78	0.77	0.70	0.78	0.78	0.52	1.00												
	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02													
Libya	1.00	0.76	0.90	0.89	0.69	0.99	0.99	0.81	0.95	0.92	0.95	0.74	1.00											
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00												
Malaysia	0.89	0.83	1.00	0.65	0.91	0.96	0.96	0.97	0.99	1.00	0.76	0.76	0.91	1.00										
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
Maldives	0.92	0.84	0.99	0.69	0.87	0.98	0.98	0.96	1.00	1.00	0.80	0.78	0.94	1.00	1.00									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00										
Morocco	0.98	0.81	0.95	0.82	0.77	1.00	1.00	0.88	0.98	0.97	0.89	0.78	0.99	0.96	0.98	1.00								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
Oman	0.99	0.75	0.82	0.92	0.59	0.96	0.96	0.72	0.89	0.86	0.94	0.75	0.99	0.84	0.88	0.96	1.00							
	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
Qatar	0.91	0.83	1.00	0.68	0.89	0.97	0.97	0.96	1.00	1.00	0.79	0.77	0.93	1.00	1.00	0.97	0.87	1.00						
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
Saudi	0.95	0.83	0.97	0.76	0.82	0.99	1.00	0.92	1.00	0.99	0.85	0.78	0.97	0.98	0.99	1.00	0.92	0.99	1.00					
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
Suriname	0.97	0.56	0.77	0.98	0.55	0.91	0.91	0.67	0.84	0.79	1.00	0.56	0.96	0.78	0.82	0.91	0.96	0.81	0.87	1.00				
	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
Syria	1.00	0.76	0.90	0.89	0.70	0.99	0.99	0.82	0.95	0.92	0.94	0.74	1.00	0.92	0.94	0.99	0.98	0.93	0.97	0.96	1.00			
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Tunisia	0.87	0.83	1.00	0.62	0.92	0.95	0.95	0.98	0.99	1.00	0.74	0.76	0.89	1.00	0.99	0.95	0.82	1.00	0.97	0.76	0.90	1.00		
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Turkey	0.99	0.78	0.92	0.86	0.73	1.00	1.00	0.84	0.97	0.94	0.93	0.76	1.00	0.93	0.96	1.00	0.98	0.95	0.98	0.94	1.00	0.92	1.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
UAE	0.92	0.85	0.99	0.70	0.86	0.98	0.98	0.95	1.00	1.00	0.80	0.79	0.94	0.99	1.00	0.98	0.88	1.00	1.00	0.82	0.95	0.99	0.96	1.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

prices to demand shocks. Among the four GCC states committed to pursuing the monetary union, two sets of pairs come through in terms of the symmetrical supply shocks: Bahrain/Saudi Arabia and Qatar/Kuwait. The examination of impulse responses of output and prices indicates that Bahrain, Qatar, Saudi Arabia and UAE experienced fairly symmetric response of output and prices to supply shocks.

A few important policy implications can be concluded. One obvious policy implication from the results is that, given the OIC's diverse economic conditions and developments, the idea of Gold Dinar for OIC may be stillborn. However, the results do imply that monetary integration for OIC shall start with smaller currency areas, known as "clusters" in the literature, and the enlargement of these clusters at a later stage to include more countries.[11] Another implication from the results is that if the OIC countries are committed to pursuing the Gold Dinar or any sorts of monetary integration, much work needs to be done to reduce the disparities

and to induce the co-movement of business cycles. There are at least two policy suggestions which provide new impetus towards greater economic integration within the OIC. Firstly, drawing on the celebrated work of Frankel and Rose (1997, 1998), increased trade integration within the OIC may result in more highly correlated business cycles due to common demand shocks or intra-industry trade, making them better candidates for monetary union. This implies that the OIC countries could enhance their economic cooperation through trade in order to synchronize their business cycles. Secondly, Darvas et al. (2005) found that countries with persistently similar ratios of government surplus/deficit to GDP and lower fiscal deficits tend to have more synchronized business cycles. The authors concluded that Maastricht convergence criteria of fiscal convergence and deficit reduction may have moved Europe closer to an OCA. These are important lessons for the OIC countries if they are interested to pursue the idea of a common currency using Gold Dinar. Nevertheless, the drive towards monetary integration will depend on other economic and non-economic factors as well. While political issues are beyond the scope of this paper, it is recognized that OIC countries lack the political solidarity and cohesion for a monetary union at present.

[11] See Bacha (2008) and Hazel (2001).

Table 1
Correlation of impulse response functions to supply shocks impulse response of prices.

	Alb	Alg	Bhr	Bru	Egt	Gb	Gy	Indo	Iran	Jd	Kwt	Lbn	Lbya	M'sia	M'dv	M'co	Om	Qt	SA	Sur	Syria	Tun	Tky	UAE
Albania	1.00																							
Algeria	−0.72	1.00																						
	0.00																							
Bahrain	−0.91	0.85	1.00																					
	0.00	0.00																						
Brunei	−0.81	0.98	0.86	1.00																				
	0.00	0.00	0.00																					
Egypt	−0.79	0.69	0.94	0.69	1.00																			
	0.00	0.00	0.00	0.00																				
Gabon	−0.86	0.97	0.93	0.98	0.79	1.00																		
	0.00	0.00	0.00	0.00	0.00																			
Guyana	−0.92	0.93	0.96	0.96	0.82	0.99	1.00																	
	0.00	0.00	0.00	0.00	0.00	0.00																		
Indo	−0.87	0.79	0.99	0.80	0.98	0.89	0.92	1.00																
	0.00	0.00	0.00	0.00	0.00	0.00	0.00																	
Iran	−0.92	0.91	0.99	0.93	0.88	0.98	0.99	0.96	1.00															
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00																
Jordan	−0.91	0.91	0.99	0.93	0.88	0.98	0.99	0.96	1.00	1.00														
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00															
Kuwait	0.60	−0.99	−0.76	−0.95	−0.60	−0.92	−0.86	−0.71	−0.83	−0.84	1.00													
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00														
Lebanon	0.58	−0.98	−0.74	−0.94	−0.59	−0.92	−0.84	−0.69	−0.82	−0.83	1.00	1.00												
	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00													
Libya	−0.78	0.99	0.88	0.99	0.72	0.99	0.96	0.83	0.94	0.94	−0.97	−0.96	1.00											
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00												
Malaysia	−0.91	0.89	0.99	0.91	0.91	0.97	0.98	0.97	1.00	1.00	−0.82	−0.81	0.92	1.00										
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
Maldives	−0.91	0.91	0.99	0.92	0.89	0.97	0.99	0.96	1.00	1.00	−0.83	−0.82	0.93	1.00	1.00									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00										
Morocco	−0.87	0.97	0.94	0.98	0.80	1.00	0.99	0.90	0.98	0.98	−0.92	−0.91	0.99	0.97	0.98	1.00								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
Oman	0.97	−0.57	−0.85	−0.66	−0.75	−0.74	−0.82	−0.82	−0.84	−0.82	0.44	0.41	−0.64	−0.83	−0.83	−0.75	1.00							
	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.07	0.00	0.00	0.00	0.00								
Qatar	−0.92	0.88	1.00	0.90	0.91	0.96	0.98	0.98	1.00	1.00	−0.80	−0.79	0.91	1.00	1.00	0.97	−0.84	1.00						
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
Saudi	−0.89	0.94	0.97	0.96	0.84	0.99	0.99	0.93	0.99	1.00	−0.88	−0.87	0.97	0.99	0.99	1.00	−0.79	0.99	1.00					
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
Suriname	0.68	−0.99	−0.80	−0.98	−0.64	−0.95	−0.90	−0.75	−0.87	−0.88	0.99	0.99	−0.99	−0.86	−0.87	−0.95	0.52	−0.84	−0.92	1.00				
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00					
Syria	−0.79	0.99	0.88	0.99	0.72	0.99	0.96	0.83	0.94	0.95	−0.97	−0.96	1.00	0.93	0.94	0.99	−0.65	0.92	0.97	−0.99	1.00			
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Tunisia	−0.91	0.86	1.00	0.87	0.93	0.94	0.96	0.99	0.99	0.99	−0.77	−0.76	0.89	1.00	0.99	0.95	−0.85	1.00	0.97	−0.81	0.89	1.00		
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Turkey	−0.80	0.99	0.89	0.99	0.74	0.99	0.96	0.84	0.95	0.95	−0.96	−0.95	1.00	0.93	0.94	0.99	−0.66	0.93	0.98	−0.98	1.00	0.90	1.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
UAE	−0.88	0.96	0.96	0.97	0.82	1.00	0.99	0.92	0.99	0.99	−0.90	−0.89	0.98	0.98	0.99	1.00	−0.78	0.98	1.00	−0.93	0.98	0.96	0.98	1.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Table 11
Correlation of impulse response functions to demand shocks impulse response of output.

	Alb	Alg	Bhr	Bru	Egt	Gb	Gy	Indo	Iran	Jd	Kwt	Lbn	Lbya	M'sia	M'dv	M'co	Om	Qt	SA	Sur	Syria	Tun	Tky	UAE
Albania	1.00																							
Algeria	0.91	1.00																						
	0.00																							
Bahrain	0.91	0.75	1.00																					
	0.00	0.00																						
Brunei	−1.00	−0.88	−0.90	1.00																				
	0.00	0.00	0.00																					
Egypt	0.82	0.75	0.95	−0.79	1.00																			
	0.00	0.00	0.00	0.00																				
Gabon	0.99	0.85	0.96	−0.98	0.87	1.00																		
	0.00	0.00	0.00	0.00	0.00																			
Guyana	0.95	0.99	0.84	−0.93	0.82	0.92	1.00																	
	0.00	0.00	0.00	0.00	0.00	0.00																		
Indo	−0.83	−0.66	−0.98	0.81	−0.97	−0.90	−0.76	1.00																
	0.00	0.00	0.00	0.00	0.00	0.00	0.00																	
Iran	0.93	0.75	0.99	−0.92	0.91	0.98	0.84	−0.97	1.00															
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00																
Jordan	0.87	0.66	0.99	−0.86	0.92	0.94	0.77	−0.98	0.99	1.00														
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00															
Kuwait	−0.97	−0.98	−0.81	0.95	−0.76	−0.92	−0.99	0.72	−0.82	−0.74	1.00													
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00														
Lebanon	−0.84	−0.99	−0.65	0.81	−0.67	−0.77	−0.96	0.56	−0.65	−0.56	0.95	1.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00													
Libya	0.99	0.96	0.86	−0.97	0.80	0.95	0.99	−0.78	0.87	0.80	−0.99	−0.92	1.00											
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00												
Malaysia	−0.81	−0.60	−0.98	0.80	−0.92	−0.89	−0.72	0.99	−0.97	−0.99	0.67	0.49	−0.74	1.00										
	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00											
Maldives	0.97	0.84	0.98	−0.95	0.92	0.99	0.91	−0.94	0.99	0.96	−0.90	−0.76	0.94	−0.93	1.00									
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00										
Morocco	1.00	0.91	0.93	−0.99	0.86	0.99	0.96	−0.86	0.94	0.89	−0.96	−0.85	0.99	−0.84	0.98	1.00								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
Oman	0.97	0.78	0.92	−0.98	0.79	0.98	0.86	−0.85	0.95	0.91	−0.87	−0.69	0.91	−0.87	0.96	0.96	1.00							
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
Qatar	0.91	0.74	1.00	−0.90	0.93	0.97	0.83	−0.98	1.00	0.99	−0.80	−0.64	0.86	−0.98	0.98	0.93	0.94	1.00						
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
Saudi Arabia	−0.99	−0.89	−0.95	0.98	−0.89	−0.99	−0.95	0.89	−0.96	−0.92	0.94	0.82	−0.97	0.88	−0.99	−1.00	−0.96	−0.96	1.00					
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
Suriname	0.91	0.99	0.73	−0.89	0.72	0.84	0.98	−0.64	0.73	0.64	−0.99	−0.99	0.97	−0.57	0.83	0.91	0.78	0.72	−0.89	1.00				
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00					
Syria	0.96	0.99	0.82	−0.94	0.79	0.92	1.00	−0.74	0.83	0.75	−1.00	−0.96	0.99	−0.69	0.90	0.96	0.87	0.82	−0.95	0.99	1.00			
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Tunisia	0.86	0.67	0.99	−0.85	0.94	0.93	0.78	−0.99	0.99	1.00	−0.74	−0.57	0.80	−1.00	0.96	0.89	0.90	0.99	−0.92	0.65	0.75	1.00		
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Turkey	−1.00	−0.89	−0.94	0.99	−0.85	−1.00	−0.94	0.87	−0.95	−0.90	0.95	0.82	−0.98	0.85	−0.98	−1.00	−0.97	−0.94	1.00	−0.89	−0.95	−0.90	1.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
UAE	0.83	0.62	0.98	−0.83	0.90	0.91	0.73	−0.98	0.98	1.00	−0.69	−0.51	0.76	−1.00	0.94	0.86	0.89	0.99	−0.89	0.59	0.71	0.99	−0.87	1.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	

Table 12
Correlation of impulse response functions to demand shocks impulse response of prices.

	Alb	Alg	Bhr	Bru	Egt	Gb	Gy	Indo	Iran	Jd	Kwt	Lbn	Lbya	M'sia	M'dv	M'co	Om	Qt	SA	Sur	Syria	Tun	Tky	UAE
Albania	1.00																							
Algeria	0.92	1.00																						
	0.00																							
Bahrain	0.75	0.91	1.00																					
	0.00	0.00																						
Brunei	0.97	0.82	0.59	1.00																				
	0.00	0.00	0.01																					
Egypt	−0.90	−0.70	−0.54	−0.92	1.00																			
	0.00	0.00	0.01	0.00																				
Gabon	0.94	0.99	0.92	0.83	−0.75	1.00																		
	0.00	0.00	0.00	0.00	0.00																			
Guyana	−0.86	−0.62	−0.46	−0.89	0.99	−0.68	1.00																	
	0.00	0.00	0.04	0.00	0.00	0.00																		
Indo	0.86	0.63	0.32	0.94	−0.91	0.64	−0.91	1.00																
	0.00	0.00	0.17	0.00	0.00	0.00	0.00																	
Iran	0.96	0.99	0.90	0.87	−0.80	1.00	−0.73	0.69	1.00															
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00																
Jordan	0.88	0.98	0.97	0.75	−0.67	0.99	−0.60	0.52	0.98	1.00														
	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00															
Kuwait	0.99	0.97	0.82	0.94	−0.85	0.97	−0.79	0.79	0.99	0.93	1.00													
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00														
Lebanon	1.00	0.92	0.75	0.97	−0.91	0.93	−0.87	0.86	0.96	0.88	0.99	1.00												
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00													
Libya	0.96	0.99	0.89	0.87	−0.78	1.00	−0.71	0.70	1.00	0.97	0.99	0.96	1.00											
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00												
Malaysia	0.99	0.97	0.81	0.93	−0.84	0.97	−0.78	0.80	0.98	0.92	1.00	0.99	0.99	1.00										
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00											
Maldives	0.12	0.47	0.72	−0.10	0.18	0.45	0.27	−0.39	0.38	0.57	0.24	0.11	0.39	0.24	1.00									
	0.63	0.04	0.00	0.66	0.44	0.05	0.26	0.09	0.10	0.01	0.30	0.64	0.09	0.31										
Morocco	0.90	0.99	0.95	0.78	−0.69	1.00	-0.62	0.58	0.99	1.00	0.95	0.90	0.99	0.95	0.53	1.00								
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02									
Oman	0.96	0.84	0.57	0.99	−0.87	0.83	−0.83	0.93	0.86	0.74	0.93	0.95	0.87	0.93	−0.08	0.78	1.00							
	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00								
Qatar	0.84	0.96	0.99	0.69	−0.63	0.97	−0.55	0.45	0.96	1.00	0.90	0.84	0.95	0.89	0.63	0.98	0.68	1.00						
	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
Saudi Arabia	−0.94	−0.99	−0.93	−0.83	0.77	−1.00	0.70	−0.64	−1.00	−0.99	−0.97	−0.94	−0.99	−0.97	−0.45	−0.99	−0.82	−0.98	1.00					
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00						
Suriname	0.98	0.83	0.65	0.98	−0.97	0.86	−0.94	0.92	0.90	0.79	0.94	0.98	0.89	0.94	−0.05	0.81	0.94	0.75	−0.87	1.00				
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.00					
Syria	0.78	0.96	0.93	0.64	−0.48	0.94	−0.39	0.40	0.91	0.96	0.86	0.77	0.92	0.86	0.67	0.96	0.67	0.95	−0.93	0.65	1.00			
	0.00	0.00	0.00	0.00	0.03	0.00	0.09	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Tunisia	0.89	0.97	0.97	0.76	−0.70	0.99	−0.62	0.53	0.98	1.00	0.93	0.89	0.97	0.93	0.55	0.99	0.75	1.00	−0.99	0.81	0.94	1.00		
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00			
Turkey	0.99	0.86	0.67	0.99	−0.94	0.88	−0.91	0.92	0.92	0.81	0.96	0.99	0.91	0.96	−0.02	0.84	0.97	0.76	−0.88	0.99	0.69	0.82	1.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
UAE	0.90	0.99	0.95	0.78	−0.69	1.00	−0.62	0.57	0.99	1.00	0.95	0.90	0.99	0.95	0.53	1.00	0.78	0.99	−0.99	0.81	0.96	0.99	0.84	1.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Acknowledgements

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