THE CAUSAL IMPACT OF STOCK MARKET DEVELOPMENT ON ECONOMIC DEVELOPMENT IN THE UAE: AN ASYMMETRIC APPROACH

ABSTRACT

This paper investigates the causal impact of the financial sector on the real or economic sector of the UAE. The underlying data is transformed into partial cumulative sums for positive and negative changes in order to conduct asymmetric causality tests. Allowing for asymmetry is consistent with reality since individuals in financial markets have the tendency to respond more powerfully to a negative news than to a positive one. We also capture the propagation mechanism of a shock in each variable by estimating the generalized impulse response functions, which are not sensitive to the way the variables are ordered in the model. The results reveal that the financial sector has indeed a causal impact on the real sector of the economy. However, the reverse causal impact is not found. These underlying causality results are also confirmed by the generalized impulse response functions.

Keywords: Stock Market, Economic Development, Asymmetry, the UAE, Causality

JEL Classification: C32, E44, G19

RIASSUNTO

L’impatto del mercato azionario sullo sviluppo economico degli Emirati Arabi Uniti: un approccio asimmetrico

Lo scopo di questo lavoro è quello di analizzare l’impatto causale del settore finanziario sul settore dell’economia reale degli Emirati Arabi Uniti. I dati presi in considerazione sono trasformati in somme parziali cumulative per mutamenti positivi e negativi al fine di effettuare test causali asimmetrici. Consentire l’asimmetricità è coerente con la realtà in quanto le persone che operano nel settore finanziario hanno la tendenza a reagire maggiormente alle notizie

* We would like to acknowledge, without implicating of course, the useful comments from the anonymous referee and Youssef El-Khatib that has resulted in a significant improvement of the underlying paper after revising. This research is supported by the UAE University under the grant number “21B051”, which is greatly appreciated.
negative anziché a quelle positive. Viene anche studiato il meccanismo con il quale si propaga lo
shock in ogni variabile tramite la stima di funzioni generalizzate degli impulsi di reazione, i quali
non sono sensibili al modo in cui le variabili sono ordinate nel modello. I risultati evidenziano
che il settore finanziario ha un impatto causale sul settore reale dell’economia, ma l’impatto
contrario non viene riscontrato. Questi risultati di causalità sono confermati dalle funzioni
generalizzate degli impulsi di reazione.

1. INTRODUCTION

For oil producing countries like the UAE, an important issue is to diversify the economy in order
to reduce the overreliance on the oil industry, which is very volatile and also limited by nature.
The government has been trying to make use of different approaches for diversifying the
economy by, among others, promoting the tourism industry as well as the promoting trade and
the re-export sector. According to the existing literature the promotion of tourism has been
indeed successful in causing the economic growth of the UAE\textsuperscript{1}. Published research also shows
that openness and foreign trade have important repercussions for the economic growth of the
UAE\textsuperscript{2}. Another potential strategy in this case is the financial market liberalization in order to
attract much needed resources from foreign investors. An interesting question within this
context is to figure out how important the stock market development is for the economic growth
of the underlying country. This issue is important especially to the financial market regulators.

This paper deals with this important issue in the UAE context by applying asymmetric methods
which have not been investigated before, to the best knowledge. It is widely agreed in the
literature that it is important to allow for asymmetric effects especially in financial markets,
since people tend to react more to negative news than to positive ones. We allow for asymmetric
effects by making use of the asymmetric causality tests. This method is relatively new in the
literature.

Thus, the current paper evaluates empirically whether or not the stock market development
causes economic growth in the UAE and it takes into account the asymmetric effects that might
result in empirical inference that is more informative and accords well with reality. Given the

\textsuperscript{1} See Hatemi-J (2016) for details on the relationship between tourism and economic growth in the UAE.

\textsuperscript{2} Empirical evidence on the impact of trade openness on the economic performance in the UAE is provided by Al-
Shayeb and Hatemi-J (2016).
fact that the underlying financial data is usually non-normal with time varying volatility, we produce critical values that are based on simulation methods and more accurate.

The rest of this paper is organized as follows: in Section 2 we provide a review of the relevant literature briefly. Section 3 represents the econometric methodology. The empirical results are presented in Section 4. The last section offers the concluding remarks.

2. BRIEF LITERATURE REVIEW

The relationship between financial development and economic development originates from Schumpeter (1911) and it was further extended by Mckinnon (1973), as well as by Shaw (1973). Following these seminal contributions many studies have tried to investigate the causal impact of the financial sector on the real sector of the economy. Empirical investigations by, among others, Atje and Jovanovic (1993), Korajczyk (1996) as well as Levine and Zervos (1998) provide strong correlation between stock market and economic growth that is positive. Darrat (1999) examines the potential impact of financial deepening on the economic growth of Saudi Arabia, Turkey and the UAE. He uses two measures for financial deepening – namely – the ratio of currency to M1 and the inverse of the broad money velocity. His empirical results indicate generally that a long run impact of the financial deepening on the economic performance exists in the underlying countries. Ben Naceur et al. (2008) make use of data for eleven countries in the Middle East and North Africa (MENA) region, including the UAE, to investigate the impact of stock market liberalization on the economic growth. They report that stock market liberalization does not seem to have any significant impact on the economic growth or investment in these countries. However, the reverse impact is found. The impact of economic growth on the stock market development is negative in the short run and positive in the long run according to the authors. Pan and Mishra (2018) provide a review of recently published research on the underlying topic. However, none of the mentioned articles account for the potential asymmetric impacts.

In this paper we test whether or not the stock market development can serve as an engine for the economic development in case of the emerging market of the UAE. We also test whether or not the stock market development does have an asymmetric impact on the economic development within this context. In order to be able to test the above hypotheses more accurately the paper
applies recently developed tests for asymmetric causality. We also make use of asymmetric generalized impulses response functions. This is an important issue because the standard test methods that are based on the asymptotical critical values are not reliable when the data is not normally distributed and the volatility is time-varying. These properties characterize usually financial data. The project will also make use of new statistical software components for implementing the simulations. Thus, the results from this project based on new approaches can be expected to shed new light on the underlying research question, which has important repercussions for the economy of the UAE. The government has promoted different policies in order to diversify the UAE economy. The tourism, real estate and export sectors including the free trade zones can be mentioned as successful examples in this case. Another potential sector that can help the underlying country to reduce its overreliance on the oil sector is the finance sector. Thus, new insights on the potential impact of the financial sector on the real sector of the economy can be helpful to the policy makers for designing appropriate financial guidance.

3. METHODOLOGY AND ANALYSIS

The asymmetric causality tests developed by Hatemi-J (2012) are applied to capture the potential impact of the financial sector (i.e. the stock market) on the real sector (i.e. the economic composite indicator). The advantage of this new test compared to the existing ones is the fact that it separates the effect of negative shocks from the positive ones. Via this approach it is possible to transform the underlying variable into positive and negative cumulative components. For example, assume that we are interested in the causal impacts between the positive components of two variables. Then, our vector of interest is defined as $y_t^+ = (y_{1t}^+, y_{2t}^+)$. Thus, the test for causality can be implemented by using the following vector autoregressive model of order $p$, VAR($p$):

$$y_t^+ = v + A_1 y_{t-1}^+ + \ldots + A_p y_{t-p}^+ + u_t^+,$$

(1)

where $y_t^+$ is the $2 \times 1$ vector of the variables, $v$ is the $2 \times 1$ vector of intercepts, and $u_t^+$ is a $2 \times 1$ vector of error terms (corresponding to each of the variables representing the cumulative sum of positive shocks). The matrix $A_r$ is a $2 \times 2$ matrix of parameters for lag order $r$ ($r = 1, \ldots, p$). The

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Footnote 3: For new insights on the financial markets of the UAE at the company level see AlAwadhi A (2018). Al-Mohana and Hatemi-J (2016) investigates the impact of current financial crisis on the real estate market of the country, which is one of the prioritized sectors for diversification purposes.
optimal lag order \( (p) \) is determined by an information criterion\(^4\). We also include an additional unrestricted lag in the VAR model in order to take into account the effect of one unit root as suggested by Toda and Yamamoto (1995). After selecting the optimal lag order, we test the null hypothesis that \( k \)th element of \( y_i^* \) does not Granger-cause the \( j \)th element of \( y_i^* \). That is, the following hypothesis is tested:

\[
H_0: \text{the row } j, \text{ column } k \text{ element in } A, \text{ equals zero for } r = 1, \ldots, p. \tag{2}
\]

The null hypothesis of non-Granger causality, i.e. \( H_0: C\beta = 0 \), is tested by the following test method:

\[
Wald = (C\beta)'\left[ C(Z'Z)^{-1} \otimes S_U \right]^{-1} (C\beta), \tag{3}
\]

where \( \beta \) represents the parameter vector and \( C \) is a \( p \times n(1+np) \) indicator matrix with elements ones for restricted parameters and zeros for the rest of the parameters. \( S_U \) is the variance-covariance matrix of the unrestricted VAR model\(^5\). When the assumption of normality is fulfilled, the Wald test statistic presented in equation (3) has an asymptotic \( \chi^2 \) distribution with the number of degrees of freedom equal to the number of restrictions to be tested (in this particular case it equals to \( p \)). However, as it is widely agreed in the existing literature, financial data is usually not normally distributed and the existence of autoregressive conditional heteroskedasticity (ARCH) effects is more rule than exception. To remedy this problem we can make use of the bootstrapping simulation technique. We also estimate the generalized impulse response functions. The potential results might bring new insights on the impact of the stock market on the real sector of the underlying economy.

4. DATA DESCRIPTION AND EMPirical FINDINGS

Since the data on economic performance is not available for the UAE during sufficient period of time, we make use of the economic composite indicator (denoted by \( Y \)) that is created at the UAE central bank. For a description of this index see El-Mahmah (2017). The other variable that we use is the stock market index for the entire UAE market, which consists of two indexes for

\(^4\)An information criterion that is suggested by Hatemi-J (2003) is used for this purpose. The simulation results provided in Hatemi-J (2008) reveals that this information criterion is robust to ARCH effects and it has good forecasting properties.

\(^5\) For more details on the properties of the VAR model and its transformations see Hatemi-J (2001).
Abu Dhabi and Dubai financial markets. This variable is denoted by $SP$. Our data is on quarterly basis and it covers the period 2006:Q1-2016:Q1, which is determined by data availability. It should be mentioned that the economic composite indicator was provided in percentage form. In order to obtain the original index value we made the following transformation. Let $r_t$ be the percentage change of the variable $P_t$. This percentage change is expressed as

$$ r_t = \frac{P_t - P_{t-1}}{P_{t-1}} = \frac{P_t}{P_{t-1}} - 1 \geq P_t = P_{t-1}(1 + r_t) \tag{4} $$

Based on this, the past value by one lag is given by the following:

$$ P_{t-1} = P_{t-2}(1 + r_{t-1}) \tag{5} $$

Substituting equation (5) into equation (4) gives the following:

$$ P_t = P_{t-2}(1 + r_{t-1})(1 + r_t) \tag{6} $$

We repeat this recursively until we obtain the following:

$$ P_t = P_0(1 + r_1)(1 + r_2) \cdots (1 + r_{t-1})(1 + r_t) = P_0 \prod_{i=1}^{t} (1 + r_i) $$

Before implementing the estimations, the underlying variables were transformed into partial cumulative sums for positive and negative components by using the methods suggested by Hatemi-J (2012, 2014). The graphical illustration of each component is provided in the appendix at the end of the paper. More explicitly, we treat each variable as integrated of degree one. That is,

$$ SP_t = SP_{t-1} + \epsilon_{1t} = SP_0 + \sum_{i=1}^{t} \epsilon_{1i}, \tag{7} $$

In the same way, we can express the following:

$$ Y_t = Y_{t-1} + \epsilon_{2t} = Y_0 + \sum_{i=1}^{t} \epsilon_{2i}, \tag{8} $$

for $t = 1, 2, \ldots, T$. The constants $SP_0$ and $Y_0$ represent the initial values for the variables. The error terms are denoted by $\epsilon_{1i}$ and $\epsilon_{2i}$. Each error term is assumed to be a white noise process. Positive and negative changes of these two variables are defined as $\epsilon_{1i}^+ = \text{Max}(\epsilon_{1i}, 0), \ \epsilon_{2i}^+ = \text{Max}(\epsilon_{2i}, 0)$. 


\( \varepsilon_{i1}^- = \text{Min}(\varepsilon_{i1}, 0) \) and \( \varepsilon_{i2}^- = \text{Min}(\varepsilon_{i2}, 0) \). Based on these definitions, we have \( \varepsilon_{i1} = \varepsilon_{i1}^+ + \varepsilon_{i1}^- \) and \( \varepsilon_{i2} = \varepsilon_{i2}^+ + \varepsilon_{i2}^- \). This also means that the following can be stated:

\[ SP_t = SP_{t-1} + \varepsilon_{i1}^+ + \varepsilon_{i1}^- \]

and

\[ Y_t = Y_{t-1} + \varepsilon_{i2}^+ + \varepsilon_{i2}^- \]

Via these identifications, the partial cumulative sums of positive and negative changes are found

as \( SP_t^+ = \sum_{i=1}^{t} \varepsilon_{i1}^+ \), \( SP_t^- = \sum_{i=1}^{t} \varepsilon_{i1}^- \), \( Y_t^+ = \sum_{i=1}^{t} \varepsilon_{i2}^+ \) and \( Y_t^- = \sum_{i=1}^{t} \varepsilon_{i2}^- \). These values are used in order to implement the asymmetric causality tests.

The estimation results for the causality tests are presented in Table 1. As it is evident from the causality tests results, the stock market performance has a significant causal impact on economic performance in the UAE. There is also an asymmetric causal impact since the null hypothesis that a negative permanent change in the financial market does not cause a negative permanent change in the economic sector can be rejected. Such impact for positive changes is not found. We also estimated the generalized impulse response functions. The results of these estimations are presented in Figure 7, which show that a shock in the financial sector leads to a shock in the real or economic sector. The reverse impact is not found however.

<table>
<thead>
<tr>
<th>NULL HYOTHESIS</th>
<th>Test Value</th>
<th>P-value</th>
<th>NULL HYOTHESIS</th>
<th>Test Value</th>
<th>P-value</th>
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</table>
| \( SP 
\nequiv> Y \) | 9.97994 | 0.0004 | \( Y 
\nequiv> Sp \) | 0.34397 | 0.7115 |
| \( SP^+ 
\nequiv> Y^+ \) | 0.64043 | 0.5335 | \( Y^+ 
\nequiv> SP^+ \) | 1.02852 | 0.3687 |
| \( SP^- 
\nequiv> Y^- \) | 2.55332 | 0.0931 | \( Y^- 
\nequiv> SP^- \) | 0.19538 | 0.8235 |

Notes:
1. \( SP \) represents the financial performance and \( Y \) is economic performance. The vector \( (SP^+, Y^+) \) represents the cumulative positive shocks and the vector \( (SP^-, Y^-) \) represents the cumulative negative shocks.
2. The optimal lag length in the VAR model is set to two.
3. The symbol \( A \nequiv> B \) means that \( A \) does not cause \( B \).

For transforming variables that have deterministic trend parts in addition to the stochastic trend see Hatemi-J and El-Khatib (2016). The asymmetric panel causality tests are introduced by Hatemi-J (2011). Hidden cointegration is introduced by Granger and Yoon (2002) and hidden panel cointegration is developed by Hatemi-J (2018).
5. **Conclusions**

It is generally agreed in the literature that financial assets play a crucial role on the real sector of the economy. The main goal of this paper is to empirically assess the potential causal impact of the stock market development on the economic growth of the UAE. Since the target of the policy makers in the mentioned country has been to diversify the underlying economy as much as possible, in order to reduce the dependence on the oil sector, the impact of financial development on the economic development can be particularly pertinent. Thus, it might be of paramount importance to comprehend the causal interaction between the stock market and the real sector of the economy in order to identify appropriate policies for enhancing the efficiency of the channel in which the financial sector can promote the real sector. To the best knowledge, this is the first attempt to investigate this important financial economic issue within the context of UAE that accounts for asymmetry. It is common knowledge that individuals react more powerfully to the negative news than to positive ones. This seems to be the case particularly in the financial markets. Thus, allowing for asymmetry is an important issue from the theoretical as well as the methodological perspective. The empirical findings reveal that the financial sector has indeed a positive causal impact on the economic performance. Additionally, we find that this impact is prominent when markets are falling than rising. Hence, the development of the stock market in the UAE can function as a successful tool for the development of the real sector of the economy. This mechanism could take place in form of the efficient allocation of scarce resources to the productive sectors of the economy. Given the geographic location of the country, there exists additional potential to develop in form of establishing a majestic financial center that can compete with the financial centers in the East Asian countries. The economy might benefit even more from the possible spillover effects of such undertaking.
REFERENCES


Appendix 1

**Figure 1 - Economic Performance of the UAE**

**Figure 2 - Positive Components of the Economic Performance of the UAE**
FIGURE 3 - Negative Components of the Economic Performance of the UAE

FIGURE 4 - Stock Market Performance of the UAE
**Figure 5 - Positive Components of the Stock Market Performance of the UAE**

![Positive Components Diagram](image)

**Figure 6 - Negative Components of the Stock Market Performance of the UAE**

![Negative Components Diagram](image)
FIGURE 7 - The Results of the Impulse Response Functions

Response to Generalized One S.D. Innovations ± 2 S.E.

Response of SP to SP

Response of SP to Y

Response of Y to SP

Response of Y to Y