The Relationship between Amman Stock Exchange Index and the Exchange Rate Using Granger Causality Test

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ABSTRACT

This paper examines the relationship between the Exchange Rate and Amman Stock Exchange Index over the period (1989-2004). To achieve this objective, Granger Causality Test has been applied using data gathered from monthly and annual analytical reports from the Central Bank of Jordan and Amman Stock Exchange reports. Different diagnostic tests were also performed to reach the final results, such as Lag Length Selection and Unit Root Test. Although the direction of causality seems to depend on specific characteristics of the country analyzed, most of previous empirical studies have found that Exchange Rates and Stock Prices have predictive ability for each other. However, the empirical results of this study have indicated that there is no relationship between the Exchange Rate and Amman Stock Exchange Index. The fact that the Jordanian Dinar is pegged to the US dollar might be one of the reasons of such results, in addition to the fact that the factors that affect the exchange rate might be different from the factors that affect the stock index.

Keywords: Stock Index, Granger Causality.

1. INTRODUCTION

One of the most important markets in the Financial Markets is the Stock Market, which facilitates the equity investment into firms and the transfer of equity between investors. Stocks have an effective impact on the investment and therefore on the economy. The investors monitor numerous economic factors that influence the earnings including inflation, interest rate, and the growth in the GDP. Also, the value of the exchange rate might affect the stocks prices.

In Jordan, the Amman Financial Market functioned as a stock exchange, government securities and exchange commission. It acted as a government vehicle for regulating and operating the securities market in Jordan. The role of the financial markets in Jordan especially the Amman Stock Exchange, which is the most interesting feature of development of the financial system in Jordan, has been explained by many studies.

The deepening of the financial system embraced many areas: banking intermediation has been raised, the payment system improved, and an active stock exchange established.

On the other hand, the performance of the financial system was further enhanced by the establishment of the Amman Financial Market (AFM) in 1976 for securities trading. Since that time, the AFM has expanded rapidly making it one of the most active emerging markets in the Middle East (Maciejewski and Mansur, P. 34, 1996).

Changes in stock prices might be the news that one could hear about everyday. News media usually report that stock prices fall because of a bad economical situation or rise because of an encouraging economical situation. The important thing is that there might be specific determinants or variables that will have effects on stock prices. The question is: will the exchange rate be one of these variables? The relationship between stock prices and exchange rates depends on two main theories. The first one is the traditional approach, which concludes that exchange rates should lead stock price.

The transmission channel would be exchange rate fluctuations which affect firms' values through changes in competitiveness and changes in the value of firms' assets and liabilities, denominated in foreign currency, ultimately affecting firms' profits and therefore the value of equity (Dornbusch and Fischer, 1980). The second approach, known as portfolio balance approach, stresses the role of capital account transactions. A rising stock market would attract capital flows, which increases the demand on domestic currency and causes the exchanges rate to appreciate (Frankel, 1993).

This paper tries to examine the relationship between Amman Stock Exchange Index and the Exchange Rate in Jordan during the period (1989-2004). A very popular method of examining the relationships between variables is the Granger-Causality test which will be applied after checking the stationarity of the variables. The rest of the paper is organized as following: Section II shows the importance of the study, Section III presents previous studies, Section IV describes methodology and data, Section V presents the empirical results, and finally, Section VI is the conclusion.

2. IMPORTANCE OF THE STUDY

This paper is expected to test the relationship between the Amman Stock Exchange Index and the Exchange Rate in Jordan using monthly data during the period (1989-2004). The importance of this study comes up through two aspects; first aspect, the importance of the stock market recently due to the surge of public interest and investment in the stock market, second aspect, to the knowledge of the researcher, this is the first time in Jordan in which the researchers run a study for the purpose of examining the relationship between the Amman Stock Exchange Index and the Exchange Rate Markets by using time series analysis.

3. PREVIOUS STUDIES

The issue of whether stock prices and exchange rates are related or not has received considerable attention in many studies. Most of empirical literature that has examined the stock prices-exchange rate relationship has focused on examining this relationship in the developed countries with a little attention given to the developing countries. Some studies have found a positive significant relationship between stock prices and exchange rates. Aggarwal (1981) explored the relationship between changes in the Dollar Exchange Rates and change in indices of stock prices using monthly; data during the period (1974-1978). By using simple regressions, Aggarwal argued that a change in exchange rates could change stock prices of multinational firms directly; and those of domestic indirectly. In both cases, multinational and domestic firms, stock prices could move in either direction especially when most stock prices are aggregated to investigate the effects of devaluation on stock markets. Therefore, Aggrawal found that the stock prices and the value of the US dollar are positively related. Solnik (1987) examined the impact of several variables (exchange rates, interest rates and changes in inflationary expectation) on stock prices using monthly data from nine western markets (U.S., Japan, Germany, U.K., France, Canada, Netherlands, Switzerland, and Belgium). He found a positive insignificant influence on the U.S. stock market compared to change in inflationary expectation and interest rates. Oskooee and Sohrabian (1992) also tested the causality between stock prices and the effective exchange rate of the dollar using monthly data over the period (July 1973- December 1988). Their results show that there is bidirectional causality between stock prices and the effective exchange rate of the dollar.

Other studies found a significant negative relationship between Stock Prices and Exchange Rates. Soenen and Hennigar (1998) examined the relationship between the value of the U.S. dollar and the change in stock prices using monthly data for the period (1980-1986). They found a strong negative relationship between the value of the U.S. dollar and the change in stock prices. Also, some studies found that there is not any relationship between stocks and exchange rates. Franck and Young (1972) were the first to study and examine the relationship between stock prices and exchange rates. They found no relationship between these two financial variables. Bartov and Bodnor (1994)

concluded that contemporaneous changes in the dollar have little power in explaining abnormal stock returns.

Abdallah and Murinde (1997) investigated the interaction between the Exchange Rate and the Stock Prices in emerging markets for India, Korea, Pakistan, and Philippines by using BVAR (Bivariate VAR) method. They found a unidirectional causality from exchange rates to stock prices in all the countries, except the Philippines. In the case of the Philippines, they found that stock price to Granger caused the exchange rate. Additionally, they documented the presence of a long-run relationship for the cases of India and Pakistan. Granger *et al.* (2000) determined the appropriate Granger relations between stock prices and exchange rates by using unit root, cointegration models, and impulse response function. They have examined the data up to 1997 in South Korea, The Philippines, Hong Kong, Malaysia, Singapore, Thailand, Taiwan, Indonesia, and Japan. The study has found that in some countries exchange rates lead stock prices, while in others stock prices lead exchange rates; which means that stock prices granger cause exchange rate. However, in July 1997, the financial crisis sparked in Thailand has sent shockwaves throughout Southeast Asia, South Korea, and Japan. The short-run interest rate in Hong Kong took a huge Jump to maintain its exchange rate to the US Dollar. Therefore, the currency crisis set off a financial avalanche in the stock market in South Korea. In 2000, Ibrahim analyzed the interactions between stock prices and exchange rates in Malaysia. He used real effective exchange rate, nominal effective exchange rate and the RM/US$ rate. Ibrahim found that there is evidence of cointegration when the models are extended to include M2 money supply and reserves. The findings indicated that in the short run, an intensive stance on monetary, exchange rate and reserves policy is essential for stock market stability. Also, the results indicated informational inefficiency in the Malaysian stock market.

Smyth and Nandha (2003) examined the relationship between exchange rates and stock prices in South Asia (Bangladesh, India, Pakistan and Sri-Lanka) using daily data over a six- year period   (1995-2001). Smyth and Nandha found that there is uni-directional causality from exchange rates to stock prices in India and Sri-Lanka, but in Bangladesh and Pakistan, exchange rates and stock prices are independent. The main implication is that changes in exchange rates influence firms' exports and ultimately affect stock prices in these countries. In Bahrain, Tahir and Ghani (2004) examined the relationship between stock prices and exchange rates using monthly data from January 1992 till October 2003 by using Co-integration and ECM models and Granger Causality Tests. As the Bahraini Dinar is pegged against the US Dollar, Tahir and Ghani have expected that the exchange rate may not fully respond to stock price movements, therefore, they used the British Pound and the Japanese Yen to test this relationship. The results suggest long-run bi-directional causal relationship between stock prices and exchange rates and only uni-directional from stock prices to exchange rates in the short run. Finally, Tabak (2006) studied the dynamic relationship between stock prices and exchange rates in Brazil using daily data from August 1, 1994 to May 14, 2002. Tabak found that there is linear Granger Causality from stock prices to exchange rates i.e. stock prices lead exchange rates with negative correlation, and exchange rates lead stock prices.

In general, most of the empirical findings found that these two financial variables (exchange rates and stock prices) have predictive ability for each other, although the direction of causality seems to depend on specific characteristics of the country analyzed. This study will examine the relationship between the Exchange Rate and Amman Stock Exchange Index in Jordan as one of the developing countries.

4. METHODOLOGY AND DATA

This study employed the quantitative approach; this approach is represented here by the econometric analysis (Time Series Analysis) of documentary secondary data. The data in the research will be gathered from monthly and annual analytical reports from the Central Bank of Jordan, and Amman Stock Exchange (ASE) reports. The data will cover the period (1989-2004) monthly data.

In the second stage after gathering the data, a Vector Autoregression model will be utilized in the research by using the variables: Amman Stock Exchange Index (ASE) and the Exchange Rate. The tests that will be used in this paper will include: The Lag Length Selection, Unit Root Test, and Granger Causality Test.

The general VAR process for any time series takes the form:

$$Yt = \sum_{i=1}^{n} A_i Y_{t-i} + \mu$$

Where:

Yt: is the vector of endogenous variables.

Ai: is the matrices of coefficients.

μt: a vector white noise process.

i: the number of lags

The variables in this paper are represented, as mentioned earlier, by the Amman Stock Exchange Index, which measures the general level of share prices for companies listed in the Amman Stock Exchange. This index is calculated by Amman Stock Exchange, and is weighted by the market value of the companies'

shares. And the Exchange Rate, which has been pegged to the US dollar since 1995. The model of this study is based on a monthly data starting from 1989 till 2004.

5. EMPIRICAL RESULTS

Given the series Amman Stock Exchange Index (ASE) and the Exchange Rate. The first problem is to determine the suitable lag length; selecting the inappropriate lag length may cause a problem and may cause the residuals regression not to behave well. By using the RATS program, the appropriate lag length can be selected by choosing the absolute minimum value of Akaike which will represent the suitable lag length. According to Akaike Information Criteria (AIC), which is based on the residual variance, we have to get the model that has the smallest residual variance. Then we will choose the lag length in the model with the smallest residual variance (Vogelvang, 2005, P. 344) (Eviews user's guide, 2004, P.513). Therefore, according to Akaike Information Criteria (AIC), the absolute minimum value, as shown in table (1), is (|-7.233|) with (10) lag length. So the suitable lag length to be used here is (10) lag length.

Table (1): Lag Length (ASE, EXRATE)

Lags	Akaike Value
1	-7.234
2	-7.278
3	-7.281
4	-7.276
5	-7.271
6	-7.266
7	-7.258
8	-7.248
9	-7.240
10	-7.233

The next step is to find the stationarity of the variables through applying the unit root test. Suppose we have this model: $Y_t = \rho Y_{t-1} + \upsilon_t$, and we run the regression and found that $\rho = 1$, then we say that the stochastic variable Y_t has a unit root (which means that

it is nonstationary). A time series that has a unit root is known as a random walk (Hamilton, 1994, PP. 435-447). However, we need to have a stationary time series in our tests, otherwise, we would have spurious regression.

To test the presence of a unit root, we will apply the

Augmented Dickey-Fuller Test. This test can also be used to help detect the presence of a stochastic trend (Enders, 2004, P. 156) (Cryer, 1986, pp. 9-16). If the computed ADF value exceeds the critical or tabulated value, then we fail to reject the null hypothesis that suppose that the variable has a unit root (nonstationary). However, if it is less than the critical value, then we reject the null hypothesis, so the variable will be stationary (Eviews user's guide, 2004, PP. 504-505)

(Franses, 1998, pp. 80-84). Since the Augmented Dickey-Fuller test for stationarity shows the values of the variables in the model, i.e. Amman Stock Exchange Index (ASE) is nonstationary but the first difference of its value is stationary as shown in table (2), the researcher took the first difference of the Amman Stock Exchange Index (ASE). However, the value of the Exchange Rate (EXRATE) is stationary; therefore the researcher took the value of the EXRATE.

Table (2): Unit Root (ASE, EXRATE)

	Augmented	**Dickey-**	**Fuller**			
Variable	1%	5%	10%	T-statistic	H_0: variable has a unit root	Is it Stationary?
ASE	-3.46	-2.87	-2.57	3.12	Don't reject	NO
ΔASE	-3.46	-2.87	-2.57	-9.54	Reject	Yes
EXRATE	-3.46	-2.87	-2.57	-12.45	Reject	Yes

Since the computed value in the test exceeds the critical values at 5% level of significance, we can conclude that the variable under consideration, Amman Stock Exchange Index (ASE), is not stationary, and we need to make it stationary in order to be able to use it in the granger causality test. One way to make the given series stationary is by taking the first difference of that series; i.e. ASE^*, where $ASE^*_t = \Delta ASE_t = ASE_t - ASE_{t-1}$. It is very clear from table (2) that ASE^* is stationary, which implies that the ASE series is integrated of order one, i.e. I(1). On the other hand, we found that the computed value of the Exchange Rate (EXRATE) is less than the critical value, therefore, we can conclude that Exchange Rate (EXRATE) is integrated of order zero I(0) (stationary).

The final step is to apply the Granger Causality Test between the Amman Stock Exchange Index and the Exchange Rate. The Granger Causality Test is a test in which the lags of one variable enter into the equation for another variable (Enders, 2004, P. 283). And the variable (X) is said to granger cause (Y) if the lags of (X) have additional predictive power above and beyond the predictive power of the lags of (Y) itself. However, it is

important to note that the statement "(X) granger cause (Y)" doesn't imply that (Y) is the effect or the result of (X). Granger causality measures precedence and information content but does not indicate causality in the more common use of the term. Moreover, granger causality refers to the effects of past values of (X) on the current value of (Y). Therefore, granger causality measures whether the current and past values of (X) help to forecast or predict future values of (Y) (Eviews user's guide, 2004, P. 376) (Enders, 2004, P. 283).

The null hypothesis we have in granger causality test supposes that; variable (X) does not granger cause variable (Y), and that can be tested by running OLS regression, calculate the sum of squared residuals and the sum of squared residuals of a univariate autoregression, then calculate F-statistic, and compare it with the critical F-value. If the F-statistic is greater than the critical value, we reject the null hypothesis, that (X) does not granger cause (Y), and we conclude that (X) does granger cause (Y) (Hamilton, 1994, PP. 304-305). The results of applying the granger causality test between the Amman Stock Exchange Index (ASE) and the Exchange Rate is shown in table (3) below.

Table (3): Granger Causality Test {D (ASE), EXRATE}

Null Hypothesis	F-Statistic	Probability
D(ASE) does not Granger Cause EXRATE	0.66003	0.76004
EXRATE does not Granger Cause D(ASE)	1.30714	0.23075

The table above shows that Stock Price Index does not Granger Cause Exchange Rate and cannot predict it. Also, the Exchange Rate does not granger cause Stock Index, so Exchange Rate (EXRATE) cannot predict Stock Index. This means that the Exchange Rate in Jordan cannot forecast the movement of the stock market in the future whether it is going to increase or decrease.

In conclusion, there is no relationship between the Exchange Rate and the Stock Price Index in Jordan and that is consistent with what Franck and Young (1972), Bartov and Bodnor (1994) found that there isn't any relationship between exchange rates and stock prices. Additionally, a weak or no relationship ever between stock prices and exchange rates can be explained. The asset market approach to exchange rate determination treats exchange rate as the price of an asset (price of one unit of foreign currency). Therefore, like prices of other assets, the exchange rates are determined by expected future exchange rates. Any news that affect future values of exchange rate will affect today's exchange rate. Moreover, the news that causes changes in exchange rates might be different from the news that causes changes in stock prices. In addition, In October 1995, with an effective action, the Central Bank of Jordan took a decision to peg the Jordanian Dinar to the US Dollar. Hence, the CBJ, has fixed the JD Exchange Rate to US$ to almost 0.70 JD (1.42 US$ per JD) and allowed the Exchange Rate against the other currencies to be market-determined. Since that time, the JD is pegged to the US Dollar; therefore, the CBJ follows the Fed rate in its policy regarding the interest rate. Under such scenario, there should be no relationship between the exchange rate and the stock price. However, in some of the studies mentioned above in the developing countries like Bahrain, it has been found that there is a two- way causality between exchange rates and stock prices, but the exchange rates that have been used here are the British pound and the Japanese Yen instead of the US Dollar as the Bahraini Dinar is pegged to the US Dollar, because it is expected that the exchange rate in this case may not fully respond to stock price movements.

6. FINAL REMARKS

This study has examined the relationship between the Exchange Rate and Amman Stock Exchange Index in Jordan over the period (1989-2004) using monthly data. The available historical data for the exchange rate and the stock index was handled by a time series technique; The Lag Length Selection, Unit Root Test, and Granger Causality Test. The empirical results have shown that there is not any relationship between the exchange rate and the stock index, as the Jordanian Dinar is pegged to the US dollar and the factors that affect the exchange rate might be different from the factors that affect the stock index.

While this study has provided valuable insight, further research could address several issues raised by the result of this study. The current study examined the relationship between Amman Stock Exchange Index and the Exchange Rate using Granger Causality Test. Further research might attempt to extend the empirical analysis to include the cointegartion based on granger causality test, to account for the existence of the long-run relationship between the variables.

An interesting future research project would be to investigate the relationship between the Stock Index and the Exchange Rates based on British Pound instead of US Dollar, to check out if the results will be different form our case in this research in order and to use other variables such as money supply and other macroeconomic variables in order to check out which variables might have effects on Stock Index.

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