THE 2008 FINANCIAL CRISIS AND THE EMH: EVIDENCE FROM MSM

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Abstract
This paper examines the weak-form market efficiency of the Muscat Securities Market (MSM) in Oman, a developing Middle Eastern country, before, during and after the 2008 global financial crisis using daily observations from the Muscat Securities Market index. The data were divided into three different periods: pre-crisis from January 1, 2007 to June 8, 2008, crisis from June 9, 2008 to January 22, 2009 and post-crisis from January 23, 2009 to January 17, 2011. The runs test was used to test the weak-form market efficiency using both raw and adjusted return. Findings revealed that the Muscat Securities Market is weak form efficient during both the crisis and post-crisis periods, using adjusted return. The results indicate that it would have not been possible for investors to obtain abnormal returns using historical information on stock prices in the Muscat Securities Market during the crisis and post crisis.

Keywords: Muscat Securities Market, Financial Crisis, Weak-Form Market Efficiency, Runs Test

1. Introduction

This study examines the weak form of the efficient market hypothesis with a focus on the Muscat Securities Market (MSM) in Oman, a developing Middle Eastern country before, during and after the 2008 global financial crisis. The specific time frame in this study includes three different market stages: pre-crisis from January 1, 2007 to June 8, 2008, crisis from June 9, 2008 to January 22, 2009 and post-crisis from January 23, 2009 to January 17, 2011. The MSM index reached a peak of 12,008.04 points on June 8, 2008 and then started to decline due to the global financial crisis, reaching a low of 4,405.43 points on January 22, 2009. Following this decline, the market increased and reached its highest post-crisis level on January 17, 2011. If the market at any stage is efficient, given the weak form, the conclusion is that past information is fully reflected in stock prices.

Given a lack of research on the effect of the financial crisis on stock markets, the motivation for this research is to add research to the literature to fill the gap. Moreover, this paper aims to study the efficiency of the market at three different stages, in order to investigate whether the behavior of investors in the stock market changed during each period; pre-crisis, crisis and post-crisis. Efficiency is to be measured using the runs test (Lim, Brooks and Kim, 2008).

The aim of the authors is to find new evidence on the weak form market efficiency in Muscat Securities Market during the 2008 financial crisis. Section 2 and 3 presents the literature review and overview of Muscat Securities Market, respectively. Section 4 addresses the hypothesis and section 5 presents the data and methodology used in this study. Section 6 outlines the statistical and empirical results and the conclusion in section 7.

2. Literature Review

Since the introduction of the efficient market hypothesis in the 1960s, many research studies have been conducted to examine market efficiency in developed countries. More recently, researchers have begun to test the weak form of market efficiency in developing countries. The conclusions from these tests, in both developing and developed markets, are varied. Research rejects or fails to reject the weak form hypothesis depending on the statistical methodology being used, the data set, frequency of observations, and whether the country is developed or developing. The question being asked about weak-form market efficiency is: can investors predict future stock prices by using historical information? Fama and French (1988) found that 25 to 40 percent of the holding period returns in the long run are predictable from historical returns, while Poterba and Summers (1988) found that New York Stock Exchange returns during 1926-1985 demonstrated a negative serial correlation in the long-run and positive correlation over the short-run.

Gandhi, Saunders and Woodward (1980) carried out a study of the Kuwait Stock Exchange from December 1975 to May 1978 using data published by the Central Bank of Kuwait. They found that the market was inefficient in the weak form implying that the market could be predicted by investors, following their observation of past returns. The study was conducted using the serial correlation and runs test.

Butler and Malaikah (1992) investigated the weak-form efficiency in the markets of Saudi Arabia and Kuwait using runs test and serial correlation. They concluded that both markets were not efficient.

Dahel and Labaas (1999) also tested the random walk hypothesis employing the Muscat Securities Market, as well as the countries of Saudi Arabia, Kuwait and Bahrain. They concluded that only the Kuwait stock market is following a random walk using the serial correlation test, the runs test and the variance ratio test.

Squalli (2006) conducted a study in UAE testing weak-form market efficiency in both capital markets of the United Arab Emirates, the Dubai Financial Market and the Abu Dhabi Securities Market. Squalli looked at all sectors of both markets using daily data from 2000 to 2005 using both the variance ratio test and runs test. The variance ratio test of all sectors in both markets rejected the random walk hypothesis and, the market was found to not be efficient at the weak form of the efficient market hypothesis, with the exception of the banking sector in Dubai Financial Market. On the other hand, the unit root test showed that the insurance sector in Abu Dhabi Securities Market to be the only efficient sector.

Al-Raisi and Pattanaik (2006) investigated the weak-from efficiency in Muscat Securities Market from 1997 to 2006 using both the Auto Regressive Conditional Heteroscedasticity test and the Generalized Autoregressive Conditional Heteroscedasticity test. They found the market to be inefficient and, therefore, predictable from past returns.

Hoque, Kim and Pyun (2007) investigated the weak-form market efficiency using the variance ratio test at two different periods for eight different Asian markets. The pre-crisis period was from 1990 to 1997 and the post-crisis period from 1998 to 2004. They found no significant effect of the crisis on six of the countries being tested; Thailand, Indonesia, Hong Kong, the Philippines, Malaysia and Singapore. The markets were still inefficient, even after the crisis. Only Taiwan showed improvements in efficiency from pre-crisis to post-crisis. Korea, however, showed a move toward less efficiency.

Al-Khazali, Ding, and Pyun (2007) used serial correlation, variance ratio and runs tests to test the weak-form efficiency in Bahrain, Egypt, Jordan, Kuwait, Morocco, Oman, Saudi Arabia, and Tunisia. They used weekly data for all markets from October 1994 to December 2003 except for Egypt where they collected the data from January 1996 through December 2003. Their paper concluded that the focus markets were not efficient and led them to reject the random walk hypothesis. These markets, however, could have been efficient in the weak form if the indexed returns were corrected for the existence of statistical biases. They corrected the return using the method of Miller, Muthuswamy and Whaley (1994), reflecting the number of non-trading days by calculating a moving average return, thus removing the effect of thin trading.

Smith (2007) investigated the random walk model in Oman, Israel, Lebanon, Kuwait and Jordan. He rejected the random walk model with Oman and Kuwaiti companies traded on the Kuwait Stock Exchange. Moreover, he found that Tel-Aviv, Amman, Beirut and non-Kuwaiti companies traded on the Kuwait Stock Exchange were efficient. Al-Jafari (2011), however, found that the Kuwait Stock Exchange was inefficient using autocorrelation, runs, and unit root tests between July 2001 and December 2010.

Kim and Shamsuddin (2008) examined the stock market return in nine Asian countries. They found that market efficiency varied with the level of development in the stock markets. They concluded that advanced emerging and developed markets (Singapore, Taiwan, Japan, Hong Kong, Korea) demonstrated weak form efficiency. Indonesia, Malaysia and Philippines, however, were found to be inefficient. They found, moreover, that both the Singapore and Thai stock markets became more efficient following the 1997 Asian financial crisis. This result supports the claim that investor's behaviors change after a crisis, with the result that all markets became more efficient.

Lim, Brooks and Kim (2008) investigated the effects of the 1997 financial crisis on the efficiency of eight Asian stock markets: Korea, Taiwan, the Philippines, Malaysia, Hong Kong, Indonesia, Singapore, and Thailand using rolling bicorrelation test statistics for three sub periods of pre-crisis, crisis and post-crisis. The rolling bicorrelation test helps to understand not only whether a market is efficient or inefficient but also the degree of efficiency or inefficiency. Furthermore, it shows if the market is close to efficiency/inefficiency or if it is changing from being efficient to inefficient and vice versa. They found that the crisis adversely affected stock market efficiency at varying degrees. Hong Kong was the most adversely affected, followed by the Philippines, Malaysia, Singapore, Thailand and Korea. During the post-crisis period, however, most markets recovered and improved their efficiency. Greater inefficiency was found in markets during a crisis. This is a logical conclusion, since investors are expected to overreact to information during a time of turmoil.

A recent study by Jaradat and Al-Zeaud (2011) examined the Amman Stock Exchange in Jordon using serial the correlation, runs test, and unit root test during the period from January 1, 1999 to October 31, 2009. The market was inefficient, consistent with previous findings by Civelek (1991) who employed serial correlation and runs tests. He concluded that the industrial sector of the Amman Stock Exchange was positively correlated and thus the market is weak form inefficient.

3. Muscat Securities Market: Brief Description

Over its history, the capital market in Oman, the Muscat Securities Market (MSM), passed through three different phases. The first phase was the creation of a closed and public Joint Corporation starting in 1973. This phase continued until the late 1980s where the total number of companies reached 71 with 17,000 shareholders and $675 million market capitalization. The second phase began with the creation of the official stock market in Oman, the Muscat Securities Market, by a royal degree on June 1988. Oman is one of the oldest stock markets, along with Bahrain (launched in 1988), in Gulf Cooperation Council after Kuwait, which was launched in 1977. The first public trading in MSM started on May 1989. The third phase began in 1998 when two royal degrees (80/98) and (82/98) were issued to restructure the market. The restructuring created three separate entities related to capital markets; 1) the Muscat Securities Market where all listed securities are traded, 2) the Capital Market Authority that regulate and monitor the transaction and activities for both investors and listed companies in MSM and Muscat Depositary, and 3) the Securities Registration Company1 that provides records, information, registration and other services to shareholders, brokerage firms, and listed companies.

Table 1 shows the MSM index, market capitalization, along with the number of listed companies for selected years from 1989 until 2010. As depicted in Table 2, the market index, market capitalization and the total number of listed companies increased gradually from 1989 all the way until 2009. This increase is due to the increase in oil prices2 on average, direct foreign investment and greater awareness regarding the importance of capital markets as a means for wealth and income generation, as more people began to include equity investments in their portfolios, along with real assets. Real assets have historically provided both social and psychological value to Omani investors. The annual return of MSM30 varies widely depending on many factors including oil prices. During the financial crisis of 2008, the market declined by 39.80% whereas in 2009 and 2010 it increased by 17.05% and 6.06%, respectively. Table 2 shows the MSM30 annual returns from 2000 until 2011.

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1 The name recently changed to Muscat Clearing and Depositary Company
2 Most of the Sultanate revenue is coming from oil. In 2009, 67% of total revenue is from oil

Table 1: MSM30 index, market capitalization and the number of listed companies for selected years from (1989-2010)

Year	Index	Market Capitalization ($Million)	Number of Listed Companies
1989	N/A	1,036.75	83
1990	N/A	1,316.25	80
1995	1,581	3,180.00	132
2000	2,011.983	4,869.50	222
2005	4,875.11	14,672.25	242
2010	6,754.92	27,250.00	2604

Sources: Muscat Securities Market

The MSM consists of three different markets: the regular market, the parallel market and the third market. Each market has it is own set of criteria and rules in order for a security to be listed on that market. Companies listed in the regular market are considered to be blue chip companies. The market index of Muscat Securities Market is called the MSM30, which was established in 1992 with a base year of June 1990. It is based on 30 companies, which represents 10 companies from each of the three sectors of the Muscat Securities Market: Banking and Investments sector, Industry sector, and Services and Insurance sector. The 30 companies that represent the index are changed from time-to-time, based upon a set of criteria including share liquidity and trading volume. The market is dominated by the Banking sector followed by the Telecommunication sector where they account for 41.7% and 21.4% of the market capitalization of the index, respectively.

Table 2: Muscat Securities Market index annual return from 2000-2011

Index	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MSM (%)	-19.5	-24.4	26.2	42.4	23.8	48.7	14.5	61.9	-39.8	17.1	6.1	15.7

Source: Oman Arab Bank for the years 2000-2005 and Muscat Securities Market for the years 2007-2011

Among the top 10 companies in terms of market capitalization are five banks. The top five largest listed companies in terms of market capitalization are: Bank Muscat, Oman Telecommunication, Bank Dhofar, Nawras Telecommunication, and the National Bank of Oman.

4. Research Hypothesis
This paper investigates the existence of the weak form market efficiency in the Muscat Securities Market at three different market stages: pre-crisis from January 1, 2007 to June 8, 2008, crisis from June 9, 2008 to January 22, 2009, and post-crisis from January 23, 2009 to January 17, 2011. The null hypothesis for this test is:
H_0 : The Muscat Securities Market (MSM30) is efficient in the weak form of the efficient market hypothesis, during the three defined stages: pre-crisis (January 1, 2007-June 8, 2008), crisis (June 9, 2008-January 22, 2009) and post-crisis (January 9, 2009-January 17, 2011).

5. Data and Methodology
The data employed are the daily stock price index of the MSM30 for three continuous periods over three distinct market stages: pre-crisis, from January 1, 2007 to June 8, 2008 with a total of 361 observations; crisis, from June 9, 2008 to January 22, 2009 with a total of 148 observations; and post-crisis, from January 23, 2009 to January 17, 2011 with 490 observations. The data were collected from the Muscat Securities Market website www.msm.gov.om. The daily return is calculated using the logarithm of the relative prices converted to a percentage, calculated as:

$$y_t = Ln\left(\frac{P_t}{P_{t-1}}\right) * 100 \qquad (1)$$

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[3] The use of a base of 1000 points instead of a base of 100 for the index began 2000.
[4] The number of listed companies for 2008

Where

Pt = The MSM30 index at time t

$Pt - 1$ = The MSM30 index at time $t - 1$

The critical test is the runs test which is used to check the randomness of the daily stock returns, by testing sequences of stock returns to ascertain if they are mutually independent. It is defined as the length of the sequence of consecutive changes in stock prices with the same sign, positive, negative or unchanged. In other words, the runs test is testing the sign of the run whether it is positive or negative, and the length of the sequence. Siegel (1956) defined it as "a succession of identical symbols which are followed or preceded by different symbols or by no symbols at all." This test is conducted by comparing actual runs in the data vs. the expected number of runs. If there is a significant difference between the two then the price changes are considered dependent and thus the MSM30 is not efficient. In contrast, if there is no significant difference between the actual and expected number of runs then the market is considered efficient. The number or runs in a certain sequence (N) gives (N+) for positive return and (N-) for negative return. The changes in return are based on the mean so the change is considered positive if it is greater than the mean and negative if it is less than the mean. The positive dependency is when there are fewer runs than expected and negative dependency is when the actual runs is more than expected runs. In both cases there is a dependency in prices and the market is not efficient. The expected number of runs is calculated as:

$$M = \frac{N(N+1) - \sum_{i=1}^{3} n_i^2}{N} \qquad (2)$$

Where:

M = Mean

N = Total number of observations

i = signs of plus, minus or no change

and

n_i = number of price changes of each sign

The standard error of M is calculated as:

$$\sigma_M = \frac{\sum_{i=1}^{3} n_i^2 [\sum_{i=1}^{3} n_i^2 N(N+1)] - 2N \sum_{i=1}^{3} n_i^3 - N^3}{N^2(N-1)} \qquad (3)$$

σ_M = The standard error

N = Total number of observations

i = signs of plus, minus or no change

and

n_i = number of price changes of each sign

The standardized variable Z is calculated as:

$$Z = \frac{r^{\frac{1}{2}} - M}{\sigma_M} \qquad (4)$$

Where

M = is the expected number of runs

r = is the actual number of runs

If the standardized variable Z is normally distributed (mean = 0, variance = 1) at a 5% significance level then the market is considered to be independent and weak form efficient. Moreover, the Z value should be positioned beyond the critical value of ± 1.96.

Since the Muscat Securities Market is characterized by thin and infrequent trading, some literature suggests that correcting the data for infrequent trading might have an effect on the results. The MSM30 daily price index is corrected for thin and infrequent trading using Miller, Muthuswamy and Whaley (1994) method. This method is used to adjust for infrequent and thin trading. The non-trading day's adjustments are found by calculating the residuals from the following formula

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \varepsilon_t \qquad (5)$$

and then using it to calculated the adjusted return for thin trading.

$$R_t^{Adj} = \frac{\varepsilon_t}{1-\alpha_1} \qquad (6)$$

Table 4 shows the descriptive statistics for Muscat Securities Market during the pre-crisis, crisis and post crisis. The average daily return for the Muscat Securities Market index is 0.0021, -0.0063, and 0.0009 for the pre-crisis, crisis and post crisis, respectively. The mean return is negative only during the crisis period. The maximum and minimum daily return for MSM30 is 8.37% and -8.33%, respectively. In the pre-crisis period, the maximum and minimum daily return for MSM30 is 3.54% and -8.33%, respectively. During the crisis period the maximum and minimum daily return for MSM30 is 8.37% and -8.29%, respectively. In the post-crisis period the maximum and minimum daily return for MSM30 is 6.12% and -5.62%, respectively. The standard deviation is much greater during the crisis period, 2.9%, as compared with 0.9% and 1% for the pre-crisis and post crisis, respectively. This higher variation during the crisis is due to the panic and the uncertainty in the stock market. This panic could lead to irrational behavior by investors, which will make the market to be inefficient.

Table 4: Descriptive Statistics for Muscat Securities Market during the pre-crisis, crisis and post crisis

Descriptive Statistics	Pre-crisis	Crisis	Post-crisis
Mean	0.002148	-0.006296	0.000901
Median	0.001846	-0.004527	0.000769
Maximum	0.035889	0.083708	0.061169
Minimum	-0.083314	-0.082874	-0.056241
Standard Deviation	0.009447	0.028946	0.010317
Observation	361	148	490

Table 5 shows the results of normality tests during the pre-crisis, crisis and post crisis period for Muscat Securities Market. The analysis of the results shows a departure from a normal distribution. The pre-crisis period is negatively skewed, which indicates a higher probability of a negative return than anticipated by a normal distribution. In contrast, during the crisis and post crisis the return is positively skewed, which indicates a higher probability of a positive return than anticipated by a normal distribution. The kurtosis is greater than three, which means that during this period the distribution is peaked about the mean more than would be the case of a normal distribution. Furthermore, the p-value for Jarque-Bera test is significant at a 5% significance level. Given this result, the null hypothesis is rejected and the Muscat Securities Market is not normally distributed over all periods: pre-crisis, crisis and post crisis.

Table 5: Normality Distribution Test for Muscat Securities Market during the pre-crisis, crisis and post-crisis period

Normality Distribution Indicators	Skewness	Kurtosis	Jarque-Bera	P-value
Pre-crisis	-1.637709	22.07191	5632.596	0.000
Crisis	0.081362	4.114313	7.820394	0.020
Post-crisis	0.292790	10.95921	1300.376	0.000

6. Results of Runs Test

Table 6 shows the result of the runs test for Muscat Securities Market during the three market stages using raw data. The results show that the actual numbers of runs are less than the expected number of runs during all three market stages. The z value is negative and significant given that it is beyond the critical value. As a result, the null hypothesis is rejected and the Muscat Securities Market is weak form market inefficient during all periods: pre-crisis, crisis and post-crisis.

Table 6: Runs test for Muscat Securities Market during the pre-crisis, crisis and post-crisis using raw data

	Observation (N)	n(+)	n(-)	Expected runs (m)	Actual runs R	Z	P-value
Pre-crisis	361	171	190	181	132	-5.179	0.000
Crisis	148	81	67	74	59	-2.553	0.005
Post-crisis	490	239	251	246	218	-2.521	0.006

Table 7 shows the result of the runs test for the Muscat Securities Market during the three market stages using adjusted returns (see equations 5 and 6). The results show that the actual numbers of runs are less than the expected number of runs. The z value is negative and significant given that it is beyond the critical value. As a result, the null hypothesis is rejected and the Muscat Securities Market is weak form market inefficient. However the z value is not significant during the crisis and post crisis period, as it is not beyond the critical value during these periods. As a result, we fail to reject the null hypothesis that the Muscat Securities Market is efficient at the weak form of market efficiency.

Table 7: Runs test for Muscat Securities Market during the pre-crisis, crisis and post-crisis using adjusted return

	Observation (N)	n(+)	n(-)	Expected runs (m)	Actual runs R	Z	P-value
Pre-crisis	361	170	190	180	140	-4.282	0.000
Crisis	147	77	70	74	67	-1.217	0.112
Post-crisis	489	232	257	245	238	-0.623	0.267

7. Conclusion

This study is the only study that examined the Muscat Securities Market during the recent financial crisis using the Muscat Securities Market daily price index. The time frames were divided into three stages: pre-crisis, crisis and post-crisis based on the stock market price movements. The pre-crisis period is from January 1, 2007 to June 8, 2008, the crisis from June 9, 2008 to January 22, 2009 and the post-crisis from January 23, 2009 to January 17, 2011. The runs test indicates that the Muscat Securities Market is efficient during the crisis and post crisis only when using adjusted return. Investors cannot use historical information to predict the future prices during the crisis and post crisis period in Muscat Securities Market.

Further study is needed using the serial correlation and variance ratio test using the same time frame to investigate if the Muscat Securities Market is efficient during the crisis and post-crisis.

Biography

Sami Al Kharusi is Assistant Professor of Finance in Sultan Qaboos University, Oman. He completed his Bachelor degree at Sultan Qaboos University and a Master degree at Johns Hopkins University in finance in USA. His doctorate was received from University of Missouri in 2012. This paper is part of his dissertation at University of Missouri in the Personal Financial Planning Department. He can be reached at P.O.Box 3864 PC 112, Ruwi, Oman, ksami@squ.edu.om.

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