

# **The Effect of the Financial Crisis on the Relation Between the Egyptian GDR's and Their Underlying Stocks in Egypt**

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## **ABSTRACT**

This research examines the relationship between the behavior of the prices of the Egyptian GDR's in London and their underlying stocks in Egypt, and whether the previous financial crisis of 2008 showed any difference in the price behavior of these securities. There were 10 stocks tested that represent 3 main sectors which are; the financial sector, the telecom sector and the constructions sector. We found that there is a strong direct relationship between the Egyptian GDR's and their underlying stocks in Egypt and that this relation was maximized during the crisis of 2008 and it appears most in the financial and telecom sector.

## **INTRODUCTION**

The acceleration in the globalization of markets over the past years is not only represented by the free flow of goods and services, but also by the international liberalization of capital flow. This helped companies in emerging markets to obtain listings on American and European Exchanges through the issuance of American Depository Receipts, ADR's, and Global Depository Receipts, GDR's. These may include firms going public for the first time (Global Initial Public Offering), or firms that are already public deciding to list their equity in a foreign market (Nyvltova, 2006).

On the other hand, the trend of the rising correlation among global markets affected the trust of investors in the international globalization negatively. Those investors appeared in the late 1980's and the early 1990's when the long period of international equity performance began. This period witnessed lower overall returns with little reduction in portfolio volatility (Srivastava, 2007). In addition to that, domestic investors are likely to have better information about firms in their own country than foreign investors, therefore, the two types of investors may price a security differently (Nuno, 2003).

The purpose of this paper is to understand the behaviour of the Egyptian GDR's and their underlying stocks in Egypt. Moreover, the research will give us some highlights about the efficiency between the two markets and whether there are arbitrage opportunities between the two markets and hence the two markets are inefficient or the linkages between the two markets are really efficient.

The importance of this study appears widely for the investors that are the main users of the theory of arbitrage. In fact it will show investors the relationship between the two markets and whether the rising correlation between the world markets appeared between those specific markets and affected the performance of the securities that are listed in both market.

## **LITERATURE REVIEW**

As countries are moving towards a more global market, and as the barriers and constraints are removed, allowing access to the financial markets, international investors have greater access to individual securities providing better performance for the risk undertaken. As Thomas, 2003, observed that investors that would use the buy-and-hold strategy in dealing with international stocks will be able to recognize similar returns as those of fund managers.

Karolyi, 2004, mentioned that the expansion of ADR's and GDR's in emerging economies may be a result of the declining market conditions and not a cause of them. He explained his point of view that the deterioration in the fundamental economic, political, legal or other institutional forces in the emerging markets create incentives for companies to leave by issuing GDR's and ADR's abroad.

Also Demissew and Chinmoy, 2004, observed in their findings regarding the trading volume in a market after DR listing that the average daily trading volume more than doubled for the stocks, and consequently the average daily

There are 3 kinds of investors in the equity market that correspond to three different temporal locations in the market. Hedgers that seek reducing the risk they confront, and they move towards the derivatives market in order to reduce the risk they already face. Speculators that actively try to expose their selves to calculated risk by trading in the future markets. Arbitrageurs are engaged in risk free trading activities and they take positions in more than one economically related markets (Hull, 1997).

On the other hand, Hardie, 2004, showed that arbitrageurs should not be categorized as a separate investor type, but in fact arbitrageurs are just 'noise' or irrational traders. Hardie draws attention to inconsistent understanding of what arbitrage is in both financial economics and the social studies of finance mentioning that there is a difference between the 'theory' and the 'practice' of arbitrage. In his view, any trade can take a view that an asset is mispriced, but, unless profit is guaranteed, the trade is not arbitrage.

Dow and Garton, 1994, assumed that the efficiency of security prices depends upon arbitrage, that means trading based on information that the price of an asset is not the same as its fundamental value. They argued that arbitrageur's information cannot be reflected in the price he pays upon submission of the order and that the arbitrageur must be able to hold the security until he will be able to realize profit. However, their findings showed that an arbitrageur that receives bullish news will only buy under the condition of the likeliness that at the end of the trading horizon, another arbitrageur's buying will have pushed up the expected prices (Dow and Gorton, 1994).

Kumar and Seppi, 1994, observed that there are many reasons that would help arbitrage in less developed and less fragmented markets to be more profitable than arbitrage in more developed and fragmented market. First, there are less people aware of arbitrage in less developed markets. Second, higher level of noise traders due to lower experience of experts to identify arbitrage opportunities. The last reason is the high costs of achieving information before the market makers do get these information.

According to Grossmann et al, 2006, if markets are efficient, the prices of the same identical stocks that trade in different locations should be similar, as any deviation in their prices will be arbitrated away. Consequently, the price of a DR which is the US\$ value of a claim on the equity of a foreign company, should be equal to the exchange rate adjusted price of the common stock of that company. Therefore, when the deviation exists between the DR and the price of its underlying asset, the DR is said to be mispriced.

A number of factors have combined to deteriorate the performance of the Egyptian stock exchange which began its decline in early 2008. Mainly was a rush by foreigners to liquidate their financial assets in order to bail out their enterprises in their home countries in the wake of the mortgage crisis. As a result the EGX 30 index dropped by around 56 % in one year, which suggests that the drop of the Egyptian stock Exchange was one of the strongest drops all over the world. (Abu Hattab, 2010)

After reviewing the literature review on the effect of cross listing and arbitrage on the performance of the companies, investors and overall market, we concluded that our hypothesis in examining the effect of the financial crisis on the relation between the Egyptian GDR's and their underlying stocks in Egypt will be as follows:

There is a direct strong relationship between the returns of the Egyptian GDR's listed in London stock exchange and the return of their underlying stocks in Egypt.

The research now will proceed to the empirical section of the study.

## RESEARCH METHODOLOGY

The population consists of 10 shares. The 10 shares come from 3 different sectors; the financial sector, the telecom sector and the constructions sector. Each of these shares is listed both in the Egyptian Stock Exchange and in London Stock Exchange and they are the only 10 stocks that are listed in both exchanges. The 10 stocks have an Egyptian Pound value and have an equivalent US Dollar value that is traded in London.

We ignored from our analysis 4 shares; Ezz Steel Rebars, Lecico, Suez Cement and Pachin, as there were no enough data regarding the prices of the GDR's in order to perform this statistical analysis. In our analysis we converted all DR's to Egyptian pounds, using the appropriate exchange rate between the \$US and the Egyptian pound, so that all securities value are in one currency.

**Table -1- Egyptian GDR's**

Name	Code	Sector
1) Commercial International Bank	COMI.CA	Financial Services
2) EFG-Hermes	HRHO.CA	Financial Services
3) Orascom Telecom	ORTE.CA	Telecom
4) Telecom Egypt	ETEL.CA	Telecom
5) El Ezz Steel Rebars	ESRS.CA	Constructions
6)Palm Hills Development	PHDC.CA	Constructions
7)Lecico Egypt	LCSW.CA	Constructions
8) Suez Cement	SUCE.CA	Constructions
9)Paint & Chemical Industries(Pachin)	PACH.CA	Constructions
10)Orascom Constructions Industrial	OCIC.CA	Constructions

The series of the prices of stocks are trended and therefore in most cases they are non-stationary. The problem with non-stationary or trended data is that the standard ordinary least square (OLS) regression procedure outcome can easily lead to incorrect conclusions. Augmented Dickey–Fuller test (ADF) is a test for a unit root in a time series sample. It is an augmented version of the Dickey–Fuller test for a larger and more complicated set of time series models. The augmented Dickey–Fuller (ADF) statistic, used in the test, is a negative number. The more negative it is, the stronger the rejection of the hypothesis that there is a unit root at some level of confidence. The possible form of the augmented Dickey Fuller (ADF) test is given by the following equation:

$$\Delta Y_t = \chi Y_{t-1} + \sum_{i=1}^p \beta_i \Delta Y_{t-i} + U_t$$

Where,

$Y_t$  = Price of shares

t = time index

$U_t$  = Error term

$\chi$  = Constant

$\beta$  =Coefficient on a time trend

What we need to examine here is whether  $\chi$  is equal to one (unity and hence 'unit root').

In fact, we can obtain a different and more accurate result of this test by subtracting  $Y_{t-1}$  from both sides to obtain:

$$\Delta Y_t = \chi Y_{t-1} + U_t$$

Therefore the test of hypothesis will be as follows:

$H_0 : \chi = 0$  (Non Stationary)

$H_1 : \chi < 0$  (Stationary)

As the term error term is unlikely to be white noise, Dickey and Fuller extended their test procedure suggesting an augmented version of the test which includes extra lagged terms of the dependent variable in order to eliminate autocorrelation.

The ADF test for stationary is simply the normal 'T' test on the coefficient of the lagged dependent variable  $Y_{t-1}$ . However, this test does not have a conventional 'T' distribution and thus we must use special critical value which is originally calculated by Dickey and Fuller.

If the ADF statistical value is smaller in absolute terms than the absolute value or critical value then we reject the null hypothesis of a unit root and conclude that  $\chi$  is a stationary process.

After testing for stationary, if the data proved to be stationary we will measure the correlation between the prices. If the data was non-stationary we will measure the return and then test for stationary of the return, if the returns tend to be stationary we will measure the correlation between the returns.

To measure the linear correlation between the returns of the Egyptian GDR's and their underlying stocks in Egypt, we will depend on Pearson correlation which is denoted by (r). To find whether this relation is direct or inverse, weak or strong, we will follow the following classification:

0 to 0.4 = weak direct , 0.4 to 0.7 = moderate direct , 0.7 to 1 = strong direct  
 0 to -0.4 = weak inverse , -0.4 to -0.7 = moderate inverse , -0.7 to -1 = strong inverse  
 Absolute zero = No linear relation.

According to Pearson:

$$r = \frac{\text{COV}(x, y)}{\sigma(x) \times \sigma(y)}$$

where,  
 cov= the covariance between x and y.

To test if this linear relation exists on the population level or not, we have to make the test of hypothesis about the population correlation according to the following:

Ho:  $\rho = 0$  (no linear correlation)                      H1:  $\rho \neq 0$  (linear correlation exists)

Where,

**Ho** : there is no linear correlation in the sample.  
**H1**: there is a linear correlation in the sample.

T-calculated =  $\frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$  Where,

r : The sample correlation.                      n : The sample size.

To take a decision or reject the null, we can depend on the P-value. By comparing the P-value with  $\frac{\alpha}{2}$ , we can take a decision according to the following criteria:

If P-value >  $\frac{\alpha}{2}$ , we cannot reject Ho, If P-value  $\leq \frac{\alpha}{2}$ , we reject Ho

**Analysis of hypothesis:**

There is a direct strong relationship between the returns of the Egyptian GDR's listed in London stock exchange and the return of their underlying stocks in Egypt.

The aim of calculating the linear correlation between the return of the Egyptian DR's and their underlying stocks, is that they are going to show us the relation between the Egyptian stock exchange and London stock exchange, and whether the financial crisis affected their relation, as these companies are the only companies that have traded securities in both markets.

Stock	Critical Value	Original Data ADF		Conclusion		Return ADF		Conclusion	
		Egypt	London	Egypt	London	Egypt	London	Egypt	London
COMI	-2.868	-1.378	-1.4025	non-stationary	non-stationary	-9.7002	-10.788	Stationary	Stationary
HRHO	-2.8709	-0.6086	-0.46524	non-stationary	non-stationary	-7.9293	-7.9232	Stationary	Stationary
OCIC	-2.8679	-1.1057	-1.09573	non-stationary	non-stationary	-9.5849	-10.012	Stationary	Stationary
ORTE	-2.868	-0.4432	-0.41208	non-stationary	non-stationary	-9.4932	-10.110	Stationary	Stationary
PHDV	-2.9042	-1.1162	-1.1035	non-stationary	non-stationary	-4.315	-5.031	Stationary	Stationary
ETEL	-2.8715	-1.9885	-2.2938	non-stationary	non-stationary	-8.4414	-8.8	Stationary	Stationary

Table -1- Stationary Test

First of all we tested for the stationary of the prices of the GDR's and their underlying stocks in Egypt. We witnessed that the data is non-stationary as the critical value is lower than the T-value of the original data, and hence

this may lead us to incorrect conclusions. We calculated the returns of the prices of the GDR's and their underlying stocks, and tested for the stationary of the data. We witnessed that the returns proved to be stationary and hence we can calculate the correlation between the returns of the GDR's and their underlying stocks in Egypt.

**Table -2- Correlation throughout the Period**

Company	r-value	P-value	Decision
COMI	0.571	0	Significant difference (reject Ho)
HRHO	0.65	0	Significant difference (reject Ho)
OCIC	0.858	0	Significant difference (reject Ho)
ORTE	0.779	0	Significant difference (reject Ho)
PHDV	0.659	0	Significant difference (reject Ho)
ETEL	0.352	0	Significant difference (reject Ho)

From the previous table, it appears that there is a direct linear relation between the returns of the Egyptian DR's and their underlying stocks in Egypt for the 6 tested companies.

This direct linear relation appears on the level of population for all the companies at any significant level, as the P-value of all companies = zero.

For the Commercial International Bank , EFG-Hermes and Palm Hills, this direct relationship is moderate as the results of the r-value is between 0.4 and 0.7. While the results of Orascom Constructions Industrials and Orascom Telecom showed that the relationship is strong direct. On the other hand the results regarding Telecom Egypt showed that the relationship is weak direct.

This means that the return behavior of the Egyptian Depository receipt and the behavior of the return of their underlying stocks in Egypt move in the same direction, and that arbitrage opportunities may appear higher in Telecom Egypt than EFG-Hermes, CIB and Palm Hills as the correlation is lower so the spread is expected to be higher. Also the arbitrage opportunities would appear higher in EFG-Hermes, CIB and Palm Hills than Orascom Telecom and Orascom Constructions Industrial as the correlation is higher in Orascom Constructions and Orascom Telecom is higher. By analysing the linear correlation between the return of each DR and its underlying stock in Egypt annually, we obtained the following results:

**Table -3- Correlation between the returns of the Depository Receipts and their underlying stocks in Egypt**

Company	2007			2008			2009		
	R-Value	P-Value	Decision	R-Value	P-Value	Decision	R-Value	P-Value	Decision
COMI	0.245	0	Significance Difference	0.627	0	Significance Difference	0.633	0	Significance Difference
HRHO	0.589	0	Significance Difference	0.656	0	Significance Difference	0.673	0	Significance Difference
OCIC	0.78	0	Significance Difference	0.91	0	Significance Difference	0.728	0	Significance Difference
ORTE	0.747	0	Significance Difference	0.806	0	Significance Difference	0.753	0	Significance Difference
PHDV	N/A	0	Significance Difference	0.534	0	Significance Difference	0.835	0	Significance Difference
ETEL	0.125	0	Significance Difference	0.594	0	Significance Difference	0.519	0	Significance Difference

The results for the Commercial International Bank showed that there is a weak direct relationship between the returns of the DR and its underlying stock in Egypt for 2007, but this relation increased in 2008 and 2009 to become moderate direct relationship.

The results for the EFG-Hermes showed that there is a moderate direct relationship between the returns of the DR's and their underlying stocks in Egypt in 2007, 2008 and 2009 while in 2008 and 2009 the direct relationship is relatively higher than 2007.

Regarding the financial sector, EFG-Hermes and CIB's results show that the correlation between the two markets is increasing among time. This proves that the financial sector in Egypt is becoming more and more related to the financial sector in London, and therefore arbitrage opportunities are becoming less from one year to another.

The results for the Orascom Constructions showed that there is strong direct relation between the returns of the DR's and their underlying stocks for all years. And the results also proved that 2008 showed the highest rate of correlation.

The results for the Orascom Telecom showed that there is strong direct relation between the returns of the DR's and their underlying stocks for all years. And the results also proved that 2008 showed the highest rate of correlation.

The results for Orascom Telecom and Orascom Constructions show that the correlation between the two markets are really strong, and that they appeared to be very high in 2008. This might be a result of the high liquidity of these securities in both markets or the increased investments of these companies in the foreign markets.

The results for the Palm Hills Development showed that there a moderate direct relationship between the returns of the DR's and their underlying stocks for 2008, while 2009 showed that this relation is a strong direct relationship.

The results for Telecom Egypt showed that there is weak direct relation between the returns of the DR's and their underlying stocks for 2007. While this relation in 2008 and 2009 was moderate direct relationship with a higher rate of correlation in 2008.

After analysing each company annually, the results show that the relationship between the returns of the DR's and their underlying stocks for all the examined securities is higher in 2008 and 2009 than 2007.

The relationship between the returns of the DR's of Orascom Constructions and Orascom Telecom and their underlying stocks appeared to be the highest among the selected stocks. In fact the results of both securities in addition to Telecom Egypt showed the highest rate of correlation in 2008 which observed the peak of the global financial crisis.

On the other hand, EFG-Hermes and CIB showed that the rate of correlation between the returns of the DR's and their underlying stocks increases from one year to another, and therefore 2009 shows the highest rate of correlation in this sector. In fact 2009 witnessed part of the global financial crisis. This may be explained that the financial systems are getting more related over time, and that the financial sectors between the two markets are getting more efficient over time.

This means that during the financial crisis, the movements of the returns of the Egyptian stocks were highly correlated to the movements of the returns of the Egyptian DR's, in all the sectors that we have tested, proving that during extreme circumstances the relation between GDR's and their underlying stocks is stronger, and that during these times global markets react and respond more quickly as in this case where the Egyptian market and London market were highly correlated in the previous financial crisis.

## CONCLUSION

First of all, we concluded that there is a direct relationship between the returns of the GDR's and their underlying stocks in Egypt all over the period of the research. This direct relationship tend to differ among the sectors and number of observations, as this relation appeared to be weak, moderate and strong in different circumstances proving that the efficiency level between the 2 markets is not high. This proves that the information linkage between the two markets is not very strong and hence arbitrage opportunities appear but with minimal effect. This supports the finding of Wahab et al,1992 and Suh, 2003 that the arbitrage opportunities between the DR's and their underlying stocks are very few and in most of the times they are not profitable and that those opportunities may be a result of the exchange rate risk.

In fact, during the period of the financial crisis which took place majorly in the year 2008, and with the prices dropping from the 2<sup>nd</sup> quarter of 2008, we witnessed that during these extreme circumstances the correlation and the linkage between the two markets increased, and the reaction of the stocks to the changes in either markets are very rapidly interpreted allowing very low arbitrage opportunities between the two markets.

## LIMITATIONS OF THE STUDY AND FUTURE STUDIES

We faced some limitations in the data collection, as we needed the intra-daily prices of the securities and the bid and ask prices of these securities on a 10 minutes basis, in order to interpret if the arbitrage opportunities were profitable or not. But in fact the 10 minutes prices were not available for the Egyptian stocks.

We can also suggest some future areas of research for this study, including the examination of the price behavior of the GDR's and ADR's in the MENA region (Middle East North Africa) and their underlying stocks in their countries.

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