



Arbitrage and Stock Mispricing: Empirical Evidence from GCC Markets

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Abstract: Cross listing has become a worldwide phenomenon and is considered a great way for listed companies to raise extra capital and gain access to new markets and segments. However, the impact of cross listing is very vague and data and research regarding the subject in relation to the Arabian Gulf are very limited. It is very important to know the implications of cross listing; in addition, the relationship between cross listing and the price movement of the cross listed company in both the home and host markets (i.e., existence of arbitrage). The purpose of this research study is to not only gain a better insight on the performance and consequences of cross listing in the Gulf, but also whether arbitrage trading is possible or not, taking into consideration the difference in the listing currency between home and host markets, along with the level of volume traded on the stock. The sample data for this research study was manually collected from the official websites of the Bahrain Bourse, Bourse Kuwait and the Dubai Financial Markets, whilst exchange rates have been gathered from the Bloomberg Terminal system. There were 8 Bahraini cross listed companies as of 31st December 2019; however, 4 companies have been excluded due to extreme illiquidity of the stocks in both the home and host markets; therefore, a sample data of 4 firms were analysed using EViews 9 software and Statistical Product and Service Solutions (SPSS). The Wilcoxon Test was conducted to test for arbitrage between home and host markets; Multiple regression analysis was performed to test the relationship between arbitrage and liquidity, returns, and exchange rate; the Granger Causality test was used to test for causality between arbitrage and exchange rates. The Wilcoxon Test showed that there is a significant difference in share price of certain listed companies tested, on a yearly basis and for the period of 2016 to 2019 as a whole. The multiple regression showed different results for each analysed cross listed company, indicating that arbitrage is company based and not an index based, whilst the Granger Causality test showed that the exchange rate was not the cause of arbitrage, vice versa. This paper provides valuable input to all GCC listed companies, regulators, investors, and other Capital Market stakeholders by providing them with solid data on the effects and consequences of cross listing.

Keywords: Stock market, cross listing, arbitrage, mispricing, GCC, Bahrain.

JEL Classifications: G10, G11, G15

1. Introduction

With the rise of globalization, the access for companies to gain exposure outside their country and region has been more prolific than ever. Mergers and Acquisitions have been the subject of many shareholding companies around the world, however more than that, shareholding companies have begun the process of cross listing as well, whereby companies would list their shares in one market (Home Market) following another secondary listing in a different market (Host Market).



In the topic of cross-listing, there are many advantages and disadvantages that would tempt a company into cross-listing its shares, however, ultimately the cost-benefit result depends on the financial situation of each company and its end objective. Furthermore, it is important for each company to analyse whether cross-listing is the best course of action for a company, given that there are other options for a company to gain a global exposure than cross-listing, such as the issuance of Global Depository Receipts (GDR) or American Depository Receipts (ADR), so on and so forth.

Nevertheless, this research paper will not delve into the topic of which course of action is the best pursuit for a listed company to gain exposure to further sources of capital, but rather this paper focuses on whether arbitrage (riskless profit) exists in terms of trading Bahraini cross listed companies' shares, the factors that influence such mispricing of cross listed equity, and the main drivers that influence and bring about such arbitrage opportunities. In addition, it is important to know whether currency exchange rates play a role in arbitrage, and what comes first, is it the change in the gap of cross listed securities stock price between the home and host markets or is it the change in exchange rates that influence arbitrage.

Cross listing has become extremely attractive, especially in the Frontier and Developing Capital Markets. The phenomenon of dual listing a company's shares has profound benefits, most notably the reduction of market segmentation, reduction of cost of capital as well as the greater level of exposure to the global financial markets.

Prices of cross listed firms' underlying equity should have the same price in both the home and host markets that it is listed in (taking into consideration the exchange rate) as the underlying asset of both the host and home markets are identical (based on the law of one price), and if price deviations do occur between the home and host markets, such deviation is supposed to be available for a very brief period of time as the work of arbitrageurs (buying the financial asset in the undervalued market and selling in the overvalued market) would drive the prices back to equality and eradicate such mispricing.

Numerous researchers have published papers and studies on the matter of the existence of arbitrage in cross listed companies however limited research have been done in relation to Bahraini cross listed companies (if any), let alone the Capital Markets in the Gulf region. Furthermore, other challenges are present such as the unknown consequences of cross listing and its impact on not only the individual cross listed company, but the market.

The following research questions are going to be framed as scientific hypothesis for being tested:

- I. Whether price discrepancy and mispricing truly exists between Bahraini cross listed companies' share price in the home and host market(s)?
- II. What are the main drivers and causes of arbitrage?
- III. Is the causation of arbitrage opportunities best characterized by the currency exchange rate between the host and home markets?

The scientific objective of this research is to determine if arbitrage trading of Bahraini cross listed stocks is permissible, and if so, what is the relationship regarding the level of share price discrepancy between the home and host market of the cross listed firm, against that of liquidity and exchange rate, and is the exchange rate the cause of the mispricing of the financial asset.

According to the literature review, it will be noticed that earlier studies have focused primarily on studying cross-listed companies that share a listing in a Developed Capital Market. On the contrary, this research will focus primarily on Bahraini cross listed companies of whom are listed in other frontier / developing markets, and in this case the host markets include the Dubai Financial Market (located in



United Arab Emirates, Dubai city) and Bourse Kuwait (Located in Kuwait, Kuwait City).

Furthermore, one of the many benefits of this research is that it augments data on cross listed companies as it focuses on a much narrower niche, and in doing so, Capital Markets in the Middle East will finally have empirical results and answers in relation to the effects of cross listing on a company's shares, and future repercussions in terms of the return on share price, along with the effects of liquidity not only on the cross listed company's shares, but the market in its entirety. In addition, the study will assist in navigating investors by having a quick overview on the liquidity patterns without the need to process information contained in financial statements since arbitrage opportunities could easily be located via technical analysis (tables and price charts).

In addition, such study will help in the development of the GCC Capital Markets given the fact that it will assist companies, regulators, and other stakeholders to be able to figure out the cause and effect of arbitrage, volume of trading on a cross listed stock, price movement of a stock and its effect on the entire index that cross listed companies' stocks are listed on.

To attempt to answer the questions above mentioned, data relating to each cross-listed security will be collected, and they are as follows:

- I. The daily closing share price in both the home and host markets (from 2016 to 2019);
- II. Bid and ask spreads on Bahraini cross listed companies in both the home and host markets;
- III. Volume of shares traded of Bahraini cross listed companies in both the home and host markets; and,
- IV. Daily changes in exchange rates in terms of currency of host listing against the home listing currency of the cross listed firm.

A simple daily line graph depicting the price movement of a security in both home and host market could clearly identify the existence of arbitrage and help us in answering the first hypothesis however to get a more technical and empirical answer, data is first tested for normality using the Shapiro-Wilk and Kolmogorov-Smirnov tests. Accordingly, the results indicated that the data was not normal and hence a non-parametric test has been conducted which is the Wilcoxon Test instead of the simple paired-t test, to figure out whether arbitrage truly exists or not on Bahraini Cross listed stocks, while a Granger causality test will be executed by the researcher to help identify whether arbitrage is affected by the level of exchange rates in terms of currency of host listing against the home listing currency of the cross listed firm, or is it the other way around.

The sample used for this study will not only include dual listed companies that have their shares listed in one host market, but also companies that have other listings across multiple listed markets and exchanges. The main contribution of this study is to investigate the significance of whether arbitrage (mispricing) exists in relation to Bahraini cross listed companies and its shares that are listed at home versus host markets, other variables, and their degrees of which led to ultimately driving potential arbitrage opportunities through the buying of a company's security in the under-valued market and selling them in the over-valued market.

The thesis is organized as follows: Chapter one provides an overview of introduction to the research problem, research objectives, questions, and significance of the research study. Chapter Two reviews the literature, to determine the association between dependent and independent variables. Chapter Three describes the methodology, data and variables used in this study and the conceptual framework model used to describe the factors related to arbitrage. Finally, Chapter Four will discuss the findings, conclusion, limitations, and recommendation for future research.



2. Literature Review

1. Cross Listing

The era of cross-listing has attracted numerous researchers on the subject, enticing them to investigate the underlying motives to cross list shares, direct advantages, and other related benefits to cross-listing. Several research papers on cross-listing have found that such an activity creates a reduction in capital market segmentation, which is a huge motive to cross-list, in addition to reducing the risk associated with international investment barriers as well as exposing the cross-listed company to the global market. Such an exposure undoubtedly further limits the cost of capital, and in return allows the firm to raise external capital, and improve the liquidity of its shares, i.e. share turnover as tested by Errunza & Losq, 1985, and Stapleton & Subrahmanyam, 1977; in which a theoretical and empirical investigation of the pricing implications of investment barriers in the context of international Capital Markets were made.

A following research that was issued by Stulz in 1999 and Coffee in 1999 and 2002 have accounted for another major benefit that strengthens a firm's decision to cross-list its shares in another exchange, and that is the structure of a firm's ownership. It has been explained that a significant issue faced by large corporations is the control held by major shareholders (investors that own 5% or more of a company's shares) at the expense of minority shareholders, and hence this stands as a major obstacle to the firm as it impedes it in raising further capital at a lower cost. Accordingly, Stulz and Coffee argued that firms are able to reduce their cost of capital by proving to the market their commitment to protect the rights of such minority shareholders by choosing to cross-list their shares in exchanges which adopt stricter rules and regulations in favor of minority shareholders.

Another study conducted by Abed and Christos in 2010 have found (using a modified international asset-pricing model) strong evidence that publicly listed companies choose to cross-list when exhibiting strong performance in their domestic market, and hence wish to benefit from this status. However, the paper also revealed that this advantage disappears after cross-listing. In addition, it was found that there was not any change to be found in terms of a decrease in market risk faced by a firm over time, of which diminishes almost completely. Furthermore, it was found that there was no change in the global market risk after cross-listing, with the exception of the firms that have cross-listed during the period between 2001 and 2007, where their exposure to international market risk decreased.

It is crucial to note that after decades of empirical research, there is no conclusive evidence regarding the true economic advantages and benefits that result from cross-listing under the hypothesis of Capital Market segmentation, whereby it has been found by several studies that cross-listing creates an appreciation in prices and thereby reducing the expected returns and risk, which is accomplished by a reduction in the cost of equity capital (e.g. Alexander, Eun, & Janakiramanan, 1988; Foerster & Karolyi, 1993, 1999; Jayaraman, Shastri & Tandon, 1993; Miller, 1999; Ramchand & Sethapakdi, 2000). On the other hand, other studies have found the opposite results to be true and that they do not support the validity of the market segmentation hypothesis (e.g. Howe & Kelm, 1987; Howe, Madura, & Tucker, 1993; Lau, Diltz, & Apilado, 1994).

There are several other studies that have been conducted with relation to the development of the global stock market towards encouraging firms to cross-list their securities, either in the form of direct secondary listing or in the form of depository receipts, such as De Jong et al. in 2009 and Otsubo in 2014. It was discovered by numerous studies as well of the precise benefits obtained by such cross-listed companies from going overseas, whereby Flavin and O'Connor in 2010 learned that cross-listing companies have benefited from a reduction in debt, while other studies revealed other benefits such as: an increase in investor protection as well as a decrease in capital cost with a simultaneous gain



in corporate governance (Benos and Weisbach, 2004; Coffee, 2002; Doidge et al., 2004; Reese and Weisbach, 2002; King and Segal, 2009; Sarkissian and Schill, 2009 and 2012). However, the greatest benefit is unquestionably the international exposure, as illustrated in the studies conducted by Baker et al., in 2002, Errunza and Miller in 2000, and Foerster and Karolyi in 2000.

Whenever studying cross-listed companies, there are several factors that are needed to be taken into consideration. First and for most, the reader must be aware on issues pertaining to why a company would decide to cross-list in the first place, most notably in terms of the cost and benefits surrounding cross-listing and international exposure via issuance of DRs. Benefits have already been mentioned earlier but to reiterate, they are as follow:

- The depreciation and reduction in the costs of capital by the cross-listed firm (as shown and studied by Alexander et. al. in 1988; Jayaraman et. al. in 1993; Sundaram and Logue in 1996);
- High appreciation in the rate of share turnover and liquidity on the cross-listed stock (as shown and studied by Foerster and Karolyi in 1993; Norhana et. al. in 1996; etc.); and
- The higher level regarding the base of share equity (as shown and studied by Saudagaran in 1988).

On one hand, these were a few of the major benefits and advantages associated with cross-listing. However, on the other hand, costs are also faced by firms that desire to cross-list its shares, and the following are some of the most notable disadvantages:

- Extra costs that are faced by the cross-listing firm which are needed to conform and comply with the increased level of disclosure requirements by regulators in both the host and home markets (as shown and studied by Saudagaran and Biddle in 1992); and
- The readers, analysts, academics, and practitioners need to be made aware of the level of integration or segmentation of the markets that the cross-listed stock is available in (home and host market integration level).

This section revolves around the topic of arbitrage and hence the law of one price which states that both markets (home and host) that have the cross-listed firm's stocks listed, actually share the same underlying share price and hence the movement of price and return should be identical in all markets that are hosting and listing the same underlying stock of the firm. Many studies have delved into the topic and have shown that no market is completely integrated with another. Nevertheless, a level of integration between markets hosting the same cross-listed firm's securities (as shown and studied by Kryzanowski and Zhang in 2002; Lowengrub and Melvin in 2002; Werner and Kleidon in 1996; etc.) does exist to a certain extent.

It is imperative to note that even though not all studies have documented and concluded with similar results, other contradictory instances do exist in which markets are not integrated at all. For example, a study conducted by Froot and Dabora in 1999 investigated a total of three pairs of what is known as "Siamese Twin" stocks of companies, and it has been concluded that markets can be segmented in nature regardless of the shared assets and securities between them, adding that "stock prices are affected by the location of the trade". Such difference in results amongst numerous studies just adds further fuel and makes us certain that the topic of cross market integration and segregation is yet to be resolved and solidified.

Undoubtedly, the benefits that cross-listing has on a company and its underlying assets and securities have been established. However, to what extent does such cross-listing aid companies and corporations, i.e.: Does cross-listing help in mitigating stock crash risk? A study published by Imen in 2019 investigated and attempted to answer that very question.



Specifically, the paper investigated the role that cross-listing in the U.S. has on a cross-listed company's underlying securities as well as the extent of mitigation it has in terms of stock crash risk, and it was found that it does mitigate the risk to a large extent. It has also been found that "by disentangling the effect of cross-listing from either increased disclosure or investor protection rules or reduced market segmentation, it has been found that cross-listing on the Over The Counter unregulated market play a more significant role compared to cross-listing on the regulated exchanges."

To delve further into this issue, it is important to define the term "stock crash" which, as per Kim et. al. in 2014, was defined as "the conditional skewness of return distribution which is an important characteristic of return distribution that captures asymmetry in risk, especially downside risk. Thus, it is important for investment decisions and risk management".

Likewise, there are other studies, for example the one that was conducted by Harvey and Siddique in 2000, which stated that crash risk is in fact priced and occurs specifically when asset returns (not just equity returns) have adopted substantial and heavy negative skewness to the left, thereby, the equity investors in a company would require an additional level of premium to compensate for the additional level of risk as an incentive to invest in the firm.

However, in 2010 Sunder argued that simple portfolio diversification of assets is not a mean to mitigate asymmetric volatility, and that is why in return, cross-listing was looked at as an alternative to stock crash risk mitigation, which according to Imen (2019) works and does have a substantial role in such mitigation.

To further support the definition of stock crash, a theoretical model that was developed by Jin and Myers in 2006 was able to show that "crash risk is higher when accumulated negative firm specific information is abruptly disclosed."

Furthermore, by using a sample of 40 firms for the period from 1990 to 2001, it has been shown that stocks that are opaque in nature, have a poor degree of transparency and disclosure, along with "imperfect protection of investors' property rights", are more prone to an enhanced riskiness level of a stock crash. This is further supported by Hutton et. al. in 2009 and Kim et. al. in 2011, as they have provided empirical evidence that supports a positive relationship between a company's stocks that are opaque of nature along with excessive negative returns of their underlying equity. Similarly, Zhang et. al. in 2017 provided evidence that a correlation does exist when better investor protection rules and compliance exist in terms of reducing the riskiness associated with stock crash.

A publication by the World Federation of Exchanges (WFE) in 2015 estimated an approximate 10% of the entire globe's publicly listed companies are foreign, which is evidence supporting the amount of cross-listed and dual listed companies around the world's exchanges. These exchanges are either in the form of direct secondary listing, or in the form of American Depository Receipts (ADR), in addition to their home market, which stands to show the extent of globalization that all markets are going through.

According to Karolyi in 2012, it was found that cross-listing could increase by a large extent the pool of investors for such firms, along with boosting the prospects of increasing the level of capital raised with the condition that the secondary listing host market is in favourable conditions. Also, Peng and Su stated in 2014 that it may extend the strategic scope of the cross-listed company's products and services. According to the paper, researchers gave a lot of regard on the effects of cross-listing to the cross-listing firm's market value, security, and financial performance (such as Bailey et al., 2006; Doidge et al., 2004; Hail and Leuz, 2009; Reese and Weisbach, 2002). However, such studies have shown little focus on the effects of cross-listing on environmental, social, and corporate governance performance attributes of the firm. Such attributes are vital and of growing importance internationally in the global financial markets.



2. Arbitrage

Aside from the previously stated, there are numerous empirical evidence and studies that touched on the matter of whether markets for cross-listed stocks are indeed fully efficient or not, of which the results have been mixed. For example, Rosenthal (1983), Kato et al. (1991), Park and Tavakkol (1994) and Miller and Morey (1996) have already proven and shown that price deviations of a cross-listed security between the Home and Host listing markets are not significant and that arbitrage opportunities are infrequent. However, other studies that are more recent have proven otherwise such as Suarez (2005), Gagnon and Karolyi (2010), Alsayed and McGroaty (2012) and Ansotegui et al. (2013), whereby they have shown that prices of cross-listed stocks significantly deviate between the host and home markets, and that result may in fact open a window for investors to make arbitrage profit by trading on these price differences.

It is significant to mention that those specific earlier studies have typically focused on stocks listed in only two countries or also known as “Dual Listed Stocks”, and are also concentrated on the markets within the United States; hence, the results of those studies are not conclusive nor applicable on this paper that focuses on those dually listed companies who have their home markets in the Kingdom of Bahrain, in addition, those previous results do not provide the solution to our hypothesis of whether markets for cross-listed companies in the GCC (which are considered to be undeveloped nor developing) actually provide arbitrage opportunities and that price deviations between them exists.

A substantial number of studies showed that an increasing number of companies have listed their shares and securities in multiple markets, both in the form of direct listing and DRs, with the target being large and developed institutional markets, exchanges, and countries.

Furthermore, it was documented that when companies decide to cross-list their shares in different markets, and said markets operate at the same trading hours, simultaneous trades occur on the same underlying stock of the cross-listed security in both the home and host markets, and often trade at different prices.

The act of cross-listing results in arbitrage opportunities. An example of this has been documented and studied by Kaul and Mehrotra in 2007 whereas they studied and provided evidence proving that economically significant price differences exist for Canadian stocks that are listed at the New York Stock Exchange as the host secondary listing market, as well as the Toronto Stock Exchange representing the home or initial listing market.

Most often, whenever there is a mispricing between the home and host markets of the cross-listed security, it is due to the transaction costs or exchange rates since stocks are at times listed in the home denomination in the home market, and on the other hand they are listed in the host market's currency. Therefore, the denomination difference must be converted and in doing so, both prices would equalize. However, arbitrage does exist at times, even in developed exchanges. Gagnon and Karolyi's paper in 2010 is another example of a study in which it reported a wide-ranging price differential and mispricing for pairs of stock prices of international/cross-listed firms in the United States. Such deviation from the theory of what is known as the “Law of One Price” has naturally in return generated numerous considerable interests between all parties, both in the academia field and in the financial industry.

Another paper issued in 2006 by Emily and Petko studied the intraday price behavior of Australian and New Zealand cross-listed stocks in both ways, in which Australian cross-listed firms that cross-listed in the New Zealand stock exchange were studied along with New Zealand cross-listed firms that are cross-listed in the Australian stock exchange. The aim of the study was to investigate and figure out which of the two markets (home or host market) is integrated and also whether or not arbitrage exists. Furthermore, it was found that the results were consistent with previous studies that prove the home



market to be the dominant market. Additionally, it has been concluded that arbitrage that would result from trading the cross-listed stocks in both the Australian and New Zealand stock markets is generally non-existent and available.

The final topic that is important for academics, practitioners, and the industry in general with relation to cross-listed companies is the identification of arbitrage and riskless profit opportunities. Kato et. al. published a paper in 1991 that investigated whether such arbitrage opportunities exist or not by means of trading a company's issuance of ADRs and their corresponding underlying securities in the home market. In the study, such arbitrage opportunities have not been found, in fact, it was found that arbitrageurs would incur a loss when taking into consideration transaction and transfer costs into account, and that arbitrage profits were non-existent. Another paper studied the same topic in 1992 by Wahab et. al. and have arrived at the same conclusion, other examples of such studies include Hupperets and Menkveld in 2002, and Lieberman et. al. in 1999.

Even though there are many papers and studies that have been conducted on the topic of cross-listed companies and securities, there is an existing large gap in the literature, results, and data available.

A study conducted by Karolyi in 2004 explicitly stated that most papers have focused their research and study samples on cross-listed companies that have a listing (whether as DRs or direct stock listing) with markets in the U.S. (either as a home or host market exchange). However, there are very limited studies available in relation to cross-listed companies that come from underdeveloped markets, and even far less from Frontier markets and exchanges. In fact, data as well as studies in relation to cross-listed companies in the Middle East are extremely sparse, if any.

A paper published in 2012 by Hamad and Frank investigated a market mechanism in which they have contrasted between trading cross-listed company stocks and ADR parities (pair trading) against another alternative mechanism parity known as "direct arbitrage", a term that refers to converting the stock of the underlying cross-listed security into its ADR and vice versa. The paper was mostly inspired by (and considered to be a follow up on) a study conducted by Chen et. al. in 2009 along with Werner and Kleidon in 1996, through which both studies concluded that all markets whether developed, developing, or frontier are always less than fully integrated when it comes to the matter of cross-listed securities.

They further elaborated that trading in cross-listed securities by investors, and the reasoning behind them is diverse, and hence the reason why investors choose to trade in a cross-listed security in one market rather than the other is greater and far beyond than merely deciding to trade in the market that lists the same underlying for a cheaper price than the other.

Furthermore, a study by Kondor in 2009 stated that arbitrageurs should be further compensated for trading in the markets where the cross-listed security is listed in, this is due to the theory that they benefit the market in providing equilibrium, liquidity, and price stability in the underlying security, therefore, it can be considered that these arbitrageurs share very similar characteristics to Market Makers. Other studies have gone further to examine if it was truly profitable for investors to trade and attempt to benefit from such parities between markets, such as Kato et. al. in 1991 and Miller and Morey in 1996, and they both concluded that after taking into consideration the transaction costs, brokerage, and exchange fees, as well as transfer fees, arbitrage is actually not profitable. On the other hand, it was found by Suarez in 2005 that there are possibilities of arbitrage profit in specific French cross-listed securities and their mirrored listed ADR's in other host markets.

However, as highlighted by Hamad and Frank in 2012, all of these studies have examined arbitrage using direct arbitrage methods, such as purchasing the stock of a cross-listed security in the home market and then transferring it to the host market whereby it is converted into its respective cross-listed



company's ADR, the benefit then comes from selling the underlying security. Thus, they have studied other methods of arbitrage that investors may undertake to benefit from mispricing parities and generate a greater level of profit if anything at all.

3. Effects of Liquidity on Arbitrage

The relationship between the existence of arbitrage opportunities and the level of liquidity available for those cross-listed/dually-listed stocks in both the home and host markets is a very critical factor that comes into play that needs to be analyzed, of which several earlier empirical and theoretical studies have already shown a significant relationship that does exist between price movement and liquidity (e.g. Biais et al., (1995); Chordia et al., (2001, 2008); Chan et al. (2013)). Furthermore, it is a well-known fact that liquidity is of the utmost importance in the field of finance and investments. It is certain that the surge of high frequency trading has added to the attention drawn towards a substantial number of researchers and practitioners. Therefore, in such a trading environment, the ability to find and estimate liquidity in a fast and accurate way is extremely precious and challenging, even if arbitrage opportunities did exist between the home and host market in terms of the listed price of the same cross-listed security, if there is no liquidity then an arbitrageur would be unable to take advantage of such opportunities.

There are further empirical and theoretical studies and published research that showed strong evidence of a relationship between price movements and liquidity, such as Blume et al. in 1989, who has examined the interactions between liquidity and price dynamics by researching the impact of order imbalances on stock price movements during the October of 1987 stock market crisis. In the study, the author proved and showed that indeed a strong correlation between order imbalances and the differential of the cross-listed stock prices in both the home and host markets existed.

Moreover, by researching and studying aggregate market spreads, depths and trading activities of cross-listed securities that are listed in the United States, Chordia and Subrahmanyam (2004) empirically found that liquidity and trading activities are indeed affected by market returns and volatility. Additionally, they found that effected and well quoted spreads increase dramatically in a downward bear market, not just at a market level, but at a company level as well. Chordia et al. (2002) have reached a similar conclusion as well whereby they identified a significant impact of order imbalances on both market volatility and returns on a security. Another study conducted by Harris and Panchapagesan in 2005 have examined whether the limit order book is informative and can predict future price changes using Tobias-Q. In the study, they have demonstrated that there is in fact a relationship between limit order book and previous price movements. Chan (2005) have also been able to show that traders are more aggressive in buying, however when it comes to selling, they have been slower and much more patient after previous stock market returns.

In addition to demonstrating that traders are much less aggressive when bid and ask spreads are large and significant, a paper produced by Cao et al. in 2009 used a sample of 100 Australian stocks and have successfully proved that order books certainly facilitate price discovery, complementing the previous studies. In addition, it was discovered that order imbalances between the demand and supply schedules along with the order books are highly significant and related to future short-term returns.

There are many studies that have been issued to study the relation between order books, stock bid and ask spreads, liquidity, as well as its significance and effect on the existence of arbitrage profit. Needless to say, the evidence of a significant relationship is present in other markets; however, the theory whether that relationship also exists in the GCC, more specifically in relation to Bahraini cross-listed and dually listed securities, and whether it can be used as a variable of predictability, is what this paper tries to unveil.



Early studies have further indicated that the decision of a firm to cross-list its shares have profound influence on the firm's liquidity and volume of shares traded, however the level and direction of the liquidity differs as it is circumstantial depending on the market and time period.

According to research published by Noronha et al. in 1996, the liquidity was studied and examined in relation to the New York Stock Exchange cross-listed companies, and it was observed that informed trading and trading activities increased after the underlying cross-listed security in both the home and host listing markets are introduced. On the other hand, the paper recorded that the bid and ask spreads do not increase mainly since as informed trading increases, a reaction is created whereby it increases the cost bared by the specialist (also known as a market maker) to continue providing liquidity and market making services which are done to effectively reduce the spreads and enhance the level of trades and liquidity on the stock.

On the contrary, a paper that was published by Foerster and Karolyi in 1999 found opposing results in relation to cross-listed stocks that are listed in the Toronto stock exchange and the markets in the United States. The results showed that the bid and ask spreads of the underlying stock listed security have become narrower in the domestic market (Toronto Stock Exchange).

The result of the study concluded that the narrowing of the bid and ask spreads is mainly contributed towards the decrease in transaction costs which is also driven by the increased competition formed by the market makers in the United States.

Another study performed by Moulton and Wei in 2009 backs up the result of the study. In a similar fashion, it was established that narrower bid and ask spreads as well as the increase in the liquidity and volume of shares traded of the European cross-listed securities is established due to the availability of substitutes. Notably, results vary as previously iterated, for example: a study conducted by Berkman and Nguyen in 2010 have studied and examined domestic liquidity after cross-listing in the United States, and it was found that there are actually no improvements and benefits in the home listing market's liquidity and volume of shares traded due to the firm deciding to cross-list its shares.

It is crucial to go over the commonality of liquidity when studying cross-listed stocks in any manner, pertaining to the volume of shares traded and the price of the underlying stock in both the home and host markets. When mentioning commonality of liquidity, it is referred mainly to the impact and influence of market or exchange based liquidity on a particular security, and in this case being the cross-listed firm's equity in both the home and host markets.

Many papers and studies have been discussed in this paper with a focus on cross-listed securities, and mainly the benefits generated from cross-listing, which in summary includes expansion of the cross-listed firm's shareholder base, and in general the strengthening of the cross-listed firm's information environment and investor protection, as well as disclosure standards (such as Errunza and Losq, 1985; Alexander et al., 1988; Stapleton and Subrahmanyam, 1977; Stulz, 1999; Foerster and Karolyi, 1999; Coffee, 2002; Doidge, 2004 and 2009; Reese and Weisbach, 2002).

Furthermore, all the factors and benefits previously mentioned tend to drive the commonality in liquidity as per Karolyi's published study in 2012. It is important to understand and answer whether, and if at all, cross-listed securities liquidity commonality increases. Furthermore, the topic of commonality in liquidity bears important implications for both traders and investors. It was further demonstrated by empirical studies conducted that commonality in liquidity is considered to be the type of risk that is systematic in nature, whereby investors tend to require additional compensation to invest in stocks that share a correlation in its liquidity between its stocks and the market as evidenced by Acharya and Pedersen, 2005; Lee, 2011. Such a discovery and findings inject a significant hypothesis of what actually does effect in this case the commonality of liquidity, and while numerous researchers have successfully



documented and proven that commonality in liquidity does exist at a country and exchange level as a whole, few other researchers have gone narrower and focused their research on variations and other independent variables that shape the commonality in liquidity from a cross-listed equity point of view (such as Chordia et al., 2000; Hasbrouck and Seppi, 2001; Kamara et al., 2008; Hameed et al., 2010; Coughenour and Saad, 2004).

Furthermore, as noted previously, there are numerous factors that dictate the level of foreign trading volume that is exuberated by cross-listed stocks in multiple markets.

This topic was thoroughly studied and investigated by Olga et. al. in 2015, where she tried to examine the exact determinants and their degrees in relation to the foreign trading volume level that it had on specific European cross-listed stocks that are listed in multiple markets. Accordingly, it was concluded with a theory: “stocks that cross-list in foreign markets that are larger and more liquid than their home markets, and stocks for which foreign investors acquire information at a lower cost, they are the ones that experience higher volumes of trade in foreign markets”.

Nevertheless, it is important to note that such studies and their conclusions are not comprehensive given that the study is focused on Europe’s specific cross-listed securities. Therefore, when it is compared for example with cross-listed securities that also have one of its listed markets as the U.S., the analysis and findings will definitely be impacted since markets and exchanges in the U.S. are known to be generally much more attractive to foreign traders than cross-listed securities in the European markets.

Furthermore, one can assume that the motives to trade between markets in the US against that in Europe include diversification benefits and therefore lower systemic and unsystematic risks that are associated with stocks, which is more important than the fundamental motive to trade in Europe, as highlighted by Olga et. al.’s study in 2015, which focuses on trading costs. Another major motive to be taken into consideration why cross-listed securities, that have shares or ADR’s listed in an American market, are more attractive in terms of the level of a firm’s presence regarding information and product significance in foreign markets.

The study also highlights the many benefits of cross-listing as it increases the level of firm value. Additionally, it has been suggested in previous studies (for example Bancel and Mittoo in 2001) that Corporate Managers have a high preference to cross-list a company’s shares whenever a problem of enhancing a company’s liquidity presents itself. Thereby, it is implied that when trading and listing in multiple markets, it immediately enhances the volume and level of trading.

4. Theory on “Law of One Price”

Other studies have delved narrower and took a deeper look on the reasons behind firms deciding to cross-list, as well as its effects from a security pricing and valuation point of view. Additionally, it has been discovered that firms also cross-list based on the theoretical belief of the law of one price and market segmentation theories, meaning that the price of the same underlying security in both the home and host markets would remain unaffected and have an insignificant relationship in terms of the listing locations and foreign currency exchange rates, thereby the stock price in both the home and host markets would be identical through the operations of the integrated and efficient stock markets (Qadan and Yagil, 2012; AlHaj-Yaseen, 2013). However, that is not consistent in all the markets since such studies are limited to the developed markets, and even then, these limited studies have found the occasional existence of mispricing and differentials between the home and host markets of the same underlying cross-listed security.



In addition, according to several studies (e.g. Jarrow, 1992; Saurez, 2005; Dewachter and Smedts, 2007; Liu and Bogomolov, 2013), it is indicated that the existence of arbitrage opportunities that are derived from cross-listed return differentials indicate potential opportunities for profit-making through the security mispricing between home and host markets.

In another study by Dodd and Frijns in 2015, it was revealed that activities consisting of foreign bias in relation to cross-listed securities and their locations which have their home market as the selected favorite by investors (which can be seen by the level of liquidity), have a higher and a positive significant influence on potential security mispricing that would lead to providing investors with potential arbitrage opportunities and profit.

5. Trading Location

The influence and relationships that certain independent variables have had on share prices, and most importantly those that aid in explaining the differential and mispricing of underlying cross-listed and dually listed securities, creating an opportunity for arbitrage profit have been made and studied by numerous researchers. It has been discovered by Froot and Dabora in 1999 that trading locations of cross-listed securities generally show insignificant influences on share prices, however, it has also been discovered that the stock market index of a new trading location (i.e. the host market /secondary listing exchange) has a significant and positive influence on the daily return of a stock (Chan et al., 2003; Ghadhab and Hellara, 2016b).

Moreover, according to Karolyi and Stulz publication in 1996, large daily movements and return of stock market indices have larger positive and significantly influential results on the return and mispricing for arbitrage opportunities of cross-listed stocks. In the same manner, the movements of the secondary host market of a cross-listed security have a significant positive influence on location-specific country funds as well (as per Bodurthda et al., 1995; Harouvelis et al., 1994; Sarkissian and Schill, 2016).

Similarly, it has been discovered that foreign cross-listed stocks that have chosen to have the United States as its secondary listing or at least one of its listings, have had a significant positive influence on the U.S.'s markets as well (Esqueda, 2017; Miller, 1999), whereby the returns of the aforementioned cross-listed security portrayed positive and significant correlated movements and returns with that of its host listing in the U.S.'s exchange index (Gagnon and Karolyi, 2010; Ghadhab and Hellara, 2016a).

In summary, it can be understood that cross-listed securities do in fact gain an advantage from the home country's information in terms of the promotion of company growth and potential, along with the growth of the stock market, which in turn is improved further by a reduction in trading costs, providing an even more positive influence to be generated by cross-listing (Frijns et al., 2010).

It is important to remember that different levels of trading volumes for a cross-listed security in one market as opposed to another would generate price differentials. According to Ding et al. and Ghadhab in 1999 and 2016 respectively, it has been discovered that cross-listed securities with lower trading volumes and liquidity, face a barrier in generating higher prices and return differences, whilst on the other side of the spectrum, active trading reduces the stock price margins of the cross-listed security of companies between both trading locations (home and host markets) with an increase in liquidity.

It was also presumed that as a measure of liquidity, an increase in the trading volume and liquidity of a cross-listed security lowers the return of the cross-listed asset in all markets (Huang et al., 2016; Stoll, 2000); hence, it is deduced that changes in the level of the volume and liquidity traded have a significantly positive influence on the underlying cross-listed security's return (Pathirawasam, 2011). Additionally, it is important to note that cross-listed securities from emerging markets are unlike those listed in developed or developing exchanges, whereby they exercise stronger trading volume and



liquidity-sensitivity than that of other markets and exchanges.

Furthermore, due to such parameters, this behavior leads to the result of having a positive correlation between the level of volume and liquidity traded, and the cross-listed security (Zhou and Owusu-Ansah, 2014). In addition to the previously mentioned, it has been discovered that companies having their home markets and headquarters in an emerging market and country, benefit from cross-listing in a more advanced exchange, whether that exchange is developed or developing, providing added benefits of which are: an increased level of investor protection and stronger valuations for the cross-listed company (Benos and Weisbach, 2004; Coffee, 2002; Doidge et al., 2004; Reese and Weisbach, 2002). In addition, they also gain greater liquidity, visibility, and international exposure (Baker et al., 2002; Jayakumar, 2002; Errunza and Miller, 2000; Sarkissian and Schill, 2016).

6. Corporate Social Responsibility, Corporate Governance & Liability of Foreignness

A study published by the WFE in 2015 have shown that investors are not showing elevated interests and stronger opinions regarding the way in which companies manage, operate and perform on non-financial parameters, as well as institutionalizing the cross-listed firm's role in corporate social responsibility and corporate governance. As time passes, according to Waddock in 2008, corporate social responsibility's aspect and role in a firm has grown to an extent that it also now covers the environmental and social dimensions, becoming a global norm for conducting and operating any sort of business. Such a combination between corporate social responsibility and the non-financial dynamics and parameters (social and environmental aspects) has well established expectations in terms of how companies must ensure protection of all aspects and constituents of their activities (Eccles et al., 2011).

Furthermore, an article was published by Barbra and Nicola in 2016, which investigated the influence and the effects of companies that have cross-listed their shares, and its effects on the performance of the cross-listed firm's environmental, social, and corporate governance. The argument of the study was that ensuring that environmental, social, and corporate governance performance are improved and satisfactory to every investor's expectations, aids the cross-listed firm to obtain further legitimacy and overcome what is known as the "liability of foreignness", a phenomena incurred by the firm whenever it goes global and decides to cross-list its shares in another host market and exchange (meaning foreign firms entering new markets as per Kostava and Zaheer in 1999).

The liability of Foreignness has been described as a debt faced by a cross-listed company that increases the cost for foreign firms to be listed or even participate in a market, country, and exchange, in relation to only being available in the home market. Such liability is defined to include several aspects and parameters including cost related to geographic and cultural distance, information asymmetry which is described as misinformation regarding a firm between both its home market and secondary listing and participating markets and exchanges, as well as unfamiliarity; the cost has been found to be higher for firms that are related to low-legitimate countries (Bartlett and Ghoshal, 2000; Ramachandran and Pant, 2010; Stevens and Shenkar, 2012).

Typically, the studies and investigations which were previously issued mainly focus on the liability of foreignness that is experienced by cross-listed companies specifically in relation to their products and services, or supply markets. Although, recent studies have extended the concept of liability of foreignness to include the entry into foreign Capital Markets (Bell et al., 2012), and this fact only demonstrates the need for firms to acquire and obtain further legitimacy when attempting to appreciate a firm's capital from foreign investors.

Companies that apply to cross-list their shares in another market or through DRs can face backlash as well as become more costly, through an increase in their liability of foreignness. However, it has been predicted that if a firm chooses to cross-list its shares or depository receipts in a more advanced market,



country or exchange, this would perhaps force the firm to initially enhance its environment, social and corporate governance performance, and in doing so, the result is a steep depreciation and increase in mitigation of the liability associated with foreignness, acting as a motivator to adopt practices in the pursuit of legitimacy and global acceptance.

It is also through institutionalization, corporate social responsibilities, and corporate governance that firms now use legitimacy enhancing mechanisms as shown by numerous numbers of studies (such as Aguilera and Jackson, 2003; Bell et al., 2014; Jain et al., 2016; Marano et al., 2016). If these mechanisms were adopted correctly, they could drastically enhance and improve the way a cross-listing firm is perceived by external regulators and assessors. Additionally, it is through the adoption of proper and enhanced environmental, social, and corporate governance, cross-listed firms will seemingly be much more attractive, consequently, increase its ability to enhance its goodwill, along with meeting social expectations regarding environmental protection, and as the protection of the constituents' interests as well. This includes all shareholders, but more importantly minority shareholders, along with other stakeholders of the firm.

Subsequently, a firm cross-listing its shares will automatically boost and increase the number of company shareholders and other stakeholders, providing further stimulus in terms of the non-financial parameters and dimensions. Moreover, the level of investor protection and disclosure standards adopted by a regulator of a market and exchange should have a positive significant effect on the corporate governance of the cross-listed firm. This happens by providing shareholders with an extra layer of protection that would keep them in a safer position from being exploited by the firm's own insiders. However, it is important to note that this may be viewed as a double-edged sword, whereby an increase in investor protection and a greater level of disclosure standards would create greater demands and requirements that would force the company to shift more of its resources towards that aspect of the firm, effecting the financial results of the cross-listed company negatively in the short term, in contrast to the long-term vision which is what the aim of any good corporate governance should be.

7. Goodwill, Enhanced Capital Levels and Reduction in Cost of Capital

It is important to highlight that whenever firms decide to cross-list their shares, they begin to increase the possibility of potential access of external financing in the host listing exchange and country. It is such cross-listing that aids companies to overcome barriers in relation to investments between different countries and their Capital Markets. This leads to providing a higher-level access towards a greater range and more diversified amount of investor groups, rather than the limits that are available in only the home market and country.

Therefore, cross-listing allows for a greater advantage of raising capital and in better conditions if the host market is graded higher than that of the home market. The reasoning behind this is mainly due to the higher visibility and proof that the cross-listed company can align their activities with admission requirements, rules and regulations as well as the standards imposed by the host listing exchange and country. According to a study published by Doidge et al. in 2004, cross-listed companies, unlike those firms listed only in one/home market, gain an added advantage which is the achievement of a higher Tobin's Q ratios, and a stronger level of returns to be generated by the underlying security in both the home and host exchange markets which is achieved by greater analysis coverage (Lang et al., 2003), as well as a greater level of analysis coverage too.

It has also been discovered that cross-listed companies experience higher levels of transactions and volume of shares traded (i.e. liquidity), even in the home market exchange (Herrmann et al., 2014; Smith and Sofianos, 1997).



All of the benefits mentioned compensate the cross-listed company for the costs that the firm incurs to cross-list in the first place; these costs could vary but typically include those related to investment fees for banks, costs of reconciling financial statements and results between the home and host markets and exchanges simultaneously, etc.

Other advantages that make a firm more attracted to cross-list its shares in a foreign host market are the fact that active international firms can facilitate internationalization as studied by Hassan et al., 2011. Additionally, the decision to cross-list a firm's shares has the capability to improve product market reputations, enhance a company's goodwill and make it more well-known and familiar abroad (Khanna et al., 2004), facilitating a better marketing and other public relations benefits.

8. The Bonding Effect

A study has been conducted by Robert et. Al (2006) that aims at seeing if cross-listing conveys a positive message about a company at all times, and if it generates positive returns post listing in the host market. The study focused mainly on returns after cross-listing, and it included approximately eighty cross-listed Australian firms that cross-listed their shares in the American stock markets. The findings revealed that cross-listing does not result in an "unambiguous" positive signal about a particular corporation.

In addition, studies by Biddle and Saudagaran in 1991 and, Pagano et al. in 2002 highlighted that the firms that decide to cross-list their shares, especially if their home market is one that is considered to be of small or less-developed Capital Market, benefit from the gain of access to new and, in most cases, cheaper sources of capital. It was also found that firms originating from less developed Capital Markets that choose to cross-list their shares in truly developed markets such as the United States, have benefited immensely from this reality, even if they were not cross-listing their shares but rather listing in the form of ADRs over the counter in the lowest degree of market possible (Durand et al. 2005).

Moreover, A previous study published in 1999 by Miller revealed that even though most investors that read positive cross-listing news, get into the hype, and buy into the stories of such companies, (as iterated in the previous paragraph), there were numerous theories published along with empirical studies presenting data that suggests cross-listing is not necessarily a positive signal for most firms. In fact, the studies showed the effects of "bonding", which in this scenario refers to companies needing to abide by the host market's regulations and rules, for example: corporate governance, as well as adhering to their regulatory and governance standards which are often superior to their home market's regulations and rules.

This signals to shareholders that a company may be overwhelming itself hence acting as a negative signal, which results to selling pressure in the stock or otherwise a home market high trading activity. Thus, if this theory regarding "bonding" holds true, such cross-listing of shares into a secondary market may signal poor future results to be incurred by the company and therefore actually result in abnormal negative returns to be reflected in a company's cross-listed shares. However, it is to be noted that the study was conducted on Australian cross-listed firms that have cross-listed and therefore bonded with markets based in the United Kingdom and the United States of America. Therefore, due to the similarities in features amongst those three markets, as well as the similarities in regulatory and governance rules and requirements, the effects of bonding may not be high and therefore non-existent as suggested by Brown and Tarca in 2005, displaying the limited effects of bonding of Australian firms with markets in the U.S.

Due to the high number of firms that decide to cross-list their shares, the effects of bonding is higher and more frequent than not, therefore, in an efficient market (if such even exists), a firm will not need to convince their stakeholders and most importantly their shareholders of bonding effects with



the secondary market's financial reporting requirements and governance standards, and as such, cross-listing would in this case be associated with positive abnormal returns as more and more information and data is produced to the markets post the cross-listing of a firm.

There are an exuberant number of reasons to support a firm's decision to cross-list its shares, and those reasons that are communicated to the public, and markets play a pivotal role in the company's returns as well. For example, if a company is associating cross listing its shares with an international growth strategy, then such news is deemed to further attract a good amount of publicity ("positive" publicity no doubt) in the foreign and home markets, and therefore showing that a positive and effecting marketing campaign brings the same outcome as that of bonding, which is positive abnormal returns. Additionally, according to Durand, et. al. in 2005, it was found that 3.9% of their studied sample of cross-listed companies have made sub-sequent equity offerings in the host market so as to raise capital and listed their reason as international growth, resulting in abnormal positive growth and returns.

Studies have had different views regarding the effects of cross-listing on a company, thus it is safe to conclude that it is possible to have both positive and negative outcomes of cross-listing. However, it is important to note that a good marketing campaign for a firm that intends to cross-list its shares can undoubtedly lead to positive abnormal returns. Nevertheless, there are many reasons to motivate a firm to cross-list its shares, for example: it may decide to do that in order for it to improve and enhance its goodwill and image rather than obtaining further liquidity (which should be one of the top reasons and orders to decide whether to cross-list or not).

Karolyi in 1997 have revealed that after reviewing past studies on international cross-listing, he concluded that even though share prices appear to be positive and favorable in the beginning (which here is seen as the first month after cross-listing shares in the host market), in the long term post cross-listing, performance and results are highly variable across these firms depending on their home and host markets; the firm's market capitalization; liquidity and the solvency levels of the company (i.e. capital raising needs); as well as, other company specific systematic factors and risks.

Evidenced by studies performed by Alexander et. al. in 1988, and Foerster and Karolyi in 1999 and 2000, it has been shown and reported that in the long term, firms that have cross-listed experience a sharp decline in cumulative annual returns in the long run activities of the company, which is another reason that demands further analysis and investigation in such a domain.

Due to the passage and adoption of the Sarbanes Oxley Act by the U.S.'s Capital Markets, the costs associated with bonding (discussed in earlier passages) have increased drastically, especially in terms of costs associated with continuous registration. For small foreign listed and cross-listed firms, which already have low trading volumes, to consider exiting the host market seemed like the logical next step since costs outweigh the benefits.

For this reason, the importance of considering globally cross-listed firms and ADRs is much more critical than that of the U.S. markets, prompting more examinations and studies to be conducted on non-U.S. markets. Such a global growth of non-U.S. markets as hosts for cross-listings and foreign listing of ADRs highlights the need for and importance of comprehensive studies to be conducted on global level and scale.

9. The effect of cross-listing on the host market

Most of the studies that are conducted in the area of cross-listing have focused on the effects that this act has on their own home market. On the contrary, very few studies focused on the effects of cross-listing on the host/secondary market. These studies are vital because of the effects a cross-listing has on markets, whereby since borders are being demolished, a fast and more effective distribution and



movement of capital from one market and country to another is being taken into effect.

It is due to this reason, along with other factors, that markets and exchanges (ranging from efficient to non-efficient) are competing amongst themselves to attract cross-listed firms and listings, as illustrated by Pagano et. al. in 2002. It is very important to study the effects of cross-listing on the host market especially when data shows that a market or exchange becomes a host to a larger number of foreign securities and firms, than the country's own stocks and firms, thereby having a large and significant impact on the market and country as a whole, which is illustrated by Sun et. al. in 2013,

Furthermore, Sun et. al. have used the Mainland China and Hong Kong companies as a subject pool. The study focused on the effects and impact of Chinese cross-listed firms and shares on their host markets, specifically the Hong Kong equity market and exchange. Accordingly, it has been found that the increased presence and availability of such Chinese cross-listed firms in Hong Kong as the secondary market have significantly enhanced and increased the size, volume of shares traded (share turnover), and more importantly, because this created a stronger link for the secondary market (Hong Kong) to that of the home market (China), the overall market volatility of the secondary market has reduced and became more in line with the other global markets that China has a link to. Additionally, this enhanced the secondary market's quality, increasing the illiquidity ratio, however creating a higher spread of home listed firms that are Hong Kong born and have it as the primary market. Lastly, such a significant presence of Chinese cross-listed firms in Hong Kong has actually made the Hong Kong stocks to be more correlated in its price movement and thereby reducing investment sensitivity.

Moreover, it has been illustrated that even though a high presence of Chinese cross-listed firms in Hong Kong is highly beneficial to the country and market of the secondary listing, it is also argued that this comes at a cost as illustrated by Santos and Scheinkman in 2001, who introduced a theory known as "Race to the Bottom". It is debated that if numerous companies and firms decide to cross-list their shares from their home market which is of low quality, the host/secondary markets start to become contaminated and hence, it negatively effects the quality of the host market. Increasing the level of information asymmetry, in addition to increasing the amount of volatility as well as the bid and ask spreads of the host market, making it less and less informative as time passes.

Therefore, since it is arguably known that the Chinese stock exchange is of lower quality than that of Hong Kong, this is of a real concern which stems from two main reasons; Firstly, since such cross-listed companies have been used to comply with lower level of corporate governance and standards, the host market will not be able to force such cross-listed firms to uphold its high standards for long. Secondly, the secondary host market will be contaminated overall by lower quality of stocks per se, and when this happens, information becomes less symmetrical across all listed markets (King and Wadhvani in 1990), traders begin changing their strategy towards cross trading and therefore increase illiquidity in one market driven by liquidity shocks (Kodres and Pritsker in 2002).

It has been proven in previous literatures in relation to market liberalizations that the expansion and opening up of emerging stock markets at a global scale can actually enhance and lead to a more improved level of risk-sharing benefits (as demonstrated by Obstfeld in 1992 and 1994; Lewis in 1996 and 2000), in addition to increased level of equity flows (illustrated by Bekaert et al., in 2002), as well as higher stock market returns and capital stock growth (illustrated by Henry in 2000 and Chari and Henry in 2008).

10. The influence of the Volume Level on Share Price Performance

A discussion and portrayal regarding the importance of volume in cross-listed companies' shares have already been made earlier in this paper, and to further delve into the critical role that the level of volume plays on a cross-listed company's share price movement and performance in both the host and



home markets, it is empirical to go through a study conducted by Jing and Haigang in 2014.

The study has effectively documented the level of global trading volume of cross-listed equities in both home and host markets, as well as examined the factors that would make the host market considered more competitive, and hence more attractive in terms of getting order flows than the home market of the cross-listed firm. Additionally, it was notable in the results that if the host market and the home market have similarities or differences in the language and geographical region, a significant impact will take place on the level of order flows and volume traded on the cross-listed company's shares.

In addition, it has been found that the host market (if the case of same language and region is shared between home and host markets) will enjoy a higher success with having lower spreads between the bids and asks of a cross-listed company shares, alongside an increased level of information and trading volume, resulting even in a better state and quality of disclosures, enhancing the market as a whole. The paper also concluded that if the cross-listed company is classified as a small but mature firm that has the features of a high growth rate firm, as well as volatile swings in stock returns and activity, it is expected that higher trading and orders will be executed in the host market rather than the home market.

The markets available in the U.S. have always been considered to be one of the most developed and efficient markets to exist. Even though it is known for being a harbor of attraction for numerous cross-listed firms in the past, it is important to note that the highest that markets in the U.S. accounted for globally cross-listed companies' stocks has never breached the 30%. Also, in recent years it has been significantly dwindling at a fast rate (as illustrated by studies conducted by Baruch et. al. in 2007; Halling et. al. in 2008; Barclay et. al in 2003; Sarkissian et. al. in 2009; Kutan and Zhou in 2006).

On the other side of the spectrum, it has been noted that over the past decade or so, there has been a steady growth in the level and number of globally cross-listed firms and applications, not just in terms of direct cross-listing of the shares, but also in the form of ADRs as well. Whilst over the same period the figures of listed ADRs' programs and instruments listed in the U.S. markets have decreased. The main reason for such is believed to be triggered initially by the adoption of the Sarbanes Oxley Act which was passed in the U.S. The Sarbanes-Oxley Act (2002) is a Federal Law that established a comprehensive auditing and financial regulations for publicly traded companies with the aim to help protect the shareholders from fraud and financial errors. The application of this law was prompted and considered to be one of the most common reasons that cross-listed and other listed foreign firms have left the U.S.'s Capital Markets (Fernandes et. al. in 2010; Marosi and Massoud in 2008; Doidge et. al. in 2010; Bianconia et. al. in 2013).

11. Price Discovery in Cross-listed Firms

A lot of discussion has been made regarding price discovery, emphasizing on its importance as studies were conducted by numerous researchers (in both the academic and professional aspects) when it comes to internationally cross-listed firms, and most have found that the home market is and remains to be the more dominant market in terms of price discovery. However, there are still a lot of areas that need to be explored, and questions that remain unanswered, such as:

- Does price discovery change over time in relation to cross-listed firms from one market to another (from home market to host market; vice versa)? And,
- What are the factors that affect the change in market where the cross-listed companies are listed in, that are also used for price discovery?

A previously mentioned study that was conducted by Coffee in 2002 have implied that the increase in the level of global market desegregation, level, and quality of technology advancements, as well



as globalization, all lead to the smaller and less developed markets to gradually “lose out” or fade to larger and more developed Capital Markets. Hence, there is a need for more studies on price discovery in relation to smaller and less developed markets, these could help analyze and answer the above-mentioned couple of questions.

It is important to note that there are several assumptions related to the topic of price discovery that need to be taken into consideration; firstly, price discovery is heavily relied on the implicit assumption that whenever price differentials occur between host and home markets, such differentials are bounded by arbitrage opportunities and hence prices of the underlying cross-listed firm’s stock in all listed markets are actually cointegrated. Secondly, such price differentials and arbitrage opportunities can only be observed and recorded when both markets are open and functioning at the same time, therefore making it is self-explanatory why the studies are conducted for short periods as illustrated by numerous studies (e.g., Grammig et. al. in 2005 and Pascual et. al. in 2006).

The topic of price discovery has been studied and implemented on various assets and financial instruments, for example: stocks (Harris et. al. in 1995, and Hasbrouck in 1995), options (Chakravarti et. al. in 2004), futures (Mizrach and Neely in 2008) as well as credit spreads too (Forte and Pena in 2009). These studies involved various financial instruments and devices and was conducted in numerous market settings as well. For example, studies have been conducted taking into consideration the regional Capital Markets of the U.S. (Harris in 2002), floor markets as opposed to electronic markets for price discovery (Martins in 1998) as well as international markets (Eun and Sabherwal in 2003).

Initially, most of the studies concerning cross-listed companies were conducted while considering the markets in the U.S. as the domestic market, however later studies have progressed as markets progressed and adopted a larger view of globalization, expanding to markets other than that of the U.S.

Overall, most of the studies mentioned above have documented similar results in which it was found that the home market of the cross-listed financial instruments is the predominant one rather than the host/secondary foreign market. It is the foreign/secondary host market that has price adjustments reflecting the price movement of the home market. Moreover, a study was conducted by Lieberman et. al. in 1999 in which a sample of six Israeli companies that are cross listed in the New York Stock Exchange were studied. Results showed that for five of the six companies, price discovery actually occurs in the home market (Israeli Stock Market) rather than the host market, while the sixth firm showed opposite results, whereas price discovery occurred in the secondary market rather than the home market (Israeli Stock Exchange), the price discovery differential was not significant.

Another example of a similar study was conducted by Su and Chong in 2007, through which a portfolio sample of eight Chinese cross-listed firms that are also listed in two other secondary markets (Hong Kong Stock Exchange and the New York Stock Exchange). The study concluded by documenting that most of the price discovery (89.4%) occurred in the Hong Kong Stock Exchange. Even though this goes against the notion that price discovery always occurs predominantly from the home market, these studies still share the fact that markets in the U.S., particularly the New York Stock Exchange, reveal a very limited (and could be considered to be negligible) role of price discovery when it comes to foreign cross-listed firms in its markets.

Evidently, every study conducted share different results and conclusions with each other, and as highlighted by Roosenboom and Van Dijk in 2009, a lot of the early studies focused on the relationships involving the U.S. markets. However, Ding et. al. in 1999 was different, as he considered the case of a Malaysian multinational conglomerate company that happens to be cross-listed in the Singapore Stock Exchange, during which it was documented that approximately 70% of the price discovery of the underlying cross-listed stock occurred in the home market, Malaysia. Similarly, Kadapakkam et.



al. in 2003 published a study on price discovery of cross-listed companies in which a sample of Indian cross-listed companies that have the United Kingdom as its secondary listing host market were taken into consideration, and it was found that both the home and host markets have contributed equally to the price discovery of all sample companies. One final example of a study that was conducted in relation to price discovery, examined by Lok and Kalev in 2006, considered New Zealand cross-listed companies, with Australia as the secondary listing/host market. The study declared that for the sample studied and results computed, price discovery predominantly was made from the home market, of which the host market is required to adjust its price and movements to mimic the home market.

It is without a doubt that a firm deciding to cross-list its shares globally will have high beneficial outcomes, especially in terms of the information environment in the host market, thereby creating and bettering the quality of information that is disclosed to the public in both the home and host markets. Consequently, such will be imbedded in the cross-listed stocks reflecting the positive attribute by generating lucrative returns on its stocks, leading to a higher home market pricing efficiency.

A study was conducted by Shinhua in 2007 examining the theory by employing a basic non-parametric test. It was successfully concluded that cross-listing firms, that have their host as a market in the U.S., actually enhances the cross-listed firm's home market stock pricing efficiency. It was also found that such an efficiency is not just applicable to foreign cross-listed companies, with the host market being the U.S., but to others regardless of the home market development status and the cross-listed firm's foreign or secondary cross-listing equally.

The combination of the continuous search by listed companies for low-cost financing opportunities and source of capital, as well as the interest by investors in increasing the level of diversification in their portfolios have induced firms to take extra measures. This led company executives and shareholders to make the decisions to cross-list their shares abroad (both by way of direct share listing and DRs). Thereby, not only mitigating barriers developed by international market segregation of capital and entry, but also benefiting from differences in taxes, deregulation, and foreign market controls, along with information symmetry between all (domestic/home and foreign/host) markets.

Theoretical models have proven that the desegregation and removal of investment barriers leads to a significant reduction in the required rate of return percentage demanded by investors and shareholders, thereby, creating a reaction in the stocks' prices and driving them higher. This kind of action and reaction is due to several attributes, such as higher liquidity generated by its entrance to a new market and hence access to more investors, the enhanced level of recognition viewed by investors (as demonstrated by Foerster and Karolyi in 1999), as well as the increased level of quality in terms of the information environment (as demonstrated by Baker et. al. in 2002; Lang et. al. in 2003; Karolyi in 2006); but mainly it is due to the decrease in the cross-listed firm's systematic risks (i.e.: betas).

Further studies have been conducted on cross-listed firms, one of which is Eun and Sabherwal in 2003, who have explored the interactions and correlations between the stock prices of cross-listed companies in the home market (their sample was the Canadian Stock Market) and the host market (being the markets in U.S.). In the study, it was documented that the stock price of the cross-listed stocks in both the home and host markets are in fact "co-integrated" and "mutually adjusting". Additionally, they went a step further and reported that the stock prices in the home market is roughly 38.1% on average, taking into consideration the value weighted average price rising with host/secondary cross-listed market volume and trades, and then falling in a parallel fashion.

It was also similarly reported and documented in another study conducted by Sun and Chong in 2007, in which it was reported that the trades executed in both the markets of Hong Kong Stock Exchange and markets in the U.S. offer a high and significant contribution to the "price discovery" in



relation to cross-listed Chinese companies that are cross-listed with having Hong Kong and the U.S.'s Capital Markets as their secondary listing.

It was a study by Foucault and Gehrig in 2007 that have proven the international markets to be segmented in terms of information availability and quality. Therefore, international cross-listing by companies is deemed to improve the price in relation to informativeness of the underlying shares which is done through attracting a larger number of investors which it will be exposed to, as well as having a higher level of informed traders being encouraged to enter orders and execute trades more aggressively based on their own private information, analyses, and assessments.

Bart et. al. in 2009 have analyzed the dynamics when it comes to price discovery of cross-listed firms between both the Australia and New Zealand exchanges and markets, i.e. markets with bilateral cross-listings. In the paper, it has been discussed that in both cases (meaning when Australia was the home market and New Zealand the host, and also when Australia is the host market and New Zealand the home market), the home market is always the most dominant in terms of price discovery, however whenever one market begins to grow at a level higher than the subsequent, such growth is positively correlated to the growth and size of the cross-listed firm, proving another theory which is that as firms grow, the cost of trading in the growing/more dominant market decreases as well, and becomes more informative in nature.

The final third topic that relates to cross-listed companies and this paper that everyone should be aware of and is important and vital is the process of price discovery, which in this case is referred to when the share price of a company whether in host or home market adjusts and incorporates to newly released information or event. Past papers, specifically the one written by Harris et. al. in 1995, have defined price discovery as the “process by which markets attempt to find equilibrium prices” in relation to cross-listed companies.

Accordingly, such a topic in relation to price discovery has been looked upon and reviewed extensively. For example, Schreiber and Schwartz in 1986, who while others went deeper, they took into consideration the process of price discovery during different times of a trading day (similarly Bhattacharya and Das in 2002; Cao et. al. in 2000, so on and so forth). Others have studied the process of price discovery not only during different times of the day, but also in relation specifically to cross-listed stocks in their primary (home) and secondary (host) listing markets (for example Kim et. al. in 1999 and Ling in 1997).

Therefore, it is evidently important to study and monitor not only the existence of price discovery and its efficiency, but more so to be aware of the effect that both markets (if a company is cross listed) play in the process of price discovery and the gravity of their role if any.

Furthermore, if the result came out that both markets do play an influential role, it is then imperative to determine which of the markets play the greater role in price discovery, and therefore has the greater influence over the price of the security of the cross-listed company. As iterated, there has been a growth and surge in the number of cross-listed companies and hence in a parallel fashion, many academics and practitioners alike have issued studies, papers, and reports on this particular issue (such as Grammig et. al. in 2005).

Overall, most of the previously mentioned papers have pointed to the same finding, which is that the home market is the more dominant market and therefore, it is the primary market with the greatest contribution to price discovery of a cross-listed security's share price (an example of such a study is the one published by Roope and Zurbruegg in 2002).



Additionally, A study conducted by Ding in 1999 took into consideration an analysis of the trading execution price of a single cross-listed stock, that is traded in both the Singapore Stock Exchange and the Kuala Lumpur Stock Exchanges, of which it has been concluded that the market that has the greatest influence over price discovery is in fact the home market. This is due to having the larger trading volume of the two markets, and therefore having more dominance.

Another similar study was conducted by Leiberman et. al. in 1999, in which the sample was the Israeli cross-listed companies in both Israel and the U.S. Accordingly, all cross-listed securities' share price was mostly influenced and impacted by the home market rather than the host market, all with the exception of one cross-listed security, which happens to indicate that most of the trading for that particular security was being executed in the host market.

Moreover, an investigation was conducted by Hupperets and Menkveld in 2002 in which both the home and host markets were studied and compared with each other. It was found that cross-listed stocks' share prices in the host (secondary) market react more quickly to changes of the same underlying cross-listed security in the home market, but not the other way around. This theory was then supported further by Garbade and Silber in 1979 who argued the statement: "the home market is dominant and the foreign market is satellite".

Not all studies concluded the same results, and an example of such is a study conducted by Eun and Sabherwal in 2003 in which they examined cross-listed companies that have their securities listed directly in the Canadian and U.S.'s stock exchanges. In the study they have assimilated and gathered conflicting data and reached mixed findings and results, where in some instances even though the home market was found to be the more dominant market and hence project greater influence on the cross-listed security's price level, in a few instances the opposite was found to be true as well.

12. The Impact of Cross-listing on the Share Price

When a firm has its shares, cross-listed from its home market to a host, the firm normally has the option to either list its shares based on the home market price currency rather than the host market so as to avoid the effects and exposure it has, also referred to as interest rate risk. However, more often than not, cross-listed companies would choose to have the referenced currency in the host/secondary market the same as what the secondary market's country follows, of which according to previous studies, is more attractive to the host market's investors and thereby attracts more sources and amounts of capital.

Hence, whenever there is a difference between host and home market listing currency for the same underlying stocks of the cross-listed firm, most studies tend to convert all prices into the same denominated currency prior to the testing of price discovery amongst the listed markets of the cross-listed firm. For example, the abovementioned study, conducted by Liebermann et. al. in 1999, converted all the cross-listed sample of companies to the same denomination (the U.S. Dollar), whilst the study conducted by Eun and Sabherwal in 2003 converted all its sample of cross-listed companies to the denomination of the Canadian Dollar.

Other conducted studies beg to differ, for example, a study by Grammig et. al. in 2005 pointed out that there is little proof and evidence showing that the stocks' prices of cross-listed companies in multiple markets adjust to exchange rate movements and changes. Furthermore, they concluded that financial and econometric models that omit the factor of exchange rate includes an information bias on the share, as well as the market of whose prices are converted.

Studies conducted on cross-listed firms of Central and Eastern European companies that are considered to be less developed and sophisticated than that of the U.S. exchanges are important since it is much more related to cross-listed Bahraini companies. Furthermore, a study conducted by Piotr and



Martin in 2004 have empirically investigated the implications associated with cross-listed companies in semi-recently established and new capital markets in central and eastern Europe. Since cross-listed firms in such a region are known for having a relatively small market capitalization on their local markets, followed by a lack of liquidity and investor sentiment, along with moderate effectiveness of legal systems, all these factors are pivotal in studying the effects on share prices, and they also share the same challenges being faced by the Bahraini cross-listed firms.

Accordingly, it has been documented in the study that cross-listed companies that decided to have exposure abroad, not via direct listing of its shares but by way of DRs, and have successfully entered a foreign market, all have immediately benefited from a permanent increase in over value of about 26%. It was further documented that such exposure to foreign markets have actually benefited the company in terms of liquidity at a company level, and on a larger scale, resulting in an enhanced liquidity and share turnover ratio in the home market. Therefore, this suggests that cross-listing does indeed assist in attracting and drawing additional sources of capital, drawing interest from new investors and encouraging the public to trade in both the home and host markets but on the same underlying stock.

The impact of cross-listing on share price of the firms have been documented by numerous studies (e.g., Alexander et. al. in 1988; Jayaraman et. al. in 1993; Serra in 1999) and found it to have had an initial positive spike in share price in the home market prior to the cross-listing period. However, in the long run and once the fab is reduced, a downward drift in share price is followed, which supports other studies that have been conducted to measure changes in theoretical models in terms of cost of capital of cross-listed companies whenever they list abroad (such as Stapleton and Subrahmanyam in 1977; Errunza and Losq in 1985; Alexander et. al. in 1987). All studies share the same notion of risk and required rate of return, whereby according to the theoretical models, investment barriers that are imposed by exchanges and markets drive up risk premium, however when the markets become less segregated and globalization takes rise, international listing actually results in a much more effective way of risk sharing and thereby reduces the required rate of return demanded by investors, and hence enhance the price level of cross-listed firms.

The studies abovementioned, most notably in relation to that of Stulz in 1999 and Coffee in 1999 and 2002, took a different approach in relation to viewing the effect that cross-listing has on a firm's required rate of return by investors. Their views and explanations are more logical and general in which they assume that a cross-listed company would always cross-list its shares abroad in a better and more developed market. It is therefore, the cross-listed company will be required to adopt more stringent rules and regulations, thereby effecting its quality and level of disclosures, information, and corporate governance in a positive manner. Hence, investor protection will be stronger leading to possible agency problems to diminish as gaps between managers and other stakeholders are filled and held closer together. However, it is important to note that not many studies have been conducted on cross-listed companies that come from central and eastern Europe, and instead most papers are focused more towards either developing or emerging capital markets that are associated with having a long history, such as Latin America and Asia (for example studies conducted by Domowitz et. al. in 1998; Costa et. al. in 1998; Martell et. al. in 1999; and Pinegar and Ravichandran in 2002).

Moreover, a study conducted by Nuno and Miguel in 2007 attempted to answer the question of whether cross-listing improves the firm's information environment and whether it gets reflected on its shares. More precisely, the document examined and focused on the information environment for corporations all over the globe, not just from ones that are derived from a single market and country, and additionally, to what degree did their share prices "incorporate firm specific information in an accurately and timely manner". Whenever a firm cross-lists its shares, some measures of change and degree in terms of its commitment to a higher level and quality of disclosure towards incentives for all



sorts of stakeholders relating to the cross-listed firm will exist, acting as another reason to collect and make use by trading on private information, and hence influencing and taking a large tole on the firm's environment in terms of information and the process of stock price formation.

In the conducted above-mentioned study, a total of three empirical findings have been documented that are related to this paper. First, it has been noted that cross-listing is positively related and associated with the underlying stock of the firm's price in terms of informativeness (which was highlighted previously and hence is further supported by this study). Secondly, the first hypothesis and result has been broken down further to segregate between the different types of markets (whether developed, developing, or emerging markets or even Frontier). It has been found that the price informativeness that has been generated by firm deciding to cross-list its shares is actually heavily concentrated in relation to developed markets, and as the type of host market and exchange deteriorates and falls, so does the level of price informativeness as it has been recorded that it is negatively correlated with regards to emerging markets and their firms. Lastly, it has been concluded that the increased and added quality and level of disclosures helps in explaining the price informativeness of cross-listed firms, whilst coverage and trading patterns and aggressiveness is related and helps in explaining the impact for emerging market firms and not price informativeness.

13. The Impact of the Information Environment on the Cross-listed Firm

Regardless of the number of studies being conducted, results have always been a pool of different scenarios and hence there is extremely limited evidence to date (and even more so in relation to Middle Eastern cross-listed companies if any) on the relationship and impact of a cross-listed company's information environment, and their cross-listed stock. Another reason that is attributed to such is the immense difficulty of being able to quantify, approximate and figure directly the firm's (whether cross-listed or not) information environment; although, many literatures have reasoned in fact that as analyst's coverage increases and more forecasts in terms of earnings become accurate and spot on, such factors are in fact indicators of an improved and stronger level of information environment (as suggested by Lang and Lundholm in 1996; Healy et. al. in 1999). Another study performed by Baker et. al. in 2002 have also suggested and documented an increased level when it came to disclosures and visibility, calculated based on analyst and coverage performed by media and other public agencies. in 2003 Lang et. al. has suggested, (also supporting Baker's study), that foreign cross-listed companies that decide to cross-list their shares in the U.S. markets and exchanges have in fact experienced and faced a much higher degree and level of coverage from the media and therefore more accurate forecasts; whilst a study produced by Bailey et. al. in 2006 that documents a higher level of volatility and hence trading activity and liquidity of the cross-listed firm's underlying stocks in the host market (being the more developed market than the home market) and hence further explains the relationship it has in changing a cross-listed firm's disclosure and informativeness environment.

It is to be noted that most studies published regarding price informativeness in terms of foreign cross-listed stocks in exchanges and other markets in the U.S. have opted to use firm specific volatility in price and its movements and returns as a summary measure. For example, a considerable number of studies have found that stock returns, volatility and variation in movement is closely related with that of price informativeness, whereby French and Roll in 1986, and Roll in 1988 have shown on the other hand that a statically large and significant portion of price return variations and volatility of stocks is not related nor explained by market movements and variations. Instead, they have proposed that firm-specific variation (also known as idiosyncratic volatility) is truly what adequately measures the rate, extent, and degree of private information incorporation within share prices of cross-listed firms which is done via trading.



Furthermore, specific papers have been taken into consideration when writing this paper, including that of Kamran et. al. in 2005, in which a stochastic approach was used to answer the question of “does cross-listing effects returns on the underlying shares, and how so and to what extent?”. Accordingly, the paper took into consideration the returns of cross-listed Australian firms which decided to cross-list their shares on major international markets and stock exchanges. However, due to the limited sampling of such cross-listed Australian firms, the examiners used and applied “bootstrapping and stochastic dominance techniques” to convey the result and analyse returns of a cross-listed firm’s shares along with the variance changes, after a firm had cross-listed.

Furthermore, it has been documented by the study and found that for the sample of Australian cross-listed firms, the returns on the underlying stock of the firms have declined after the firm has decided to move forward with cross-listing, and it has also been associated with another decline and depreciation in variance regarding stock return of the cross-listed firm. In addition, it was evidently found that there is no indication of any superior or artificial positive returns, nor even any reduction of risk benefits being obtained by the cross-listed Australian firms, although the level, degree and quality of investor protection, disclosures, corporate governance and accounting reporting and practices did improve.

This does not take away from the fact that according to many organizations that provide research and data statistics, have well proven that during the period starting from 1986 to 1998, the number of firms that have decided and went on to cross-list their shares in any of the top 10 largest market stock exchanges has more than tripled around the world, from 1,594 all the way to 4,703 (as per Faff et. al. in 2002), which shows the extent that globalization has on the world, and the direction for desegregation that firms and investors all around the world are heading towards, regardless of the negative results found in the study, and a possible reason for such direction is of no doubt the extra level of exposure that will be enjoyed by a cross-listed company, and hence making it an easy source of extra capital. Not to mention, that not only firms aim to become multinational and therefore breaking down barriers, but markets and stock exchanges have also started taking a pivotal role in playing a part of attracting foreign firms to list their respective markets, which raises its potential classification further, and enhances the development level of their countries and governments as a whole. As well as through adequate circulation of money generated by extra layer of trades which are produced and induced by these new foreign listings, i.e. circulation of money and funds generated from trading commissions and transfers, etc.

14. Stock Price Limits & Regulations

One particular issue that is sure to affect the movement and prices of cross listed companies include the price limits issued by regulators and exchanges on the market. A study conducted by Mai and Khairy in 2017, investigated the relationship between daily price limits and stock volatility, trading volume, delayed adjustment of stock prices and its fair value with regards to listed companies in the EGX30 index. Accordingly, it was found that not only is there a relationship, but a positive one at that between the upper daily price limits and stock volatility, along with the upper daily price limits and the return between the closing price of the stock and the opening price of the stock for the same trading day. A positive relationship was also found to exist between the low daily price limit and the return between the closing and opening price of the stock on the next trading day; however, a negative relationship existed between the upper daily price limit and the return between the closing price of the stock and its opening price on the next trading day, and a positive relationship between the daily stock price limits, along with its fair value.

Such daily price limits are mostly prevalent and used in the Emerging financial markets and frontier markets, and the main idea of their existence is for the daily price limits to act as a tool in protecting



investors from sharp and sudden movements of the stock that may be considered as undesirable fluctuations in daily stock price movements and changes. As you can imagine, each stock market of each country is special and unique with its own stakeholders and sectors and investors; therefore, different markets adopt different set of limits that they apply; in Bahrain for example, the stock limit for both the high and low are 10% in both directions. The Dubai Financial Market and Abu Dhabi Securities Market both adopt a 15% limit on stock prices for the upper level whilst a 10% as a low limit. Boursa Kuwait adopts not only a price limit (10% on the upper level whilst a 5% for the lower price limit) but also a circuit breaker at the 5%, 7% and 10%.

Such circuit breakers have been extremely important especially during the start of the Covid-19 pandemic in which 67% of global exchanges confirmed that their circuit breakers have been triggered in March of 2020, and that because of such, 30% of the exchanges have reviewed and others are expected to review their calibration of limits and circuit breakers. An example of this include Boursa Kuwait, the Dubai Financial Market and Abu Dhabi Securities Market of whom both readjusted their lower price level movement levels to 5% from 10%. However, as of February 2021, the 10% lower limit was reinstated for both the Dubai Financial Market and Abu Dhabi Securities Market whilst Boursa Kuwait has chosen to keep the adjustment as is. Other global markets such as the New York Stock Exchange have implemented a three-level circuit breaker that gets into effect if the S&P 500 declines to 7% (market is halted for 15 minutes), decline of 13% (market is halted for another 15 minutes) and a decline of 20% (here the market is shut down completely and is opened on the next trading day). Other examples of markets include Saudi Stock Market, Doha Securities Market, Muscat Securities Market of which all three have a 10% price limit for both the upper and lower price limits. It is 10% as well for Shanghai, 7% in France, 5% in Australia, 15% in Korea, 7% in Taiwan and 30% in Malaysia, and 5% in Egypt.

Many argue the effects of price limits on an exchange, and as declared by the Dubai Financial Market, after readjusting the price limits in 2020, the general index jumped by 56% from its low point in April, value traded increased by 24% in which it reached AED 66 billion, and the Dubai Financial Market attracted 4,027 new investors which includes 2,350 that are foreign investors. Hence, it is suggested that price limits firmly effect economic expansion and growth of capital markets, aid in fostering stability and control, and most importantly it helps in maintaining healthy liquidity and volatility levels.

It is such daily price limits that are implemented are the mechanisms that are mostly used by exchanges and regulators to avoid the circuit breaker which is considered as the second line of defense against irrational investors as information reaches them or manipulators that try to create an impact in the market in their favor. As mentioned in a study conducted by Hanco in 2014, "Daily price limits give irrational investors the time span needed to make rational investment decisions.". There are of course other benefits to daily price limit mechanisms in which they save time for investors during the trading day by protecting small level investors with somewhat insignificant capital to react in time from the undesired speculation that is causing the price of a financial instrument to go in a frenzy. In addition, as per Chen in 2005, "Daily price limits may increase the level of confidence of small investors in the market mechanism.".

Such price limits however have advantages and disadvantages and hence can be viewed as a double-edged sword whereby in one hand as the proponents emphasize that applying daily price limits in the past, could have easily prevented a market crash, specifically in relation to that of the market crash of October 1987. Furthermore, such price limits offer investors the benefit of being able to slow down the sequence of events that led the price to reach its limit (high or low) and hence the rational investor would be able to re-evaluate and re-process the next step of his or her investment decision. Moreover,



it is believed that the presence of price limits decrease volatility further whereby manipulators would not be attracted to swing the price up and down since such mechanisms are in place and therefore there will exist an extra layer of stability and efficiency, and not to mention compliance. It is important to note that such mechanisms of daily price limits are not to be considered an intervention by regulators in the market as they do not dictate or effect trading activities of any sort.

On the other side of the coin lie the critics of the daily price limit mechanism (of which are not a few). What is known as “Volatility Spillover Hypothesis” comes into play whereby it is believed that for example if negative news such as poor financial results have been announced regarding a listed firm, negative sentiment would be borne by investors and hence selling frenzy would occur; however, since the price is capped up to a certain limit, the true value of the company’s stock would not be reached until the next day and hence a spillover of volatility would continue to occur. As such, the critics do believe that such mechanisms do in fact hinder the market from being transparent, efficient, and free. Such mechanisms are considered to be a violation and a manipulation of the market in the favor of regulators and the market as a whole as it creates a cap during that trading day (creation of a “false market”), which is a hypothesis also known as “Trading Interference Hypothesis”.

Other studies such as that of Kim in 1997 have also examined the relationship between the daily limit prices imposed, and its effect on the maximum level of price variation, the return of the stock on a daily basis along with the volume traded, within the context of the Tokyo stock market over the period of 1989 to 1992 of which it was concluded that the daily price limits that has been imposed by the exchange do in fact decrease the level of volatility in regards to daily stock returns, however it does not influence the level of volume traded on the stock.

Another study however conducted by Lehmann in 1989 studied the relationship between the daily price limits and stock volatility of which the results generated were similar to that of Chinese and American stock markets (New York specifically), and it was concluded that it is the disparity between demand and supply that influence stock prices to reach their maximum limits (both up and down). It was also concluded that price limits (unlike the study conducted by Kim mentioned in the above paragraph) do not create a decrease in volatility of stock price returns, and in fact the reason for the volatility in return is mainly to be attributed to what is believed to be the extension of risk and its spread which took place for a long period of time as the mechanism of stock price daily limits prevent investors from trading the stock at its true value (past the limit associated with it) and hence it is spilt over from one day on to the next, and price correction takes place therefore in a longer period.

During the boom of the Greece stock market in 1999 however, Phylaktis et. al. conducted a study in which two main points have been concluded on the matter relating to daily stock price limits against the volatility of stock returns, and they are as follows: first, stocks that have not reached its associated price limit revert much faster to their original price than stocks that have touched their price limits whether up or down; secondly, the only method in which daily stock price limits did in fact effect volatility and daily stock returns is when price manipulation is being attempted by malicious investors and hence an increase of volatility occurs in relation to daily returns.

Study results vary according to the market that the data and research are being conducted on as noticed earlier. However, it is important not only to know the effects of the daily price limits’ impact on the return volatility of a stock on a daily basis, but it is also important to know its impact on the level of volume traded, which is more related to cross listed securities. Whereby if a cross listed security’s home market adopts a daily price limit mechanism that is different to that of the host market, then it is important to know whether that will impact the level of volume traded as of course the higher the level of volume and liquidity, the higher the impact on a stock price will exist, possibly creating a difference between the listing price of the same underlying asset between the home and host markets,



and therefore creating arbitrage.

15. Effects of Daily Price Limits on Level of Volume Traded

Many researchers have delved into the topic of the relationship and impact that daily price limits on stock mechanisms implemented by the exchange and regulators, on the level of volume and liquidity traded in the market. An example of such a study is one conducted by Joan and James in 1997 in which not only did they examine the relationship of daily price limits on the level of trading volume, but also its impact on price movement as well. In doing so, the researchers have used data pertaining to the American markets (specifically the S&P 500) from the period ranging from 1995 to 1997; and by using simple multiple linear regression models for analysis, it has been concluded that daily price limits that are imposed in the market does in fact interfere in the trading process, and hence there is an impact on the level of volume traded by investors.

In order to back up this study, Steenbeek along with Berkman in 1998 not only agreed with the results of Joan and James by stating that such daily price limits are an intrusion of the regulators and exchange on the market, but it is also an interference that hinders trading activities as it effects the level of volume traded in two main ways: firstly, it has been documented that daily price limits affect investment decisions whereby if a price of a stock is trading at a price that is close to the price limit (whether up or down), investors would react by trading more and hence impacting the market by enhancing the level of volume traded; secondly, if a Satellite market does exist and is available for access by investors, this would persuade a rational investor to stray away from the regular market and onto the Satellite market when the price of a stock is close to its daily price limit, which in effect reduces the level of volume traded in the market and not only that, a reduction of shares and market capitalization would take place in the main home market as investors would transfer their holdings to the Satellite market.

Wang in 1998 conducted a similar study to that of Steenbeek and Berkman (1998), whereby the relationship of daily price limits and the trading volume levels were explored, however data used to study the relationship revolved around the Taiwan Stock Exchange rather than the American markets, for the period of 1995 to 1998 using several methods to reach their conclusion which include the use of auto-correlation and GARCH models. Accordingly, it was concluded by Wang that “the daily price limits resulted in interference in the trading activities as the increase in trading volume decreases daily auto-correlation of approximately half of the stocks that are listed in the market.”. In addition, it has also been concluded and found that the daily price limits does have a positive relationship and effect on the levels of volume traded in cases that maximum daily price limits have been reached.

In addition, another study conducted by Chen in 2002 examined the relationship and effect of the daily price limits that are adopted in Mainland China, on the daily level of volume traded for the period of 1980 ranging to 1994, and to reach a conclusion, the methodology used were simple linear regression models and a T-test. Accordingly, it has been concluded that the results portray that daily price limits actually do result in an interference in the market and its trading activities as it reduces the level of volume that is traded in the long term future (spillover hypothesis). The result and conclusion is also supported by Merkoulova and Yulia in 2003 in which their studies on the same subject resulted in a similar result by stating the following: “Daily price limits result in interference in the trading activities because price limits prevent prices from movement in a certain direction. Thus, investors will not be able to trade at the equilibrium price. Consequently, this will lead to decrease in liquidity which would affect the market in the future.”.

On the other side of the spectrum, there are other studies that have found results that led to proponents of adopting daily price limits, such as a study for example conducted by Fernandes and



Rocha in 2004 of whom used EGARCH and autocorrelation models to conduct an analysis on the relationship between the daily price limits and trading activities as a whole, in which the following conclusions have been reached: firstly, transaction costs have been actually improved ever since the adoption of daily price limits by markets; secondly, the level of volume traded on a stock during a given trading day increases on the next trading day that the stock reaches its allowable price limit.

Other similar results have been recorded by researchers from other jurisdictions. Chen et. al. in 2005 for example also studied the level of volume traded in Mainland China's Capital markets, and its relationship with daily price limits and other trading activities for the period of 1996 to 2003 of which it has been concluded that the rate and extend of trading activities that took place, increases significantly after the price of a stock reaches its maximum or minimum allowable price limit. Guly and Bildik also in 2006 issued a study on the same subject, however with regards to the Istanbul stock exchange, and have effectively concluded that the level of volume traded in the market increases in particular during trading days that follow a stock reaching its maximum allowable upper price limit, however on the other hand, it decreases significantly as well when the price of stock does not succeed in reaching the price limit imposed on it, leading to greater illiquidity in the market.

To conclude this section, Chen in 2014 issued a study in which he agreed with all aforementioned papers conducted on the topic by concluding that "the trading volume increases for shares which have price limits over other shares that do not have price limits imposed on them, and that the rational investor becomes more optimistic and would buy the shares even after reaching the highest limit of the price."

As can be seen from the above-mentioned previous literatures and studies, there is no agreement that exists in terms of adopting the mechanism of daily price limits when dealing in price volatility, which is why several countries which include North America are beginning to experiment and adopt different mechanisms to address and attempt to configure the level of volatility in the market, including amending the limits of circuit breakers.

A study conducted by Kin et. al. in 2020 delved into the topic of the magnet effect that circuit breakers cause in the market, along with its interactions with price limits in the Chinese stock markets. As per the study, the magnet effect is referred to as a "theory suggesting that the existence of circuit breakers could actually make the price accelerate toward the boundaries when it gets closer to the limits", hence as an analogy it is very similar to a moth being attracted to the light. The study's results concluded with the result that the magnet effect does not only coexist and is present, but it also interacts with the price ceiling limit. The study mainly revolved though around a small group of stocks that crashed during the start of the COVID-19 pandemic, of which during the period the prices of those group of small stocks reached their upper maximum allowed daily price limit and soon after, a circuit breaker would be triggered after those events in an accelerated fashion. Furthermore, it was established that the magnet effect was most notable when the prices of the small group of stocks aforementioned would approach 3% from the circuit breaker threshold.

It is very important to distinguish properly between the two mechanisms, daily price limits and circuit breakers. Even though both are adopted around the world and employed to mainly curb market volatility, price limits are used mainly to set the boundaries in order to limit the volatility and price movement of a stock on a daily basis. Trading halts (i.e. circuit breakers), are different that daily price limits in that they would cause a complete stop in trading for a period of time (each market and jurisdiction adopts its own unique parameters as per its own market needs and characteristics). Furthermore, such circuit breakers and trading halts could be applicable not only to the overall market as a whole, but also could be implementable on an individual company's security; a circuit breaker that is implementable on the market as a whole, would end up suspending the entire market activity when



the index level reaches a pre-specified limit if it were to be activated. In addition, according to a survey produced by the World Federation of Exchanges, the proportion and number of exchanges that adopt circuit breakers has increased significantly from about 60% during 2008 up to 86% approximately in 2016, and now more and more exchanges adopt these two mechanisms especially after the hit taken by global capital markets by the COVID-19 pandemic.

As noted, the importance of daily price limits and the circuit breaker mechanisms are not to be taken lightly. Further evidence of this is the new attraction it has caused researchers to study and analyze its relationship on performance, daily stock returns, daily stock volatility, stock price discovery, and the spillover effects (such as Kim and Yang in 2004; Kim and Rhee in 1997; Kim et. al. in 2013; Jiang et. al. in 2009; Frino et. al. in 2011). There are other studies however that have used the topic of these two mechanisms to have a narrower focus and specialized study on trading halts and suspension of specific individual shares of which have been triggered by new information in the market by the company, such as Lauterbach and Ben-Zion in 1993 of whom studied the effects that trading halts had on listed companies' shares available on the Israeli stock market during market crashes and slumps. In addition, the single stock circuit breaker that was introduced and triggered during the real estate backed mortgage bubble burst and ultimately capital market crash was studied by Cui and Gozluclu in 2016.

3. Conceptual Framework and Methodology

Chapter 2 has reviewed the literature research relevant to this research study. This chapter provides an outline of the methodology which has been adopted in implementing and carrying out this research. All data used in this study are secondary data of which have been used to reach our objectives and test our hypothesis. Specifically, the secondary data used in this study will be used primarily to test whether arbitrage opportunities exist or not in relation to Bahraini cross-listed securities, determine the factors that affect arbitrage the most, along with investigating whether there exists a causality between the movement of exchange rates along with the level and percentage of arbitrage of the cross listed security.

Starting with the Bahrain Bourse All Share Index, all cross-listed companies have been extracted from that list that happen to also have Bahrain as their home market during the period of 2016 to 2019. The reason for choosing this period is that several cross listed Bahraini companies just recently during 2015 have begun cross-listing their shares abroad, and therefore to get the most "Bang for our Buck", we start our data from 2016 up to end of 2019 since the Bahraini market as a whole along with other exchanges around the world have been negatively impacted by the COVID pandemic and hence results and activity post year 2019 does not accurately depict the nature of cross-listed securities. Furthermore, all cross-listed companies have shares that are directly listed in a host market, and not by way of Depository Receipts, and all cross-listed companies have cross-listed their shares to have Bahrain as the home market, while the list of host markets include only the following markets: Boursa Kuwait, Dubai Financial Market, and Nasdaq Dubai. In total, the population number of Bahraini cross-listed companies during the above-mentioned period was 8. The following include a detailed description of each:

Table 1. Bahraini Cross Listed Companies and their Host Markets

| Host Exchange / Market | Cross-listed Company | Ticker |
|------------------------|------------------------------------|---------|
| Boursa Kuwait | Bahrain & Kuwait Insurance Company | BKIC |
| | Ahli United Bank | AUB |
| | INOVEST B.S.C. | INOVEST |
| | GFH Financial Group B.S.C. | GFH |
| | Ithmaar Holding B.S.C. | ITHMR |



| | | |
|------------------------|--|-------------------------------|
| Dubai Financial Market | Arab Insurance Group GFH Financial Group B.S.C. Ithmaar Holding B.S.C. Al Salam Bank - Bahrain B.S.C. | ARIG GFH ITHMR SALAM |
| Nasdaq Dubai | Al Baraka Banking Group B.S.C. | BARKA |

Source: Bahrain Bourse

To further reduce any outliers from our data set, cross-listed companies whose shares are seemingly illiquid have been omitted. However, it is important to note that the rate and level of illiquidity is always subjective to judgement.

It is difficult to say with certainty what precise level of share turnover does a company need to meet for it to be considered liquid or illiquid, and for the Bahraini market, neither the Central Bank of Bahrain nor the Bahrain Bourse have a precise definition or classification in terms of equity and labelling them as liquid or illiquid. Therefore, for the sake of this study, the rule that was used in omitting companies whose shares have not executed a single trade for a period of 3 consecutive months or more.

Therefore, after all the outliers have been omitted, the final data sample from the population include four out of the total eight Bahraini cross-listed companies. They are as follows:

- I. Ahli United Bank,
- II. INOVEST B.S.C.,
- III. GFH Financial Group B.S.C., and
- IV. Ithmaar Holding B.S.C.

I. AUB

The parent company, Ahli United Bank B.S.C. (“AUB” or “the Bank”) was incorporated in the Kingdom of Bahrain on 31 May 2000 originally as a closed company and changed on 12 July 2000 to a public shareholding company by Amiri Decree number 16/2000. The Bank and its subsidiaries as detailed in note 2.3 below (collectively known as the Group”) are engaged in retail, commercial, Islamic and investment banking business, global fund management and private banking services through branches in the Kingdom of Bahrain, the State of Kuwait, the Arab Republic of Egypt, Republic of Iraq, the United Kingdom and an overseas branch in Dubai International Financial Centre (DIFC). It also operates through its associates in Libya and in the Sultanate of Oman. The Bank operates under a retail banking license issued by the Central Bank of Bahrain (the “CBB”). The Bank also engages in life insurance business through its subsidiary, Al Hilal Life B.S.C.(c).

AUB officially got listed on Bursa Kuwait as part of the premier market on 26th June 2006 and continues to be cross listed company between Bahrain and Kuwait Capital Markets and Exchanges.

II. GFH

GFH Financial Group BSC (“GFH”) was incorporated as Gulf Finance House BSC in 1999 in the Kingdom of Bahrain under Commercial Registration No. 44136 and operates under an Islamic Wholesale Investment Banking license issued by the Central Bank of Bahrain (“CBB”). The Bank’s shares are listed on the Bahrain, Kuwait, and Dubai Financial Market Stock Exchanges. The Bank’s sukuk certificates are listed on London Stock Exchange.



The Bank's activities are regulated by the CBB and supervised by a Shari'a Supervisory Board. The principal activities of the Bank include investment advisory services and investment transactions which comply with Islamic rules and principles determined by the Bank's Shari'a Supervisory Board.

GFH officially got listed on Bursa Kuwait as part of the premier market on 25th January 2004 and listed in the Dubai Financial Market on 13th May 2006, and continues to be cross listed company between Bahrain, Dubai and Kuwait Capital Markets and Exchanges.

III. INOVEST

Inovest B.S.C. (Inovest) is a public shareholding company incorporated in the Kingdom of Bahrain since 18th June 2002 and is listed on the Bahrain Bourse and cross listed on the Kuwait Stock Exchange (with the cross-listing date on 5th September 2005).

IV. ITHMAR

Ithmaar Holding B.S.C. (formerly Ithmaar Bank B.S.C.) ("Ithmaar") was incorporated in the Kingdom of Bahrain on 13 August 1984 and was licensed as an investment bank regulated by the Central Bank of Bahrain. During 2016, shareholders approved the reorganization of Ithmaar Bank B.S.C at its Extraordinary General Meeting (EGM) held on 28 March 2016 to restructure Ithmaar Bank B.S.C into a holding company and two subsidiaries to segregate core and non-core assets. Effective 2 January 2017, the Bank has been converted in to Ithmaar Holding B.S.C., holding 100% of Ithmaar Bank B.S.C. (c) and IB Capital B.S.C. (c).

Dar Al-Maal Al-Islami Trust ("DMIT"), a Trust incorporated in the commonwealth of Bahamas is the ultimate parent company of Ithmaar.

The principal activities of Ithmaar and its subsidiaries (collectively the "Group") are a wide range of financial services, including retail, commercial, investment banking, private banking, takaful and real estate development. Ithmaar's activities are regulated by the CBB and are subject to the supervision of Sharia Supervisory Board. Ithmaar's shares are listed on the Bahrain Bourse, Bursa Kuwait and Dubai Financial Market. During an Ordinary General Meeting on 29 August 2019, the shareholders approved to voluntarily delist from Bursa Kuwait. On 13 September 2020, the Capital Market Authority, in Kuwait, rejected Ithmaar's application for voluntary delist and instead forcedly delisted Ithmaar's shares as per their regulations.

In this study, to determine whether arbitrage does exist between the underlying price of a cross-listed security in the home and host markets, the distributions of returns of all previously mentioned sample of cross-listed companies, which includes Ahli United Bank, INOVEST B.S.C., GFH Financial Group B.S.C., and Ithmaar Holding B.S.C. were observed and compared over the period from 2016 to 2019.

Furthermore, the listed and traded currency of the sample cross-listed companies is different in the home market than the host market, whereby the sampled cross-listed companies' stocks are listed and traded in the U.S. Dollars on the BHB (Home Market) as opposed to the currency in the host market, which is denominated by the host country's own currency, this is true for the entire sample.

Therefore, the prices of the underlying stocks of our sample in the host market have been converted to the USD for it to be consistent with the home market's currency. However, since the United Arab Emirates' (UAE) currency is pegged to the dollar, the interest rate is stable unlike the currency of the State of Kuwait which is not pegged to the dollar, hence the daily closing exchange rate was used to convert the prices of the cross-listed company in the host market to the home market, making this study an empirical one in nature.



It is important to note that since the purpose of this study is to investigate the existence of Arbitrage, it is essential to take the closing prices of securities and exchange rates for days that all these firms have been trading / are open simultaneously. Therefore, even though the sample period of the data studied is between 2016 and 2019, the number of days in which both markets as well as the exchange rates have been open simultaneously for trading, differs.

The period also excludes the days during which a security (not just the market) has been suspended, which disables the execution attempts of arbitrage trading and subsequently arbitrage profit. Therefore, the sampling period is different for each company as it all depends on the dates during which the cross-listed company had its underlying shares available for trading on all listed markets, along with the exchange rate (applicable only to Bahraini cross-listed companies that have their shares cross-listed in Kuwait since the listing price is not pegged to the U.S. Dollar).

In addition, as mentioned earlier in the literature review section of this paper, arbitrage trading is a phenomenon that does not require a very long gestation period, and on the contrary to traditional trading, is very short term in nature. Whereby prudent investors, traders, and arbitrageurs could accumulate a profit through the arbitrage opportunities within few hours or minutes, and that is why the above-mentioned sample and sample period, are very appropriate for the scope of this study.

There are several important variables to be considered throughout the course of this study and are deemed pivotal in all its stages. These include:

- The daily closing stock prices of the cross-listed companies (for both the home and the host markets),
- The daily closing exchange rate (from Kuwaiti Dinar (KD) to USD) to convert the denominated currency of the cross-listed security in the host market to the home market,
- The Bid and Ask spreads of the underlying cross-listed security in all the listed markets, and finally
- The volume traded between the home and host markets.

The daily closing stock prices of the cross-listed companies (both in the home and host markets) have been extracted from their relevant listed stock market websites, whilst further data pertaining to the bid and ask quotes, volume traded, as well as the exchange rates have all been extrapolated from the Bloomberg Terminal and Thomson Reuters trading platforms. Furthermore, the study used the inter-bank exchange rates to convert the prices from Kuwaiti Dinar to their equivalent U.S. Dollar.

The study covers the period during which all the sampled cross-listed companies were listed in their respected home and host markets rather than the start of the initial cross-listing date of the share; subsequently, the sample period ranges from the year 2016 up to the end of 2019 (prior to the COVID pandemic).

Furthermore, while conducting the study, the period was further narrowed down to cover the days during which the markets in both the home and host country were operational simultaneously with active trading and orders in all the markets. Moreover, since the purpose of this study is to see if arbitrage opportunities exist between the home and host markets of the Bahraini cross-listed securities, as well as uncover the main attributes to the creation of arbitrage, and test whether the level of exchange rate is a main attributor that causes arbitrage opportunities, it was deemed irrelevant to take data specifically from the initial listing dates as the extracted data was immaterial to the study hypothesis.

It is also less relevant to take data specifically from initial listing dates since the purpose of this study is not to see the effects of cross-listing on arbitrage and security performance, but rather to see if arbitrage opportunities exist between home and host markets of the Bahraini cross-listed securities,



the main attributes to the creation of arbitrage, and finally to test whether the level of exchange rate is a main attributor that causes arbitrage opportunities.

The assumption in this study is that arbitrage does not exist if the share price of a cross-listed company in the host market is identical to that in the home market upon converting it using the inter-bank exchange rate. Therefore, this leads to the first hypothesis regarding the existence of arbitrage:

Hypothesis 1: The difference between the price of the cross-listed security in the home market (Bahrain) and the price of the same underlying security in the host market is statistically significant.

Therefore, we can conclude that arbitrage does not exist in the following scenario:

$$P(k) = P(u) = P(t) \quad (\text{equation 1})$$

Where:

$P(k)$ is the share price of the cross-listed security in the home market (Bahrain Bourse);

$P(u)$ is the share price of the cross-listed security in Boursa Kuwait (host market); and,

$P(t)$ is the share price of the cross-listed security in the Dubai Financial Market (host market).

Subsequently, if it was found that the variables in equation one does not equal each other with one variable being significantly different, then arbitrageurs would come in play and buy the cross-listed security in the market where the stock is priced the lowest and sell the same underlying security in the market where it is priced highest.

By examining the above-mentioned variables, the study would be able to assess and confirm the first hypothesis on whether an investor can make excess returns by way of arbitrage trading or not. Assuming that the main motivation is capital gains rather than anything, and that such capital gains are tax exempt in all three involved markets: The Bahrain Bourse, Boursa Kuwait and the Dubai Financial Market.

Additionally, for a more accurate assessment, the analysis requires the testing of the mean price or mean returns of the underlying cross-listed security in the home and host market(s) and compare them to see whether they are statistically different or not, and hence a paired t-test is adequate. However, to perform such a test, the data needs to be tested for normality and therefore the Shapiro-Wilk and Kolmogorov-Smirnov of which it has been noted that data is not normal and hence the Wilcoxon Test has been conducted as a substitute to the paired sample t-test.

This testing method for arbitrage is suitable since it is an appropriate technique to examine the difference between means when the data between them is paired and the paired difference between the two variables does not follow a normal distribution and assumed to have a wide variance.

However, merely testing to see whether there is a statistical difference between the prices in the home and host markets of the same underlying cross-listed security is not as important as testing to see what are the main factors that contribute to its existence. This leads to the second hypothesis which is:

Hypothesis 2.1: Arbitrage is dependent on the level of bid-ask spreads

Hypothesis 2.2: Arbitrage is dependent on the level of volume traded

Hypothesis 2.3: Arbitrage is dependent on the exchange rate between the home and host markets of a Bahraini cross-listed security

Therefore, to draw a conclusion on the above hypothesis, a multiple regression model is used as follows:



$$Y_{it} = \beta_0 + \beta X_1 + \beta X_2 + \beta X_3 + \beta X_4 + \epsilon_{it} \quad (\text{equation 2})$$

Where, the variables representatives are as follows:

Y_{it} : Arbitrage

βX_1 : Bid and Ask Spread in the Home Market

βX_2 : Bid and Ask Spread in the Host Market

βX_3 : Difference in Volume traded on the stock between the Host and Home markets

βX_4 : Exchange Rate

Whereas:

Arbitrage is the dependent variable that is a measure of the price difference between the cross-listed securities' home and host market during time t . In most literatures, this is the difference between the home and host market's price of the same underlying cross-listed security.

Bid and Ask Spread in both the Home Market and Host Markets were calculated by subtracting the closing bid quote with the ask quote and dividing the result by two in order to indicate a direction of the following trading day's opening price.

As mentioned earlier in this study, liquidity is very important in relation to arbitrage, therefore, it is critical to factorize it into the above multi-regression model as well. It is calculated by subtracting the volume traded between the host and home markets.

Lastly, it is important to take into consideration the movement of the exchange rate as it effects the price of the cross-listed security in the host market and therefore playing a role in the investors and traders' decision to employ arbitrage techniques, hence, it is the main coefficient of interest as independent variables go.

The regression model is implementable only on cross-listed companies that are listed between Bahrain and Kuwait, due to the nature of the currency in Kuwait as it is not pegged to the dollar.

With varying prices (hence arbitrage between cross-listed companies' underlying securities between home and host markets), it is important to consider, since the listing price is different in both markets, whether the level of exchange rate effect the level of arbitrage (if found), or not. Therefore, a causality test needs to be conducted and the "Granger Causality Test" has been implemented within an error-correction framework in order to examine the existence of a long-term relationship between the two variables (the movement of the exchange rate along with the movement in the level of arbitrage). Furthermore, the Granger causality test is used to infer and indicate the existence of a relationship as well as indicate the direction of the effect between the two variables.

The following includes a general specification of the Granger causality test in a univariate context and is expressed as follows:

$$Y_{it} = \beta_0 + XY_{t-1} + \epsilon_{it} \quad (\text{equation 3})$$

To conduct the test, since the data is a time series, it is transformed from un-stationary to stationary by taking the first difference of the data to eliminate the possibility of autocorrelation. Similarly, the data after the transformation exclude any unit roots since they tend to skew test results.

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Table 4. GFH Normality Test

| | Kolmogorov-Smirnova | | | Shapiro-Wilk | | |
|----------------|---------------------|-----|--------|--------------|-----|--------|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| GFH BHB Return | 0.275 | 943 | <0.001 | 0.729 | 943 | <0.001 |
| GFH DFM Return | 0.114 | 943 | <0.001 | 0.872 | 943 | <0.001 |
| GFH BK Return | 0.101 | 943 | <0.001 | 0.897 | 943 | <0.001 |

Source: SPSS Statistics

Table 5. GFH Test Statistic

| | GFH DFM - GFH BHB | GFH BK - GFH BHB | GFH BK - GFH DFM |
|------------------------|-------------------|------------------|------------------|
| Z | -3.066b | -26.292c | -26.138c |
| Asymp. Sig. (2-tailed) | 0.002 | <0.001 | <0.001 |

Source: SPSS Statistics

As we can see from the above result, there is a significant difference between the share price of GFH in all 3 markets (Bahrain, Kuwait and Dubai Capital Markets and Exchanges) whereby it is significantly different at 99% between all listed markets.

In INOVEST's case, data as well turned out to not be normally distributed, whilst the Wilcoxon Test indicated that there is significant difference in share price between the home market and the other host market, whereby it is significantly different at 99%.

Table 6. INOVEST Normality Test

| | Kolmogorov-Smirnova | | | Shapiro-Wilk | | |
|--------------------|---------------------|-----|--------|--------------|-----|--------|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| INOVEST BHB Return | 0.484 | 845 | 0.000 | 0.189 | 845 | <0.001 |
| INOVEST BK Return | 0.167 | 845 | <0.001 | 0.895 | 845 | <0.001 |

Source: SPSS Statistics

Table 7. INOVEST Test Statistic

| | INOVEST KW - INOVEST BHB |
|------------------------|--------------------------|
| Z | -4.636b |
| Asymp. Sig. (2-tailed) | <0.001 |

Source: SPSS Statistics



Furthermore, as we can see from the below result, there is a significant difference between the share price of ITHMR in all markets (Bahrain, Dubai and Kuwait Capital Markets and Exchanges) whereby it is significantly different at 99%.

Table 8. ITHMR Normality Test

| | Kolmogorov-Smirnova | | | Shapiro-Wilk | | |
|------------------|---------------------|-----|--------|--------------|-----|--------|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| ITHMR BHB Return | 0.399 | 390 | <0.001 | 0.284 | 390 | <0.001 |
| ITHMR BK Return | 0.246 | 390 | <0.001 | 0.716 | 390 | <0.001 |
| ITHMR DFM Return | 0.106 | 390 | <0.001 | 0.916 | 390 | <0.001 |

Source: SPSS Statistics

Table 9. ITHMR Test Statistic

| | ITHMR BK - ITHMR BHB | ITHMR DFM - ITHMR BHB | ITHMR DFM - ITHMR BK |
|------------------------|----------------------|-----------------------|----------------------|
| Z | -18.329b | -23.253b | -20.533b |
| Asymp. Sig. (2-tailed) | <0.001 | <0.001 | <0.001 |

Source: SPSS Statistics

II. Regression Results

Below include the regression results of the sampled Bahraini cross listed companies.

2.1 AUB

The largest mean and standard deviation relates to the Volume variable.

Table 10. AUB's Descriptive Statistics

| | Mean | Std. Deviation | N |
|--------------------------|----------------|-----------------|-----|
| Arbitrage | -0.0099 | 0.0787 | 772 |
| BHB BidAskSpread | 0.5742 | 0.1266 | 772 |
| BK BidAskSpread | 0.5749 | 0.1325 | 772 |
| Volume | 4,700,853.4301 | 10,398,953.5681 | 772 |
| USD to KWD Exchange Rate | 0.3029 | 0.0015 | 772 |

Source: SPSS Statistics

Furthermore, the below table shows the correlation matrix for AUB.



Table 11. AUB's Correlation Matrix

| | Arbitrage | BHB BidAsk Spread | BK BidAsk Spread | Volume Spread | UsdKwd |
|------------------|-----------|-------------------|------------------|---------------|--------|
| Arbitrage | 1.000 | -0.071 | -0.077 | -0.079 | -0.057 |
| BhbBidAsk Spread | -0.071 | 1.000 | 0.964 | 0.381 | 0.367 |
| BkBidAsk Spread | -0.077 | 0.964 | 1.000 | 0.380 | 0.368 |
| Volume Spread | -0.079 | 0.381 | 0.380 | 1.000 | 0.175 |
| UsdKwd | -0.057 | 0.367 | 0.368 | 0.175 | 1.000 |

Source: SPSS Statistics

The largest correlation in relation to the dependent variable arbitrage is the exchange rate however not by a large margin; in addition, all independent variables have and share a negative correlation with the dependent variable. The largest correlation between independent variables is the bid ask spread in both countries.

Table 12. AUB's Model Summary

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|--------|----------|-------------------|----------------------------|
| 0.138a | 0.019 | 0.014 | 0.0782 |

Source: SPSS Statistics

Table 13. AUB's ANOVA

| | Sum of Squares | df | Mean Square | F |
|-------------------|----------------|------------|--------------|--------------|
| Regression | 0.091 | 4 | 0.023 | 3.714 |
| Residual | 4.687 | 767 | 0.006 | |
| Total | 4.778 | 771 | | |

Source: SPSS Statistics

Table 14. AUB's Coefficients

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|-------------|-----------------------------|------------|---------------------------|--------|-------|
| | B | Std. Error | Beta | t | Sig. |
| (Constant) | 0.539 | 0.572 | | 0.943 | 0.346 |
| UsdKwd | -1.850 | 1.888 | -0.036 | -0.980 | 0.327 |
| Bid-Ask BHB | -3.914 | 1.433 | -0.099 | -2.731 | 0.006 |
| Bid-Ask BK | -1.713 | 2.015 | -0.031 | -0.850 | 0.396 |
| Volume | <0.0001 | 0.000 | -0.075 | -2.064 | 0.039 |

Source: SPSS Statistics



2.2. GFH

The result is similar for GFH (as can be seen below) in which the largest mean and standard deviation also relates to the Volume variable.

Table 15. GFH's Descriptive Statistics

| | Mean | Std. Deviation | N |
|-----------|-----------------|----------------|-----|
| Arbitrage | 0.0339 | 0.0299 | 960 |
| Interest | 0.3032 | 0.002 | 960 |
| Home BA | -0.0101 | 0.0473 | 960 |
| Host BA | -0.0022 | 0.0053 | 960 |
| Volume HH | -2,073,230.7687 | 6,655,091.9797 | 960 |

Source: SPSS Statistics

For GFH, the results of the correlation matrix can be viewed in the below matrix.

Table 16. GFH's Correlation Matrix

| | Arbitrage | Interest | Home BA | Host BA | Volume HH |
|-----------|-----------|----------|---------|---------|-----------|
| Arbitrage | 1.000 | -0.145 | -0.259 | 0.021 | 0.083 |
| Interest | -0.145 | 1.000 | -0.016 | -0.138 | 0.068 |
| Home BA | -0.259 | -0.016 | 1.000 | 0.000 | 0.021 |
| Host BA | 0.021 | -0.138 | 0.000 | 1.000 | -0.082 |
| Volume HH | 0.083 | 0.068 | 0.021 | -0.082 | 1.000 |

Source: SPSS Statistics

The largest correlation in relation to the dependent variable arbitrage is the volume traded variable and not the exchange rate which was the case for AUB.

Table 17. GFH's Model Summary

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|--------|----------|-------------------|----------------------------|
| 0.315a | 0.099 | 0.095 | 0.02845 |

Source: SPSS Statistics

Table 18. GFH's ANOVA

| | Sum of Squares | df | Mean Square | F | Sig. |
|------------|----------------|-----|-------------|--------|---------|
| Regression | 0.085 | 4 | 0.021 | 26.235 | <0.001b |
| Residual | 0.774 | 955 | 0.001 | | |
| Total | 0.859 | 959 | | | |

Source: SPSS Statistics



Table 19. GFH's Coefficients

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|---------------|-----------------------------|------------|---------------------------|--------|--------|
| | B | Std. Error | Beta | t | Sig. |
| (Constant) | 0.726 | 0.139 | | 5.220 | <0.001 |
| Exchange Rate | -2.286 | 0.459 | -0.155 | -4.979 | <0.001 |
| Home BA | -0.166 | 0.019 | -0.263 | -8.568 | <0.001 |
| Host BA | 0.042 | 0.176 | 0.007 | 0.241 | 0.809 |
| Volume | <0.0001 | 0.000 | 0.100 | 3.245 | 0.001 |

Source: SPSS Statistics

2.3. INOVEST

For INOVEST, the results also follow suit with that of AUB and GFH in which highest mean and standard deviation is the Volumes traded in all three markets as illustrated below.

Table 20. INOVEST's Descriptive Statistics

| | Mean | Std. Deviation | N |
|-----------|---------------|----------------|-----|
| Arbitrage | 0.0246 | 0.0355 | 708 |
| Home BA | -0.0495 | 0.0928 | 708 |
| Host BA | -0.0036 | 0.00787 | 708 |
| Volume HH | -585,501.9958 | 1,889,210.7475 | 708 |
| Interest | 0.303 | 0.0015 | 708 |

Source: SPSS Statistics

As for INOVEST, the largest correlation in relation to the dependent variable arbitrage is the volume traded variable (similar to GFH and unlike AUB), however again not by a large margin as well, as evidenced in the below matrix.

Table 21. INOVEST's Correlation Matrix

| | Arbitrage | Home BA | Host BA | Volume HH | Interest |
|-----------|-----------|---------|---------|-----------|----------|
| Arbitrage | 1.000 | -0.611 | 0.046 | 0.076 | -0.514 |
| Home BA | -0.611 | 1.000 | -0.029 | -0.093 | 0.291 |
| Host BA | 0.046 | -0.029 | 1.000 | -0.063 | -0.101 |
| Volume HH | 0.076 | -0.093 | -0.063 | 1.000 | 0.003 |
| Interest | -0.514 | 0.291 | -0.101 | 0.003 | 1.000 |

Source: SPSS Statistics

**Table 22. INOVEST's Model Summary**

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|--------|----------|-------------------|----------------------------|
| 0.705a | 0.498 | 0.495 | 0.02527 |

Source: SPSS Statistics

Table 23. INOVEST's ANOVA

| | Sum of Squares | df | Mean Square | F | Sig. |
|------------|----------------|-----|-------------|---------|---------|
| Regression | 0.445 | 4 | 0.111 | 174.041 | <0.001b |
| Residual | 0.449 | 703 | 0.001 | | |
| Total | 0.893 | 707 | | | |

Source: SPSS Statistics

Table 24. INOVEST's Coefficients

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|---------------|-----------------------------|------------|---------------------------|---------|--------|
| | B | Std. Error | Beta | t | Sig. |
| (Constant) | 2.636 | 0.200 | | 13.200 | <0.001 |
| Exchange Rate | -8.647 | 0.659 | -0.369 | -13.131 | <0.001 |
| Home BA | -0.192 | 0.011 | -0.501 | -17.839 | <0.001 |
| Host BA | -0.017 | 0.122 | -0.004 | -0.143 | 0.886 |
| Volume HH | <0.0001 | 0.000 | 0.030 | 1.125 | 0.261 |

Source: SPSS Statistics

2.4. ITHMR

In similar fashion, ITHMR includes the Volume variable as the largest mean and standard deviation.

Table 25. ITHMR's Descriptive Statistics

| | Mean | Std. Deviation | N |
|-----------|-----------------|-----------------|-----|
| Arbitrage | 0.0103 | 0.0078 | 617 |
| Interest | 0.3027 | 0.0016 | 617 |
| Home BA | -0.0023 | 0.0189 | 617 |
| Host BA | -0.0006 | 0.0005 | 617 |
| Volume HH | -6,314,958.2366 | 10,675,899.3322 | 617 |

Source: SPSS Statistics



ITHMR on the other hand, resulted in the highest correlation in relation to the dependent variable arbitrage to be the Bid-Ask Spread on its shares on the Kuwaiti stock market as shown in the following matrix.

Table 26. ITHMR's Correlation Matrix

| | Arbitrage | Interest | Home BA | Host BA | Volume HH |
|-----------|-----------|----------|---------|---------|-----------|
| Arbitrage | 1.000 | -0.139 | -0.174 | 0.036 | -0.142 |
| Interest | -0.139 | 1.000 | -0.021 | -0.119 | -0.309 |
| Home BA | -0.174 | -0.021 | 1.000 | 0.029 | -0.115 |
| Host BA | 0.036 | -0.119 | 0.029 | 1.000 | 0.156 |
| Volume HH | -0.142 | -0.309 | -0.115 | 0.156 | 1.000 |

Source: SPSS Statistics

Table 27. ITHMR's Model Summary

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|--------|----------|-------------------|----------------------------|
| 0.599a | 0.359 | 0.356 | 0.0093 |

Source: SPSS Statistics

Table 28. ITHMR's ANOVA

| | Sum of Squares | df | Mean Square | F | Sig. |
|------------|----------------|-----|-------------|---------|---------|
| Regression | 0.044 | 4 | 0.011 | 128.974 | <0.001b |
| Residual | 0.079 | 920 | 0.000 | | |
| Total | 0.123 | 924 | | | |

Source: SPSS Statistics

Table 29. ITHMR's Coefficients

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|------------|-----------------------------|------------|---------------------------|---------|--------|
| | B | Std. Error | Beta | t | Sig. |
| (Constant) | -0.803 | 0.051 | | -15.675 | <0.001 |
| Interest | 2.643 | 0.169 | 0.425 | 15.650 | <0.001 |
| Home BA | 0.080 | 0.018 | 0.120 | 4.495 | <0.001 |
| Host BA | 6.932 | 0.646 | 0.298 | 10.734 | <0.001 |
| Volume HH | <0.001 | 0.000 | -0.167 | -6.057 | <0.001 |

Source: SPSS Statistics



III. Granger Causality Test

III.I. GFH

Table 30. GFH Granger Causality Test Result

| Null Hypothesis | Obs. | F-Statistic | Prob. |
|--|------|-------------|--------|
| (Arbitrage) does not Granger Cause (Exchange Rate) | 207 | 0.71872 | 0.4886 |
| (Exchange Rate) does not Granger Cause (Arbitrage) | | 1.97854 | 0.1409 |

Source: EViews

III.II. INOVEST

Table 31. INOVEST Granger Causality Test Result

| Null Hypothesis | Obs. | F-Statistic | Prob. |
|--|------|-------------|--------|
| (Arbitrage) does not Granger Cause (Exchange Rate) | 705 | 0.08140 | 0.9218 |
| (Exchange Rate) does not Granger Cause (Arbitrage) | | 0.87741 | 0.4163 |

Source: EViews

III.III. ITHMR

Table 32. ITHMR Granger Causality Test Result

| Null Hypothesis | Obs. | F-Statistic | Prob. |
|--|------|-------------|--------|
| (Arbitrage) does not Granger Cause (Exchange Rate) | 196 | 2.53007 | 0.0823 |
| (Exchange Rate) does not Granger Cause (Arbitrage) | | 1.87498 | 0.1562 |

Source: EViews

III.IV. AUB

Table 32. AUB Granger Causality Test Result

| Null Hypothesis | Obs. | F-Statistic | Prob. |
|--|------|-------------|--------|
| (Arbitrage) does not Granger Cause (Exchange Rate) | 169 | 1.28724 | 0.2788 |
| (Exchange Rate) does not Granger Cause (Arbitrage) | | 1.68394 | 0.1888 |

Source: EViews

As per the results, it has been noticed that not all cross listed companies have their share prices between the home and host markets as statistically different (in our case that happens to only be AUB). Such a phenomenon indicates that the capital markets of Bahrain, Kuwait and Dubai are far from efficient as per the efficient market hypothesis.

Furthermore, while conducting the study, the period was further narrowed down to cover the days during which the markets in both the home and host country were operational simultaneously with active trading and orders in all the markets. Moreover, since the purpose of this study is to see if arbitrage opportunities exist between the home and host markets of the Bahraini cross-listed securities, as well as uncover the main attributes to the creation of arbitrage, and test whether the level of exchange rate is



a main attributor that causes arbitrage opportunities, it was deemed irrelevant to take data specifically from the initial listing dates as the extracted data was immaterial to the study hypothesis and hence this has been the main cause for differences in the number of observations for not only each test, but also for each company that tests were conducted on.

It is important to note however that for most companies, the regression model could have exhibited a higher R² result and therefore adding further variables might be more beneficial. A possible addition to the model could be the market index of each capital market that the sample of Bahraini cross listed companies that have been analysed be taken into consideration.

The results are contrary to most of the previous literature results and studies on the same subject conducted in other developed markets as mentioned in the literature review section of this study.

The main reason for the availability of arbitrage opportunities could be somewhat attributed to the levels of volume traded between the home versus the host markets of the cross listed companies. As it has been noted, the mean and standard deviation is extremely high between the home and host markets and therefore lack of liquidity in the home market is very alarming.

Furthermore, due to the high difference in volume traded between the home and host markets, it is evident that it is the host market that controls the price movement of the cross listed companies rather than the home market. In addition, due to the lack of liquidity present in the home market, as trading sessions pass, the price gap between the home and host markets becomes more prevalent as it becomes tougher for the home market to catch up and react to the share price movement of the cross listed underlying security price available in the host market.

Due to the difference in the level of volume traded between the home and host markets, a rational investor's (even if he or she does not want to trade and exploit arbitrage opportunities) shares are most likely to be transferred out of the home market and into the host market since liquidity risk is much reduced and hence it weakens the home market further.

There are benefits however that needs to be mentioned based on the results of the study and that is cross listed Bahraini companies are listed in dollar in the Bahraini capital markets as opposed to the Kuwaiti dinar which is the currency that Bahraini cross listed companies listed in the Kuwait Capital Market are. Since the currency of Bahrain is pegged to the U.S. Dollar, there exists a lower exchange rate risk as opposed to the Kuwaiti Dinar.

Another benefit is that since the home market is the one that reacts to the host market price movement of its cross listed securities rather than control it, this poses as another opportunity for investors whereby since they can see the intrinsic value of the stock by invigilating the stock price movement of the same underlying security in the host market, investors could buy when it has been noticed that the cross listed stock has increased in price in the host market, knowing that the home market will follow the movement in the host market, or the rational investor could sell the cross listed stock in the home market when it has been noticed that the price in the host market of the underlying cross listed security has depreciated, which will provide the investor an opening of an early exit window so as to not be effected by the upcoming depreciation of the cross listed security in the home market.

Overall, since arbitrage opportunities do exist, this poses several pros and cons that all stakeholders are liable to depending on how they perceive such mispricing as mentioned and discussed above.

In order to alleviate or somewhat limit arbitrage opportunities (which should be the first course of action), several amendments need to be made on a regulatory level. As per the decree and recent status change of the Bahrain Bourse becoming a self-regulated organization, the Bahrain Bourse needs to amend its Market Rules, specifically in relation to Articles 6.9.6 and 6.9.7 which state the following:

**6.9.6 Adjustments to price fluctuation limits applicable to cross-listed securities**

- (1) Subject to Rule 6.9.6 (3), the existing Minimum price limit of a cross- listed security will be decreased by an additional 5% following the presence of a Qualifying ask order in the security.
- (2) Subject to Rule 6.9.6 (3), the existing Maximum price limit of a cross- listed security will be increased by an additional 5% following the presence of a Qualifying bid order in the security.
- (3) Adjustments to the price fluctuation limits specified in Rule 6.9.6 (1) and (2) will not be made within 30 minutes of the end of each trading session.
- (4) If the last closing price of the cross-listed security in the market in which it is most actively traded is above the last closing price the cross-listed security on Bahrain Bourse by more than 5%, and no trades were executed on Bahrain Bourse in that cross-listed security for the market day, then the existing Maximum price limit shall be increased by such percentage as to reflect the Maximum price limit allowed for the cross-listed security in market in which the cross-listed security was most actively traded. In the case in which the last closing price in the market in which it is most actively traded is below the last closing price of the cross-listed security on Bahrain Bourse by more than 5%, and no trades were executed on Bahrain Bourse in that cross-listed security for the market day, then the existing Minimum price limit shall be decreased by such percentage as to reflect the Minimum price limit allowed for the cross-listed security in market in which the cross-listed security was most actively traded.
- (5) Adjustments to the price fluctuation limits specified in Rule 6.9.6 (4) shall take effect from the start of the first trading session after the events described in those paragraphs.
- (6) The price fluctuation limits shall revert to 10% once a new last closing price has been established in a cross-listed security on Bahrain Bourse.

6.9.7 Adjustments to price fluctuation limits applicable to Illiquid securities

- (1) The existing price fluctuation limits of illiquid securities shall be increased or decreased to 50% of the last closing price in the security. No changes will be made to either the existing Maximum price limit or the existing Minimum price limit if either limit is 50% or more of the last closing price of the security.
- (2) Adjustments to the price fluctuation limits in this Rule 6.9.7 shall take effect from the start of the first trading session after a security is deemed an Illiquid security.
- (3) The price fluctuation limits shall revert to 10% once a new last closing price has been established in the security.

Article number 6.9.7 of the Bahrain Bourse Market Rules relates to regulations regarding price fluctuations on illiquid securities, however what constitutes a security to be labelled as illiquid needs to be defined as it is currently not. There needs to be properly defined parameters in terms of the number of trades, volume traded and value that would label a company's stock as illiquid or not.

In relation to price fluctuation limits of cross listed companies as stated in Bahrain Bourse's Market Rules, particularly Article 6.9.6, the entirety of the Article revolves around "Qualifying Orders" which as per the Bahrain Bourse is defined as:



“Qualifying orders” shall mean the following:

(1) A “Qualifying bid order” is a Regular ‘bid’ order at the Maximum price limit, entered into the Trading System during a continuous trading session, of value determined by BHB from time to time or more and which remained in the order book for a period of 30 minutes or more.

(2) A “Qualifying ask order” is a Regular ‘ask’ order at the Minimum price limit, entered the Trading System during a continuous trading session, of value BD5,000 or more and which remained in the order book for a period of 30 minutes or more.

Such parameter attributed to qualifying orders is too heavy in the sense that the value of a qualifying order being BHD 5,000 is too high and furthermore, as stated in the definition of qualifying bid order as “...of value determined by BHB from time to time...” is extremely vague, general, not clear and creates room for large misinterpretations, all of which need to be amended in a way that would be less strict so as investors, brokers, dealers and other stakeholders would feel less threatened and hence make the Bahrain Capital Markets more inviting.

4. Conclusion & Recommendations

This study and its results provide meaningful information about the state of the capital markets not just in Bahrain, but also provides a general view of the Capital Markets in the GCC as a whole. In addition, despite facing challenging micro and macroeconomic challenges, the Bahrain Capital Markets reached a new all-time high in 2019 prior to the hit posed by the global COVID-19 pandemic.

The existence of arbitrage can be viewed as somewhat of a catalyst to a large opportunity for investors to enter the market and exploit such equity mispricing. Although, in terms of future studies, to build up on this paper, perhaps it would be even better to include further variables into the regression model, to take further into consideration the indices of both the home and host markets of cross listed companies, compare the results of this study with other cross listed companies that come from similar markets as Bahrain’s in order to get a better idea and view on arbitrage, price movements and more.

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