Research Paper – Article

Differentiation of Market Risk Characteristics among Sharia Compliant and Conventional Equities listed on the Pakistani Capital Market - KSE 100 Index over a selective time period.

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Abstract:

This technical paper highlights the substantive and notable Market Risk difference among Islamic and Conventional Securities with respect to their Actual Price Volatility Risk Characteristics in context of Listed Pakistani Capital Markets. The data analyzes market risk of each listed security based on price series of the last five years drawn from the KSE 100 Index. We have used KMI 30 Index within KSE 100 Index to separate Islamic Stocks from their conventional counterparts. The study has applied two different market risk measurement methods of VaR - Value at Risk calculation such as Historical Simulation and VCV – Variance Covariance. In this paper three different confidence intervals are applied distinctly but simultaneously to both methods of VaR Calculation and groups of stocks ie (Islamic/Sharia Compliant and Conventional Equities). At the end, Percentiles are used to classify VaR measurements belonging to each group of stock. The Null Hypothesis is tested using a difference between means of two populations' z test statistic model at given 5% level of significance. The intention of writing this paper was to technically 'fill the literature gap' which exists within the purview of literature review covering both areas in Risk Finance and Islamic Finance.

Keywords: ***Equity Capital Markets, Value at Risk, Historical Simulation, Variance- Covariance, Market Risk, Islamic Finance, Sharia Compliant, KSE 100 Index, and KMI 30 Index .***

Glossary of 'Key' Terms

- ***VaR – Value at Risk***
- ***HS – Historical Simulation***
- ***VCV – Variance Covariance***
- ***CI – Confidence Interval***
- ***KMI 30 – Karachi Meezan 30 Index***
- ***KSE 100 – Karachi Stock Exchange 100 Index***
- ***STDEV- Standard deviation***

1. Introduction and Background of the Study

The topic of this study touches unique areas within the field of Islamic Capital Markets in general and Market Risk in particular. The primary objective of this research is to highlight *Differentiation among Market (Price) Risk Characteristics of Islamic and Conventional Firms drawn from the Universe of Companies enlisted on the KSE 100 Index*.

In this technical study, the Shariah Compliance and Screening of securities shall be done as per published regulations laid down by the country's premier Sharia-Compliant Equity Performance Measurement Benchmark the KMI (Karachi Stock Exchange – Meezan) Index.

The research overtly and ostensibly intends to magnify the quantifiable and differentiable aspects of Market Risk Volatility Characteristics in light of empirical evidences drawn from the day-end close secondary market (Divided, Bonus Shares, Stock Split and Rights Issue adjusted) price time-series of Equity Securities enlisted on the KSE 100 Index; collected over a selective time period, stretching between 2007 upto 2013. Hence we shall differentiate in terms of Market Risk Characteristics among 'Sharia' and Non-Sharia Compliant' Equities, by applying market risk measurement models such as VaR – Value at Risk Variance–Covariance and Historical Simulation Methods. Furthermore we shall be using at-least three different confidence intervals to predict 'potential unexpected losses' on a daily basis.

In this Exploratory cum Predictive Technical Study, the aim is to show as to which method better captures fatter tails within an emerging market and how one method of VaR calculation tends to underperform or outperform the other in context of various stocks/ securities which constitute of the largest, aptly liquid and most representative index at the Karachi Stock Exchange, the KSE 100 Index.

Hence the most obvious Literature Gap observed in the research areas dominating Islamic Capital Markets in general and Risk Finance in particular, has been the glaring of absence of application of *Market Risk Management Techniques* in explaining *Volatility Risk Characteristic* difference among *Sharia & Conventional Listed Equity Capital Market Securities* on a *one –to-one basis*.

All previous comparative studies have focused more on indices, funds or portfolio of Islamic Equity Capital Market Securities. In an overall context of Pakistani Capital Markets, there are very few studies to cite that actually make a significant impact and contribution to the field of application of Value at Risk Models in the Listed Equity Market in general and the KSE 100 Index in particular.

Hence I propose to *fill this Literature Gap* by academically contributing to the upcoming and exciting area of knowledge through application of results that emerges from within this study.

2. An Overview of Literature Review

The Literature Review Survey will be made as much thorough as possible and includes relevant *other author works* in this technical study. However we should note that no directly related studies are available within the chosen area of research, hence we may have to rely on some backdated contributions to establish an argument in favor of *filling the literature gap*.

We can largely classify most of the research work and empirical data contributions of other authors into two broad areas of academia. Firstly are Theory Testing Studies and the remaining are Theory Generating Studies. In this research it shall be indicated as to what and how I intend to use other author works as concept building blocks. Special attention shall also be paid with respect to creating a middle ground between vintage and latest research publications and works. Nevertheless all along I shall make it a point to indicate as to where and when the perceived other author contributions may be inadequate in addressing the laid down research questions.

The number of articles downloaded from online databases and libraries have shown mixed results. Most of the articles have some co-relationships with the variables and / or research methods that we intend to use in our study. But by and large what we have observed is that the topic under investigation remains a largely untouched area within the field of Islamic Finance and Risk Finance Literatures. There seems to be just two scholarly articles, one by ***Herwany and Febrian*** **[15]** ***(2013)*** in which the authors presented findings that had rumblings with the structure of our research study; however even

that was not very useful as a contribution due to the fact that the author did Research of some sorts on distinct portfolios of Indonesian Listed Equity Securities in context of Islamic and Conventional Finance with respect to volatility. The second is another comparative study conducted by ***Setiawan and Oktariza*** **[53]** ***(2013, pp.62)*** which used market risk adjusted performance measures such as Sharpe Ratio, Treynor ratio and other measurements to calculate the tradeoff between Risk and Return metrics among Islamic and Conventional Equity Security Portfolios.

We first begin with the ***Structural Analysis*** of Islamic Capital Markets and the contemporary issues surrounding its configurable design, which provides us with the start up that we need to identify the literature gaps. Notable authors ***Tag el-Din and Obaidullah*** **[58]** ***(1996, p.1)*** argue in favor of establishing an ethical stock market which is both efficient and vibrant. The authors attempt to discuss normative rules governing the functioning of an Islamic Stock Market in modern times. This particular paper is helpful in terms of its contribution to developing the reader's understanding of Islamic Equities, the market structure of a Sharia Compliant Exchange and how the latter differs from its conventional counterparts. Similarly ***Tag el-Din*** **[59]** ***(2002, p.1)*** reemphasizes and re-examines in his research work, the need to distinguish among free market capitalist models of stock market from its Islamic Counterpart. The contribution is significant because it lays down the legal and economic perspectives of a Sharia Scholar with respect to Islamic Equity Securities within an Islamic Capital Market.

In other similar studies, Sharia Finance Experts promote the significance of establishing an Islamic Stock Market. The strongest views have always been asserted with regards to the development of Islamic Capital Markets in context of Malaysian Financial Markets and lays down the principles of Sharia Compliant Portfolio Management of Equity Securities **[3]** ***(Anwar 1995, p.1)***. Likewise ***Ahmed*** **[2]** ***(n.d., p.43)*** states that the development of a fully-fledged Islamic Securities Market may be a challenge for both the policy maker and market markers as the process may not come about as a natural choice for policy makers at the present. The work of the author contributes to our indirect understanding of how constrained supply and fresh listings of Sharia Compliant Equities across capital markets may also affect valuations and have market risk consequences for the investors.

Another very significant contribution by ***Manan*** **[40]** ***(1993, p.1)*** proposes that the essential nature of the Islamic Economic System is such that the latter is based on the Sharia Principles of Equity Participation, Risk Sharing and Financing. Therefore the author identifies three general modes of contractual partnerships between suppliers and buyers of long-term liquidity in a Sharia Compliant Market, which includes *Musharakah, Modaraba and Murabaha* Modes of Financing.

Types of Islamic Legal Contracts that exist in Equity Capital Markets between companies and their shareholders usually take two major forms: *Musharakah or Modaraba*. The working definition of *'Musharakah'* is described as equity participation, investment and management from all partners; profits are shared according to a pre-agreed ratio, losses according to equity contributions. '*Mudarabah'* is described as a profit-sharing partnership to which one contributes the capital and the other the entrepreneurship; or the bank provides the capital, the customer manages the project. Profit is shared according to a pre-agreed ratio **[54]** ***(Siebel and Omar 2006, p.5).***

Finally the contribution by ***Osmani and Abdullah*** **[47]** ***(n.d., p.5)*** deliberates upon the basic principles of establishing a Sharia Compliant Stock Market as ***"****The universal rule of Islam for transactions reveal that trading is not only permitted but also entitled as Ibadah but with the condition that it is free from all forms of Riba, Al-Maysir, Al-Gharar, price controlling, Al-Ihtikar, misinformation and coercion****".*** The emphatic statement of these authors is of significant importance to our study, as we search for answers in our research questions within Pakistani Capital Market which only partially fulfils the conditions and best practises laid down by Sharia Scholars.

Other paramount aspect of Islamic Capital Markets touched by ***Obaidullah*** **[48]** ***(n.d., p.10)*** outlines an ethical and legal background of how Islamic Listed Equity Capital Markets should operate in accordance with the injunctions of Quran and Sunnah. According to the findings of the author, the Islamic Exchange should place ethics above efficiency. The author further notes that when speculation tends to take the shape of gambling and generates unearned income, it must be curbed, irrespective of its impact on efficiency. This particular contribution helps us to understand as to how and why lack of price discovery in certain asset classes may actually hide its real value and Affect investor perception of market risk from a moral perspective. Other important contribution encompassing role of morality and ethics in Islamic Finance is put forward by ***Pitluck*** **[50]** ***(2008, p.21)*** where he outlines that stock market prices can be socially constructed to be sensitive to an issuing firms ethical and moral behavior. This study which compares the Malaysian Capital Market with its American counterpart opens a new area of discussion among Market Risk Practioners, who often describe market volatility only as a function of valuations and future expected profits.

It is most important to note, that in Islamic Finance they are contrasting opinions expressed by religious scholars and experts, who belong to different schools of thought. Consequently the definition of morality and ethics may also vary from scholar to scholar from one jurisdiction to another **[57]** ***(Thomas n.d., p.12).*** This particular contribution is significant for developing the scope and limitations' of our study, as the definition of 'Market Risk in light of the religious definition of Gharar that emerges from our research findings can neither be understood nor be applied equally and uniformly at the global level.

The most noteworthy contribution by ***Hussein*** **[21]** ***(2004, p.38)*** differentiates between the Performance on FTSE Global Islamic Index versus those of FTSE All World Share Index. The author concludes that risk adjusted return performances of ethical investments are as good as those produced by the conventional FTSE Index. This study shall be used in analogous terms to better understand the market risk adjusted performance of Sharia Compliant stocks Vis a Vis Conventional Equities listed on the KSE 100 Index by drawing an appropriate parallel with the past performances of FTSE Indices.

Another extension to Morality and Socially Responsible Investments is related to the screening methodology applied by Sharia Scholars with respect to Islamic Stocks in Capital Markets. We would briefly address issues related to this subtopic within the ambit of our Literature Review Section, as concepts gained here, have a direct bearing on writing the Research Methodology Section and subsequently shall also impact the Data Analysis Section in this technical research study. It is also important to study the general guidelines with respect to the stock screening process applied and approved by Sharia Scholars under various regimes and jurisdictions, which shall enable the reader to better appreciate the procedural stages of any sample design that bifurcates stocks: ie Sharia and Conventional Equities within the KSE 100 Index.

Islamic Indices have not received great deal of academic attention like other research areas have in Islamic Finance as of today. Islamic indices were launched in the late 1990s by stock exchanges across various countries. Over the span of last few years, Islamic Equity Indices emerged as an ethical addition to the existing universe of asset classes. Not all Islamic Indices follow the same rules and criteria for screening of stocks, but nevertheless all of them employ some kind of qualitative and quantitative screens to include and/or exclude equities. All firms engaged in prohibited activities avoid selecting firms that involved in, involved in Gambling, Riba / Usury Transactions, Alcohol, Pork-related products, etc. Additionally Shariah boards of Islamic indices pass judgment on stocks eligibility using certain types of financial ratios ***Khamlichi, SannaJust and Sarkar*** **[37]** ***(n.d, p.11).***

At the international level we have a wide variety of literature which compares stock selection methodology in context of Sharia Finance. Authors ***Ismail et al.*** **[25]** ***(n.d., p.12)*** asserts ***"****The DJIM, FTSE, Wellington Islamic Index etc. uses the same financial criteria ie level of debt, level of liquidity*

and level of interest income as compulsory criteria during the screening process for prospective companies".

In other works ***Khatkhatay and Nisar*** **[34]** ***(2007, p.72)*** demonstrates the need to properly *analyze firms at the group level* before they are included within any Sharia Compliant Equity Investment Index. The researchers in this study argue in favor of excluding firms from any index if they use subsidiaries or minor businesses to undertake Haram (Un-Islamic) Business Activities. Some authors have also rightly focused on the need to standardize the screening methods at the global level. There seems to be differences between qualitative and quantitative screens used by stock exchanges and scholars across various markets to approve or disapprove of securities. This leads to more misunderstandings, which should be avoided in the best interest of promoting Islamic Finance around the world **[6]** ***(Bellalah, Rehman and Masood 2013, p.16).***

Iqbal and Mirakhor, 2007 **[29]** ***(cited in Jamal et al. 2010, p. 14)*** evaluates that the data for determining the ratios used for including and / or excluding a stock within a portfolio, are taken from balance sheets and income statements. Certain Islamic Indices also use stock market data to calculate financial ratios. The ratios fall into three categories such as Financial Leverage / Gearing Ratio, Cash / Liquidity Balances to Total Asset Ratio and Interest Income Earnings to Investment Ratio. *The ratio benchmark varies from: Liquid asset: 30%-49%, Interest income: 5%-15% Leverage: 30%-33%.*

"Many stocks that form a part of the fund manager's Sharia-compliant fund portfolio in a particular year might become non-compliant the next year" **[7]** ***[COGNIANT] (2012).*** This statement of concern expressed by investors and fund managers also has a bearing on the stocks that we select in the study from within KSE 100 Index using third party - KMI 30 Index Equity Security Selection Methodology. Hence as far as our research is concerned we shall put a cut-off date for selection of stocks, after which we shall hold all changes constant in order to stabilize and control the results of our experiments within a chosen timeframe.

KSE - Meezan Index that we intend to use to screen Sharia Socks enlisted on the KSE 100 Index is calculated using the Free-Float Market Capitalization Methodology. The Sharia screening filters applied by the exchange to include and/or exclude stocks from the Index, is based on a six step criteria, which includes analysis of the Business of the Investee Company, Interest Bearing Debt to Total Assets should be less than 37%, Non-Compliant Investments to Total Assets should be less than 33%, Non-complaint Income to Total Revenue should be less than 5%, Illiquid Assets to Total Assets should be atleast 25% and lastly the Net Liquid Assets/Share should be equal to or greater than Market Price/Share **[41]** ***[Meezan Group] (2013)*** **.**

The KMI 30 Index is not free from academic criticism as our attention to detail is drawn by the group of Pakistani Authors ***S.A.Z., R.U. and M.*** **[55]** ***(2012, p.57)*** appraises their readers by discussing the clash of ethical values' with regards to screening and subsequent selection of stocks within the KMI 30. The authors note that the laid down 'Hilal Business Criteria' states that every company should be in that business which is valid according to the Islamic parameters, but on the other hand as laid down in criteria No.3, the non-complaint investments ratio, allows every company to have less than 33% non-complaint investment. These both points are contradictory, because if a company has up to 32% non-complaint investment of total assets than how can we say that particular company is doing Hilal business. According to the study conducted, it is emphasized by the authors that there must be complete harmony among the criteria set by KSE/KMI to select Equity Securities.

As noted by ***Sheikh*** **[52]** ***(2010, p.5)*** the Islamic Stock Selection Methodology in context of KSE /KMI 30 is such that it requires an aspirant firm to make sufficient investment in illiquid assets and at the same time discourages investments in 'highly geared companies'. These facts make the author suggest that Sharia Screening Principles hinder inclusion of certain equities within the index that are both

liquid and leveraged. This may affect the investors, because certain highly geared companies earn a higher Return on Equity during cyclic period's i.e economic boom /expansion. This study also serves as a capstone contribution on its own merits as far our research is concerned. The inferences that one may draw from the contribution may prove helpful in analyzing risk adjusted returns and market risk differentiations among Islamic and Conventional Stocks within our selected sample of Listed Equity Securities.

[ISRA] **[28]** ***(2013, p.11)*** describes Equity Investment Risk as "*The risk arising from entering into a partnership for the purpose of undertaking or participating in a particular financing or general business activity as described in the contract, and in which the provider of finance shares in the business risk. This risk is relevant under Mudarabah and Musharakah contracts*".

Market Risk in Islamic Finance is probably the most ignored and least researched topic within Islamic Finance. As of today author contributions are very limited and hence most of the focus has been on volatility transmissions linkages between markets and analyses of mutual funds, indices and portfolios. This particular drawback in research has been best described by ***Bacha*** **[5]** ***(2004, p.4)*** as "*lack of attention to the management of risk has meant that players in Islamic Capital Markets have little by which to ensure the preservation of their wealth*". Another plausible reason for not focusing too much on market risks and volatility in Islamic Finance may have been intentional, as the dislike for derivatives and structured products among clerics and scholars is not a hidden fact. Most of the mainstream Sharia Experts have dissuaded investors from using conventional hedging methods which in return may only give rise to more gambling, speculation, excessive risk taking (**Gharar)** and unproductive behaviour **[56]** (***Suwailem 2006, p.141).***
One of the most notable contributions in the field is done with respect to Equity Price Risk Management Methods by IRTI (Islamic Research and Training Institute) at IDB – Islamic Development Bank. Economists' ***Khan and Ahmad*** **[36]** ***(2001, p. 140)*** explains how Bay –al –Arboun (Options) may be used by stock market investors to hedge against downside price risk. However the OIC Fiqh Academy have declared Arboun as illegitimate products, irrespective of this, they are still being used by certain asset management companies to design principal protected funds in the GCC and beyond.

Another study done on Islamic Option Contracts by ***Obaidullah*** **[48]** ***(n.d, P.13)*** concludes that using khiyar al-shart framework is not permissible within Sharia Law, but such solutions can allow the investor to hedge against Market Risk Volatility in Financial Markets. Having said that, the sharp contrast between Islamic and Conventional Option Contracts is duly highlighted in this paper by the author, when he demonstrates how upfront premium or asset protection insurance fee should become part of the entire *contractual price /thaman* and should not be paid in any case as upfront money by Sharia Compliant Investor to the seller of the protection. Such contributions are highly priced in context of our technical research, as they enable the readers to understand how market risk for Islamic Equity Securities may differ in absence of a price risk hedging mechanism in markets against conventional securities which may optionally be hedged by the investors using derivative securities.
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One of the most authoritative guidelines so far on the Islamic Market Risk Management Principles is provided by IFSB (Islamic Financial Services Board) in Malaysia, which describes the presence of Market Risk both within the contexts of Banking and Trading Book Transactions. The Difference between Conventional and Islamic understanding of Risk Management is best understood by analyzing the Facility/ Product Risks in each sector ***[IFSB]*** **[26]** ***(2005).*** In our research we shall be studying Market Risk as Volatility Risk from a Listed Equity Security's perspective.

Kia **[35]** ***(2001, p. 37)*** asserts that Islamic Stock Market and Conventional counterparts can never be a look alike, as the latter creates waste, speculation, shorter-dated holding periods and poses threat to financial instability of the entire economic system. This paper is significant to our study in order to understand the mindset which prevails in the Sharia Finance Industry which respect to capital markets

and its forbearing on market risk that an investor may experience within such an ideally controlled environment. Generally the paper makes us rightly believe the notion that Islamic Jurists and Experts on Capital Markets dislike Market Risk beyond a certain permissible risk-sharing level, which inherently and inevitably exists in all *t+1 (one day settlement)* or *t+3 (three day settlement)* equity security market transactions.

"*Naturally, no one can deny that Islamic securities currently on the market are less liquid compared to securities on western markets and to similar ones in our own countries due to the fact that the latter types of securities can easily be purchased and sold at all times and in any amount. Moreover, this relatively high level of liquidity in the nearby markets offers greater possibilities for the achievement of profits from price speculation. Yet, these same factors may occasionally lead to a total collapse of the market leaving it in a state of panic, and with considerable losses"* **[2] *(Ahmad n.d., p.21*).** Through this quotation, we are able to understand the cautious mindset of a Sharia Expert as he tries to convince the investor that markets experience price swings which can be in excess of one standard deviation and at times the amount of change in prices may become so violent; possibly going beyond two to three standard deviations.

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We have found very little material with respect to mention of Islamic Finance in context of Pakistani Capital Markets and / or the Karachi Stock Exchange 100 Index. Again only two authors have shown some promise by promoting research which may come directly into our use. ***Nishat*** **[46]** ***(2002, p.591)*** identifies that market risk as measured by the '*standard deviation'* is higher for *Modarabah* stocks than for the non-Islamic stocks which is contradictory to what is expected. The leasing stocks have smaller standard deviation than the non-Islamic stocks. Dr. Nishat in the same study further concludes that skewness and kurtosis are higher for *Modarabah* and leasing firms than the non-Islamic stocks. Similar patterns were observed during the first sub-period of reforms, as the average return on *Modarabah* stocks (0.863 percent) is higher than both the leasing (0.283 percent) and non-Islamic stocks average returns (0.469 percent). Statistically the mean returns for these stocks are not different. The standard deviation is higher for *Modarabah* than the non-Islamic stocks but lower for leasing stocks. In another study authors ***Jabeen and Dars*** **[30]** ***(n.d., p.18)*** contrasts the risk and return difference among Islamic and Conventional Funds in Pakistan using daily NAVs – (Net Asset Values). Furthermore the research shows with the help of market risk adjusted performance measuring ratios that conventional funds have turned out to be better performing asset class in terms of their returns. This research provides a macro-perspective of Pakistani Financial Markets, as most of the equity funds and balanced funds invest in listed equity securities that shall be re-tested and re-verified within the framework of our research study.

Ali **[4]** ***(2005, p.13)*** concludes that out of the three most developed capital markets among Islamic Nations such as Malaysia, Bahrain and Pakistan, the latter has the highest concentration of turnover, which is again *indicative of the presence of speculative activities in a stock market*. The values of shares traded as a percentage of market capitalization stood at around 365.4%. Hence this statistic quoted by the author will give our research an empirical background with regards to market risk that investors experience in Pakistani Equity Capital Markets, which mostly ostensibly also influences the price and volatility formation patterns of equity securities issued by companies, enlisted on KSE 100 Index.

Value at Risk Calculation Methods have been widely employed by banks and other Financial Institutions around the globe to report and measure market risk exposures. The three models of VaR calculation which are commonly used are Historical Simulation, VCV – Variance covariance and MCS – Monte Carlo Simulation **[10]** ***(Cheung and Powell 2012, p.112).***

The quotation from one of the leading global consultancy firms on risk shall set up a background with regards to the application of VaR models in general and the suitability of relying on such models within the context of Pakistani Capital Markets in particular as *"Indeed, the perceived limitations of VaR are bringing the industry under severe scrutiny. A decade rarely passes without a market event*

*that some respected economist claims, with a straight face, to be a perfect storm, a 10-sigma event, or a catastrophe so fantastically improbable that it should not have been expected to occur in the entire history of the universe from the big bang onward. In the wake of the most recent troubles, critics have noted VAR's reliance on normal market distributions and its fundamental assumption that positions can be readily liquidated" **[McKinsey & Company]* **[39]** ***(2012).***

In three eye opening KSE – Karachi Stock Exchange specific studies the role of VaR importantly contributed to the literature on Market Risk in context of Pakistani Capital Markets. The first study of this type is done by ***Iqbal, Azher and Ijaz*** **[27]** ***(2010, p.17)*** where they explain that "*VaR measures are more accurate when KSE index return volatility is estimated at 95% confidence level".* This study is a milestone in context of context of Listed Equity Capital Markets. The results from this study shall be closely scrutinized to check volatility trends and also compare my Value at risk metrics with those produced by the other contributors.

In another study on VaR methods, ***Nawaz and Afzal*** **[44]** ***(2010, p.7476)*** discuss how stock exchange margins affects volumetric activity at the KSE – Karachi Stock Exchange. The method chosen for calculation of value at risk is Historical Simulation, which is based on a 500 day look back period and uses a 99% confidence interval.

The third and probably the most detailed study is done by ***Mudakkar and Uppal*** **[38]** ***(n.d., p.2)*** whereby they examine the distribution of KSE index return series over the period Jan 2001 - June 2012. The study concludes that VaR Models may not be suitable for calculating market risk of equities enlisted on the KSE 100 index, as the latter displays abnormal shifts in price volatility due to presence of fatter tails phenomena. The authors support using ESF – Expected Short Fall or Conditional Value at Risk Models to capture market risk volatility of equity securities.

All three studies shall strongly guide my technical study results, which we propose to, generate in the Data Analysis Section.

Khilji **[32]** ***(1993, p. 601)*** argues that returns in Pakistani Capital Markets ie the Karachi Stock Exchange are not normally distributed. These returns are generally 'positively skewed', exhibit 'Leptokurtic shape' and have a positive central location ie mean value. ***Husain and Uppal*** **[22]** ***(1998, p.70)*** second the previous author on the same grounds, that returns do no exhibit a normal (bell-shaped curve) distribution. The returns exhibit a positive skew and hence the stock market is expected to produce positive returns on most of the days. The author further forewarns market risk practioners that models developed with regards to KSE Stocks, should only be done with the utmost caution. In a complimentary study preceding the previous one done in 1998, the authors ***Husain and Uppal*** **[23]** ***(1999, p.35)*** identify that persistence in variance of returns is a phenomenon which explains why volatility cycles ape one another and continue for longer periods over time at the Karachi Stock Exchange.

In a somewhat co-related study, ***Farid and Ashraf*** **[13]** ***(1995, p. 655)*** explains ***"****Volatility of stock prices was found to be quite high. It ranged from a minimum of 26 percent per annum to 51 percent per annum".* Again this contribution reasserts the view that Pakistani Equity Capital Markets are extremely uncertain and may produce huge jumps both in terms of financial risk and rewards.

The most recent study on this subject was done by ***Nawazish and Sara*** **[45]** ***(2012, p.45)*** proves "*the empirical evidence indicates presence of time varying volatility. Therefore, valuations in such markets should be dealt carefully by taking into account conditional variance. These findings have strong implications for fund managers and investment analysts who rely on a Gaussian style standard deviation as measure of risk for their exposures".*

Henceforth after going through the discourses and contributions put forward by various authors, it is largely believed that any risk modeling effort in context of Pakistani Capital Markets shall face both theoretical and practical challenges.

As we are aware by now, that the premise of Lognormal Distribution of Returns serves as the building block in all Financial Studies including Market Risk Modeling Studies. As evidenced in context of the Literature Review, we have reasons to suggest that KSE 100 returns may also not fulfill the normality

assumption. Hence if pattern of returns in our experiment design, does not meet the return distribution model assumptions, than in such a case we need to streamline model selection and validation processes using Backtesting Modality.

The contribution by ***Escanciano and Olmo*** **[12]** ***(2008, p .25)*** is most interesting in shaping the discussion on VaR Backtesting methods. The authors argue that with the advent of Basel Capital Accords, the role of market risk modeling has taken ascendancy in terms of functions performed within financial institutions, and hence Economic Capital Modeling requires sound risk management models. The paper underscores the need to select the *right confidence interval* (the cut-off point) within the returns distribution model. A poor choice of selection may lead to wrong VaR outcomes, higher model exceptions and poor volatility forecasting outcomes. This particular study and its outcomes shall guide our research work as I intend to use three different confidence intervals to produce VaR on periodic basis and consequently select the model with the 'lowest exceptions' (Backtesting failures) using daily market prices changes expressed as continuous returns.

Nieto and Ruiz **[42]** ***(2008, p.12)*** explain the mechanism of Backtesting as laid down by the Basel II Committee with regards to Trading Book Transactions. The minimum data that a risk model builder should look back at are 250 days as per the guidelines laid down by BIS - Bank of International Settlements, the patron in chief of the Basel Accords. In equity market, the convention is to use 252 days as this constitutes of a one full working year minus all the weekly holidays. This particular contribution lays down the mechanism for us to select an appropriate look-back period for this particular research study. All samples within our research design are listed equity securities. Hence we shall be using the entire five year period along side with yearly periods to report exceptions which exceed VaR estimates for the given confidence intervals.

The failure of VaR Models in various crises around the world is quite evident by now. The problem with such models is that they get blinded during periods of shock and awe, when the forecasted probabilistic measure of volatility exceeds the calculated standard deviation metric. The author contributes to the Backtesting literature in the field of risk management, by proposing the use of Desk Level P&L (Profit and Loss) Account Data to Backtest VaR shortcomings.

Authors Cassidy and Gizycki **[8]** ***(1997, p. 34)*** conclude as ***"****These weaknesses in the VaR model can, to a large extent, be attributed to the observed non-normality of profit and loss".* This particular quotation of the two authors strikes the balance in the debate between wrong estimates and wrong model selection. As discussed in the paragraphs above, the distribution of the returns determine whether a model is applicable of producing desired results. Linear VCV-Variance Covariance Value at Risk Model assumes that the mathematical properties of a normal return distribution will not be violated in applied terms. This particular contribution is relevant for us, as I intend to use various VaR calculation methods to evaluate volatility from different perspectives.

Campbell **[9]** ***(2005, p.16)*** frames the discussion one step ahead on VaR calculation methods with respect to the HS – Historical Simulation Model. The HS model does not make any prejudgments about the shape of the return distribution and this relaxation in distributional assumptions, provides the risk modeler more confidence to forecast loss potential. However in our case, only listed equity securities with linear payoffs are selected as samples; nevertheless the return distributions of highly positively or negatively skewed asset classes may mislead us in selecting the right model. Hence in my research study, all market risk research models shall be duly screened using Normality Tests results.

Finally we note that there is great paucity of risk research contributions in the field of Islamic Stock Markets in context of Pakistan.

Hence I would like to conclude this section of the article by reiterating the ominous literature gap observed in almost all areas which are closely related to the working title of this technical research study and the statement of the research problem. Barring a few aberrations, none of the major literary works performed either within Pakistan or overseas, helps scholars to *differentiate Market Risk Characteristics among Sharia and Conventional Listed Equity Capital Market Securities on a one to*

one basis. The maximum academic effort we see is directed towards volatility and / or market risk analyses of funds, indices and at best some portfolios of stocks drawn from both the Sharia and Conventional Equity Asset Classes from different markets over different periods of time. Hopefully this study shall contribute to a new body of knowledge.

In addition to theory building exercise, I intend to facilitate both scholars and practioners alike involved in Theoretical and Applied Learning jointly within the fields of Islamic Finance and Risk Finance in context of Pakistani Capital Markets, with limited universal applicability in context of global financial and capital markets.

3. Research Methodology

I define the research framework, approach and methods that I shall utilize to advance this study, as being outright *Inductive in its orientation.* There is a benign acceptance of the phenomenon at the very outset that market risk difference does exist among Islamic and Conventional Equity Asset Classes in some form or the other. This predetermined mindset, based on empirical observations, leads to a generalization which can either be accepted or rejected later onwards. The premise of this research is largely based on Inductive style of constructing the problem statement and set of research questions.

I would now like to throw some practical insights on the **Procedural Design of the Research**. Our research experiment design outlines six step wise steps as listed below:

- **Research Question**
- **Research Hypothesis Testing**
- **Operational Definition /Instrumentation of Concepts**
- **Collection of Data and Sample Design**
- **Market Risk Measurement and Modeling Methods**
- **Limitations of Research**

- **Research Question**

The Study endeavors to focus on the need to explore Market Risk differentiations among Islamic and Conventional Listed Equities in context of Listed Pakistani Capital Markets, drawn from the KSE 100 Index. We shall seek to construct basic research questions in light of the stated problem as:

- ***Primary Research Question***

With the help of the concept diagram we have conceptualized two possible research questions which exemplify the stated research problem in the best possible manner.

  - ✓ *Are Market Risk Characteristics differentiable among Listed Islamic and Conventional Companies in context of Pakistani Listed Equity Capital Market?*

The research questions framed shall remain the focal point of our research study. These questions should be able to highlight and answer the Literature Gap that we have indentified in the introductory paragraphs of article and subsequently enable us to frame the *brittle research hypothesis* accordingly.

- **Research Hypothesis Testing**

- ***Research Hypothesis***

The research hypothesis shall answer the research question raised in this study.

- ✓ *The first hypothesis deals with testing the existence of market risk characteristic differentiations among Islamic and Conventional Stocks in context of Pakistani Listed Equity Capital Market.*
- ✓ *(**Null Hypothesis**) Ho: They are no quantifiable market risk characteristic differentiations among Islamic and Conventional Listed stocks.* ***Ho = 0***
- ✓ *(**Alternative Hypothesis**) H1: They are quantifiable market risk characteristic differentiations among Islamic and Conventional Listed stocks.* ***H1 ≠ 0***

Hence we shall be applying two-tail tests to verify and subsequently accept or reject the null hypotheses using a significance level of 5% in both of the cases.

✓ **Operational Definition /Instrumentation of Theoretical Concepts**

The operational construct / definition of the instruments that one intends to use are vital for any research, its experiment design and the overall outcome/s. From the research methods selected to answer the two research questions, one can confidently assume that the study shall operationalize itself by creating a *theoretical construct* around the definition of concepts such as Market Risk Characteristics as measured by *Value at Risk Modeling Techniques*. The illustration (***as shown in the figure 1.1)*** depicts how we intend to do market risk factor mapping and problem solving using various research instruments/methods in context of this study. The Leading *instrumental operators* that shall guide the overall research objectives, experiment design and methods are: *Historical Simulation VaR, Variance-Covariance VaR, and Market Risk, Islamic and Conventional Equity Securities*.

- **Collection of Data and Sample Design**

We have chosen *a Non - Probabilistic Purposive Sampling Design to carry* out experiments in context of our research study. Outlining the primary scientific criteria for selection data forms an essential part of this VaR calculation using the two methods namely Historical Simulation and Variance Covariance Models. A total of (252 × 6 = 1512) daily observations of day-end close prices of each security are selected for developing the empirical evidence database that I shall utilize to measure market risk in Sharia and Conventional Securities that constitute of the index. Do note that in Equity Capital Markets, the maximum size of one reporting full year consists of 252 days (minus Saturday and Sunday). Similarly we have also accumulated daily data of the index itself for the same five year period. The index data shall be used to calculate risk adjusted performance measures and also other relative market risk measures. The total sample size is made up of 100 stocks drawn from the entire Index, which is representative of the market performance of Listed Equity Capital Markets in Pakistan. Upto 26 stocks selected as parts of the research procedural design are classified as Sharia Compliant and the remaining 74 are classified as Conventional Securities (***refer to Appendix Section I***).

As we are aware by now, that the premise of Lognormal Distribution of Returns serves as the building block in all Financial Studies including Market Risk Modeling Studies. The time-series data which primarily consists of daily day-end close stock prices and the market capitalization of the KSE 100 index have been collected to generate primary data in the form of Daily VaR Metrics for both Islamic and Conventional Stocks.

The sample is drawn over a selected period of five years (January 2007 to July 2013), which meets the statistical and industry requirements to calculate risk models such as VaR – Value at Risk. Do note that in Listed Equity Capital Markets, the maximum size of one reporting full year consists of 252 days (minus Saturday and Sunday). Similarly we have also accumulated daily data of the index itself for the same period.

The segregation of Islamic Equities from their Conventional Counterparts is done using the KMI-(Karachi Meezan Index) - 30 Index Stock Selection Methodology within the parameters of KSE 100 Index. Hence only those KMI 30 index Sharia Compliant Stocks are selected for comparison, which (at the same time) do not violate the asset inclusion parameters set by the KSE 100 Index.

- **Market Risk Measurement and Modeling - Quantitative Methods**

The back bone element of our research methodology in this paper shall be centered upon Quantitative Risk Research Methods such as Value at Risk. These models will not only help to understand market risk volatility but also streamline market risk difference among Islamic and Conventional Stocks in context of our research.

Value at Risk is a probabilistic measure of maximum loss (as per a given a model) for a confidence interval over a selected investment horizon. In our study we have generated VaR Values on a daily basis, ie a one-day look forward VaR Metric. All Value at Risk Models has *variants* which vary in terms of application and usefulness under one assumption and / or set of return distribution to another. In this study we for the purposes of broadening our understanding of market risk characteristics, have applied two methods /models to calculate VaR under three different confidence intervals settings to compare one set of results with another. Hence the first method chosen is the Variance Covariance VaR Model and the other is the Historical Simulation VaR Model of Market Risk Calculation.

*"The **Historical Method** simply re-organizes actual historical returns, putting them in order from worst to best. It then assumes that history will repeat itself, from a risk perspective*. ***The Variance-Covariance Method*** *assumes that stock returns are normally distributed and that the change in portfolio value is linearly dependent on all risk factor returns"* **[14]** ***(Harper, 2013)***.

In this research study, I shall calculate Value at Risk Metrics on a daily basis (ie one day forecast) using confidence intervals of 90%, 95% and 99% respectively; using both Historical Simulation and VCV Methods. The results of each shall be compared with one another to test and validate our null hypothesis. Hence our chosen risk horizon is square root of 1 for any volatility scaling purpose. Furthermore we have chosen EWMA- Equal Weighted Moving Average Method to forecast Daily VaRs Metrics. Hence each sample of stock return over the look back period shall be assigned an equal weight irrespective of time. This is a technique which is also referred to as the *Philip Jorion Method of Calculating VaR.*

I have also been mindful of the fact that VaR - Value at Risk Modeling modality uses look-back periods that may generally vary between **6 months to 5 years**. It all Depends on the market volatility track record of the securities**. Ostensibly very volatile stocks require a shorter look-back period as their history is fluctuating in an unpredictable manner and least volatile stocks may use a more well spread out data set. Hence model selection should always rely on observed volatility and future expected volatility forecasts.** Henceforth in my opinion at-least 5 year data set for each stock / security will provide a more standardized and conservative basis for undertaking analysis, which would in return help us to arrive at analytical conclusions, and built subsequently build Grounded Theoretical Contributions within the chosen field in a more prudent way. Nevertheless the advantages and disadvantages of selecting a very short or a very long look back period tends to compete with one another.

- **Limitations of Research**

The research study in this article is subject to certain risk modeling, statistical information and conceptual constraints and limitations. I have mentioned these in the order below:

- The first limitation is with respect to the **Financial Risk Modeling Methods**, as most of the Mathematical and Statistical Models applied in Risk Finance are subject to **validation and authentication constraints in a real-time environment**. Market Risk Measurement Models which are primarily developed in Advance Financial Markets, may not be correctly applied in context of Emerging Markets due to lack of depth in stock market capitalization levels and absences of price transparency and discovery.

- The second Limitation is an explanation of the first limitation. The current set of **Market Risk Models (VaR – Value at Risk)** in vogue, suffer from **abnormal events such as unpredictable volatility variations**, which may go beyond model design and experiment controls. Volatility can only assume to be 'normal under normal market conditions. However it is noted that abnormal market events such as a *Financial Market Crash* can seriously undermine the

efficiency of Market Risk Metrics and related forecasts. Hence a *Normal Probability Distribution Function* (bell shaped curve) cannot always accurately capture *Tail (Extreme Financial Market) Risk Events*, which exist across Asset Markets as witnessed during the recent Global Credit Crises of 2007-2009.

- The third limitation is with respect to **the interpretation and application of results**. The reach of this research is intended to be global, however asset volatility cycles in all markets differ from one another and hence overseas applications remain subject to both Systematic and /or Systemic Risk Constraints.

4. Data Analyses and Concluding Remarks

The data analyses and research findings show that Market Risk Characteristics among Islamic and Conventional Stocks in context of Pakistani Capital Markets have '*notable'* and '*quantifiable'* differences as distinctly measured by the two VaR Methods for the three given confidence intervals ***(as shown in the tables 1.1 and 1.2*)**.

As we can see from the various equity market risk measurements generated through our VaR methods, the Historical Simulation Model better captures presence of fatter tails (ie *large extreme losses*) within the context of KSE 100 Index and outperforms the VCV – Variance Covariance Model of calculation, when we're specifically applying confidence intervals of 99% and 95%. However what remains noteworthy is that the Historical Simulation Model underperforms the VCV Model, when a confidence interval of 90% is used to calculate VaR of all stocks (***as presented in table 1.3***).

This summarizes our understanding in the light of results that Historical Simulation Model is more suitable for Market Risk Modeling at higher confidence intervals, whereas the VCV Model is better suited to meet Market VaR Model building requirements at a lower confidence interval such as 90%.

To meet the primary research objective, which is to evaluate whether there is or is not any market risk difference in terms of characteristics among Islamic and Conventional Stocks enlisted on the KSE 100 Index, we have assigned percentiles as a methodology to divide our both groups of equity securities into different VaR categorization levels as per each model and confidence intervals used in this technical study. To attain this differentiation by means of classification, we have used the 90^{th}, 75^{th}, 50^{th}, 25^{th} and 10^{th} percentiles respectively **(*as shown in the table 1.4*).**

The results we analyze in the empirical light of *various percentiles (as they applied distinctly to both VaR Models/Methods under set of three different confidence intervals each*) reveals that Islamic Listed Stocks by and large on all counts are proven less '*risky in Market Risk Terms'* in comparison to Conventional Listed Stocks within the KSE 100 Index as observed over the selective time period ***(as shown in the table 1.5).***

To scientifically validate and test the *Null Hypothesis*, I have used the two independent sample *z test statistic* which is used to determine if two *population means are equal or unequal*. We assume that the populations are not normally distributed. All *population variances* are known and due to the large sample size the *central limit theorem* is in effect. *Significance Level* of 5% (0.05) is selected to undertake a *two tail test* across all experiments. From the test statistic results we can confidently assert ***that Market Risk Difference among Islamic and Conventional Stocks does exist and hence the Null Hypothesis stands rejected under all given scenarios (as shown in the tables 2.1, 2.2 and 2.3 of section III of the Appendix Section)***.

Hence the concluding remarks are that portfolio investors should invest more in Islamic Stocks in particular and should consider allocating greater financial resources to this particular segment of the Pakistani Capital Markets from a Market Risk Perspective. The Value at Risk Model which should ideally be used by risk practioners to calculate market risk should be the Historical Simulation Method, preferably at a higher confidence interval of 99% or more. That would enable the investors to better capture extreme tail events, confidently forecast unexpected stock losses, developed more forward looking hedging strategies, apply better designed stop loss limits and avoid overall classic market risk model backtesting failures.

References and Bibliography

[1]Akhtar, Shumi, Jahromi, Maria, and John, Kose, n.d.," ***Intensity of Volatility Linkages in Islamic and Conventional Markets",*** *Australian National University and University of New York, pp.1-48.*

*[2]Ahmed, Abdul Rahman Yousri, n.d., "****Islamic Securities in Muslim Countries Stock Markets and an Assessment of The Need For An Islamic Secondary Market"****, IRTI, pp. 1-47.*

*[3]Anwar, Muhammad, 1995, "****An Islamic Perspective on Capital Markets and Islamic Securities in Malaysia****", Vol. 34:4, Part II, pp. 865-878.*

*[4]Ali, Syed Salman, 2005, "****Islamic capital products: developments and challenges",*** *IDB, occasional paper number 9, pp. 1-92.*

*[5]Bacha, Obiyathulla Ismath, 2004, "****Value Preservation through Risk Management. A Shariah Compliant Proposal For Equity Risk Managemen****t", INCEIF the Global University in Islamic Finance, Malaysia, pp. 3-34, Online at http://mpra.ub.uni-muenchen.de/12632/ MPRA Paper No. 12632, posted 12. January 2009 10:27 UTC.*

*[6]Bellalah Mondher, Rehman, Asma Abdul and Masood,Omar, 2013, "****Syariah Compliant Screening Practises",*** *Thema working Paper n°2013-16, Theory of economic, models and application, Université de Cergy Pontoise, France,pp.1-19.*

*[7] Cognizant January 2012, "****Sharia Stock Screening: A Fund Manager's Conundrum****", Cognizant 20-20 insights, pp. 1- 10, available online at www.cognizant.com*

*[8]Cassidy, Colleen and Gizycki, Marianne, 1997, "****Measuring Traded Market Risk: Value-At-Risk and Backtesting Techniques",*** *Research Discussion Paper - 9708, Reserve Bank of Australia, pp. 1-37.*

*[9]Campbell, Sean D., 2005, "****A Review of Backtesting and Backtesting Procedures****", Finance and Economics Discussion Series, Federal Reserve Board, Washington, D.C., pp.1-23.*

*[10]Cheung, Yun Hsing and Powell, Robert J., 2012, "****Anybody can do Value at Risk: A Nonparametric Teaching Study"****, Australasian Accounting Business and FinanceJournal,6(1),pp.111-123, Available at: http://ro.uow.edu.au/aabfj/vol6/iss1/16*

*[11]El-Gari, Mohamed Ali****, n.d.,"Towards An Islamic Stock Market",*** *Department of Economics, King Abdul-Aziz University****, pp.1-26.***

*[12]Escanciano, Juan Carlos, 2007, "****Backtesting Parametric Value-at-Risk with Estimation Risk"****, CAEPR Working Paper, pp. 1-38, http://ssrn.com/abstract=975104*

*[13]Farid, Aslam and Ashraf, Javed, 1995, "****Volatility at Karachi Stock Exchange****", PDR, Vol. 34:4, Part II, pp. 651-657.*

*[14]Harper, David, 2013, "****Value at Risk Models****",www.investopedia.com/articles /04/092904.asp*

*[15]Herwany, Aldrin and Febrian, Erie, 9-11 September 2013, "****Growth, Equity and Stability: An Islamic Perspective****", THE NINTH INTERNATIONAL CONFERENCE ON ISLAMIC ECONOMICS AND FINANCE (ICIEF), Turkey, pp.1-36,* ***Electronic copy available at: http://ssrn.com/abstract=2331803****.*

*[16] Hayat, Raphie and Kraeussl, Roman, (2011),"****Risk and return characteristics of Islamic equity funds",*** *Emerging Markets Review, vol. 12, pp. 189–203, www.elsevier.com/locate/emr*

*[17] Hakim, Sam and Rashidian, Manochehr, 2004****, "How costly is Investors' Compliance With Sharia?",*** *Working Paper 0414 presented at the ERF Eleventh Annual Conference. Beirut, Lebanon, pp 1-12.*

*[18] Hayat****,*** *Raphie, 2006 "****An Empirical Assessment of Islamic Equity Fund Returns",*** *Free University, Amsterdam, Master Study,* ***pp. 1- 69.***

[19] Hussein, Khaled A., n.d., ***"Islamic Investment: Evidence From Dow Jones and FTSE Indices",*** *Islamic Research and Training Institute/ Islamic Development Bank pp. 1-14.*

*[20] Hashim, Noor, 2008****. "The FTSE Global Islamic and the Risk Dilemma"****, AIUB Bus Econ Working Paper Series, American International University-Bangladesh (AIUB), VolNo2008-08, pp. 1-21.*

*[21]Hussein, Khaled A., 2004, "**Ethical Investment: Empirical Evidence from FTSE Islamic Index"** Islamic Economic Studies, Vol. 12, No. 1, pp. 21-40.*

*[22] Husain, Fazal and Uppal, Jamshed, 1998, "**Distribution of stock returns in an emerging market**", Pakistan Economic and Social Review, Vol. XXXVI: No.1, pp. 47-72.*

*[23] Husain, Fazal and Uppal, Jamshed, 1999, **"Stock Returns Volatility in an emerging market: The Pakistani Evidence",** Pakistan Journal of Applied Economics, Vol. 15 –No1 &2, pp.19-40.*

[24] Hearne Scientific Software, 2013. EViews Software. www.hearne.com.au/software/EViews

*[25] Ismail, Rohaida, Sanusi, Zuraidah Mohd., Hudayati, Ataina and Harjito, Agus, n.d., **"Screening process of shariah-compliant companies: enterprise risk management practices and shariah criteria"**, MARA University of Technology and Universiti Islam Indonesia, pp.1-16.*

*[26] IFSB December 2005,"**Guiding Principles of Risk Management for Institutions (Other Than Insurance Institutions) Offering Only Islamic Financial Services**", pp. 1-32.*

*[27] Iqbal, Javed, Azher, Sara and Ijaz, Ayesha, 2010, **"Predictive Ability of Value-at-Risk Methods: Evidence from the Karachi Stock Exchange-100 Index",** EERI-Economics and Econometrics Research Institute, pp. 1-19.*

*[28] ISRA 2013, "**Risk Management in Islamic Finance"** by Assoc Prof. Dr. Mohamad Akram Laldin Executive Director. www.**isra**.my/*

*[29] Jamal,Jasri, Hambali,Naaishah and Ali,Hasani Mohd,2010,"**Islamic capital market and Shari'ah screening in Malaysia",** International Research Symposium in Service Management, Paper type:Conceptual paper,ISSN 1694-0938, Le Meridien Hotel, Mauritius, pp. 1-16.*

*[30] Jabeen, Hummaira and Dars, Javaid, n.d., "**Comparison between Islamic and Conventional Mutual Funds in Pakistan",** Department of Management Sciences, ISRA University, pp. 1- 26*

*[31] Kassab, Sameh, 2013, "**Modeling volatility stock market using the ARCH and GARCH models: comparative study between an Islamic and a conventional index (SP Sharia VS SP 500)**", European Journal of Banking and Finance, Vol.10, pp.72-77.*

*[32] Khilji, Nasir M., 1993, "**The Behavior of stock returns in an Emerging Market: A case study of Pakistan**", PDR, Vol. 32:3, Part II, pp. 593-604.*

*[33] Kholid, Muhamad and Sukmana, Dr.Raditya, n.d.,"**Impact of global financial crisis on Islamic and conventional stocks in emerging market: an application of ARCH and GARCH method",** Airlangga University, Surabaya, Indonesia, pp.1-11.*

*[34] Khatkhatay. H.M. and Nisar, Shariq, 2007,"**Shariah Compliant Equity Investments: An Assessment Of Current Screening Norms**", Islamic Economic Studies, Vol. 15, No. 1, pp. 47-76.*

*[35] Kia, Amir, (1421 A.H / 2001 A.D),"**Speculative Activities, Efficiency and Normative Stock Exchange",** J.KAU: Islamic Econ., **Vol. 13**, pp. 31-50.*

*[36] Khan, Tariqulah and Ahmed, Habib, (1422H/2001), **"Risk Management: An Analysis of Issues In Islamic Financial Industry", Occasional** Paper No. 5, IRTI, IDB, pp. 1-193.*

*[37] Khamlichi, Abdelbari EL, SannaJust, Aurélie and Sarkar, Hamayun Kabir, n.d., "**Islamic Equity Indices: Insight and Comparison with Conventional Counterparts",** Clermont University and the Global University of Islamic Finance (INCEIF) Kuala Lumpur, Malaysia, pp. 1-18.*

*[38] Mudakkar, Dr. Syeda Rabab and Uppal, Dr. Jamshed Y., n.d., **"Risk Management in Financial Services Sector - Applicability and Performance of VAR Models in Pakistan",** pp. 1-17.*

*[39] Mckinsey, 2012, "**Managing Market Risk: Today and tomorrow"**, McKinsey Working Papers on Risk, Number 32, pp. 1-16.*

*[40] Mannan, M.A., 1993, "**Understanding Islamic finance – a study of the securities market In an Islamic framework"**, IDB/ IRTI Research paper number 18, pp. 1-114.*

*[41] Meezan Group, Al, 2013,"**What is KMI 30**", URL: www. http://www.almeezangroup.com*

*[42] Nieto, María Rosa and Ruiz, Esther, 2008, "**Measuring Financial Risk: Comparison of Alternative Procedures to Estimate VaR and ES"**, Universidad Carlos III de Madrid, Statistics and Econometrics Series 26, Working Paper 08-73, pp. 1-42.*

*[43] Nieppola, Olli, 2009, "**Backtesting Value - at - Risk Models"**, Master's Study in Economics, Helsinki School of Economics, pp. 1-78.*

*[44] Nawaz, Faisal and Afzal, Muhammad, 2011, **"Value at risk: Evidence from Pakistan Stock Exchange",** African Journal of Business Management Vol. 5(17), pp. 7474-7480, Available online at http://www.academicjournals.org/AJBM*

*[45] Nawazish, Mirza and Sara, Saeed Mawal, 2012, **"Time Varying Stock Market Volatility: The Case of an Emerging Market",** Research Journal of Recent Sciences, Vol. 1(11), pp.41-46, Available online at: www.isca.in*

*[46] Nishat, Mohammed, 2002, "**Experience of Equity-based Islamic Shares in Pakistan**", The Pakistan Development Review 41:4 Part II, pp. 583–608.*

*[47] Osmani, Dr. Noor Mohammad and Abdullah, Md. Faruk n.d.,"**Towards an Islamic Stock Market**: **A review of Classical and Modern Literatures",** IRKHS, International Islamic University Malaysia, pp. 1-9.*

*[48]Obaidullah, Mohammed, n.d.,"**Islamic Risk Management: Towards Greater Ethics and Efficiency"**, International Journal of Islamic Financial Services, Volume 3: Number 4, pp. 1-18.*

*[49] Obaidullah, Mohammed n.d., **"Ethics and Efficiency in Islamic Stock Markets",** International Journal of Islamic Financial Services, Volume 3, No.2, pp. 1-10.*

*[50] Pitluck, Aaron Z., 2008, "**Moral Behavior in Stock Markets: Islamic finance and socially responsible Investment"**, Illinois State University, Normal, pp. 1-30, Online at http://mpra.ub.uni-muenchen.de/9477/MPRA Paper No. 9477, posted 8. July 2008 00:51 UTC.*

*[51] Romli, Nurhanani, Sulaiman, Ahmad Azam Mohamad, Yusof, Mohd Faiz Mohamed, 2012,"**Volatility analysis of FTSE Bursa Malaysia: Study of the problems of Islamic stock market speculation in the period 2007 to 2010**", African Journal of Business Management, Vol.6 - (29), pp. 8490-8495, Available online at http://www.academicjournals.org/AJBM*

*[52] Shaikh, Salman Ahmed, 2010, **"Analysis of Stock Screening Principles in Islamic Mutual Funds Industry**", SZABIST, pp.1-13, Online at http://mpra.ub.uni-muenchen.de/19755/MPRA Paper No. 19755, posted 04. January 2010 / 08:27*

*[53] Setiawan, Chandra and Oktariza, Hesty, 2013. "**Syariah and Conventional Stocks Performance of Public Companies Listed on Indonesia Stock Exchange",** Journal of Accounting, Finance and Economics, Vol.3.No. 1, pp.51-64.*

*[54] Seibel, Hans Dieter and Imady, Omar (2006), "**Principles and Products of Islamic Finance**", The Open Access Publication Server of the ZBW – Leibniz Information Centre for Economics, Working paper / University of Cologne, Development Research Center, Vol. No.2006-1, pp. 1-6, www.econstor.eu.*

*[55] S. A. Z, Haider, R. U , Ashraf and M., Ramzan, (Sep, 2012),"**Analysis of KMI-30 Islamic Market Index of Pakistan: Enter or Exit Decisions of Shariah Advisory Board"**, International Poster Journal of Science and Technology, Biomass Convention Research Center, ISSN: 2224-5618 Volume 2, Issue 2, Poster No. 08 , pp. No. 51-60.*

*[56] Suwailem, Sami al, 2006. **"Hedging in Islamic Finance"**, occasional paper number 10, IDB, pp.1-149.*

*[57] Thomas, Abdulkader,n.d., based upon the work of Bryan Kraty, Stella Cox and Lawrence Oliver with Mustafa Hussain, "**Introduction: the origins and nature of the Islamic financial market"**, www.euromoneybooks.com*

*[58] Tag el-Din, Seifuddin I., (1996), "**Characterizing the Stock-Exchange from an Islamic Perspective",** JKAU: Islamic Economics, J.KAU: Islamic Econ., Vol. 8, pp. 55-66.*

*[59] Taj El-Din, Seif El-Din I., (1422 A.H / 2002 A.D), **"Towards an Islamic Model of Stock Market*,** J.KAU: Islamic Econ., The Islamic Foundation, Vol. 14, pp. 3-29.*

*[60] Tag el-Din, Seifuddin I., (1412 A.H./1992 A.D.), "**Debt and Equity in a Primary Financial Market: A Theory with Islamic Implications**", JKAU: Islamic Econ., **Vol. 4**, pp. 3-34. http://**islamic**center.**kau**.edu.sa/arabic/Magallah/Pdf/**4**/04-Seif_07.pdf*

*[61] Yusof, Rosylin Mohd. and Majid, M. Shabri Abd., 2007 A.D./1428 A.H., "**Stock Market Volatility Transmission in Malaysia: Islamic Versus Conventional Stock Market",** J.KAU: Islamic Econ., Vol. **20**, No. 2, pp: 17-35.*

Appendix Sections

- ✓ ***Section I: Operational Definition /Instrumentation of Theoretical Concepts***
  Figure1.1: Process Flow as shown in the Experiment Design

Section II : KMI 30 and KSE Indices

- ***A. KMI 30 Index composition- http://thefinancialdaily.com***
- ***B. KSE 100 Stocks Codes***

Section III : List of Tables of VaR Calculations

Section IV: Hypothesis Testing Model

Section I

Figure1.1: Process Flow as shown in the Experiment Design

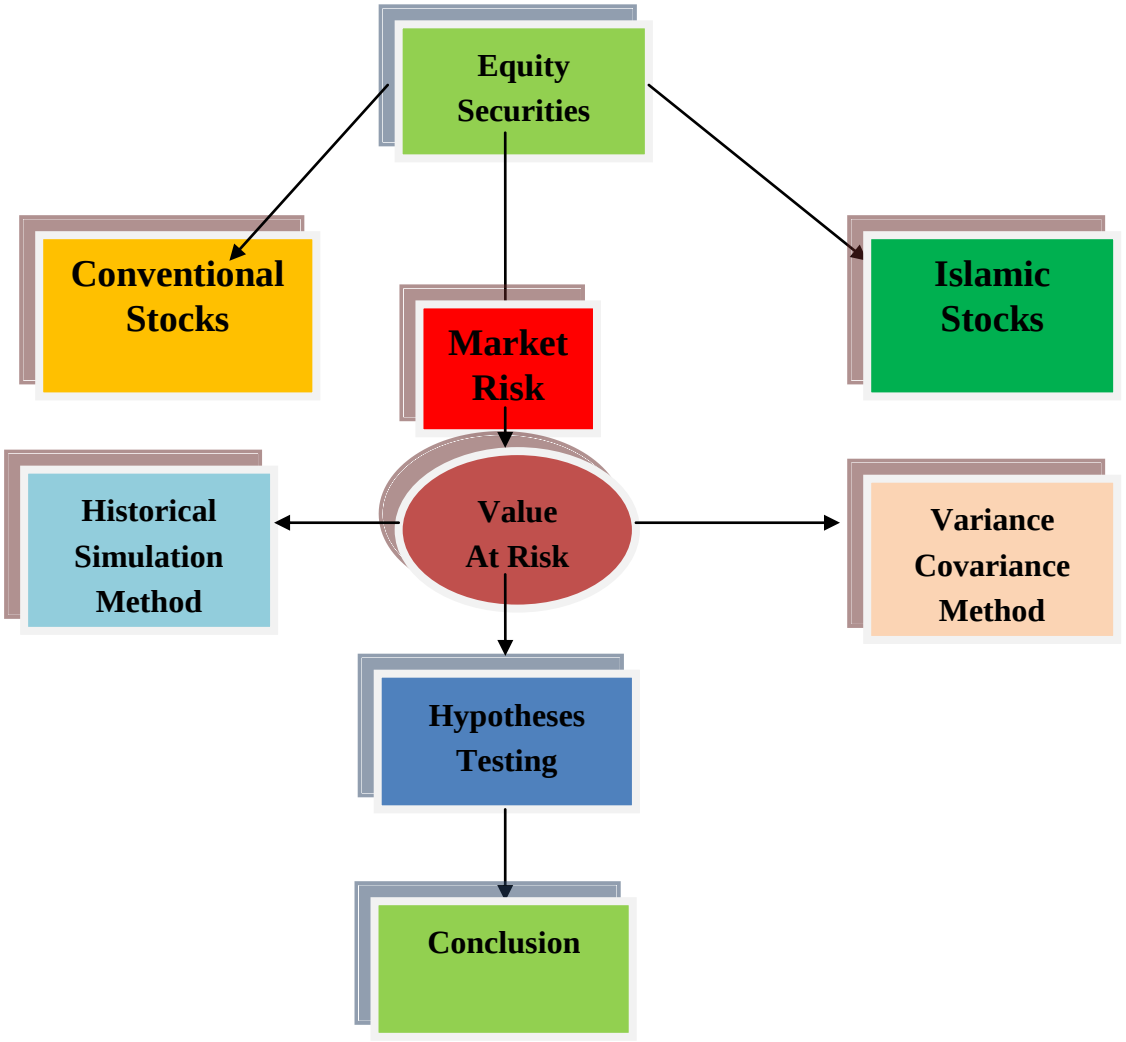

Fig 1.1: *The Leading instrumental operators that shall guide the overall research objectives, experiment design and methods are:* ***Historical Simulation VaR, Variance-Covariance VaR, Market Risk, Islamic and Conventional Equity Securities***

Section II

A. Companies in KMI-30 Index

Al Meezan Investment Management, a subsidiary of Meezan Bank in collaboration with Karachi Stock Exchange has introduced in Pakistan the first co-branded Islamic index of listed companies - KSE Meezan Index. The objective is to provide investors with a suitable benchmark for comparing returns on their Shariah compliant investments.

The Index comprises of 30 companies that qualify the Shariah screening criteria and are weighted by float adjusted market capitalization. An individual security weightage is capped at 12% at the time of recomposition. An index policy committee comprising of Al Meezan Investments and KSE representatives will review, recompose and rebalance the Index bi-annually. Al Meezan Investments has the mandate for Shariah screening of stocks to be included in the Index using principles prescribed by Shariah Supervisory Board of Meezan Bank which is chaired by eminent Shariah scholar Justice (Retd.) Mufti Muhammad Taqi Usmani. KSE Meezan Index is a total return Index based on free float methodology.

The index will be maintained and disseminated by Karachi Stock Exchange. The Shariah screening criteria set by the Shariah Supervisory Board is as follows: -

***1)** Nature of business of the investee company should be Halal.*

***2)** The total interest bearing debt of the Investee Company should not exceed 40% of the total assets.*

***3)** The total illiquid assets of the Investee Company as a percentage of the total assets should be at least 20 per cent.*

***4)** The total investment of the Investee Company in Shariah non-compliant business should not exceed 33% of its total assets.*

***5)** The income from Shariah non-compliant investment should not exceed 5% of the gross revenue of the Investee Company. (Gross revenue means gross sales plus other income).*

***6)** The net liquid assets per share should be less than the market price of the share.*

Companies in KMI-30 Index

- ***OGDC***
- ***Pak Petroleum***
- ***Fauji Fertilizer***
- ***Pak Oilfields***
- ***PSO***
- ***Engro Chemicals***
- ***PTCL***
- ***Hub Power***
- ***Lucky Cement***
- ***Fauji Fertilizer Bin Qasim***
- ***Dawood Hercules***
- ***D. G. K. Cement***
- ***Unilever***
- ***National Refinery***
- ***Nishat Mills***
- ***Attock Refinery***
- ***SNGPL***
- ***SSGC***
- ***GlaxoSmith***
- ***ICI***
- ***Fauji Cement***
- ***Shell Pakistan***
- ***Indus Motor***
- ***Pak Suzuki***

- ***Bankislami Pak***
- ***Bosicor Pakistan***
- ***Maple Leaf Cement***
- ***Mari Gas Company***
- ***Crescent Steel***
- ***Pak Refinery***

Source http://thefinancialdaily.com/NewsSearchResult/NewsSearchDetail.aspx?NewsId=63777

B. KSE 100 Index Stocks – Codes and Company Titles

Commercial Banks		(18 companies)
Symbol	Company Name	Outstanding Shares
NIB	NIB Bank Limited	10,302,851,164
SCBPL	Standard Chartered Bank Limited	3,871,585,021
NBP	National Bank Of Pakistan	2,127,512,862
BAFL	Bank Al-Falah Limited	1,349,156,250
HBL	Habib Bank Limited	1,333,502,280
UBL	United Bank Limited	1,224,179,688
JSBL	JS Bank Limited	1,072,464,262
HMB	Habib Metropolitan Bank Limited	1,047,831,480
ABL	Allied Bank Limited	1,040,976,210
MCB	MCB Bank Limited	1,011,846,139
BAHL	Bank Al-Habib Limited	1,010,386,745
MEBL	Meezan Bank Limited	1,002,737,867
SNBL	Soneri Bank Limited	1,002,239,549
FABL	Faysal Bank Limited	927,350,803
BOK	Bank Of Khyber Limited	900,262,030
AKBL	Askari Bank Limited	813,071,084
BOP	Bank Of Punjab Limited	528,797,376
BIPL	Bankislami Pakistan Limited	527,968,000
Oil and Gas		(9 companies)
Symbol	Company Name	Outstanding Shares
OGDC	Oil and Gas Development Company Limited	4,300,928,400
PPL	Pakistan Petroleum Limited	1,643,095,013
PSO	Pakistan State Oil Company Limited	246,987,217
POL	Pakistan Oilfields Limited	236,545,920
MARI	Mari Petroleum Company Limited	91,875,000
SHEL	Shell Pakistan Limited	85,609,864
ATRL	Attock Refinery Limited	85,293,000
NRL	National Refinery Limited	79,966,560
APL	Attock Petroleum Limited	69,120,000
Fixed Line Telecommunication		(1 company)
Symbol	Company Name	Outstanding Shares
PTC	Pakistan Telecommunication Company Limited	3,774,000,000

Electricity		(6 companies)
Symbol	Company Name	Outstanding Shares
KESC	Karachi Electric Supply Company Limited	2,266,215,300
HUBC	Hub Power Company Limited	1,157,154,400
KAPCO	Kot Addu Power Company Limited	880,253,228
NCPL	Nishat Chunian Power Limited	367,346,939
NPL	Nishat Power Limited	354,088,500
KOHE	Kohinoor Energy Limited	169,458,600
Chemicals		(8 companies)
Symbol	Company Name	Outstanding Shares
FATIMA	Fatima Fertilizer Company Limited	2,100,000,000
FFC	Fauji Fertilizer Company Limited	1,272,238,147
FFBL	Fauji Fertilizer Bin Qasim Limited	934,110,000
ENGRO	Engro Corporation Limited	511,269,370
DAWH	Dawood Hercules Corporation Limited	481,287,124
AHCL	Arif Habib Corporation Limited	453,750,000
ICI	I.C.I. Pakistan Limited	92,359,050
CPL	Clariant Pakistan Limited	34,118,229
Construction and Materials (Cement)		(7 companies)
Symbol	Company Name	Outstanding Shares
FCCL	Fauji Cement Company Limited	1,331,115,839
LPCL	Lafarge Pakistan Cement Limited	1,312,644,488
DGKC	D.G. Khan Cement Company Limited	438,119,097
LUCK	Lucky Cement Limited	323,375,000
ACPL	Attock Cement (Pakistan) Limited	99,584,755
CHCC	Cherat Cement Company Limited	95,580,094
JVDC	Javedan Corporation Limited	58,128,172
Multiutilities (Gas and water)		(2 companies)
Symbol	Company Name	Outstanding Shares
SSGC	Sui Southern Gas Company Limited	880,916,400

SNGP	Sui Northern Gas Pipelines Limited	634,216,666
Food Producers		(6 companies)
Symbol	Company Name	Outstanding Shares
EFOODS	Engro Foods Limited	763,890,575
JDWS	J.D.W. Sugar Mills Limited	59,776,661
NESTLE	Nestle Pakistan Limited	45,349,551
NATF	National Foods Limited	41,443,350
ULEVER	Unilever Pakistan Limited	13,293,869
RMPL	Rafhan Maize Products Limited	9,236,400
Financial Services		(1 company)
Symbol	Company Name	Outstanding Shares
JSCL	Jahangir Siddiqi Company Limited	763,285,323
Personal Goods (Textile)		(5 companies)
Symbol	Company Name	Outstanding Shares
ANL	Azgard Nine Limited	449,349,439
NML	Nishat Mills Limited	351,599,848
NCL	Nishat Chunian Limited	181,986,028
COLG	Colgate Palmolive (Pakistan) Limited	43,595,395
BATA	Bata Pakistan Limited	7,560,000
Industrial metals and Mining		(2 companies)
Symbol	Company Name	Outstanding Shares
ISL	International Steels Limited	435,000,000
INIL	International Industries Limited	119,892,600
Support Services		(1 company)
Symbol	Company Name	Outstanding Shares
TRG	TRG Pakistan Limited	385,390,665
Household Goods		(1 company)
Symbol	Company Name	Outstanding Shares
FML	Feroze 1888 Mills Limited	376,800,968
Equity Investment Instruments		(3 companies)
Symbol	Company Name	Outstanding Shares
JSGF	JS Growth Fund	318,004,463
PGF	PICIC Growth Fund	283,500,000
ARM	Allied Rental Modaraba	97,500,000
Non Life Insurance		(5 companies)

Symbol	Company Name	Outstanding Shares
PAKRI	Pakistan Reinsurance Company Limited	300,000,000
JGICL	Jubilee General Insurance Company Limited	136,443,636
EFUG	EFU General Insurance Limited	125,000,000
AICL	Adamjee Insurance Company Limited	123,704,543
IGIIL	IGI Insurance Limited	111,535,937
Pharma and Bio Tech		(2 companies)
Symbol	Company Name	Outstanding Shares
GLAXO	GlaxoSmithKline (Pakistan) Limited	289,515,706
ABOT	Abbot Laboratories (Pakistan) Limited	97,900,302
Real Estate Investment and Services		(1 company)
Symbol	Company Name	Outstanding Shares
PACE	Pace (Pakistan) Limited	278,876,604
Tobacco		(1 company)
Symbol	Company Name	Outstanding Shares
PAKT	Pakistan Tobacco Company Limited	255,493,600
Technology Hardware and Equipment		(1 company)
Symbol	Company Name	Outstanding Shares
TPL	TPL Trakker Limited	217,248,963
General Industrials		(5 companies)
Symbol	Company Name	Outstanding Shares
GHGL	Ghani Glass Mills Limited	117,351,434
PKGS	Packages Limited	84,379,504
THALL	Thal Limited	81,029,917
TRIPF	Tri-Pack Films Limited	30,000,000
SIEM	Siemens Pakistan Engineering Co. Limited	8,247,037
Industrial Transportation		(1 company)
Symbol	Company Name	Outstanding Shares
PICT	Pakistan International Container Terminal Limited	109,153,152
Life Insurance		(1 company)
Symbol	Company Name	Outstanding Shares

EFUL	EFU Life Assurance Limited	100,000,001
Automobile and Parts		(3 companies)
Symbol	Company Name	Outstanding Shares
PSMC	Pak Suzuki Motor Company Limited	82,299,851
INDU	Indus Motor Company Limited	78,600,000
AGIL	Agriautos Industries Limited	28,800,000
Software and Computer Services		(1 company)
Symbol	Company Name	Outstanding Shares
NETSOL	NetSol Technologies Limited	78,571,703
Health Care Equipment and Services		(1 company)
Symbol	Company Name	Outstanding Shares
SHFA	Shifa International Hospitals Limited	50,513,800
Media		(1 company)
Symbol	Company Name	Outstanding Shares
HUMNL	Hum Network Limited	50,000,000
Forestry (Paper and Board)		(1 company)
Symbol	Company Name	Outstanding Shares
SEPL	Security Paper Limited	41,149,992
Engineering		(1 company)
Symbol	Company Name	Outstanding Shares
MTL	Millat Tractors Limited	40,265,947
Travel and Leisure		(1 company)
Symbol	Company Name	Outstanding Shares
PSEL	Pakistan Services Limited	32,524,250
Electronic and Electrical Goods		(1 company)
Symbol	Company Name	Outstanding Shares
PCAL	Pakistan Cables Limited	28,462,376
Beverages		(1 company)
Symbol	Company Name	Outstanding Shares
MUREB	Murree Brewery Company Limited	20,957,296
Lesiure Goods (Miscellaneous)		(1 company)
Symbol	Company Name	Outstanding Shares

GRAYS	Grays Of Cambridge (Pakistan) Limited	7,348,950

KSE Stocks: *As on November 23rd, 2013 there are 579 companies listed in KSE and the total market capitalization is Rs. 5,399.109 billions. The listing is done on the basis of strict rules and regulations laid out by Securities Exchange Commission of Pakistan (SECP) & Karachi Stock Exchange (Guarantee) Limited. All the listed companies are categorized in various main business sectors. There are total 36 sectors listed on Karachi Stock Exchange. Out of these, 32 sectors contribute towards the market capitalization and all the listed companies (excluding their future contracts) are divided among these. The KSE-100 Index was introduced in November 1991 with base value of 1,000 points. The Index comprises of 100 companies selected on the basis of sector representation and highest market capitalization, which captures over 90% of the total market capitalization of the companies listed on the Exchange. Out of the above mentioned 36 Sectors, 32 companies are selected ie one company from each sector (excluding the non market capitalization contributing sectors) on the basis of the largest market capitalization and the remaining 68 companies are selected on the basis of largest market capitalization in descending order. This is a total return index ie dividend, bonus and rights are adjusted.*

Source: ***http://ksestocks.com/AboutKSE***

Section III

Table – 1.1 (Daily) Value at Risk Metrics of Islamic Stocks enlisted on the KSE 100 Index

	HS VaR			*VCV VaR*		
STOCK	***CI 99%***	***CI 90%***	***CI 95%***	***CI 99%***	***CI 90%***	***CI 95%***
OGDC	4.87%	2.07%	3.17%	4.05%	2.23%	2.87%
FFC	4.87%	2.00%	2.86%	3.85%	2.12%	2.72%
PPL	4.88%	1.72%	2.72%	3.92%	2.16%	2.77%
POL	5.92%	1.78%	3.20%	4.56%	2.51%	3.22%
HUBC	5.04%	1.76%	2.96%	4.32%	2.38%	3.05%
PSO	5.87%	1.85%	3.50%	5.06%	2.79%	3.58%
LUCK	6.52%	2.35%	4.19%	5.45%	3.00%	3.85%
KESC	13.26%	3.39%	5.99%	9.65%	5.32%	6.83%
DGKC	8.51%	2.91%	4.83%	6.39%	3.52%	4.52%
NML	8.86%	2.89%	4.78%	6.29%	3.47%	4.45%
EFOODS	10.54%	3.53%	4.87%	6.31%	6.30%	6.30%
FFBL	7.31%	2.02%	3.37%	5.04%	2.77%	3.56%
MTL	6.65%	1.77%	3.38%	4.29%	2.36%	3.03%
PKGS	9.13%	2.24%	4.60%	6.02%	3.32%	4.26%
INDU	9.24%	2.11%	4.20%	5.76%	3.17%	4.07%
NRL	7.72%	2.26%	4.20%	5.87%	3.23%	4.15%
ABOT	6.14%	2.03%	3.67%	4.74%	2.61%	3.35%
ATRL	9.95%	3.46%	4.87%	7.13%	3.93%	5.04%
CHCC	9.22%	3.05%	4.84%	6.82%	3.76%	4.82%
GLAXO	6.04%	1.64%	3.23%	4.61%	2.54%	3.26%
PSMC	7.08%	2.31%	4.07%	5.69%	3.14%	4.03%
LPCL	13.01%	2.99%	5.95%	9.74%	5.36%	6.89%
ACPL	7.56%	2.15%	3.90%	5.2%	2.8%	3.7%
MARI	8.7%	3.0%	4.9%	6.1%	3.4%	4.3%
SHEL	5.76%	1.51%	2.99%	4.53%	2.50%	3.21%
ICI	4.88%	2.74%	4.29%	5.11%	2.82%	3.61%
MAXIMUM	**13.26%**	**3.53%**	**5.99%**	**9.74%**	**6.30%**	**6.89%**
MINIMUM	**4.87%**	**1.51%**	**2.72%**	**3.85%**	**2.12%**	**2.72%**
AVERAGE	**7.60%**	**2.36%**	**4.06%**	**5.63%**	**3.21%**	**4.05%**

Islamic Stock VaR Metrics: *The above table presents Islamic Stocks (enlisted on the KSE 100 Index) VaR Summary Metrics by applying the Historical Simulation and Variance-Covariance Calculation Methods /Models. Three different confidence intervals of 99%, 95% & 90% are applied distinctly to each model respectively in this study.*

Table 1.2 - (Daily) Value at Risk Metrics of Conventional Stocks Enlisted on the KSE 100 Index

	HS VaR			VCV VaR		
STOCK	CI 99%	CI 90%	CI 95%	CI 99%	CI 90%	CI 95%
MCB	8.380%	2.323%	4.737%	5.940%	3.272%	4.200%
ULEVER	5.121%	1.677%	3.097%	3.855%	2.124%	2.726%
ENGRO	7.320%	2.435%	4.430%	5.574%	3.071%	3.941%
UBL	7.148%	2.485%	4.248%	5.441%	2.997%	3.847%
NBP	6.812%	2.263%	4.411%	5.490%	3.024%	3.881%
BAHL	5.037%	1.450%	2.725%	3.840%	2.115%	2.715%
NESTLE	9.902%	2.004%	4.321%	5.455%	3.005%	3.857%
HBL	7.242%	1.667%	3.578%	5.206%	2.868%	3.681%
PTC	7.073%	2.259%	3.932%	5.667%	3.122%	4.007%
BAFL	7.009%	2.460%	4.369%	5.936%	3.270%	4.197%
KAPCO	4.819%	1.390%	2.519%	3.637%	2.004%	2.572%
DAWH	9.355%	2.863%	4.775%	6.223%	3.428%	4.400%
FCCL	10.127%	2.628%	4.483%	7.051%	3.884%	4.985%
COLG	8.442%	2.657%	4.678%	5.645%	3.110%	3.991%
HMB	6.124%	1.842%	3.529%	4.760%	2.622%	3.366%
PSEL	9.688%	1.944%	4.780%	6.406%	3.529%	4.530%
FATIMA	7.095%	2.204%	3.652%	4.783%	2.635%	3.382%
ABL	7.558%	2.152%	4.202%	5.980%	3.294%	4.228%
AICL	9.207%	3.184%	4.871%	6.881%	3.791%	4.865%
AKBL	7.418%	2.291%	4.154%	5.776%	3.182%	4.084%
EFUG	10.240%	3.122%	4.872%	7.005%	3.859%	4.953%
APL	5.370%	1.889%	3.638%	4.360%	2.402%	3.083%
FML	12.098%	0.000%	2.469%	7.019%	3.867%	4.963%
AKBL	7.418%	2.291%	4.154%	5.776%	3.182%	4.084%
EFUG	10.240%	3.122%	4.872%	7.005%	3.859%	4.953%
SNBL	9.521%	2.429%	4.363%	6.632%	3.653%	4.689%
NATF	11.674%	3.536%	4.875%	6.818%	3.756%	4.821%
PGF	7.730%	2.044%	3.207%	6.490%	3.575%	4.589%
JSCL	14.243%	4.852%	6.010%	9.348%	5.150%	6.610%
IGIIL	9.114%	2.625%	4.767%	6.844%	3.770%	4.839%
NCPL	6.797%	2.100%	3.217%	4.404%	2.426%	3.114%
NPL	6.670%	2.100%	3.694%	5.031%	2.771%	3.557%
NCL	11.010%	3.285%	5.554%	7.401%	4.077%	5.233%
NIB	14.303%	3.009%	5.232%	8.867%	4.885%	6.269%
TRG	16.873%	3.922%	7.351%	11.812%	6.507%	8.352%
SSGC	7.315%	2.229%	4.299%	5.434%	2.993%	3.842%
SCBPL	9.225%	2.543%	4.431%	6.697%	3.690%	4.735%
THALL	7.336%	2.573%	4.470%	5.327%	2.934%	3.766%

MUREB	8.039%	2.653%	4.693%	5.506%	3.033%	3.893%
FABL	8.823%	2.168%	4.106%	6.646%	3.661%	4.699%
LOTCHEM	12.024%	2.823%	5.322%	8.480%	4.672%	5.996%
BATA	9.758%	3.097%	4.871%	6.360%	3.504%	4.497%
PAKRI	11.783%	3.950%	4.998%	7.763%	4.277%	5.489%
AHCL	8.460%	3.364%	4.854%	6.571%	3.620%	4.646%
BOP	11.233%	2.943%	5.046%	8.319%	4.583%	5.882%
SNGP	6.343%	2.126%	4.277%	5.375%	2.961%	3.800%
JVDC	4.879%	2.540%	4.503%	4.674%	2.575%	3.305%
JSGF	9.778%	3.493%	5.580%	8.018%	4.417%	5.669%
MEBL	7.890%	2.280%	3.594%	5.380%	2.964%	3.804%
GHGL	7.618%	2.113%	3.505%	5.238%	2.885%	3.703%
KOHE	5.130%	3.175%	4.445%	6.028%	3.321%	4.262%
CPL	4.878%	2.425%	4.120%	4.535%	2.498%	3.206%
ANL	11.065%	4.831%	5.686%	8.946%	4.928%	6.325%
RMPL	4.879%	3.401%	4.676%	5.081%	2.799%	3.593%
JGICL	4.865%	2.609%	3.635%	5.951%	3.278%	4.207%
EFUL	4.879%	4.203%	4.874%	5.926%	3.264%	4.190%
ARM	5.827%	1.047%	4.231%	6.144%	3.384%	4.344%
TRIPF	4.877%	2.982%	4.337%	4.828%	2.659%	3.413%
INIL	4.877%	2.583%	4.324%	5.280%	2.909%	3.733%
SIEM	4.879%	3.168%	4.565%	5.567%	3.067%	3.936%
ISL	7.138%	2.369%	3.829%	5.224%	2.878%	3.693%
JSBL	12.450%	4.554%	6.274%	9.342%	5.146%	6.605%
PAKT	4.879%	3.187%	4.793%	5.218%	2.875%	3.689%
BOK	11.661%	3.445%	5.858%	8.301%	4.573%	5.869%
AGIL	4.879%	3.101%	4.666%	5.228%	2.880%	3.697%
BIPL	10.483%	4.081%	6.201%	8.158%	4.494%	5.768%
PICT	4.879%	4.618%	4.871%	5.841%	3.218%	4.130%
SEPL	4.871%	2.434%	3.642%	4.824%	2.658%	3.411%
NETSOL	6.402%	4.791%	4.871%	6.722%	3.703%	4.753%
PACE	11.991%	4.728%	5.864%	9.420%	5.190%	6.661%
HUMNL	6.174%	4.339%	4.862%	6.743%	3.715%	4.768%
SHFA	5.204%	4.029%	4.774%	5.912%	3.257%	4.180%
PCAL	4.878%	3.589%	4.857%	5.501%	3.030%	3.890%
TPL	9.935%	3.662%	5.432%	7.913%	4.359%	5.595%
GRAYS	4.879%	4.620%	4.871%	6.422%	3.538%	4.541%
MAXIMUM	**16.87%**	**4.85%**	**7.35%**	**11.81%**	**6.51%**	**8.35%**
MINIMUM	**4.82%**	**0.00%**	**2.47%**	**3.64%**	**2.00%**	**2.57%**
AVERAGE	**8.02%**	**2.84%**	**4.52%**	**6.26%**	**3.45%**	**4.42%**

Conventional Stock VaR Metrics *The above table presents Conventional Stocks (enlisted on the KSE 100 Index) VaR Summary Metrics by applying the Historical Simulation and Variance-Covariance Calculation Methods /Models. Three different confidence intervals of 99%, 95% & 90% are applied distinctly to each model respectively in this study.*

Table 1.3 - (Daily) HS and VCV - Value at Risk Metrics: Computational Difference

VaR Metrics Difference: *The above table calculates the computational difference between Historical Simulation VaR and VCV – Variance Covariance VaR Metrics using three different confidence intervals selected in this study, to calculate market risk of all Stocks enlisted on the KSE 100 Index. Minimum, Maximum and Average VaR Differences (as per the aforementioned chosen methods) are also summarized for each method under the three given confidence intervals. The stock symbols shaded in green are* ***Sharia Compliant.***

DIFFERENCE			
EQUITY/INDEX	***CI 99%***	***CI 90%***	***CI 95%***
KSE-100 Index	**0.345%**	**-0.260%**	**-0.086%**
OGDC	**0.82%**	**-0.16%**	**0.31%**
MCB	**2.44%**	**-0.95%**	**0.54%**
FFC	**1.02%**	**-0.13%**	**0.14%**
PPL	**0.96%**	**-0.44%**	**-0.05%**
POL	**1.36%**	**-0.73%**	**-0.02%**
HUBC	**0.72%**	**-0.62%**	**-0.09%**
ULEVER	**1.27%**	**-0.45%**	**0.37%**
ENGRO	**1.75%**	**-0.64%**	**0.49%**
PSO	**0.81%**	**-0.93%**	**-0.08%**
UBL	**1.71%**	**-0.51%**	**0.40%**
LUCK	**1.07%**	**-0.65%**	**0.33%**

NBP	1.32%	-0.76%	0.53%
KESC	3.61%	-1.93%	-0.84%
DGKC	2.13%	-0.61%	0.31%
NML	2.57%	-0.58%	0.33%
BAHL	1.20%	-0.67%	0.01%
EFOODS	4.23%	-2.77%	-1.44%
NESTLE	4.45%	-1.00%	0.46%
HBL	2.04%	-1.20%	-0.10%
FFBL	2.28%	-0.76%	-0.19%
PTC	1.41%	-0.86%	-0.08%
BAFL	1.07%	-0.81%	0.17%
KAPCO	1.18%	-0.61%	-0.05%
DAWH	3.13%	-0.56%	0.38%
FCCL	3.08%	-1.26%	-0.50%
MTL	2.37%	-0.59%	0.35%

COLG	2.80%	-0.45%	0.69%
HMB	1.36%	-0.78%	0.16%
PSEL	3.28%	-1.59%	0.25%
FATIMA	2.31%	-0.43%	0.27%
ABL	1.58%	-1.14%	-0.03%
AICL	2.33%	-0.61%	0.01%
APL	1.01%	-0.51%	0.56%
FML	5.08%	-3.87%	-2.49%
PKGS	3.11%	-1.08%	0.34%
AKBL	1.64%	-0.89%	0.07%
EFUG	3.24%	-0.74%	-0.08%
INDU	3.48%	-1.06%	0.13%
SNBL	2.89%	-1.22%	-0.33%
NRL	1.85%	-0.97%	0.05%
ABOT	1.40%	-0.58%	0.32%

NATF	4.86%	-0.22%	0.05%
PGF	1.24%	-1.53%	-1.38%
JSCL	4.89%	-0.30%	-0.60%
IGIIL	2.27%	-1.15%	-0.07%
ATRL	2.82%	-0.47%	-0.17%
NCPL	2.39%	-0.33%	0.10%
NPL	1.64%	-0.67%	0.14%
NCL	3.61%	-0.79%	0.32%
NIB	5.44%	-1.88%	-1.04%
TRG	5.06%	-2.58%	-1.00%
CHCC	2.40%	-0.71%	0.01%
GLAXO	1.43%	-0.90%	-0.03%
SSGC	1.88%	-0.76%	0.46%
SCBPL	2.53%	-1.15%	-0.30%
THALL	2.01%	-0.36%	0.70%

PSMC	1.38%	-0.82%	0.05%
MUREB	2.53%	-0.38%	0.80%
LPCL	3.27%	-2.38%	-0.93%
FABL	2.18%	-1.49%	-0.59%
LOTCHEM	3.54%	-1.85%	-0.67%
BATA	3.40%	-0.41%	0.37%
PAKRI	4.02%	-0.33%	-0.49%
JDWS	1.85%	-0.42%	0.61%
MEBL	2.51%	-0.68%	-0.21%
GHGL	2.38%	-0.77%	-0.20%
ACPL	2.39%	-0.70%	0.24%
AHCL	1.89%	-0.26%	0.21%
MARI	2.55%	-0.41%	0.54%
BOP	2.91%	-1.64%	-0.84%

SHEL	1.22%	-0.99%	-0.21%
SNGP	0.97%	-0.83%	0.48%
JVDC	0.21%	-0.03%	1.20%
JSGF	1.76%	-0.92%	-0.09%
ICI	-0.23%	-0.07%	0.67%
KOHE	-0.90%	-0.15%	0.18%
CPL	0.34%	-0.07%	0.91%
ANL	2.12%	-0.10%	-0.64%
RMPL	-0.20%	0.60%	1.08%
JGICL	-1.09%	-0.67%	-0.57%
EFUL	-1.05%	0.94%	0.68%
ARM	-0.32%	-2.34%	-0.11%
TRIPF	0.05%	0.32%	0.92%
INIL	-0.40%	-0.33%	0.59%

SIEM	-0.69%	0.10%	0.63%
ISL	1.91%	-0.51%	0.14%
JSBL	3.11%	-0.59%	-0.33%
PAKT	-0.34%	0.31%	1.10%
BOK	3.36%	-1.13%	-0.01%
AGIL	-0.35%	0.22%	0.97%
BIPL	2.33%	-0.41%	0.43%
PICT	-0.96%	1.40%	0.74%
SEPL	0.05%	-0.22%	0.23%
NETSOL	-0.32%	1.09%	0.12%
PACE	2.57%	-0.46%	-0.80%
HUMNL	-0.57%	0.62%	0.09%
SHFA	-0.71%	0.77%	0.59%
PCAL	-0.62%	0.56%	0.97%
TPL	2.02%	-0.70%	-0.16%

GRAYS	**-1.54%**	**1.08%**	**0.33%**
Maximum Difference	**5.436%**	**1.400%**	**1.199%**
Minimum Difference	**-1.543%**	**-3.867%**	**-2.494%**
Average Difference	**1.789%**	**-0.655%**	**0.077%**

Table 1.4- (Daily) VaR Grouped into Percentiles: Islamic and Conventional Stocks

Islamic Stocks

PERCENTILES	*HS VaR Metrics*			*VCV VaR Metrics*		
	CI 99%	*CI 90%*	*CI 95%*	*CI 99%*	*CI 90%*	*CI 95%*
90TH PERCENTILE	10.245%	3.22%	4.87%	6.98%	4.62%	5.67%
75TH PERCENTILE	9.063%	2.90%	4.82%	6.25%	3.44%	4.42%
50TH PERCENTILE	7.195%	2.20%	4.13%	5.31%	2.92%	3.75%
25TH PERCENTILE	5.883%	1.89%	3.27%	4.57%	2.52%	3.23%
10 PERCENTILE	4.879%	1.74%	2.98%	4.17%	2.30%	2.95%

Islamic Stock VaR Metrics Grouped into Percentiles: *In the above table, KSE 100 enlisted Islamic Stock VaR Metrics have been grouped into five different categories using a range of percentiles chosen. This experimental technique has been applied to both VCV and HS VaR Methods across all selected confidence intervals.*

Conventional Stocks

PERCENTILES	*HS VaR Metrics*			*VCV VaR Metrics*		
	CI 99%	*CI 90%*	*CI 95%*	*CI 99%*	*CI 90%*	*CI 95%*
90TH PERCENTILE	11.74%	4.28%	5.57%	8.31%	4.58%	5.88%
75TH PERCENTILE	9.84%	3.38%	4.87%	6.86%	3.82%	4.91%
50TH PERCENTILE	7.42%	2.63%	4.50%	5.94%	3.27%	4.20%
25TH PERCENTILE	5.29%	2.24%	4.14%	5.30%	2.92%	3.75%
10 PERCENTILE	4.879%	1.91%	3.55%	4.77%	2.63%	3.37%

Conventional Stock VaR Metrics Grouped into Percentiles: *In the above table, KSE 100 enlisted Conventional Stocks VaR Metrics have been grouped into five different categories using a range of percentiles. This experimental technique has been applied to both VCV and HS VaR Methods across all selected confidence intervals.*

Table 1.5 - Difference among (Daily) VaR Percentiles: Islamic and Conventional Stocks

PERCENTILES	*VaR HS Metrics*			*VCV VaR Metrics*		
	CI 99%	*CI 90%*	*CI 95%*	*CI 99%*	*CI 90%*	*CI 95%*
90TH PERCENTILE	**-1.495%**	**-1.07%**	**-0.70%**	**-1.33%**	**0.04%**	**-0.20%**
75TH PERCENTILE	**-0.778%**	**-0.48%**	**-0.05%**	**-0.61%**	**-0.38%**	**-0.49%**
50TH PERCENTILE	**-0.223%**	**-0.43%**	**-0.37%**	**-0.63%**	**-0.35%**	**-0.44%**
25TH PERCENTILE	**0.596%**	**-0.36%**	**-0.87%**	**-0.73%**	**-0.40%**	**-0.52%**
10 PERCENTILE	**0.000%**	**-0.17%**	**-0.57%**	**-0.60%**	**-0.33%**	**-0.42%**

VaR Percentiles Computational Difference*: KSE 100 Enlisted Islamic and Conventional Stocks VaR Percentiles (as presented in the tables 1.3 and 1.4) are reported for both VaR Calculation Methods using the three given confidence intervals selected in this study.*

Section IV

Hypothesis Testing Model

- **Hypothesis testing of the difference between two population means**

  This is a two sample z test which is used to determine if two population means are equal or unequal. There are three possibilities for formulating hypotheses.

l. $H_0: \mu_1 = \mu_2 \qquad H_A: \mu_1 \neq \mu_2$

2. $H_0: \mu_1 \geq \mu_2 \qquad H_A: \mu_1 < \mu_2$

3. $H_0: \mu_1 \leq \mu_2 \qquad H_A: \mu_1 > \mu_2$

The same procedure is used in three different situations.

- *Sampling from populations that are not normally distributed*

  - If both sample sizes are 30 or larger the central limit theorem is in effect.
  - We can use the two-sample z-test to evaluate the difference between two groups:

$$z = \frac{\text{observed difference - expected difference}}{\text{SE for difference}}$$

Or more formally:

$$z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\sigma^2_{\bar{x}_1} + \sigma^2_{\bar{x}_2}}} = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

In this experiment the following set of assumptions and abbreviations are used:

- $\bar{x}_1$ *symbol represent all Conventional Stocks*
- $\bar{x}_2$ *symbol represent all Islamic Stocks*

- *Upto 26 stocks selected as parts of the research procedural design are classified as Sharia Compliant and the remaining 74 are classified as Conventional Securities.*

- *We utilize a two tail test in this study to validate and verify our null hypothesis.*

- *n1 = 26 Population of Islamic Stocks*
- *n2= 74 Population of Conventional Stocks*

- α *= 0 .05 level of significance (alpha value)*

- *Hypothesis Test: Two-tail performed in this study*

$$H_0 : \mu_1 = \mu_2$$
$$H_A : \mu_1 \neq \mu_2$$

- *Test statistic:*

  this is a two population z test.

  (a) Distribution of test statistic

  If the assumptions are correct and H_0 *is true, the test statistic is distributed as the normal distribution.*

  (b) Decision rule

  with α *= .05, the critical values of z are -1.96 and +1.96.*

- *We reject* H_0 *if z < -1.96 or z > +1.96.*

- Statistical decision

  Reject H_0 *if z critical value > alpha value.*

Source: http://www.stat.ucla.edu/~cochran/stat10/winter/lectures/lect21.html

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Table 2.1- Descriptive Statistics: (Daily) VaR Metrics using HS and VCV Methods

A. Islamic Stocks	***HS VaR***			***VCV VaR***		
Descriptive Statistic	***CI 99%***	***CI 90%***	***CI 95%***	***CI 99%***	***CI 90%***	***CI 95%***
MAXIMUM	13.26%	3.53%	5.99%	9.74%	6.30%	6.89%
MINIMUM	4.87%	1.51%	2.72%	3.85%	2.12%	2.72%
AVERAGE	7.60%	2.36%	4.06%	5.63%	3.21%	4.05%
VARIANCE	0.06%	0.004%	0.008%	0.02%	0.011%	0.013%
STDEV*	2.36%	0.60%	0.91%	1.50%	1.04%	1.15%

B. Conventional Stocks	***HS VaR***			***VCV VaR***		
Descriptive Statistic	***CI 99%***	***CI 90%***	***CI 95%***	***CI 99%***	***CI 90%***	***CI 95%***
MAXIMUM	16.87%	4.85%	7.35%	11.81%	6.51%	8.35%
MINIMUM	4.82%	0.00%	2.47%	3.64%	2.00%	2.57%
AVERAGE	8.02%	2.84%	4.52%	6.26%	3.45%	4.42%
VARIANCE	0.08%	0.01%	0.01%	0.02%	0.01%	0.01%
STDEV	2.75%	0.96%	0.86%	1.48%	0.82%	1.05%

Islamic and Conventional Stock VaR Metrics - Descriptive Statistics: *The above two table represent the descriptive statistics which summarizes VaR (Market Risk) Characteristics of both* ***Islamic and Conventional Stocks*** *enlisted on the KSE 100 Indexes.* ***Maximum, Minimum, Average, Variance and Standard Deviation Values*** *of both Historical Simulation and VCV VaR Metrics are reported for the three given confidence intervals selected in this study.*

Table 2.2 – Hypothesis testing using Z Test Statistic: Historical Simulation VaR Means Difference

Hypothesis Testing Model	***HS VaR***		
	CI99%	***CI 90%***	***CI 95%***
Mean - $\bar{x}_1$	0.080	0.028	0.045
Mean - $\bar{x}_2$	0.076	0.024	0.041
Standard Deviation – Islamic stocks	0.027	0.010	0.0086
Standard Deviation – Convetional Stocks	0.024	0.006	0.0091
Significance Level α	***0.05***	***0.05***	***0.05***
Z Test Statistic	0.755	2.955	2.2597
Result	**Reject** H_0	**Reject** H_0	**Reject** H_0

- *We utilize a Two-Tail Test in this study to validate and verify our null hypothesis.*
- *Mathematically expressed as:*

$H_0 : \mu_1 = \mu_2$ ----------*(1) Null Hypothesis*

$H_A : \mu_1 \neq \mu_2$----------*(2) Alternate Hypothesis*

- *n1 = 26 Independent Population of Islamic Stocks*
- *n2= 74 Independent Population of Conventional Stocks*

- $\bar{x}_1$ *symbol represent Mean value of all Conventional Stocks*
- $\bar{x}_2$ *symbol represent all Mean value of Islamic Stocks*

- α *= 0 .05 level of significance (alpha value)*
- *With* α *= .05, the critical values of z are* ***-1.96 and +1.96.***
- *We reject* H_0 *if z < -1.96 or z > +1.96.*

- *Reject* H_0 *if z critical value > alpha value*

- *Conclusion:*

From these data, it can be concluded that the population means are not equal.

Table 2.3 – Hypothesis testing using Z Test Statistic: VCV - VaR Means Difference

Hypothesis Testing Model	***VCV - VaR***		
	CI99%	***CI 90%***	***CI 95%***
Mean - $\bar{x}_1$	0.063	0.034	0.044
Mean - $\bar{x}_2$	0.056	.032	0.041
Standard Deviation – Islamic stocks	0.015	0.008	0.010
Standard Deviation – Convetional Stocks	0.015	0.010	0.012
Significance Level α	***0.05***	***0.05***	***0.05***
Z Test Statistic	1.826	1.043	1.439
Result	**Reject** H_0	**Reject** H_0	**Reject** H_0

- *We utilize a Two-Tail Test in this study to validate and verify our null hypothesis.*
- *Mathematically expressed as:*

$H_0 : \mu_1 = \mu_2$ ----------*(1) Null Hypothesis*

$H_A : \mu_1 \neq \mu_2$----------*(2) Alternate Hypothesis*

- *n1 = 26 Independent Population of Islamic Stocks*
- *n2= 74 Independent Population of Conventional Stocks*

- $\bar{x}_1$ *symbol represent Mean value of all Conventional Stocks*
- $\bar{x}_2$ *symbol represent Mean value of all Islamic Stocks*

- α *= 0 .05 level of significance (alpha value)*
- *With* α *= .05, the critical values of z are* ***-1.96 and +1.96.***

- *We reject* H_0 *if z < -1.96 or z > +1.96.*

- *Reject* H_0 *if z critical value > alpha value*

- *Conclusion:*

From these data, it can be concluded that the population means are not equal.