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İqtisad Universiteti

SABAH

University: Azerbaijan State University of Economics

Faculty: UNEC SABAH Center

Specialization: Finance

Author: Afsana Shahverenova

Supervisor: Ravan Mehdiyev

The importance of risk management in stock market. Risk management techniques and analysis of effectiveness of them in stock market

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Abstract

This work demonstrates true strategies and ideal resource allotment techniques that will be connected to value exchanging portfolios rising and illiquid markets. Crucial market hazard the executives techniques and systems that financial substances, controllers and policymakers should consider in defining their day-by-day advertise chance administration goals zone unit analyzed and are custom-made to the particular needs of rising nations which is so significant. This paper means to fill a hole inside the exchanging hazard the board writing and especially from the point of view of rising and illiquid markets, for example, inside the setting of the Mexican money related markets. Here, we demonstrate a complete and proactive methodology for the estimation, the board and control of value exchanging hazard introduction, which considers right alterations for the illiquidity of each long and short exchanging/venture positions under conventional and serious economic situations and inside a multi-security setting. Our methodology depends on Value-at-Risk alongside the development of a product instrument use framework polynomial math and elective advancement systems. To detail the best possible utilization of VAR and stress-testing (situation examination) techniques, certifiable models and pragmatic reports of market chance administration are determined and presented for a choose portfolio from the Mexican Stock Market (BMV). Additionally we put forth a strategy whereby the holding time periods are adjusted by the specific needs of each trading portfolio by explicitly showing a directly appropriated liquidation plan by techniques for an important scaling multiplier. The definite testing is practiced using data of rising Gulf-Cooperation-Council securities trades. We copy and separate different noteworthy portfolios (of both short and long-bargains trading positions) and choose the risk capital introduction under changed illiquid and hostile monetary circumstances. To this end, a few contextual analyses were accomplished with the goal of making a reasonable structure of mercantilism hazard estimation and the executive's reports

notwithstanding the origin of methodology for the figuring of the most extreme approved power unit limits.

Introduction

The exploration points of this paper square measure to examine the condition of hazard the executive's forms in an exceedingly explicit financial exchange and to talk about the degree of a productive administration system upheld the examined markets.

Exchanging of cash instruments — stocks (values), securities (fixed salary instruments), subordinate product and organized product, so on — has been on continuous development in economies, for example, inside the setting of the Mexican money related markets, the Gulf-Cooperation-Council budgetary markets. Those business sectors are portrayed when all is said in done as unpredictable, illiquid, politically shaky, lacking prudential standards and recorded monetary databases. Rather than every one of these disadvantages, the capability of high expected prizes are gigantic and subsequently the vast unexpected dangers. The administration of acquired dangers should, notwithstanding, be managed by practicing every workmanship and science systems.

Resource liquidity exchange chance administration is of dynamic significance to elements in the money related area. Real crumples of money related substance have happened in colossal part because of inadmissible liquidity important from unwanted cases.

Subsequently, the requirement for better administration and estimation devices of liquidity exchange hazard are in the ascent in the boundless achieving monetary markets. This is with the essential goal of setting an expansive arrangement of

liquidity and financing approach that are anticipated to keep up huge tractability to address showcase liquidity cases and to empower fundamental exchanging exercises to carry on to produce income even with in antagonistic conditions.

A few nations, for example, Mexico, are also deliberately changing of uprightness the execution of altered adaptations of the Basle II. Indeed, the Mexican money related markets are in dynamic stages strives a-competes other rising markets of executing updated chance administration guidelines and strategies. Regardless of the late advancement in the Mexican monetary markets to be a Basel-agreeable nation, as of late it has considered fundamental (by neighborhood regulative specialists) to adjust legitimate inner hazard models, systems and principles that money related elements, policymakers and controllers ought to think about in setting-up their gradually chance administration exchanging goals.

Because of the past discourse, value chance administration has turned into a fundamental subject in rising and illiquid markets, for example, inside the instance of the Mexican money related markets and the Gulf-Cooperation-Council monetary markets. The objectives of this paper are to exhibit the basic scientific advances and interior hazard the executives strategies that a market's member (vendor or market-creator) will require in his customary positions' taking.

The principle point of this paper is to add to the threat the executives writing and more to fill a hole inside the value business chance administration writing and particularly from the viewpoint of rising and illiquid markets.

This work endeavors to give an expert perspective on the best way to set out a proactive value chance administration philosophy and techniques that can be connected to the ordinary value exchanging exercises and explicitly at interims the possibility of rising economies. In this work, key value showcase chance administration principles, strategies and systems that monetary substances, controllers and policymakers ought to be attentive.

Consider in setting-up their gradually value business chance administration targets are inspected and adjusted to the particular wants of rising and illiquid markets, for

example, inside the setting of the Mexican Stock Market. In particular, the examination explores the use of contemporary budgetary hypothesis and financial hazard the executive's instruments and methods to the instance of developing markets' exchanging portfolios that contain gigantic measure of illiquid value cash securities.

All together as a case the right utilization of Value-at-Risk and stress-testing techniques, reports and certifiable instances of value exchanging hazard the executives are presented for a chose stock portfolio and a few lists of the Mexican Stock Market .

The way to deal with assessing liquidity-balanced Vary for unmistakable value portfolio has been exhibited with the assistance of an adjusted shut structure parametric perfect in which we suggest and test a straightly appropriated structure for exchanging resource liquidation over the nearby out period with the guide of a reasonable scaling multiplier. We at that point appear, by applying the advantage liquidness chance measures to the Gulf-Cooperation-Council budgetary markets, to which degree the evaluated resource liquidness exchanging hazard impacts can impact customary estimation of market risk under various relationship presumption: zero, exact and solidarity. The experimental testing, to characterize the degree of hazard capital1, is made for unadulterated long exchanging focuses (by forcing an operational restriction on short-selling) additionally for a mix of short and long-deals exchanging positions.

Chapter 1. Theoretical analysis of the problem

1.1 Risk management and market risk management models

Overseeing risk is at the center of overseeing any money related organization. This statement could seem self-evident, indeed trifling, but keep in mind that the "risk management" department is as a rule partitioned from exchanging administration or line management. Words matter and utilizing the term "risk management" for a group that does not really oversee anything leads to the idea that overseeing risk is some way or another diverse from overseeing other issues inside the firm. Without

a doubt, a director at a large financial gather was cited within the Monetary Times as saying that "A board can't be a chance manager." In reality, the board has the same responsibility to understand and screen the firm's hazard because it needs to understand and screen the firm's benefit or monetary position.

To rehash, overseeing risk is at the center of overseeing any money related organization; it is as well critical an obligation for a firm's directors to delegate. Managing chance is approximately making the strategic and key choices to control those dangers that ought to be controlled and to abuse those openings that can be misused. In spite of the fact that overseeing hazard does include those quantitative devices and activities for the most part secured in a "risk management" course reading, in reality, risk management is as much the craftsmanship of overseeing individuals, forms, and institutions as it is the science of measuring and evaluating hazard. In reality, one of the central arguments of this book is that chance administration isn't the same as risk measurement. Within the budgetary industry likely more than any other, risk management must be a central duty for line directors from the board and CEO down through person exchanging units and portfolio managers. Supervisors inside a monetary organization must be, sometime recently anything else, risk managers within the genuine sense of overseeing the dangers that the firm faces. Extending the center from the inactive estimation and observing of risk to the dynamic administration of chance moreover drives one toward apparatuses to assist identify the type and heading of dangers and instruments to assist recognize fences and strategies that modify chance. It contends for a more tightly association between hazard management (traditionally centered on monitoring risk) and portfolio administration (in which one chooses how much hazard to require within the interest of benefit).

Risk management has become a basic endeavor by academics, regulators, and practitioners, and a basis of recent interests is a class of models referred to as power unit techniques. The concepts of power unit and different advanced

hazard management techniques are, actually, not new and are primarily based — with some modifications — on modern portfolio theory.

The most needed is a higher understanding of the market risk administration process. That can be accomplished by striking a variety of institutional changes that will facilitate scale back the uncertainties in the exchange of securities. Normally, this must be went with more clear lawful condition, hazard the executives and bookkeeping benchmarks, notwithstanding more prominent revelations of exchanging exchanges.

Method for assessing advertise (or trading) risk has been well developed and identical in the academic also the banking world. Asset liquidness risk, alternatively, has received less attention, possibly because it is less remarkable in developed countries where majority of the market hazard methodologies were originated. In all then again the most simple of situations, comprehensive metrics of asset liquidness trading risk management don't exist (Al Manabí, 2015b, 2014a and 2014b). Nevertheless, the combination of the contemporary rapid expansion of trading activities of emerging markets and the recurring turbulence in these markets, in light of aftermaths of the recent sub-prime credit crunches, have propelled asset liquidness trading risk to the lead of market risk management analysis and development.

The lack of satisfactory market risk measurement, management and resistor tools are one of the tributary factors that have led to major monetary losses among national/ multinational firms in rising countries. The new Basel accord (so-called Basle II), for the establishment of adequate internal models of risk management, has motivated several rising countries to be half of the agreement at different implementation levels. Several rising markets, in the Asian and Latin American continents, would like to be Basel compliant and hence area unit already in advanced steps to implement, modified versions of the Basel agreement with its suggested internal models.

Resource liquidity exchanging chance administration is of imperative significance to substances in the financial administrations division. Most collapses of monetary substances have happened in large portion due to inadequately liquidity noteworthy from undesirable events. Accordingly, the require for superior estimation and administration instruments of liquidity trading chance are on the rise within the wide-reaching money related markets. Typically with the principal objective of setting a comprehensive set of liquidity and subsidizing policies that are aiming to preserve noteworthy adaptability to address advertise liquidity events and to empower center exchanging exercises to proceed to create income even under unfavorable circumstances.

Strategies for measuring advertise (or exchanging) chance has been well developed and standardized within the scholarly as well as the managing an account world. Resource liquidity risk, on the other hand, has gotten less consideration, maybe since it is less significant in created nations where most of the showcase chance methodologies were originated. In all but the foremost straightforward of circumstances, comprehensive metrics of resource liquidity exchanging hazard administration don't exist (Al Manabí, 2014a, 2015a and 2015b). In any case, the combination of the later quick extension of emerging markets' exchanging exercises and the repeating turbulence in those markets, in light of the aftermaths of the current sub-prime credit crunch, has propelled resource liquidity exchanging hazard to the bleeding edge of advertise hazard management research and advancement.

Resource liquidity exchanging hazard is an all-embracing trepidation for anyone holding a portfolio of any sort of exchanging resource and liquidity emergencies demonstrated to be imperative within the disappointment of numerous money related substances. More particularly, asset liquidity exchanging chance emerges from circumstances in which a party fascinated by trading a resource cannot do it since no one within the advertise needs to exchange that resource. Asset liquidity chance gets to be for the foremost portion critical to monetary showcase

participants who are approximately to hold or as of now hold a resource, since it influences their capacity to trade or loosen up the exchanging position. Bankruptcies regularly happen since financial entities cannot get out or loosen up their possessions viably and thus the liquidation esteem of resources may vary altogether from their current mark-to market values. For all budgetary substances that are market-makers in financial securities, the address propounded for overseeing hazard as well as for controllers is: What is your capacity to loosen up the exchanging position completely, or as a least to hedge its presentation viably? Furthermore, resource liquidity exchanging chance tends to compound other dangers. In case an exchanging substance includes a position in an illiquid exchanging asset, its constrained capacity to exchange that position at brief notice will detrimentally compound it's advertise chance. Subsequently, resource liquidity chance has to be overseen in expansion to showcase and other dangers. Since of its propensity to compound other dangers, it is troublesome or unworkable to isolate asset liquidity chance from other foremost dangers. Typically why resource liquidity exchanging hazard is more often than not found prominent in developing markets or low-volume monetary markets.

The customary Value-at-Risk (Vary) approach to computing showcase risk of a portfolio does not unequivocally consider resource liquidity hazard. Ordinary VAR models assess the most noticeably awful alter within the mark-to-market portfolio esteem over a given time horizon but don't account for the genuine exchanging hazard of liquidation. Customary fine-tunings are made on an ad-hoc premise. At most, the holding period (it is routinely moreover known as the close-out, loosening up or liquidation period) over which the VAR number is calculated is balanced to guarantee the consideration of asset liquidity hazard. As a result, resource liquidity chance can be loosely calculated into VAR assessments by guaranteeing that the liquidation skyline is as a least bigger than a deliberate liquidation interim. Additionally, the same liquidation skyline is employed to all exchanging resource classes, yet a few resources may be more fluid than others. Ignoring resource liquidity hazard can lead to an underestimation of the overall

market hazard and misapplication of capital pad for the security and soundness of financial teach. In rising monetary markets, which are generally well considered as illiquid, overlooking resource liquidity hazard can result in significant underestimation of the VAR appraisal, and particularly beneath serious market conditions (Al Manabí', 2015a).

 The VAR methodology will alert you to the most loss that your portfolio (speculation or trading portfolios) may experience at a as probability. So you can value such a loss's prospective on your trade and to aid you within the decision of wherever and when to trim redundant risk(s). The most common Value-at-Risk models estimate variance– covariance matrices of quality returns exploitation historical time series, and assume that the distributions of asset returns square measure traditional. Portfolio risk is a function of the chance of every asset and the correlation factors among the returns of all trading assets among the portfolio. The VAR is then calculated from the commonplace deviation of the portfolio, given the appropriate speculation/liquidation horizon, and the specified confidence interval.

Markowitz, in the 1950s, portrayed the hypothetical structure for present day portfolio hypothesis and the formation of productive portfolios. The solution to those theoretical models revolves around the portfolio weight or the percentage of plus allotted to be endowed in every instrument. Sharpe developed the single-index model, which relates returns on every security to the returns on a common index — overseas market index of common stock returns like S&P 500 is generally used for this aim.

The Risk Metrics system developed and popularized by J.P. Morgan has provided a incredible impetus to the growth within the use of VAR idea
different trendy hazard management techniques and procedures. Since then the Value-at-Risk idea is well better-known and scores of detailed applications
are custom-made to credit hazard management and mutual funds' investments. The general recognition and use of large-scale Value-at-Risk models has initiated a

considerable literature including applied mathematics descriptions of VAR and assessments of different modeling techniques and tools.

For a comprehensive survey, and the other VAR analysis and techniques, one of them can refer to Jordon. For the most half, VAR analyses in the public domain are limited to comparison different modeling approaches and implementation procedures using illustrative portfolios (for example, Risker, Hendricks, Marshall and Siegel). In their work, Berkowitz and O'Brien questioned how correct VAR models are at industrial banks. Trading accounts at giant business banks have considerably grownup and become increasingly various and complicated, the authors presented statistics on the commercialism revenues from such activities and on the associated VAR forecasts internally estimated by banks.

A couple of different makers have attempted to handle the issues of uncommon events and fat tails marvels inside the scattering of profits. In any case, notwithstanding the way that the greater part of their methodologies and techniques are incredible works out for scholarly purposes, they do require demonstrate of genuine applications with genuine publicize portfolios. For example, progressively intensive numerical treatment of VAR examination with vigorous copula models and unprecedented regard theory has gotten impressive treatment from Embraces et al.

Angelis' and Degiannaki list the exactness of parametric, semi-parametric and nonparametric routes in foreseeing the one-day-ahead VAR in 3 sorts of business sectors (specifically, wares, outside trade rates and stock trades) and for both long and short corporate greed positions. As per Culp et al VAR will be custom fitted for the use in resource the board and for the valuation of market hazard in the long haul skyline. They investigate the utilization of VAR to quality administration and with explicit consideration on the significance of VAR for multicurrency resource

supervisors. In other pertinent investigation, Dowd handle the disadvantage of the estimation of VAR for long-run skyline. In their paper, they

Offer an entirely unexpected, nonetheless, a somewhat direct methodology that maintains a strategic distance from the acquired issues related with the square base of time rule, additionally those identified with endeavoring to extrapolate normal unpredictability expectation over long skylines.

In his examination papers, Al Janabi has set up a practical framework and other noteworthy parameters for the estimation, the officials and control of market (trading) risk. The effects of illiquid assets, that are transcendent properties of creating markets, were in like manner solidified in his models. The set up models and general structure were prevalently reliant on grid variable based math techniques. This methodology can energize the figuring of market chance for a couple trading assets and it can without a lot of a stretch handle short selling of money related assets in day-today advertise hazard estimations.

Set against this establishment, the goals of this research paper are to supply rational and hearty quantitative estimations and systems of exhibit danger (consistently it tends to be called trading shot or value risk) for developing markets' esteem trading portfolios. Normally with the target of helping these countries in the foundation of sound peril the board rehearses inside a prudential arrangement of approaches and procedures. This consider makes a significant duty to the trading hazard the executives abstract works by displaying an exhaustive and proactive methodology for the estimation, organization and control of value trading chance presentation, which considers genuine modifications for the illiquidity of both long and brief exchanging/speculation positions (under run of the mill and genuine publicize conditions) and inside a multi-security setting. Keeping that in mind, the parameters required for the advancement of proper and modified VAR and stress testing techniques are kept an eye on from past works and refined to the specific uses of these methodologies to rising markets. In addition, an unraveled

methodology for the joining of illiquid assets, in consistently trading possibility the board rehearses, is described and is properly incorporated into the VAR and stress-testing models.

The speculative scientific/systematic models that are gotten in this depend on lattice variable based math approach. The last referenced methodology can in truth rework the programming handle in EXCELTM worksheets and can too permit simple fuse of brief offering of assets in the value trading get ready. The keep going referenced effect on exchanging positions can, in actuality, help inside the setting up of perfect structure of VAR limits. In this work, a veritable show for the estimation of the illiquidity of both brief and long exchanging position is merged. In separate to other usually used liquidity models; the liquidity model that is associated in this work is increasingly fitting for genuine world trading sharpens since it considers offering little divisions of the long/short trading securities on an everyday premise. Despite the fact that the shot estimation system that is grasped in this work depends fundamentally on the variance– covariance approach (that anticipate ordinary conveyance of profits), for rising and illiquid markets, it is possible to change for the presumption of normality by checking pressure testing (underneath extraordinary feature conditions) alongside the aggregation of a sensible hazard calculate that takes thought illiquid exchanging securities.

Market chance administration models, which are actualized in this work, were associated with a chose number of stocks; section records and principle promote markers of the Mexican Stock Market. Databases of step by step stocks' costs developments and feature records, (for example, the fundamental market's indictor, IPC list) were altogether accumulated, separated and arranged in such an approach to make important quantitative examination and finish of promote danger estimation. A couple of contextual analyses were completed with the objectives of ascertaining VAR numbers underneath various potential situations in development to the start of a reasonable framework for the establishment of VAR limits setting. The assorted situations were performed, in the first place specific asset assignment

rates, moreover by thinking about the effects of liquidity of trading assets (releasing up time of benefits), and finally by contemplating the potential outcomes of brief offering in step by step exchanging activities. Additionally, a couple of trial of irregular (bridle kilter) movements of profits was performed. To this end, various trials of scenes and kurtosis were realized on the example stocks and the various markets' files. This was taken after by a consider of consistently and yearly volatilities nearby the computations of betas of the test stocks against the most market's marker, to be explicit the IPC list.

Inside the VAR system, Jarrod and Subramanian (2014) give a showcase affect demonstrate of liquidity by considering the ideal liquidation of a speculation portfolio over a settled horizon. They determine the ideal execution procedure by deciding the sales plan that will maximize the anticipated total sales values, accepting that the period until liquidation is given as an exogenous figure. The rectification to the lognormal VAR they determine depends on the cruel and standard deviation of both: an execution lag work and of a liquidation discount. In spite of the fact that the show is basic and naturally engaging, it endures from commonsense troubles for its usage. It requires the estimation of extra parameters such as the mean and the standard deviation of the discount calculate and the period of execution—for which information are not promptly accessible, none of which may be simple to appraise and may require subjective gauges such as a trader's instinct (Al Janabí, 2014b and 2014a).

Bangla et al. (2014) approach the liquidity hazard from another point and give a demonstrate of VAR balanced for what they call exogenous liquidity—defined as common to all showcase players and unaffected by the activities of any one member. It comprises such execution costs as arrange preparing costs and adverse choice costs coming about in a given bid-ask spread confronted by speculators within the market. On the opposite, endogenous liquidity is particular to one's position within the market and depends on one's activities and shifts over market members. It is basically driven by the estimate of the position: the bigger the

estimate, the more prominent the endogenous illiquidity. They propose part the vulnerability in market esteem of a resource into two parts: an immaculate market risk component emerges from resource returns and instability due to liquidity hazard. Their show comprises of measuring exogenous liquidity hazard, computed utilizing the conveyance of observed bid-ask spreads and after that coordination it into a standard VAR system.

In a comparable vein, Le Scout (2012) applies the show created by Bangla et al. (2013) to the French stock advertises. The author's comes about show that exogenous liquidity hazard, for illiquid stocks, can speak to more than a half of total market risk. Moreover, the creator expands the demonstrate to consolidate endogenous liquidity chance and appears that it speaks to a critical component of the in general liquidity chance. Roy (2014) relates the demonstrate given by Bangla et al. (2014) to the Indian obligation showcase. To begin with, the creator presents a comprehensive study of liquidity balanced VAR models and after that embraces an altered adaptation of the exogenous liquidity approach proposed by Bangla et al. (2014). In this paper, a degree of liquidity-adjusted VAR, based on bid-ask spread, is displayed and the liquidity hazard found to be a critical component of the total hazard retained by financial institutions.

In a diverse vein, Algren and Chris (2014) show a concrete system for inferring the ideal execution technique employing a mean-variance approach, and appear a particular calculation method. Their approach includes a high potential for down to earth application. They accept that cost changes are caused by three components: float, instability, and advertise affect. Their examination leads to general insights into ideal portfolio exchanging, relating hazard revulsion to ideal exchanging procedure, and to a few commonsense suggestions counting the definition of liquidity adjusted Varro Not at all like Almgren and Chriss (2014), Hisata and Yamai (2015) turn the deals period into an endogenous variable. Their show consolidates the instrument of the showcase affect caused by the investor's possess

dealings through adjusting VAR agreeing to the level of market liquidity and the scale of the investor's position.

On the other hand, Berkowitz (2014) contends that unless the likely misfortune emerging from liquidity chance is evaluated, the models of VAR would need the control to explain the implanted chance. In hone, operational definitions change from volume-related measures to bid-ask spreads and to the flexibility of request. The creator declares that versatility based measures are of most significance since they consolidate the effect of the seller activities on costs. Besides, beneath certain conditions the extra fluctuation emerging from vender affect can effectively be evaluated given perceptions on portfolio costs and net streams; which it is possible to gauge the complete dissemination of portfolio chance through standard numerical strategies.

On another front, Shamrock (2015) fights that scaling the holding period to account for efficient liquidation can as it were be advocated in the event that we permit the portfolio to be sold all through the holding period. The creator amplifies the Risk Metrics approach by expressly modeling the liquidation of the portfolio over time and by appearing that liquidity-adjusted VAR can be effortlessly gotten by a fitting scaling of the variance-covariance network. Besides, showcase liquidity chance can be modeled by communicating the liquidation cost as a work of exchange sizes, hence forcing a punishment on immediate loosening up of huge position. Taking after this approach, liquidity-adjusted VAR can be seen as an arrangement to a minimization issue emerging from the trade-off between higher change related with moderate liquidation and higher endogenous liquidity hazard related with quick liquidation.

In measuring the market hazard of an exchanging position, the primary step is to recognize the advertise risk components that influence its mark-to-market esteem. For certain exchanging positions, the distinguishing proof of the showcase risk components is very clear. For occurrence, for an exchanging position in cash values, the costs of the person stocks decide the esteem of the position and, thus,

the value costs may well be taken as the showcase hazard variables. There's , in any case, an issue with this approach: for an expansive and differentiated exchanging book the number of risk variables gets to be exceptionally huge and the hazard estimation and accumulation gets to be unmanageable. Luckily, money related hypothesis and related observational investigate give ways of rearranging the number of showcase hazard components for value positions.

Despite the expanding significance of the GCC monetary markets, there's exceptionally few distributed investigate in this regard and especially inside resource liquidity exchanging risk administration setting. Besides, to the most excellent of our information, no work has been distributed however in any universal writing, on modeling resource liquidity risk-capital structure beneath adverse and crisis-simulated showcase viewpoints, which takes into consideration the GCC zone as a case ponder. This thinks about makes the taking after commitments to the writing in this particular chance administration field. Firstly, it speaks to one of the constrained number of scholarly and professional papers that experimentally look at risk-capital structures utilizing real monetary information of the six GCC stock markets. Furthermore, the paper in pith proposes a variety on the root-t run the show of expanding standard one-day VAR by recommending a less preservationist resource liquidity scaling calculate for including liquidation hazard in standard VAR investigation. Thirdly, not at all like most experimental considers in this field, this investigate think about applies a no-nonsense and thoroughgoing exchanging hazard administration show that considers hazard examination beneath ordinary and antagonistic illiquid market cases. The vital advantage of utilizing such a show is the capacity to capture a full picture of conceivable misfortune scenarios of real exchanging portfolios beneath distinctive relationship presumptions: experimental, zero and solidarity and under the idea of diverse market scenarios.

This paper points to shed light on resource liquidity chance emerging due to illiquid exchanging positions and to get a liquidity-adjusted VAR estimation. In

differentiate to all existing distributed writing relating to the application of VAR strategy to developing markets, this paper puts forward a modern demonstrate for evaluating a closed form parametric VAR with unequivocal treatment of resource liquidity chance. The key methodological commitment of this work is to expand VAR calculation to permit for an unfaltering liquidation of the portfolio over the holding period and by appearing that asset liquidity hazard can be clearly and instinctively coordinates into the proposed VAR system. Instead of modeling resource liquidity exchanging hazard as such, the central center of this work is to overtake a wide-ranging and adaptable system for taking care of resource liquidity risk within the generally evaluation of exchanging risk. Its quintessence depends on the suspicion of a stochastic stationary prepare and some rules of thumb, which can be of vital esteem for more precise advertise chance appraisal amid showcase stretch periods when liquidity dries up. The resource liquidity system displayed in this paper does not join all the angles of liquidity exchanging hazard. In any case, it is successful as a modeling apparatus for assessing exchanging risk and risk-capital when the effect of illiquidity of indicated financial products is noteworthy.

Resource liquidity risk-capital reenactment models, which are put into hone in this paper, are connected to the six GCC stock markets. Database of stock advertise lists (9 files in add up to) are collected, straightened-up and prepared in such a way so that to form significant quantitative examination and reenactment of resource liquidity risk-capital estimation. A few recreation cases thinks about are carried out with the destinations of surveying L-VAR beneath different illiquid and crisis-driven showcase conditions. As such, L-VAR estimations have been gotten for changed long and short value trading portfolios within the GCC stock markets. The liquidity adjusted VAR has been gotten through an altered closed-form parametric VAR approach in which we propose and test a linearly-distributed-scheme for exchanging resource liquidation over the close-out period. As such, dealers can exchange on a day by day premise little divisions of their illiquid resources all through the holding period. The presumption of a given loosening up period for efficient liquidation inevitably implies that assets' liquidation happens amid the

holding period. Accordingly, scaling the close-out period to account for efficient liquidation can be legitimized if one permits the resources to be exchanged all through the holding period. We at that point use the experimental comes about to draw conclusions almost the relative liquidity of the different stock markets and the significance of resource liquidity chance in L-VAR estimation.

The leftover portion of the paper is organized as takes after. The taking after section lays down the quantitative framework of VAR, and its impediments. To begin with, we show that liquidity-adjusted VAR can be inferred for a single-asset portfolio assuming uniform liquidation over the holding period. We at that point infer a general and wide show that consolidates the impacts of different illiquid resources in daily market hazard management by basically scaling the multi-assets' L-VAR matrix. Finally, we illustrate, by applying the liquidity-adjusted VAR measures to the GCC stock markets, to what degree the evaluated liquidity impacts can affect conventional evaluation of exchanging chance. The comes about of the observational tests are drawn within the last area together with conclusions and suggestions. The quantitative modeling structure for the estimation of yearly risk-capital is included within the Appendix.

Chapter 2. Substantiation and methodology of the empirical research

2.1 Usage of Value-at-Risk with variance/covariance (parametric) methodology

VAR is a methodology of measuring market risk that uses standard applied math techniques habitually used in other technical fields. Formally, VAR measures the most noticeably awful anticipated misfortune over guaranteed time interim under typical economic situations at a given certainty level. The standard deviation of the everyday rate of return is utilized as an estimation of the potential misfortune or addition the firm may acquire. Expecting that the arrival of a monetary item pursues an ordinary appropriation, straight pay-off profile and an immediate connection between the hidden item and the salary, the VAR is to quantify the

standard deviation of the salary for a specific certainty level. As a general rule, the VAR is a conjecture of the standard deviation. In spite of the fact that the strategy depends on a few suppositions and has been intensely condemned also, is frequently debilitated, it has increased wide acknowledgment for the evaluation of monetary chances inside monetary exchanging units. Subsequently of the speculation of this strategy, capital designations for exchanging exercises will in general be determined and balanced with the VAR strategy.

A financial entity may state that the 'day by day' VAR of it exchanging portfolio is $1 million at the 99 percent certainty level. This implies, there is just 1 chance in a 100 (or one day in each 100 exchanging days), under typical market conditions, for a misfortune more noteworthy than $1 million to happen. This single number condenses the bank's introduction to showcase hazard just as the likelihood of an unfriendly move. Similarly significant, it measures hazard utilizing indistinguishable units from the bank's main concern — dollars. Investors and supervisors would then be able to choose whether they feel alright with this dimension of hazard. In the event that the appropriate response is no, the procedure that prompted the calculation of VAR can be utilized to choose where to trim the chance. While this strategy is incredible for day-today chance administration, it is not a viable replacement for the more extensive hazard the board procedure of investigating crash situations and keeping control on operational and lawful dangers.

All together for this strategy to perform appropriately, exact exchanging positions ought to be accumulated what's more; authentic database of these positions ought to be fabricated in like manner. When the position information is incorporated, the general hazard must be determined by collecting the dangers from person contracts over the entire portfolio. This is finished by working out the impact of moves in person 'risk components' (for example, values, currency market instruments, remote trade rates) over the portfolio, which may include extensive monetary forms and, with every money, unique resource classes. VAR is worked out from

the connections between the individual hazard factors also, the impact on the arrangement of moves in each risk factor.

Up until this point, there is no industry accord on the best technique for ascertaining VAR. Likewise with any factual model, VAR relies upon certain suspicions. The decision of which technique for estimation is utilized is ordinarily directed by the client's abhorrence for impossible or over-oversimplified presumptions. There are three famous strategies: the 'variance/covariance' strategy (otherwise called the 'correlation' or 'parametric' strategy), the 'historical simulation' strategy and the 'Monte-Carlo simulation' strategy. Every one of these strategies has its own arrangement of suspicions and each is a rearrangement of the real world.

The variance/covariance strategy is the least complex one as far as application to money related practices what's more, PC time utilization. This strategy expects that the profits on hazard factors are 'normally distributed' and the connections be tween's chance variables are consistent. For risk management purposes, and in spite of the fact that it is regularly cautioned risk against, utilizing the typical circulation supposition that is commonly viewed as adequate. Deviation from ordinariness for the most part does not altogether adjust the aftereffects of the VAR estimations under the suspicion of typical economic situations. Inside this technique, a bell shaped bend (Gaussian dispersion) is basically expected and it likewise accept that extraordinary cost swings, for example, showcase crashes, happen too infrequently to add to an exact image of the probability of future occasions.

To figure VAR utilizing the change/covariance strategy, the instability of each hazard factor is separated from a pre-characterized recorded perception period. The potential impact of each segment of the portfolio on the generally portfolio esteem is then worked out. These impacts are then totaled over the entire portfolio utilizing the connections be tween's the hazard factors (which are, once more,

extricated from the chronicled perception period) to give the general VAR estimation of the portfolio with a given certainty level.

Numerous budgetary organizations have picked a certainty interim of 95 percent (or 97.5 per penny on the off chance that we just take a gander at the misfortune side (one-followed)) to compute VAR. This implies once every 40 exchanging days, a misfortune bigger than showed is expected to happen. A few banks utilize a 99 percent (one-followed) certainty interim, which would hypothetically lead to bigger misfortune once every 100 exchanging days. Attributable to fat tails of the likelihood dissemination, such a misfortune will happen more regularly. Some budgetary foundations feel that the utilization of a 99 percent certainty interim would put an excessive amount of trust on the measurable model and, thus, some certainty level ought to be doled out to the 'art– side' of the hazard estimation process.

A rearranged estimation procedure of the estimation of VAR chance components (utilizing difference/ covariance technique) for a solitary and various resources' positions is represented as pursue:

From rudimentary insights, it is outstanding that for an ordinary dispersion, 68 percent of the perceptions will exist in 1s (standard deviation) from the normal esteem, 95 percent inside 2 σ and 99 percent inside 3 σ from the anticipated esteem, along these lines the VAR of a solitary resource in dollar terms is:

$$Var_y = \alpha \times \text{Value of position }_i \text{ in dollars} \times q_i$$

Where a is the confidence level (or in different words, the standard traditional variant at confidence level a) and σ_i is the variance (volatility) of the security that constitutes the single position. The value of the position, is the amount of investment in bucks, of instrument i.

For numerous benefits or arrangement of advantages, VAR is a component of every individual security's hazard and the connection factor between the profits on the singular securities as pursues:

$$VAR_{PR} = (|VAR| \times |p| \times |VAR|T)1/2$$

This equation could be a common one for the calculation of Value-at-Risk for any portfolio not withstanding of the number of securities. It ought to be famous that this formula is displayed in terms of matrix-algebra — a useful shape to maintain a strategic distance from mathematical complexity, as increasingly securities is added. This approach can, in truth, rearrange programming in handle Excel worksheets and can also allow simple consolidation of short selling within the showcase risk management process.

This implies, in arrange to calculate the Value-at-Risk (of a portfolio of a number of securities), one needs to begin with to make a lattice of the individual VAR positions, a transpose lattice (designated above by the letter 'T' on the best of the matrix) of the person Value-At-Risk positions and at long last a matrix of all relationship variables (r). Once one multiplies the three frameworks and after that takes the square root of the result, he closes up with the VAR_p of any portfolio with any n-number of securities. This straightforward number outlines the portfolio's presentation to market risk. Financial specialists and senior troughs can at that point choose whether they feel comfortable with this level of risk. In case the answer is no, at that point the method that driven to the estimation of VAR can be utilized to choose where to diminish excess chance. For occurrence, the riskiest securities can be sold, or one can use derivative securities such as prospects and options to support the unwanted risk.

Illiquid securities such as values are very common in developing markets. Customarily, these securities are exchanged rarely (at very low volume). Their cited costs ought to not be regarded as an agent of the traders' consensus vis-a`-vis their genuine esteem but or maybe as the exchange cost that arrived at by two counterparties beneath extraordinary advertise conditions. This, of course, speaks to a genuine situation to anybody who looks for to degree the advertise risk of these securities with a strategy which is based on volatilities and relationship matrices. The primary issue emerges when the historical price arrangement are not

accessible for a few securities or, when they are accessible, they are not fully reliable due to the need of liquidity.

The select of the 'time-horizon' or number of days to sell (unwind) a position is very important figure and has enormous effect on Value-At-Risk numbers, and it depends on the objectives of the portfolio and the liquidity of its situations. For a bank's exchanging portfolio contributed in profoundly fluid monetary forms, a one-day skyline may be acceptable. For a speculation supervisor with a monthly re-balancing and announcing center, a 30-day period may be more suitable. Ideally, the holding period ought to compare to the longest period for deliberate portfolio liquidation.

In fact, if one assumes normal distribution, then he can convert the VAR horizon parameter from daily to any t-day horizon. The variance of a t-day return should be t times the variance of a 1-day return or $\sigma^2 = f(t)$. Thus, in terms of standard deviation (or volatility), $\sigma = f(t^{1/2})$ and the daily VAR number can be adjusted for any horizon as:

VAR (t-day) = VAR (1-day) x $t^{1/2}$

The over square root of time run the show was proposed and utilized by J.P. Morgan in their earlier Risk Metrics methodology. Unfortunately, the last mentioned approach does not consider real-life trading situations, where dealers can liquidate (or re-balance) little parcels of their trading portfolios on a day by day premise. In addition, this could generate untrustworthy risk appraisals and can lead to significant overestimates of VAR figures, especially for the purposes of financial capital allocation between exchanging and/or investment units.

In order to perform the calculation of VAR under more realistic illiquid market conditions, one can define the following:

VAR $_{adj}$ =VAR((t+1)/2)1/2

Where t is the number of liquidation days (t-day to liquidate the entire asset fully), VAR is VAR under liquid market conditions and VAR_{adj} is VAR under illiquid market conditions.

A straight liquidation method of the resource is accepted within the over equation, that's offering break even with parts of each resource each day till the final exchanging day (t), where the whole resource is sold. The over show is more fitting for every day exchanging circumstances where dealers can loosen up portion of their positions on an everyday premise. Additionally, the over approach can moreover be utilized to calculate the VAR for any time horizon.

As portrayed prior, VAR strategy is as it were one approach of measuring advertise chance and is basically concerned with most extreme anticipated misfortunes beneath typical showcase conditions and inside an indicated level of certainty. For judicious risk management and as an additional administration device, firms ought to increase VAR investigation with stretch testing and situation strategies. The Value-at-Risk methodology gives a probabilistic degree of misfortune that's surpassed, say 2.4 per cent of the time. From a hazard management viewpoint, be that as it may, it is alluring to have an assess for what potential misfortunes may be beneath extremely unfavorable conditions where measurable instruments don't apply.

Stress testing gauges the effect of abnormal and extreme occasions on the entity's esteem and ought to be detailed to senior administration on a day by day premise as portion of the chance announcing prepare. For emerging-market nations with extraordinary instability, the utilization of stretch testing ought to be profoundly underlined and full portrayal of the method ought to be included in any approach and procedure manual. Stretch testing ordinarily takes the frame of subjectively indicating scenarios of interest to evaluate changes within the esteem of the portfolio and it can include analyzing the impact of past huge showcase moves on today's portfolio.

In this work, risk management strategy was created to evaluate potential introduction due to an occasion risk (serious crisis) that's related with huge developments of the Mexican Stock Advertise amid periods of budgetary turmoil. The assignment here is to degree the potential risk presentation that's related with a pre-defined jump beneath a few relationship components suspicions.

2.2 MARKET RISK MANAGEMENT — THE MEXICAN STOCK MARKET CASE

Market (exchanging) hazard management could be a unit inside worldwide risk management that's dependable for checking all dangers related to restrictive exchanging (or position taking) of the financial institution. Showcase chance bargains with chance inside short-term time skyline situating, where all exchanging positions are marked-to market and hazard is re-evaluated on a day by day premise and execution is measured by means of day by day profit and loss and impacts instantly the money related institution's pay explanation. This can be so as it were for financial exchanging units that works on brief horizons.

Within the ponder detailed in this, databases of a few of the foremost liquid stocks (11 stocks in total) and market/sectors files that are experienced within the Mexican Stock Market were accumulated, sifted and enough adjusted for the creation of pertinent inputs for the calculation of all chance components. These 11 stocks are the most components of the major neighborhood stock showcase list (IPC index). A brief depiction of the 11 stocks' mechanical divisions and the market/sectors records (all are capitalization weighted records) are included in enclosures as takes after:

TV Azteca (Television and Media)

Group Televise (Television and Media)

Group modulo (Beverages)

Tele´fonos de Mexico (Telecommunication)

Wal-Mart de Mexico (Retailer Chain)

CEMEX (Cement)

Communications y Transports Index (Telecommunication and Transportation

Companies and consists of 12 Stocks)

Construction Index (Cement, Construction and

Housing Companies and contains 11 Stocks)

Comerica Index (Retailer Chains and comprises

Of 16 Stocks)

Services Index (Financial Institutions and other

Services and incorporates 10 Stocks)

Verifiable databases (for more than three a long time) of daily costs were gathered for the reason of carrying out this investigate and advance for the development of showcase risk management factors and risk limits. Within the handle of dissecting the information, to begin with, the day by day stock's returns of the 11 test stocks as well as the day by day returns of the market/sectors files have been calculated. These every day returns are, in reality, basic fixings for the calculation of standard deviations, correlation frameworks, stocks' betas, scenes and kurtosis of all the test stocks/indices and their relationship vies-a`-vies the IPC list.

A program bundle was thought up for the reason of making an exchanging portfolio of these stocks and thus to carry out all VAR and scenario-analysis calculations and results. The approach that was utilized in building-up the computer program bundle was based on matrix-algebra and duplication of lattices. In reality, Excel bundle has numerous built-in capacities that can allow the execution of increase of frameworks and other valuable numerical/ factual calculations.

 The investigation of information and talks of most of the pertinent discoveries and comes about of this investigate will be sorted out and clarified as take after.

2.3 Joining Asset-Liquidity-Risk Figure into a Parametric Value-at-Risk Modeling System

To calculate VAR utilizing the parametric (or generally known as the variance/covariance, expository and delta-neutral) strategy, the instability of each risk calculate is extricated from a pre-defined chronicled perception period. The potential impact of each component of the portfolio on the generally portfolio value is at that point worked out. These impacts are at that point amassed over the total portfolio using the relationships between the hazard variables (which are, once more, extricated from the chronicled perception period) to donate the by and large VAR esteem of the portfolio with a given certainty level (Al Manabí, 2014 and 2015b). As such, for a single trading position the outright esteem of VAR can be characterized in financial terms as follows:

$$VAR_i = | (I - \alpha * \sigma_i) [Asset_i * Fx_i] | = | \alpha * \sigma_i [Asset_i * Fx_i] | \qquad (1)$$

where μ_i is the anticipated return of the resource, α is the certainty level (or in other words, the standard typical variation at certainty level α) and σ_i is the forecasted standard deviation (or conditional instability) of the return of the security that constitutes the single position. The $Asset_i$ (from this time forward, A_i) is the mark-to-market value of the exchanging resource and shows the money related sum of value position in $asset_i$ and Fx_i indicates the unit outside trade rate of resource i. Without a misfortune of generality, ready to expect that the anticipated esteem of day by day returns μ_i is near to zero. As such, in spite of the fact that condition (1) incorporates a few rearranging assumptions, yet it is routinely utilized by analysts and specialists within the monetary markets for the estimation of VaR for a single exchanging position.

Resource exchanging chance within the nearness of different hazard components is decided by the combined impact of person risks. The degree of the overall hazard is determined not as it were by the extents of the person dangers but moreover by their correlations. Portfolio impacts are significant in chance administration not as it were for huge diversified portfolios but moreover for person rebellious that

depends on several risk factors. For numerous resources or portfolio of resources, VaR may be a work of each individual security's chance and the relationship calculate $[\rho_{i,j}]$ between the returns on the individual securities, point by point as takes after:

$$VaR_p = (\Sigma \Sigma VaR_i \, VaR_j \, \rho_{i,j})^{1/2} = ([VaR]^T [\rho] [VaR])^{1/2} \qquad (2)$$

This equation could be a common one for the calculation of VaR for any portfolio regardless of the number of securities. It ought to be famous that the moment term of the over equation is modified in terms of matrix-algebra—a useful shape to avoid mathematical complexity, as increasingly securities are included. This approach can rearrange the modeling and programming handle and licenses easy incorporation of short-sales positions into the advertise hazard administration process. This implies, in arrange to calculate VaR (of a portfolio of any number of securities), we got to make to begin with a transpose vector $[VaR^T]$ personal VaR positions—an (1*n) vector, and subsequently the superscript "T" demonstrates transpose of the vector:

$$[VaR^T] = [VaR_1 \ VaR_2 \ .. .. .. \ VaR_n] \qquad (2a)$$

Second, a vector [VaR] of person VaR positions—explicitly n lines and one column (n*1) vector, such as:

$$[VaR] = \begin{bmatrix} VaR_1 \\ VaR_2 \\ ...... \\ VaR_n \end{bmatrix} \qquad (2b)$$

And at long last, a matrix $[\rho]$ of all relationship components (ρ)—an (n*n) matrix in the following frame:

$$[\rho] = \begin{bmatrix} 1 & \rho_{1,2} & \rho_{1,3} & \cdots\cdots & \rho_{1,n} \\ \rho_{2,1} & 1 & \rho_{2,3} & \cdots\cdots & \rho_{2,n} \\ \rho_{3,1} & \rho_{3,2} & 1 & \cdots\cdots & \rho_{3,n} \\ \cdots\cdots & \cdots\cdots & \cdots\cdots & \cdots\cdots & \cdots\cdots \\ \rho_{n,1} & \rho_{n,2} & \rho_{n,3} & \cdots\cdots & 1 \end{bmatrix}$$

(2c)

Subsequently, as one duplicates the two vectors and the correlation matrix and then takes the square root of the result, one closes up with the VaR$_p$ of any portfolio with any n-number of securities.

The best way to account for resource liquidity exchanging risk is to amplify the holding period of illiquid positions to reflect a reasonable liquidation period. An adjustment can be made by including a multiplier to the VaR degree of each exchanging resource sort, which at the conclusion depends on the liquidity of each individual security. In any case, the shortcoming of this strategy is that it permits for subjective estimation of the liquidation period. Moreover, the normal suspicion of a one day horizon (or any unbendable time skyline) inside VAR system, ignores any calculation of exchanging risk related to liquidity impact (that's, when and whether a trading position can be sold and at what cost). A wide VAR show should incorporate a liquidity premium (or resource liquidity chance calculates). This could be worked out by defining a strategy by which one can loosen up a position, not at some ad-hoc rate, but at the rate that market conditions is ideal, so that one can effectively set a risk worth for the liquidity things. In common, this will raise significantly the VAR, or the sum of risk-capital to back the exchanging position.

Actually, if returns are independent and they can have any indirect multivariate distribution, then it is potential to convert the VAR horizon parameter

From day-to-day to any t–day horizon. The variance of a t–day return should be t times the variance of a 1–day return, or in other words, $\sigma^2 = f(t)$. Thus, in terms of standard deviation (or volatility), $\sigma = f(t)$, and the daily or overnight VAR number [VAR (1-day)] can be adjusted for any t-day horizon as:

$$\text{L}-\text{VAR}\,(t-day) = \text{VAR}\,(1-day)\,t^{1/2}$$

(3)

The over L-VAR equation was proposed and utilized by J.P. Morgan in their earlier RiskMetricsTM strategy. This strategy certainly expect that liquidation happens in one square deal at the conclusion of the holding period which there is one holding period for all resources, notwithstanding of their inalienable exchanging liquidity structure and eventually leads to an exaggeration of L-Varro Tragically, the latter approach does not consider real-life-trading circumstances, where dealers can liquidate (or re-balance) little parcels of their long and brief exchanging portfolios on an everyday premise. The suspicion of a given holding period for efficient liquidation inevitably suggests that assets' liquidation happens amid the holding period. Accordingly, scaling the holding period to account for efficient liquidation can be justified on the off chance that one permits the resources to be exchanged all through the holding period. In fact, the square-root of time hypothesis has been debated over the past two decades by a few creators (see for illustration, Danielson and Grand, 2016). In another important ponder; Dowd et al. (2014) handle the issue of evaluating VAR for long-term skyline. In their paper they offer a distinctive; in any case a rather straightforward, approach that maintains a strategic distance from the acquired issues related with the square-root of time run the show, as well as those related with endeavoring to extrapolate day-to-day instability figures over long skylines. In expansion, Al Janabi (2014a) and (2015b) as of late uncovers that the square-root of time run the show leads to a systematic overestimation of showcase chance. The creator concludes that in spite of the widespread application and usage of the square-root of time multiplier in Basel II regulatory agreement, it all things considered comes up short brief to address the point of Basel II accord. It is obvious that a comprehensive examination into the nature of asset market/liquidity hazard and its impact on unmistakable portfolios of both long and short illiquid resources is fundamental.

In this work we show a clear-cut re-engineered approach for calculating a closed-form parametric VAR with unequivocal treatment of resource liquidity trading risk. The proposed show and liquidity scaling calculate is more reasonable and less conservative than the ordinary root-t multiplier. In pith, the suggested multiplier

may be works of a foreordained liquidity edge characterized as the maximum position which can be loosened up without aggravating advertise prices during one exchanging day. The pith of the show depends on the suspicion of a stochastic stationary handle and a few rules of thumb, which can be of crucial value for more exact in general exchanging chance appraisal amid advertise stress periods when liquidity dries up. To this conclusion, a commonsense system of a modeling methodology (inside a disentangled scientific approach) is proposed underneath with the reason of joining and calculating of illiquid assets' day by day L-VAR.

The market risk of an illiquid long or brief exchanging position is bigger than the hazard of a something else indistinguishable fluid position. Usually since loosening up the illiquid position takes longer than loosening up the fluid position, and, as a result, the illiquid position is more uncovered to the instability of the advertise for a longer period of time. In this approach, an exchanging position will be considered illiquid in the event that its size outperforms a certain liquidity limit. The edge (which is decided by each dealer) and characterized as the most extreme position which can be unwound, without disturbing showcase costs, in ordinary showcase conditions and amid one trading day. Thus, the measure of the exchanging position relative to the threshold plays an imperative part in deciding the number of days that are required to close the complete position. This impact can be deciphered into a liquidity increment (or an extra liquidity chance figure) that can be consolidated into VAR examination. If for example, the par value of a situation is $10000 and the liquidity threshold is $2500 per day, then it will take 4 days to be out of stock the entire trading situation. Therefore, the preliminary position will be wide-open to market variation for 1 day, and the rest of the situation (that is, $7500) is subject to market deviation for additional 3-days. If it is supposed that daily variations of market values track a stationary stochastic procedure, the risk exposure owing to illiquidity special effects is given by the subsequent illustration, in depth along these lines:

In arrange to require under consideration the total illiquidity of resources (that's , the required unwinding period to sell an resource) we characterize the following:

σ_{adj}^{2} = overnight conditional variance of the illiquid asset position;

σ_{adj} = asset liquidity risk factor or the overnight standard deviation (conditional volatility) of the illiquid asset position;

and t = number of liquidation days (that is, t–days to liquidate the entire asset fully).

The proposed approach accept that the exchanging position is closed out linearly misfortunes due to illiquid trading positions over t-days are the entirety of misfortunes over the person trading days. In addition, we will expect with sensible precision that resource returns and losses due to illiquid exchanging positions are free and indistinguishably distributed (iid) and serially uncorrelated day-to-day along the liquidation skyline and that the change of misfortunes due to resource liquidity risk over t-days is the whole of the variance (σ i 2, for all i =1, 2,…, t) of misfortunes on the person days, hence:

$$\sigma_{adj}^{2} = (\sigma_1^{2} + \sigma_2^{2} + \ ..... + \sigma_{(t-1)}^{2} + \sigma_t^{2}) \qquad\qquad (4)$$

As discussed above, the square root-t condition overestimates resource liquidity hazard since it does not consider that dealers can exchange little parcels of their exchanging portfolios on a day by day premise and it verifiably accept that the total exchanging position can be sold completely on the final exchanging day. Without a doubt, in genuine monetary markets operations, liquidation happens amid the holding period and in this way scaling the holding period to account for deliberate liquidation can be advocated on the off chance that one permits the resources to be liquidated all through the holding period. As such, for this uncommon linear liquidation case and beneath the suspicion that the fluctuation of misfortunes of the first trading day diminishes directly each day (as a work of t) we will infer from equation (4) the taking after:

$$\sigma_{adj}^{2} = \left((\frac{t}{t})^2\sigma_1^2 + (\frac{t-1}{t})^2\sigma_1^2 + (\frac{t-2}{t})^2\sigma_1^2 + \cdots + (\frac{3}{t})^2\sigma_1^2 + (\frac{2}{t})^2\sigma_1^2 + (\frac{1}{t})^2\sigma_1^2 \right)$$

(5)

Apparently, the extra resource liquidity chance calculate depends as it were on the number of days required to offer an illiquid position straightly. Within the common case of t-days, the variance of resource liquidity hazard figure is given by the taking after mathematical functional expression of t:

$$\sigma_{adj}^{2} = \sigma_1^2 \left((\frac{t}{t})^2 + (\frac{t-1}{t})^2 + (\frac{t-2}{t})^2 + \cdots + (\frac{3}{t})^2 + (\frac{2}{t})^2 + (\frac{1}{t})^2 \right)$$

(6)

To calculate the whole of the squares, it is helpful to utilize a scientific shortcut approach. From numerical arrangement the taking after relationship can be obtained:

$$(t)^2 + (t-1)^2 + (t-2)^2 + \cdots + (3)^2 + (2)^2 + (1)^2 = \frac{t(t+1)(2t+1)}{6}$$

(7)

In like manner, after substituting condition (7) into condition (6) the resource liquidity risk calculate can be communicated in terms of conditional instability as:

$$\sigma_{adj} = \sigma_1^2 \{ \sqrt{\frac{1}{t^2}[(t)^2 + (t-1)^2 + (t-2)^2 + \cdots + (3)^2 + (2)^2 + (1)^2]} \}$$

$$\text{or } \sigma_{adj} = \sigma_1^2 \{ \sqrt{\frac{(2t+1)(t+1)}{6t}} \}$$

(8)

The ultimate result of condition (8) is of course a work of time and not the square root of time as utilized by a few monetary markets' members based on the Risk Metrics^{TM} techniques. Moreover, the over approach can moreover be used to calculate the VAR for any time skyline. In arrange to perform the calculation of VAR beneath illiquid advertise conditions, the resource liquidity chance figure of equation (8) can be actualized in VAR calculation, consequently, one can characterize the taking after:

$$L - VaR_{adj} = VaR \sqrt{\frac{(2t+1)(t+1)}{6t}}$$

(9)

Where VAR = Value-at-Risk under liquid market conditions and L-VaRadj = liquidity-adjusted Value-at-Risk under illiquid market cases. The latter equation designates that L-VaRadj > VAR, and for the special condition when the number of days to satisfy the entire assets is one transaction day, then L-VaRadj = VAR. Subsequently, the distinction between L-VaRadj – VAR ought to be break even with to the residual advertise chance due to the illiquidity of any resource beneath illiquid markets conditions. As a matter of reality, the number of liquidation days (t) essential to liquidate the whole resources completely is related to the choice of the liquidity threshold; however the estimate of this limit is likely to alter beneath serious markets conditions. Undoubtedly, the choice of the liquidation skyline can be evaluated from the total exchanging position measure and the day by day exchanging volume that can be loosened up into the advertise without essentially disturbing advertise costs; and in real hone it is by and large evaluated inside by isolating the exchanging position held in an asset by the normal every day exchanging volume of that resource over later days, so that:

t = Total Trading Position Size of Asset$_i$ / Average Daily Trading Volume of Asset$_i$ (10)

In actual practice, the everyday exchanging volume of any resource is assessed as the average volume over a few period of time, for the most part a month of exchanging exercises. In effect, the day by day exchanging volume of resources can be respected as the normal daily volume or the volume that can be loosened up beneath a serious showcase period. Hence, if trading volume is moo since of a "one-way market," in that most individuals are seeking to offer instead of to purchase, at that point (t) can rise considerably (Saunders and Cornett, 2015). The exchanging volume in an extreme advertises period can be roughly approximated as the normal day by day exchanging volume less a number of standard deviations.

But this elective approach is very straightforward, it is still relatively objective. Besides, it is reasonably easy to accumulate the desired information to perform the fundamental liquidation scenarios.

Chapter 3. Results of the empirical research and generalization of the results

3.1 Analysis of volatility, beta, skewness and kurtosis

In this area, the examination of the specific chance of each stock/index (day by day and yearly instability), the stocks/indices connections with regard to the IPC file and at last a test of ordinariness (symmetry) are performed on the test stocks and the market/sectors lists.

Table A1 outlines the everyday instability of each of the test stocks beneath ordinary advertise and extreme (emergency) showcase conditions. Emergency showcase volatilities were calculated by increasing the typical volatilities by a figure of five. From the table, one can watch that the stock with the most elevated instability is Empresas Ica, while Tele´fonos de Mexico stock has illustrated the most reduced instability. Annualized volatilities are delineated in Table A2, and this was performed by altering (increase) the everyday volatilities with the square root of 260 — expecting that there are 260 exchanging days within the calendar year.

A curiously result of the ponder of betas (efficient hazard) is the way in which the comes about were changed over the test stocks as shown in Table A1. Group Televise stock appears to have the most elevated beta (1.34) vies-a`-vies the IPC record (i.e. the most elevated precise chance) and Vitro stock appears to have the most reduced beta (0.42). In addition, Wal-Mart de Mexico stock (with a beta of 1.06) is the finest candidate of the whole test stocks that shows up to move exceptionally closely with regard to the IPC showcase list (with a beta of 1.0). In expansion, as one might anticipate, the INMEX and Communications y Transports

Indices have exceptionally near relationship with the IPC file with betas of 1.06 and 1.11, separately.

In another consider the estimations of skewness and kurtosis were accomplished on the test stocks and market/sectors files. The comes about are too portrayed in Table A1. It is seen that in common all stocks have appeared deviated conduct (both positive and negative values). In addition, kurtosis considers have appeared comparative designs of variation from the norm (i.e. peaked/flat disseminations). At the upper extraordinary, Empresas Ica stock has appeared the most noteworthy positive skewness (0.69) which is combined with a really tall kurtosis — peakedness of (10.19). Some stocks, such as within the case of Alfa stock, has appeared a near relationship to ordinariness (skewness of –0.19 and kurtosis of 3.45). Moreover, the IPC record has moreover shown a few signs of typicality with 0.18 and 2.59 of skewness and kurtosis, respectively.

The curiously result of this consider proposes the need of combining VAR calculations — which accept typical dispersions of returns — with other strategies such as stretch testing and situation investigation to urge a natty gritty picture of other remaining dangers that cannot be captured with the straightforward presumption of ordinariness.

3.2 Matrices of correlations

Three lattices of relationships were made in this consider, to be specific correlation¼1, and correct (or experimental) relationships. The targets here were to set up the vital quantitative foundations for progressed chance administration examination that will take after in the blink of an eye. The gathered relationship lattice is delineated in Table A3 for the correct relationship case of all stocks and files. The last mentioned relationship matrix was a basic component at the side volatilities frameworks for the creation of Value-At-Risk and stress-testing calculations for equity market chance management processes and methods. The comes about of Table A3 affirm a few well-known actualities within the Mexican

Stock Advertise such as the tall relationship figure (72 per cent) of Tele´fonos de Mexico stock with the IPC list. Moreover, the INMEX and Communications y Transports Records have appeared solid connections with the IPC file. Usually prove with the tall relationship variables of 99 per cent and 90 percent, separately.

3.3 Market risk management reports

In this area, a few case thinks about were carried out to stress the significance of advertise hazard administration reports for daily risk-taking hones. Within the calculations detailed here in, the impacts of diverse portfolio combinations, different liquidation periods (loosening up skylines of stocks possessions) and brief offering of stocks, were all investigated.

Table A4 outline a down to earth test report for the scope of value showcase risk management exercises of a theoretical equity portfolio consisting of a few of the foremost active stocks within the Mexican Stock Showcase. In this first case ponder, add up to portfolio esteem was P$110 million with an break even with resource assignment of 9.1 per cent and a liquidity skyline of one exchanging day — that's the exchanging unit requires one day to unwind all exchanging positions. This table illustrates the impacts of push testing (VAR beneath severe market conditions) and distinctive correlation factors on day by day Value-at-Risk calculations. The VAR report portrays too the overnight (daily) volatilities — that were calculated as the volatility of the rate cost changes (daily returns) — of these stocks and their respective betas.

The VAR comes about were calculated under normal and extreme advertise conditions by taking into consideration distinctive relationship factors (þ1, 0, and correct relationships between the various chance variables). Beneath relationship þ1, one is assuming 100 per cent positive relations between all hazard components (chance positions) all the times, though for the 0-correlation case, there are no connections between all positions at all the times. The final relationship case takes

into account the experimental (correct) relationship between all positions and was calculated through variance/ covariance network.

As one might anticipate, the case with correlation þ1 gives the most elevated VAR numbers (P$4,959,166 and P$24,795,831), owing to the truth that beneath these circumstances the total VAR of the portfolio is the weighted average of the person VAR of each exchanging position. It is fundamental to incorporate different correlation factors in any stress-testing work out, based on the truth that current patterns in correlations may break down with extreme showcase movements, caused by startling monetary or political crises. The degree of broadening of this hypothetical exchanging portfolio can moreover be displayed as the contrast within the esteem of the two most prominent VARs, that's the VAR of correlation ¼ þ1 case versus the VAR of the exact relationship case (P$1,996,659 or 67.40 per cent for the ordinary market condition case). The beta of this portfolio is additionally demonstrated in this report as 0.915.

Since the varieties in every day VAR are mainly related to the ways in which the assets are designated in expansion to the liquidation period of resources and the impacts of short selling, it is teacher to look at the way in which the VAR figures are affected by changes in such parameters. Table A5 illustrates the changes in VAR numbers when the liquidation period was expanded to ten trading days for all stocks inside the portfolio. In Table A6, it was expected that the first six resources ought to be sold in five trading days, though the remaining five assets can be sold in ten exchanging days, respectively.

The impacts of brief offering are portrayed in Table A7. One of the curiously comes about of this study is the way in which the VAR numbers have diminished. This conduct might be explained by the way in which the by and large portfolio is supported — in other words, a few of the long positions have been supported with the short offering of other stocks and consequently have driven to the lessening within the generally risk. In fact, one of the leading focal points of the calculation of VAR inside the matrix-algebra system is the capacity in which one can join the

effects of brief offering without tedious mathematical investigation. Whereas Table A8 also shows the impacts of brief offering with a liquidation skyline of ten exchanging days, Table A9 illustrates the same impacts of brief offering but here with the presumption that the primary six assets should be sold in five exchanging days and the remaining five resources can be sold in ten trading days, separately.

At long last, with the reason of illustrating the effects of disparate resources assignments, two more case examinations were carried out, as outlined in Tables A10 and A11. In both cases, the unwinding period was held for one exchanging day. While Table A10 appears long speculations with different resource allotments, Table A11 examines the impacts of brief offering with different degrees of resource assignments.

3.4 VAR limits setting for market hazard management

In another think about, distinctive VAR calculations have been inspected in arrange to set up methods for the foundation of VAR exchanging limits conjointly to set satisfactory arrangements for dealing with certain situations in which exchanging work areas (units) are over the authorized Value-at-Risk limits.

These Value-at-Risk limits method and methodology must be examined and endorsed by the board of executives of the monetary substance. All trading work areas have to be having such limits of VAR as practical rules additionally as a strict approach for their day by day chance takings. Any overabundance of VAR beyond the approved limits must be detailed to top administration by the showcase risk management unit. In addition, dealers require giving full and advocated clarifications of the reasons of why their overnight VARs are past the approved limits.

Tables A6–A8 speaks to a few case studies for the setting of VAR limits. In all these case ponders, the impacts of different asset allocations with and without brief selling were examined for the reason of setting adequate VAR limits. Assist, in all

cases, a liquidation skyline of one exchanging day was assumed. For the purpose of disentanglement of the examination, a volume exchanging restrain of P$220,000,000 was expected as a limitation — that is the monetary substance must keep a maximum market esteem of stocks of no more than P$220,000,000 between long and short positions.

Whereas in Table A6 rise to resource allotments of 9.2 per cent were expected, in Table A7, all equity exchanging was concentrated in one stock that has the most elevated every day return instability — Empresas Ica stock in that case. Case ponders 3 and 4 are outlined in Tables A7 and A8, respectively. In case ponder 3, unequal asset allocations rates were accepted by randomly designating more exchanging positions to a few of the test stocks. At last, in Table A8, the impact of brief offering of a few of the sample stocks was too mulled over by randomly brief offering a few of the sample stocks.

An outline of the VAR comes about for the four case thinks about is outlined

 Underneath:

1.   Every day exchanging VAR in Mexican Pesos (P$) (ordinary showcase conditions) with relationship components

Exact (Empirical)	+1	0
Case study 1	5,935,014	9,928,332	3,106,682
Case study 2	16,732,661	16,732,661	16,732,661
Case study 3	5,722,612	9,299,630	2,888,269
Case study 4	6,250,627	9,023,675	4,638,508

2.   Every day exchanging VAR in Mexican Pesos (P$) (severe advertise conditions) with correlation factors

Exact (Empirical)	+1	0
Case study 1	29,635,069	49,491,661	15,523,411
Case study 2	83,723,307	83,723,307	83,723,307

Case study 3   28,553,058   46,438,150   14,291,347

Case study 4   30,743,134   45,058,373   23,182,538

As one might anticipate the most noteworthy VAR numbers that were calculated so distant is for case ponders 2, when all exchanging budget was put in a single stock with the most noteworthy overnight instability. This is clearly due to the truth that there was no diversification advantage to be taken into account. The foremost impact of broadening on VAR limits setting appears to be through case consider 3, that is with unequal resource assignment percentages.

As a conclusion of this ponder, the board of directors of the substance can set the most extreme daily trading VAR limits as take after:

— approved VAR Limit¼P$16,732,661 (under normal market cases).

— Approved VAR Limit¼P$83,723,307 (under severe and crisis market conditions).

— approved Volume Limit¼P$221,000,000 (between long and short equity conditions).

3.5 Standpoints from the GCC Stock Markets

In this work, a database of every day returns of the six GCC stock markets' main indicators (lists) are collected and satisfactorily adjusted for the plan of relevant inputs for the calculation of all hazard variables. The entire numbers of indices that are considered in this work are nine records; seven neighborhood records for the six GCC stock markets (counting two records for the UAE markets) and two benchmark files, natty gritty as takes after: DFM Common List (Joined together Arab Emirates, Dubai Monetary Showcase Common List); ADX Record (Joined together Arab Emirates, Abu Dhabi Stock Advertise File); BA All Share List (Bahrain, All Share Stock Showcase File); KSE Common File (Kuwait, Stock Exchange General File); MSM30 List (Oman, Muscat Stock Advertise File); DSM20 Index (Qatar, Doha Stock Showcase Common Record); SE All Share

Record (Saudi Arabia, All Share Stock Advertise File); Shuaa GCC File (Shuaa Capital, GCC Stock Markets Benchmark List); and Shuaa Middle easterner List (Shuaa Capital, Arab Stock Markets Benchmark Record)

Examination of the specific chance of each file (every day conditional volatility), the records relationships—or the affectability beta factors—with regard to the benchmark record (that's, the Shua Middle easterner Record) and at long last a test of non-normality (asymmetry) are performed on the test files. To examine the statistical properties of the information, we have computed the log returns of each series. Table (1) outlines the day by day conditional instability of each of the test lists beneath ordinary and serious advertise conditions. Conditional volatilities are estimated with the help of a generalized autoregressive conditional heteroscedasticity in mean model [GARCH-M (1, 1)]. Extreme advertise volatilities are calculated by implementing an experimental dissemination of past returns for all stock market indices' time arrangement and, subsequently, the greatest negative returns (or downside losses), which are seen within the chronicled time arrangement, are chosen for this purpose. This approach can help in overcoming a few of the impediments of normality assumption and can give distant better; a much better; a higher; a stronger; an improved a much better examination of L-VAR particularly under severe and illiquid advertise settings. As such, Table (2) delineates the greatest daily positive and negative returns and their individual dates of events. To this end, downside-risk beneath unfavorable market conditions is mimicked as the conditional instability of the greatest day by day misfortunes.

From Table (1) able to watch that the list with the most noteworthy instability is the SE All Share List (beneath ordinary advertise conditions) though the DFM General Record has illustrated the most elevated instability beneath extreme market conditions. A curiously result of the ponder of affectability variables (or the beta factors for orderly hazard) is the way in which the comes about are shifted over the sample records as shown in Table (1). SE All Share File shows up to have

the highest sensitivity figure (0.98) vis-à-vis the Shuaa Middle easterner File (that's the highest systematic chance) and the BA All Share File appears to have the most reduced beta factor (0.06). In addition, and in agreement with the general belief, Shuaa GCC Index (with a affectability figure of 1.05) is the most excellent candidate of the whole test indices that shows up to move exceptionally closely with regard to the benchmark Shuaa Arab Index (with a beta calculate of 1.0).

In another think about, the estimations of skewness, kurtosis and testing for non-normality are accomplished on the test lists. The comes about of this think about are depicted in Table (1) as well. It is seen, in common, that all records show asymmetric behavior (both positive and negative values). In addition, kurtosis studies appear comparative designs of anomaly (i.e. peaked/flat conveyances). At the upper extraordinary, MSM30 List appears a negative skewness (-0.57) which is combined at the same time with a tall Kurtosis—peakedness of (18.40). As evidenced in Table (1), the over comes about of common flight from ordinariness are also affirmed with the Jarque-Bera (JB) test. The JB test appears an obvious general deviation from ordinariness and, in this way, rejects the speculation that GCC stock markets' time arrangement returns are regularly conveyed. The curiously result of this think about recommends the need of combining L-VAR calculations—which assumes ordinary conveyances of returns—with other strategies such as stress testing and situation investigation to urge a natty gritty picture of other remaining dangers (fantails in the likelihood conveyance) that cannot be captured with the simple assumption of normality.

For the reason of gathering a practical L-VAR and a risk-capital engine, three frameworks of relationship components are made in this inquire about, namely correlation (ρ) = +1, 0, and observational. The goals here are to set up the necessary quantitative frameworks for progressed chance administration modeling that will take after in no time. The gathered relationship lattice is portrayed in Table (3), for the observational relationship case, of all nine GCC records. Opposite to general belief, our analysis indicates that there's a really small

relationship (relationship) between the GCC stock markets within the long-run period. In any case, within the short run period (or on every day serious advertise conditions), be that as it may, we found that correlations tend to extend in esteem (in spite of the fact that not on an expansive scale) and it could even switch signs beneath certain extraordinary circumstances.

A few modeling case considers are carried out the importance of value exchanging chance administration recreation reports for every day risk-taking practices. Show (1) outlines a down to earth recreation report for modeling the risk-capital structure of a speculative value portfolio comprising of several indices of the GCC stock markets. Resource allotment and L-VAR examination (that is, risk-capital appraisal on an everyday basis5) are performed beneath the presumption that local files speak to precise reproductions of broadened portfolios of neighborhood stocks for each GCC stock showcase individually. Moreover, all chance modeling and analyses are performed at the one-tailed 97.5% level of certainty over different close-out periods.

In this full recreation case-study, the full portfolio esteem is AED80 million (UAE Dirham) and with the same resource allotment rate and one trading day resource liquidity horizon—that is, one day to loosen up all value trading positions. Moreover, Display (1) outlines the impacts of stress-testing (that is, L-VAR beneath extreme showcase conditions6 calculated with the greatest negative returns of Table [2]) and diverse relationship variables on day by day L-VAR assessments. In quintessence, this approach can help in overcoming a few of the limitations of the normality suspicion and can give distant better; a much better; a higher; a stronger; an improved investigation of L-VAR, especially under serious and illiquid crisis-driven showcase settings.

As one might anticipate, the modeling case in Show (1) with $\rho = +1$ gives the most elevated L-VAR numbers (AED1,712,470 [beneath typical showcase conditions] and AED10,908,688 [beneath serious showcase conditions]), owing to the truth that under these circumstances the full L-VAR of genuine portfolio is the weighted

average of the person L-VARs of each GCC stock showcase. The degree of risk capital diversification of this theoretical recreation portfolio can too be displayed as the distinction within the esteem of the two most prominent L-VARs—that is, when L-VAR is evaluated with $\rho = +1$ versus the case at which L-VAR is appraised under ρ = experimental. For occasion, the risk-capital enhancement, for the special case of ordinary showcase conditions, is surveyed as AED741, 136 or 76.30%. The overall affectability figure (beta figure) of this portfolio is additionally demonstrated in this report as 0.366, or in other words, the whole value portfolio esteem, with the actual asset allotment rate, moves remotely from the benchmark file (Shuaa Arab Record). Moreover, the L-VAR-engine's reenactment report portrays the overnight conditional undiversified L-VaRs (or undiversified risk-capital) for each GCC stock advertises. These undiversified risk-capitals (beneath typical and appraisal on a day by day basis5) are performed beneath the suspicion that local indices speak to exact reproductions of expanded portfolios of nearby stocks for each serious advertise conditions) are calculated as well with the help of conditional volatilities assessed through a GARH-M (1, 1) model.

Since the varieties in every day L-VAR are primarily related to the ways in which the resources are distributed (that's long or short-sales exchanging positions) in addition to the effect of the close-out period, it is teacher to look at the way in which the L-VAR figures are impacted by changes in such parameters. All else being rise to, and beneath the suspicion of ordinary showcase

Conditions, Display (2) illustrates the non-linear changes to L-VAR figures when the close-out period is increased in consequent interims, from 1 and up to 10 exchanging days, for all long trading positions inside the required value portfolio. At last, and with the purpose of illustrating the impacts of illiquidity of exchanging resources, beneath severe market conditions, on every day L-VAR figures, Display (3) outlines the impacts of increasing (in progressive rising interims) the loosening up period up to ten trading days for all exchanging positions inside the genuine

value exchanging portfolio. In both simulation cases of Shows (2) and (3), the whole generally exchanging volume is kept at AED70 million with alike resource allotment proportions of 14.3% in each of the seven GCC stock markets individually (that's, long exchanging positions only). Furthermore, the investigation of L-VAR beneath illiquid and crisis-simulated market conditions is performed with three distinctive relationship components (ρ): empirical, zero and solidarity individually and for immaculate long exchanging positions as it were. In fact, it is essential to include diverse relationship variables in any L-VAR and stress-testing exercises. Typically since existing patterns in relationship components may break down (or alter signs) beneath antagonistic and extreme advertise developments, caused by unforeseen monetary or political emergencies. As anticipated, the case with ρ = +1 provides the most extreme L-VAR numbers as a result of the reality that beneath these circumstances the overall L-VAR of genuine exchanging portfolio is the weighted average of the person L-VaRs of each value exchanging position. Besides, the degree of risk-diversification (or in other words the impacts of differentiated L-VAR) of this hypothetical recreation portfolio can too be derived essentially as the contrast in the values of the two most prominent L-VaRs—that is, the L-VAR beneath ρ = +1 versus the L-VAR when ρ = observational. Interests, the spread (or the degree of risk diversification in risk-capital) between the two L-VaRs increments as the number of days to loosen up the in general exchanging positions increases.

Finally, Exhibit (4) and (5) outline the effect of short-sales7 on L-VAR figures with distinctive liquidation skylines and for both typical and adverse market conditions. In both cases ponders the overall volume of portfolio esteem is maintained at AED70 million but with distinctive long/short resource allotment ratios as takes after: 43% for Dubai, 29% for Abu Dhabi, 57% for Saudi and 14% for Kuwait markets individually. Moreover, a negative (-14%) resource allotment proportion is assigned similarly over the board for each of Bahrain, Oman and Qatar stock markets. Both shows demonstrate the non-linear modifications to L-VAR figures when the liquidation period is expanded in ensuing interims, from 1

and up to 10 trading days, for all long/short exchanging positions inside the desired equity portfolio. Apparently, the spread or the degree of risk-diversification boosts up slightly as the number of days to loosen up the generally exchanging positions increases but to a lesser degree than the case of long exchanging position. The last mentioned observed phenomena can be clarified by the reality that the degree of relationship components for all GCC stock markets is generally moo as shown in Table (3). Conspicuously, low relationship variables can have a or maybe coordinate and strong effect on risk diversification for long exchanging position than for long/short positions. In this way, the combination of long/short exchanging positions with exceptionally moo relationship variables can lead to a few enhancement benefits yet to a lesser degree than the case of merely immaculate long exchanging positions.

There are numerous strategies and ways to distinguish, to measure and to control advertise hazard, and market risk directors have the errand to discover the identity of the one that suits their needs. In fact, there is no right or off-base way to measure/ manage showcase chance; it all depends on each entity's destinations, lines of commerce, chance appetite and the accessibility of reserves for venture in market hazard administration ventures. Notwithstanding of the technique chosen, the foremost important factors to consider are the foundation of sound hazard hones, approaches and standards and the consistency within the execution process across all lines of businesses and dangers.

Beneath uncommon conditions when changes in market hazard variables are regularly distributed, VAR can be calculated utilizing the variance/ covariance approach. For VAR limits setting and daily advertise hazard estimation purposes, these assumptions are made for the purpose of simplifying the calculation handle. For a rising market environment, one, in any case, needs to supplement the variance/covariance approach with other examination such as stretch testing and simulation examination. Typically done with the objective of assessing the effect of assumptions that are made beneath the VAR approach. Moreover, the impacts of

illiquidity of exchanging resources in developing markets must be managed with more admirably and ought to be brought into presence inside the VAR framework.

In this archive, a streamlined and practical method for calculating portfolios' showcase hazard is displayed and examined. Matrix-algebra approach is utilized to determine the fundamental mathematical/ quantitative showcase hazard administration methods. This approach has a few focal points owing to the truth that it can encourage the programming process in EXCELTM worksheets and can also permit simple joining of brief offering of trading resources into the value exchanging process. The impacts of illiquidity of exchanging resources are also incorporated into the VAR quantitative approach. For that reason, a disentangled and practical demonstrate for the estimation of the effects of illiquid resources (loosening up of trading assets), in every day advertise hazard management practices, is characterized and is properly integrated into the Value-at-Risk and stress-testing models.

Value-at-Risk limits' setting is a vital concern as part of the day by day chance administration handle. To this conclusion, a strategy was created to illustrate a commonsense approach for the setting of VAR limits for an equity-trading-unit. In all case thinks about, the volume constrain in Mexican Pesos (P$221,000,000) was expected consistent and was utilized as a constraint (on the matrix-algebra's complex mathematical work) for the foundation of adequate and viable VAR limits. For this particular ponder, the VAR limits were established for ordinary and extreme advertise conditions. To this end, a few cases consider and reenactments were performed with diverse resource assignments (with and without brief offering) and with the objectives of setting an ideal limits' structure for a value advertise chance administration unit.

Our observational testing comes about for the GCC zone recommend that in nearly all tests, there are clear deviated behaviors within the dispersion of returns of the sample value records. The engaging result of this ponder proposes the inevitability of combining L-VAR calculations with other strategies such as stress testing and

situation investigation to get a handle on an intensive picture of other remaining risks (such as, fat-tails within the likelihood dissemination) that cannot be uncovered with the plain presumption of ordinariness. In conclusion, the suggestions of the discoveries of this consider on the GCC stock markets recommend that although there's a clear departure from ordinariness within the conveyance of value files returns, this issue can be handled without the required of complex scientific and analytical procedures. In reality, it is conceivable to legitimize and to handle these issues for cash equities with the basic utilize of a parametric VAR strategy (in its matrix-algebra form); beside the joining of a solid stress-testing approach (under adverse and crisis-simulated advertise conditions); as well as by supplementing the risk analysis with a reasonable resource liquidity hazard figure that takes into consideration real world trading circumstances all through the close-out period. Without a doubt, our suggested modeling strategy is in-line with the suggestion of previous studies. In substance, a number of creators have argued that numerous resource dispersions have "fat tails" which Risk Metrics, by expecting the ordinary dissemination, thinks little of the hazard of extraordinary misfortunes.

An curiously issue for advance inquire about would be the usage of our matrix-algebra approach together with the real-world Value-at-Risk techniques to develop practical portfolios that comply with resource managers' risk aversion while maximizing anticipated return. This will be achieved by taking into consideration the show or expected relationships and person VAR matrices of the portfolio's components, beneath the assumption that the anticipated portfolio's returns are precise and given that the correlation along with person VAR lattices will remain constant for the chosen time skyline.

Advertise hazard administration models, which are adopted in this work, were connected to the Mexican Stock Showcase (BMV). In this way, our analyses were carried out for a few of the most active stocks within the Mexican Stock Showcase in addition to a few market/sectors files. To this conclusion, databases of day by

day stocks' costs and market/sectors indices' were gotten, filtered and coordinated. A few case ponders were carried out with the targets of calculating VAR numbers beneath different scenarios. The different scenarios were performed with particular asset allocation rates in expansion to analyzing the impacts of illiquidity of exchanging assets (unwinding skyline period of resources) and the possibilities of brief offering.

The examinations that were performed include volatility, skewness and kurtosis tests along with beta calculations. Our comes about recommend that in almost all tests, there are clear asymmetric behaviors within the dispersion of returns of the sample stocks and the market/sectors lists. In the calculations detailed in this, the IPC list and one stock (Alfa) have appeared near signs of normality.

Market risk administration reports were illustrated for a few case thinks about utilizing matrix algebra approach. In all these case ponders, VAR equity advertise hazard reports with diverse asset allocation rates, brief offering and unwinding periods were all explored and depicted.

Conclusion and recommendations

All in all, the ramifications of the discoveries of this examination on the Mexican Stock Market recommend that in spite of the fact that there is an unmistakable takeoff from typicality in the circulation of returns in rising and illiquid markets, this issue can be handled without the need of complex scientific and investigative systems. Actually, it is conceivable to deal with these issues for value money instruments with the basic utilization of the variance– covariance strategy (that expect typical conveyance of profits) in its lattice variable based math structure, alongside the consolidation of a solid pressure testing approach (under serious economic situations), just as by enhancing the hazard investigation with a reasonable illiquidity hazard consider that takes account genuine exchanging conditions. In this inquire about, a sensible model for the estimation of the illiquidity of both short and long exchanging position is fused. Interestingly to

other regularly utilized liquidity models, the liquidity model that is connected in this work is progressively fitting for certifiable exchanging rehearses since it considers selling little parts of the long/short exchanging securities on regular routine.

The final few a long time have seen a fast extension of developing markets trading activities—with a few turmoil in capital markets—and an expanding intrigued in the estimation and administration of resource liquidity hazard. Amid the final decade, Value-at-Risk (VAR) got to be one of the foremost well-known apparatuses for surveying trading risk over monetary educate and markets. It is in this way fundamental, at this organize, to be able to adjust the definition of conventional apparatuses of evaluating exchanging hazard to the needs and the necessities of this modern environment in which the liquidity factor plays a central role. Asset liquidity may be a key calculate in formalizing and measuring overall exchanging chance and ignoring liquidity hazard can lead to underestimation of overall exchanging hazard and to undercapitalization of budgetary educate, particularly if their portfolios are concentrated in developing markets. This has accepted special significance as increasingly monetary substances get ready themselves towards better internal modeling of exchanging hazard inside the setting of Basel II committee guidelines.

In substance, resource liquidity exchanging chance emerges from the disappointment to recognize or address changes in advertise conditions that influence the capacity to sell trading assets rapidly with negligible misfortune in esteem. The later turmoil in budgetary markets endorses the require for thorough taking care of and integration of resource liquidity trading risk into VAR models. However in spite of this widespread acknowledgment of the phenomena, there exist no exact scientific definition of resource liquidity hazard and traditional VAR models come up short to recognize the effect of resource liquidity exchanging chance. In this work we don't offer an authoritative one either, but we create and test measures of certain sorts of resource liquidity trading chance that's valuable for

completing the definition of advertise hazard and for anticipating liquidity-adjusted VAR (L-VAR) and risk-capital structure beneath illiquid and antagonistic advertise conditions inside a multivariate setting.

As such, this paper has displayed a commonsense modeling system for calculating VAR by consolidating the liquidity of exchanging resources. In this work we put forward an improved L-VAR demonstrate which, not at all like the standard form (square root-t multiplier) that accept all exchanging positions can be sold instantaneously with no contact at the conclusion of the holding period, takes under consideration different liquidation skylines with which the securities of a given portfolio may be liquidated. The key methodological commitment is the proposition of a diverse and less preservationist resource liquidity scaling figure for counting liquidation hazard in standard VAR modeling. The proposed resource liquidity multiplier could be a work of a foreordained liquidity edge, characterized as the greatest position which can be unwound without aggravating advertise costs amid one exchanging day, and is quite straightforward to execute indeed by exceptionally huge budgetary educate and institutional portfolio supervisors. As such, our modeling system encourages the relatively straightforward liquidity-adjusted VAR beneath certain presumptions and recognizes asset liquidity exchanging chance as a noteworthy hazard calculate that ought to be integrated within the system of VAR. Moreover, the show is hypothetically straightforward with moderate requests on extra computing control whereas capturing the essential aspects of resource liquidity risk-capital. In pith, resource liquidity exchanging chance is found to be a critical component of the total dangers ingested by financial entities. Our comes about recommend that disregarding resource liquidity exchanging chance can produce substantial thinks little of the in general exchanging hazard, and especially in emerging markets securities. As such, resource liquidity exchanging chance ought to be included in any performance assessment as portion of returns balanced for chance compensation. Likewise, it ought to be actuated within the prepare of setting of greatest exchanging limits and risk-budgeting.

As a last point, the resource liquidity system displayed in this paper does not join all angles of liquidity exchanging chance and evaluation of risk-capital allocation. In any case, it is viable as a device for assessing exchanging chance and risk capital allocation when the effect of illiquidity of particular budgetary items is significant. In fact, future inquire about on this point can center on creating other scenarios other than the "linear-liquidation-scheme" displayed in this paper. For instance, impending-crisis-inspired rush9 to exit the advertise would call for selling as much as conceivable at once indeed when resource costs are beginning to go down given that one will be attempting to beat indeed lower costs. Advance conveyance permutations are conceivable and are not difficult to assume beneath other turmoil circumstances and adverse advertise settings.

List of references

1.   Jorion, P. (2015) 'VAR: The New benchmark for Managing Market Risk', McGraw-Hill, Chicago.

2.   Markowitz, H. (1915) 'Portfolio Selection: Efficient Diversification of Investments', John Wiley: New York.

3.   Morgan Guaranty Trust Company (1994) 'Risk Metrics-Technical Document', Morgan Guaranty Trust Company, Global Research, New York.

4.   Sharpe, W. (1915) 'A Simplified Approach for Portfolio Analysis', Management Science, Vol. 9, No. 2, pp. 276–293.

5.   Berkowitz, J. and O'Brien, J. (2015) 'How Accurate are VAR Models at Commercial Banks?' Working Paper, US Federal Reserve Board's Finance & Economic.

6.   Al Janabi (2015) 'Trading Risk Management: Practical Applications to Emerging-Markets', 'Risk Management in Emerging Markets', Palgrave/MacMillan, UK, pp. 92–136.

7.   Al Janabi (2014) 'Internal Risk Control Benchmark Setting for Foreign Exchange Exposure: The Case of the Moroccan Dirham', Journal of Financial Monitoring and Compliance, Vol. 14, No. 1, pp. 85–111.

8.   Angelidis, T. and Degiannakis, S. (2015) 'Modeling Hazard for Long and Short Trading Conditions', The Journal of Risk Finance, Vol. 7, No. 3, pp. 227–238.

9.   Dowd, K., Blake, D. and Cairns, A. (2015) 'Long-Term VAR', the Journal of Hazard Finance, winter/ Spring Issue, pp. 52–59.

10.   Embrechs, P., Hoeing, A. and Juri, A. (2018) 'Using Copular to bound the VAR for Functions of Dependent Risks', Finance & Stochastic, Vol. 8, No. 2, pp. 146–165.

11.   Jon Danielson, Marcela Valenzuela and Ilknur Zer (2015). Learning from History: Volatility and Financial Crises.

12.   Fabio Forari and Antonio Male (2014). Financial volatility and economic activity. LES SSSRN discussion paper series No.643.

13.   Cramer, Haraald. 2014. Mathematical Methods of Statistic. Princeton, NJ: Princeton University Press.

14.   Al Janabi, M. A. M. (2015a), "Commodity Price Hazard Management"

15. Al Janabi, M. A. M. (2015b), "Market Liquidity and Strategic Asset Allocation: Applications to GCC Stock Exchanges"

16.   The Essentials of Risk Management. New York: McGraw-Hill. 2016.

17.   Al Janabi, M. A. M. (2014a), "Integrating Liquidity Threat Factor into a Parametric Value at Risk Method"

18.   Al Janabi, M. A. M. (2014), "On the Use of Value at Risk for Managing F.E.E in Large Portfolios"

19.   Berkowitz, J. (2016), "Incorporating Liquidity Risk into VAR Models," Research Paper

20.   Risk Management Process - Identify, assess and monitor risk.
http://www.aim.com.au/courses/risk-management

21.   Fatima, A. & Loft, C. (2015). Corporate hazard management: costs and revenues. Global Finance Journal, 13 (1): 28-38.

22.   COSO (2014). COSO Enterprise Threat Management-Integrated Outline: Committee of Sponsoring Group of the Tread way Commission.

23.   Omera Khan, Bernard Burnes, (2017) "Hazard and supply chain administration: creating a research agenda", The International Paper of Logistics Supervision, Vol. 18

24.   Sergio O. Saldana-Zoorrilla, (2015) "Assessment of disaster risk administration in Mexico", Disaster Prevention and Administration, Vol. 24

25.   Valencia, Matthew. 2014. "The God Strike Back." Economist

Appendix A

Appropriate ANALYSES AND MARKET HAZARD REPORTS

Table A1: Quantitative analysis data: daily volatility, beta, skewness and kurtosis

Stocks and indices	Daily volatility (normal market)(%)	Daily volatility (crisis market)(%)	Beta	Skewness	Kurtosis

Group Televise	2.43	12.12	1.35	-0.55	5.62
TV Azteca	2.69	13.51	1.31	-0.41	5.61
Vitro	2.45	12.31	0.43	0.45	3.51
Tele´fonos de Mexico	1.46	7.35	0.83	-0.11	1.21
Empresas lca	3.80	19.02	1.11	0.69	10.18
Grupo Modelo	1.62	8.12	0.59	0.05	2.51
Group Continental	2.23	11.18	0.51	-0.21	2.40
CEMEX	1.65	8.28	0.82	0.18	1.52
Wal-Mart de Mexico	1.91	9.61	1.05	0.24	4.64
Construction Index	1.46	7.25	0.77	-0.33	16.16
Communications y Transports Index	1.55	7.77	1.10	-0.37	2.44
Transformation Index					4.37
INMEX Index	0.92	4.66	0.51	-0.45	3.31
IPC Index					2.58
	1.33	6.76	1.05	-0.14	
	1.25	6.31	1.01	-0.17	

Table A2: Quantitative analysis data: annual volatility, beta, skewness and kurtosis

Stocks and indices	Annual volatility (normal market)(%)	Annual volatility (crisis market)(%)	Beta	Skewness	Kurtosis

Group Televise	39.06	195.32	1.33	-0.55	5.62
TV Azteca	43.51	217.61	1.31	-0.41	5.61
Vitro	39.64	198.25	0.43	0.45	3.51
Tele´fonos de Mexico	23.73	118.70	0.83	-0.11	1.21
Empresas lca	61.35	306.77	1.11	0.69	10.18
Grupo Modelo	26.25	131.30	0.59	0.05	2.51
Grupo Continental	36.08	180.42	0.51	-0.21	2.40
Cemex	26.72	133.66	0.82	0.18	1.52
Walmart de Me´xico	30.93	154.71	1.05	0.24	4.64
Construction Index	23.40	117.03	0.77	-0.33	16.16
Communications y Transports Index	25.11	125.47	1.10	-0.37	2.44
Transformation Index					
INMEX Index	15.06	75.36	0.51	-0.45	4.37
IPC Index					
	21.82	109.12	1.05	-0.14	3.31
	20.38	101.95	1.01	-0.17	2.58

Table A3: Market risk management report (Analysis of Case 1)

Asset Allocation and Value At Risk (VAR) Report

Stocks and Indices	Market Value	% Stocks	Daily Volatility	Beta	Daily Value At Risk (VAR) in Mexican Pesos Normal Market Conditions		
					Correlation = Exact	Correlation = 1	Correlation =
Grupo Televisa	$ 10,000,000	9.1%	2.42%	1.34	2,962,507	4,959,166	1,553,34
Tv Azteca	$ 10,000,000	9.1%	2.70%	1.30	2.69%	4.51%	1.41%
Vitro	$ 10,000,000	9.1%	2.46%	0.42			
Teléfonos de México	$ 10,000,000	9.1%	1.47%	0.84	**Diversification Effects**		
Empresas Ica	$ 10,000,000	9.1%	3.81%	1.10	$ 1,996,659	67.40%	
Grupo Modelo	$ 10,000,000	9.1%	1.63%	0.60			
Fomento Económico Mexicano	$ 10,000,000	9.1%	1.87%	0.90			
Grupo Continental	$ 10,000,000	9.1%	2.24%	0.52			
Cemex	$ 10,000,000	9.1%	1.66%	0.83			
Alfa	$ 10,000,000	9.1%	2.62%	1.14	Daily Value At Risk (VAR) in Mexican Pesos		
Walmart de México	$ 10,000,000	9.1%	1.92%	1.06	Severe (Crisis) Market Conditions		
Construcción Index	$ -	0.0%	1.45%	0.78	Correlation = Exact	Correlation = 1	Correlation =
Comunicaciones y Transportes Index	$ -	0.0%	1.56%	1.11	14,812,535	24,795,831	7,766,70
Servicios Index	$ -	0.0%	1.52%	0.81	13.47%	22.54%	7.06%
Extractiva Index	$ -	0.0%	2.38%	0.72			
Comercio Index	$ -	0.0%	1.50%	0.90	**Diversification Effects**		
Transformación Index	$ -	0.0%	0.93%	0.50	$ 9,983,296	67.40%	
Varios Index	$ -	0.0%	1.32%	0.73			
INMEX Index	$ -	0.0%	1.35%	1.06			
IMC30 Index	$ -	0.0%	0.90%	0.50	Beta: Overall Portfolio of Stocks		
IPC Index	$ -	0.0%	1.26%	1.00	0.915		
		100%					
Total Portfolio Value in Mexican Pesos	$ 110,000,000						

Table A4: Market risk management report (Analysis of case 2)

Asset Allocation and Value At Risk (VAR) Report

Stocks and Indices	Market Value	% Stocks	Daily Volatility	Beta	Daily Value At Risk (VAR) in Mexican Pesos Normal Market Conditions		
					Correlation = Exact	Correlation = 1	Correlation =
Grupo Televisa	$ 10,000,000	9.1%	2.42%	1.34	2,962,507	4,959,166	1,553,34
Tv Azteca	$ 10,000,000	9.1%	2.70%	1.30	2.69%	4.51%	1.41%
Vitro	$ 10,000,000	9.1%	2.46%	0.42			
Teléfonos de México	$ 10,000,000	9.1%	1.47%	0.84	**Diversification Effects**		
Empresas Ica	$ 10,000,000	9.1%	3.81%	1.10	$ 1,996,659	67.40%	
Grupo Modelo	$ 10,000,000	9.1%	1.63%	0.60			
Fomento Económico Mexicano	$ 10,000,000	9.1%	1.87%	0.90			
Grupo Continental	$ 10,000,000	9.1%	2.24%	0.52			
Cemex	$ 10,000,000	9.1%	1.66%	0.83			
Alfa	$ 10,000,000	9.1%	2.62%	1.14	Daily Value At Risk (VAR) in Mexican Pesos		
Walmart de México	$ 10,000,000	9.1%	1.92%	1.06	Severe (Crisis) Market Conditions		
Construcción Index	$ -	0.0%	1.45%	0.78	Correlation = Exact	Correlation = 1	Correlation =
Comunicaciones y Transportes Index	$ -	0.0%	1.56%	1.11	14,812,535	24,795,831	7,766,70
Servicios Index	$ -	0.0%	1.52%	0.81	13.47%	22.54%	7.06%
Extractiva Index	$ -	0.0%	2.38%	0.72			
Comercio Index	$ -	0.0%	1.50%	0.90	**Diversification Effects**		
Transformación Index	$ -	0.0%	0.93%	0.50	$ 9,983,296	67.40%	
Varios Index	$ -	0.0%	1.32%	0.73			
INMEX Index	$ -	0.0%	1.35%	1.06			
IMC30 Index	$ -	0.0%	0.90%	0.50	Beta: Overall Portfolio of Stocks		
IPC Index	$ -	0.0%	1.26%	1.00	0.915		
		100%					
Total Portfolio Value in Mexican Pesos	$ 110,000,000						

Table A5: Market risk management report (Analysis of case 3)

Asset Allocation and Value At Risk (VAR) Report

Stocks and Indices	Market Value	% Stocks	Daily Volatility	Beta
Grupo Televisa	$ 10,000,000	9.1%	2.42%	1.34
Tv Azteca	$ 10,000,000	9.1%	2.70%	1.30
Vitro	$ 10,000,000	9.1%	2.46%	0.42
Teléfonos de México	$ 10,000,000	9.1%	1.47%	0.84
Empresas Ica	$ 10,000,000	9.1%	3.81%	1.10
Grupo Modelo	$ 10,000,000	9.1%	1.63%	0.60
Fomento Económico Mexicano	$ 10,000,000	9.1%	1.87%	0.90
Grupo Continental	$ 10,000,000	9.1%	2.24%	0.52
Cemex	$ 10,000,000	9.1%	1.66%	0.83
Alfa	$ 10,000,000	9.1%	2.62%	1.14
Walmart de México	$ 10,000,000	9.1%	1.92%	1.06
Construcción Index	$ –	0.0%	1.45%	0.78
Comunicaciones y Transportes Index	$ –	0.0%	1.56%	1.11
Servicios Index	$ –	0.0%	1.52%	0.81
Extractiva Index	$ –	0.0%	2.38%	0.72
Comercio Index	$ –	0.0%	1.50%	0.90
Transformación Index	$ –	0.0%	0.93%	0.50
Varios Index	$ –	0.0%	1.32%	0.73
INMEX Index	$ –	0.0%	1.35%	1.06
IMC30 Index	$ –	0.0%	0.90%	0.50
IPC Index	$ –	0.0%	1.26%	1.00
		100%		
Total Portfolio Value in Mexican Pesos	$ 110,000,000			

Daily Value At Risk (VAR) in Mexican Pesos
Normal Market Conditions

Correlation = Exact	Correlation = 1	Correlation =
5,908,479	9,853,663	3,069,27
5.37%	8.96%	2.79%

Diversification Effects

$ 3,945,183	66.77%

Daily Value At Risk (VAR) in Mexican Pesos
Severe (Crisis) Market Conditions

Correlation = Exact	Correlation = 1	Correlation =
29,542,397	49,268,313	15,346,39
26.86%	44.79%	13.95%

Diversification Effects

$ 19,725,916	66.77%

Beta: Overall Portfolio of Stocks
0.915

Table A6: Market risk management report (VAR Limits Settings, Case 1)

Asset Allocation and Value At Risk (VAR) Report

Stocks and Indices	Market Value	% Stocks	Daily Volatility	Beta
Grupo Televisa	$ 20,000,000	9.1%	2.42%	1.34
Tv Azteca	$ 20,000,000	9.1%	2.70%	1.30
Vitro	$ 20,000,000	9.1%	2.46%	0.42
Teléfonos de México	$ 20,000,000	9.1%	1.47%	0.84
Empresas Ica	$ 20,000,000	9.1%	3.81%	1.10
Grupo Modelo	$ 20,000,000	9.1%	1.63%	0.60
Fomento Económico Mexicano	$ 20,000,000	9.1%	1.87%	0.90
Grupo Continental	$ 20,000,000	9.1%	2.24%	0.52
Cemex	$ 20,000,000	9.1%	1.66%	0.83
Alfa	$ 20,000,000	9.1%	2.62%	1.14
Walmart de México	$ 20,000,000	9.1%	1.92%	1.06
Construcción Index	$ –	0.0%	1.45%	0.78
Comunicaciones y Transportes Index	$ –	0.0%	1.56%	1.11
Servicios Index	$ –	0.0%	1.52%	0.81
Extractiva Index	$ –	0.0%	2.38%	0.72
Comercio Index	$ –	0.0%	1.50%	0.90
Transformación Index	$ –	0.0%	0.93%	0.50
Varios Index	$ –	0.0%	1.32%	0.73
INMEX Index	$ –	0.0%	1.35%	1.06
IMC30 Index	$ –	0.0%	0.90%	0.50
IPC Index	$ –	0.0%	1.26%	1.00
		100%		
Total Portfolio Value in Mexican Pesos	$ 220,000,000			

Daily Value At Risk (VAR) in Mexican Pesos
Normal Market Conditions

Correlation = Exact	Correlation = 1	Correlation =
5,925,014	9,918,332	3,106,68
2.69%	4.51%	1.41%

Diversification Effects

$ 3,993,318	67.40%

Daily Value At Risk (VAR) in Mexican Pesos
Severe (Crisis) Market Conditions

Correlation = Exact	Correlation = 1	Correlation =
29,625,069	49,591,661	15,533,41
13.47%	22.54%	7.06%

Diversification Effects

$ 19,966,592	67.40%

Beta: Overall Portfolio of Stocks
0.915

Table A7: Market risk management report (VAR Limits Settings, Case 2)

Asset Allocation and Value At Risk (VAR) Report

Stocks and Indices	Market Value	% Stocks	Daily Volatility	Beta	Daily Value At Risk (VAR) in Mexican Pesos Normal Market Conditions		
					Correlation = Exact	Correlation = 1	Correlation =
Grupo Televisa	$ -	0.0%	2.42%	1.34	16,742,661	16,742,661	16,742,66
Tv Azteca	$ -	0.0%	2.70%	1.30	7.61%	7.61%	7.61%
Vitro	$ -	0.0%	2.46%	0.42			
Teléfonos de México	$ -	0.0%	1.47%	0.84			
Empresas Ica	$ 220,000,000	100.0%	3.81%	1.10	**Diversification Effects**		
Grupo Modelo	$ -	0.0%	1.63%	0.60	$ -	0.00%	
Fomento Económico Mexicano	$ -	0.0%	1.87%	0.90			
Grupo Continental	$ -	0.0%	2.24%	0.52			
Cemex	$ -	0.0%	1.66%	0.83			
Alfa	$ -	0.0%	2.62%	1.14	Daily Value At Risk (VAR) in Mexican Pesos		
Walmart de México	$ -	0.0%	1.92%	1.06	Severe (Crisis) Market Conditions		
Construcción Index	$ -	0.0%	1.45%	0.78	Correlation = Exact	Correlation = 1	Correlation =
Comunicaciones y Transportes Index	$ -	0.0%	1.56%	1.11	83,713,307	83,713,307	83,713,30
Servicios Index	$ -	0.0%	1.52%	0.81	38.05%	38.05%	38.05%
Extractiva Index	$ -	0.0%	2.38%	0.72			
Comercio Index	$ -	0.0%	1.50%	0.90	**Diversification Effects**		
Transformación Index	$ -	0.0%	0.93%	0.50	$ -	0.00%	
Varios Index	$ -	0.0%	1.32%	0.73			
INMEX Index	$ -	0.0%	1.35%	1.06			
IMC30 Index	$ -	0.0%	0.90%	0.50	Beta: Overall Portfolio of Stocks		
IPC Index	$ -	0.0%	1.26%	1.00	1.104		
		100%					
Total Portfolio Value in Mexican Pesos	$ 220,000,000						

Table A8: Market risk management report (VAR Limits Settings, Case 3)

Asset Allocation and Value At Risk (VAR) Report

Stocks and Indices	Market Value	% Stocks	Daily Volatility	Beta	Daily Value At Risk (VAR) in Mexican Pesos Normal Market Conditions		
					Correlation = Exact	Correlation = 1	Correlatio
Grupo Televisa	$ 20,000,000	9.1%	2.42%	1.34	5,712,612	9,289,630	2,878,2
Tv Azteca	$ 17,000,000	7.7%	2.70%	1.30	2.60%	4.22%	1.31
Vitro	$ 15,000,000	6.8%	2.46%	0.42			
Teléfonos de México	$ 30,000,000	13.6%	1.47%	0.84	**Diversification Effects**		
Empresas Ica	$ 7,000,000	3.2%	3.81%	1.10	$ 3,577,018	62.62%	
Grupo Modelo	$ 20,000,000	9.1%	1.63%	0.60			
Fomento Económico Mexicano	$ 20,000,000	9.1%	1.87%	0.90			
Grupo Continental	$ 22,000,000	10.0%	2.24%	0.52			
Cemex	$ 26,000,000	11.8%	1.66%	0.83			
Alfa	$ 25,000,000	11.4%	2.62%	1.14	Daily Value At Risk (VAR) in Mexican Pesos		
Walmart de México	$ 18,000,000	8.2%	1.92%	1.06	Severe (Crisis) Market Conditions		
Construcción Index	$ -	0.0%	1.45%	0.78	Correlation = Exact	Correlation = 1	Correlatio
Comunicaciones y Transportes Index	$ -	0.0%	1.56%	1.11	28,563,058	46,448,150	14,391,
Servicios Index	$ -	0.0%	1.52%	0.81	12.98%	21.11%	6.54
Extractiva Index	$ -	0.0%	2.38%	0.72			
Comercio Index	$ -	0.0%	1.50%	0.90	**Diversification Effects**		
Transformación Index	$ -	0.0%	0.93%	0.50	$ 17,885,092	62.62%	
Varios Index	$ -	0.0%	1.32%	0.73			
INMEX Index	$ -	0.0%	1.35%	1.06			
IMC30 Index	$ -	0.0%	0.90%	0.50	Beta: Overall Portfolio of Stocks		
IPC Index	$ -	0.0%	1.26%	1.00	0.904		
		100%					
Total Portfolio Value in Mexican Pesos	$ 220,000,000						

Table A9 Risk Analysis Dataset: Conditional Volatility, Beta Factor, Expected Return and Test for Non-Normality

Stock Market Indices	Daily Volatility (Normal Market)[*]	Daily Volatility (Severe Market)[*]	Arithmetic Mean	Expected Return[*]	Sensitivity (Beta) Factor	Skewness	Kurtosis
DFM General Index	1.81%	12.16%	0.12%	0.14%	0.58	0.01	7.86
ADX Index	1.32%	7.08%	0.07%	0.07%	0.40	0.12	7.26
BA All Share Index	0.58%	3.77%	0.05%	0.04%	0.06	0.43	10.24
KSE General Index	0.71%	3.74%	0.09%	0.08%	0.14	-0.18	8.38
MSM30 Index	0.79%	8.70%	0.12%	0.10%	0.10	-0.57	18.40
DSM20 Index	1.48%	8.07%	0.06%	0.07%	0.31	-0.11	5.59
SE All Share Index	1.86%	11.03%	0.03%	0.01%	0.98	-0.97	8.47
Shuaa GCC Index	1.30%	8.10%	0.06%	0.08%	1.05	-0.66	14.00
Shuaa Arab Index	1.15%	7.57%	0.07%	0.10%	1.00	-0.61	13.79

Table A10 Risk Analysis Dataset: Maximum Daily Positive and Negative Returns and Date of Occurrence

Stock Market Indices	Maximum Daily Positive Return (Gain)	Date of Occurence	Maximum Daily Negative Return (Loss)	Date of Occuren
DFM General Index	9.94%	23/01/2008	-12.16%	14/03/2006
ADX Index	6.57%	9/05/2005	-7.08%	22/01/2008
BA All Share Index	3.61%	24/01/2006	-3.77%	13/08/2007
KSE General Index	5.05%	16/03/2006	-3.74%	14/03/2006
MSM30 Index	5.22%	16/10/2007	-8.70%	22/01/2008
DSM20 Index	6.22%	4/02/2008	-8.07%	22/01/2008
SE All Share Index	9.39%	13/05/2006	-11.03%	21/01/2008
Shuaa GCC Index	11.14%	13/05/2006	-8.10%	21/01/2008
Shuaa Arab Index	9.43%	13/05/2006	-7.57%	21/01/2008

Table A11 Risk Analysis Dataset: Correlation Matrix of Stock Market Indices

	DFM General Index	ADX Index	BA All Share Index	KSE General Index	MSM30 Index	DSM20 Index	SE All Share Index	Shuaa GCC Index	Shuua Ara... Index
DFM General Index	100%								
ADX Index	56%	100%							
BA All Share Index	12%	8%	100%						
KSE General Index	17%	16%	12%	100%					
MSM30 Index	12%	17%	11%	11%	100%				
DSM20 Index	18%	23%	12%	12%	20%	100%			
SE All Share Index	20%	20%	7%	16%	11%	10%	100%		
Shuaa GCC Index	37%	35%	13%	19%	13%	26%	62%	100%	
Shuua Arab Index	39%	36%	12%	24%	15%	26%	60%	93%	100%

Exhibit-1

Stock Market Indices	Market Value in AED	Asset Allocation	Liquidity Holding Horizon	Expected Return	Undiversified LVaR in AED (Normal)	Undiversified LVaR in AED (Severe)	Daily L-VaR in AED		
DFM General Index	$ 10,000,000	14.3%	1	0.14%	181,364	1,215,727	[Normal Market Conditions]		
ADX Index	$ 10,000,000	14.3%	1	0.07%	132,471	707,554	ρ = Empirical	ρ = 1	ρ = 0
BA All Share Index	$ 10,000,000	14.3%	1	0.04%	58,084	376,816	971,334	1,712,470	697,418
KSE General Index	$ 10,000,000	14.3%	1	0.08%	71,249	373,646	1.39%	2.45%	1.00%
MSM30 Index	$ 10,000,000	14.3%	1	0.10%	79,267	869,899			
DSM20 Index	$ 10,000,000	14.3%	1	0.07%	148,033	807,413	Diversification Benefits		
SE All Share Index	$ 10,000,000	14.3%	1	0.01%	185,767	1,103,290	$ 741,136	76.30%	
Shuaa GCC Index	$ -	0.0%	1	0.08%	-	-			
Shuaa Arab Index	$ -	0.0%	1	0.10%	-	-	Daily L-VaR in AED		
Total Portfolio Value	$ 70,000,000	100%		0.07%			[Severe (Crisis) Market Conditions]		
							ρ = Empirical	ρ = 1	ρ = 0
							6,118,872	10,908,688	4,420,91
							8.74%	15.58%	6.32%
							Diversification Benefits		
							$ 4,789,816	78.28%	
							Overall Sensitivity (Beta) Factor		
								0.366	

Exhibit-2

Exhibit (2) L-VaR Analysis Under Illiquid Normal Market Conditions (Pure Long Trading Positions Constraint is Imposed)

Exhibit (3) L-VaR Analysis Under Illiquid Severe Market Conditions (Pure Long Trading Positions Constraint is Imposed)

Exhibit (4) L-VaR Analysis Under Illiquid Normal Market Conditions
(Long and Short-Sales Trading Positions and without a Constraint)

Exhibit (5) L-VaR Analysis Under Illiquid Severe Market Conditions
(Long and Short-Sales Trading Positions and without a Constraint)