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VALUE AT RISK AT ASIAN EMERGING STOCK MARKETS

Syed Muhammad Waqar Azeem Naqvi[1], Syed Kumail Abbas Rizvi[2], Orangzaib[3], Muhammad Ali[4]

[1,3,4] Department of Business Administration, NCBA&E, Lahore, Pakistan.

[2] Associate professor, Lahore School of Economics, Pakistan.

Corresponding Author Email: swazeem786@gmail.com

ABSTRACT: *This study tries to calculate value at risk at Asian emerging stock markets of daily, weekly and monthly stock returns by calculating its log returns. This study also ranks equity markets on the basis on Sharpe ratio and risk adjusted returns. This process helps investors to gauge these stock markets on various risk levels present in these market to make a good decision of investment for wealth maximization. This study uses 10 year financial data from 2004 to 2014 of daily weekly and monthly data frequency. Value at risk is calculate of all data frequencies at 1 and 5 percent level of significance. Results are different in short, medium and relatively long run cases of each stock market. However, collectively, Pakistan, Indian and Malaysian markets perform better at a given level of risk and return.*

Keywords: Risk, Return, Value at Risk, Emerging Markets.
JEL Classification: G10, G11

INTRODUCTION

Generally, the stock market is considered as an indicator of an economy. Stock market helps in attracting capital in the form of domestic and foreign investment which is useful in economic growth, reducing unemployment, liquidity and companie's prospectus and growth. Stock market is a place where investors invest in securities in return while prices of these securities are the reflection of information about future performance. Monetary and fiscal policies also impact over the performance of stock markets. Financial markets, these days offer different investment alternatives for investors, which have different characteristics in risk-return. The stock market consists of various characteristics where individual investor, financial managers and institutions can invest in the stocks of listed firms. Other options of investment in securities are also available other than stocks like bonds, preferred shares or hybrid securities. Each security offers a return to investors depending on risk associated with it which could be in addition to the general risk of financial market.

Individual investors are gaining interest in investment rather putting their saving in saving accounts. One of the prime reason behind this is low interest rates are offered by banks for saving accounts and rerun on fixed deposits is only covering inflation only. But when investors go for the investment they expose to *risk*. Risk is vagueness and uncertainty about the future, no one can eliminate risk completely, but it can be minimized through diversification. Firms, financial institutions and investors are also exposed to risk, e.g., political risk, market risk, financial risk, operational risk, legal and liquid risk. So it is essential for individual investor, financial managers and financial analysts not only anticipate but also measure risk correctly. However, it is also necessary for the investors and financial managers to keep in mind that risk is not constant but it varies over time and situation. The study of risk measurement and management is one of the most extensively studied areas in the finance literature. Therefore, it is essential to have detailed knowledge about risk sources in equity and its management. Then optimal decision about the allocation of funds, development and execution of portfolio risk management can be taken.

In the past few years high volatility has been observed in Pakistan stock exchange (formally Karachi stock exchange). This high volatility creates doubts in investor's mind and he loses confidence. High uncertainty such as vulnerable political situation and law and order issues destroy investor's confidence and questions arise in mind which stocks to invest where and when to invest and what could versification option can be availed for choosing portfolio to minimize risk but question still remains which portfolio to choose in case of the Pakistan stock market(PSX)? Various studies are available for portfolio choice theories and value at risk models such as [1-18]. Interestingly, a very few studies are available for South Asian equity markets, which includes Pakistan stock market. Therefore, it will be vital to contribute in existing literature on South Asian markets about portfolio choices for investors in PSX based on risk-return basis using VaR models. So that invstors can choose suitable portfolios for investment.

LITERATURE REVIEW

The volatile and uncertain situation in financial market creates problems for companies to raise funding. Investors also lose confidence in uncertain and volatile situation which is necessary for investment in financial market and this non-confidence of investors also increases more volatility. Sometime a very high uncertainty leads to a financial crisis or market crash which we have observed in 2008 and 2011. So it is necessary for risk management to calculate or gauge risk more precisely and accurately. This is why knowledge of modeling market volatility is important, like value at risk (VAR) which helps in valuation of derivative and options. Although investors remain interested in stock indices volatility and want compensation accordingly, this is also possible that due to high fluctuation in daily prices causes those huge gains or some time huge losses (uncertainty) same like high fluctuation in forex rates cause huge losses and gains to exporters and importers. So this is why, it is important to choose such a model which can provide an estimation of volatility (risk-return) more precisely and accurately. If we look at the recent studies about measurement of risk, it seems that a growing literature is available on novel proxies of risk like VAR.

Value-at-risk (VAR) is defined as, the probability of losses when exposed to the market. Now the question arises why VAR's estimation is important and required to be calculated to the point. So, the answer will be pretty obvious because

312 ISSN 1013-5316;CODEN: SINTE 8 Sci.Int.(Lahore),28(4),311-319,2016

investors (individuals, banks, firms) are having portfolios, which are exposed to risk and can go either way, profit or loss, but here the risk is the fear of loss, shortfall and negative returns than expectations. Risk depends on lots of factors besides the types of portfolios e.g., market in which portfolio exists, political situation and historical response of financial markets in different situations. Therefore, estimation of risk is important so that an investor of any category (individuals, banks, firms) can make a decision and respond accordingly to minimize risk, for that VAR is one of the most popular and important measure of risk. However, in case of its wrong anticipation or measurement, VAR could lead towards disaster.

Value at risk (VAR) is a measure of risk [19,20]. The purpose of this study is to find out the differences between variance and downside risk approaches by using VAR and if so how much? This research took asset allocation in a US context while researchers [1] proceed by dividing this research into two parts, by which they theoretically and empirically analyze these issues. In the next part of their research they discuss in detail about both theoretical properties of measuring of downside risk and equivalence of mean-downside risk models. Although they demonstrate only a few out of the large group of downside risk measures which keep theoretical properties within a risk-return framework that is higher to variance. For forecasting of volatility VAR and the option pricing model can be used [2]. It is very important to have an accurate analysis of volatility and risk-return for pricing of an asset. However, the option pricing model and VAR are used to forecast for longer terms, it also includes past forecast.

VAR: seductive but dangerous and states that the calculation of VAR could be different of same portfolio. He made his emphasis that VAR not only depends upon data, parameters but also on the methodology and assumptions. Seductive but danger result, he derived after calculating VAR of three portfolios, he furthermore added VAR's usefulness, but not ultimate control of risk [3]. In the last two decades, there has been criticism upon VAR of not presenting all depiction of risk [3] that in the result will lead to the deceived calculation of protection against risk besides all it is still commonly accepted for the measurement of risk.

Bao *et al.,* study conducted an experiment to investigate proportional risk forecast by using value at risk (VAR) models [26]. Comparison is made between those models includes filtered VAR against unfiltered VAR models, nonparametric distribution against parametric distribution, function of reversing conditional distribution against quantile regression, and value extreme distributions against conventional distributions. They used white's test of reality check for comparison between VAR model's projected powers (probability of empirical coverage) and quantile projected loss of stock markets during financial crisis 1997-1998 in five economies of Asia. Data set of five economies includes composite price index of Jakarta Stock Exchange, Indonesia, composite price index of Kuala Lumpur, Malaysia, composite price index of Thailand, composite price index of Korea Stock Exchange and Weight index of Taiwan, later multiplied by 100 for investigation of VAR models performance.

METHODOLOGY

Value-at-risk (VAR), the question could be why its estimation is important and required to the point. So, the answer is pretty obvious because investors (individuals, banks, firms) having portfolios are in front of risk which goes either way and they want to measure risk more accurately. Risk depends on a lot of factors besides types of portfolio e.g., market in which portfolio have, political situation and historical response of financial markets in different situations. Therefore, accurate estimation of risk is important so that an investor of either category makes and respond accordingly to minimize risk and for that VAR is the one of the most popular and important measure of risk that could lead to disaster in case of wrong anticipation or measurement. Method chosen for estimation of VAR varies from individual to individual, bank to bank; firm to firm and from market to market and considered a far better standard deviation, for example, the last ten days estimation of a bank's capital should be three times against VAR-at 1 % set out by the Bank for International settlements [19-22]. A few ways to define VAR is probability of coverage, level of confidence (1-α), for example, level of confidence (1-α) which can give utmost loss in one day of 95% while on other day it could be no more than 5%, and lastly (τ) period of holding or time horizon [4]. Loss quantile in a portfolio describes one of the many methods of defining VAR. where $V(t)$ = portfolio value at time t, while L= loss after period τ can be:

$$L = V(t + \tau) - V(t)$$

Chen [25], described few negative aspects and short comes of VAR but it remains for always an important tool for measurement of risk compared to other conventional measures and need to be dealt with care while measuring risk due to its imperfection. Beder's research establishes that relying on methods of estimation of VAR, multiplicative constants could either be too small or large [3]. Expected shortfall (ES) is another gauge come into existence and defined average losses are lower than percentile α. With time it is becoming a popular measure of risk besides VAR and can be used as alternatives of VAR. This is still at evolutionary stages, so better to use VAR:

$$\mu_\alpha = E\{r_t \mid r_t < VAR\alpha_{t+1}\}$$

Value-at-risk is considered one of the important measures of risk calculation. VAR is also being used for the management of risk by many financial institutions like banks and financial managers. Various methods have been available for VAR calculation such as a Historical simulation method, Risk Metrics, developed by J. P. Morgan [24], considered as benchmark for market risk calculation and GARCH models. One assumption on which the famous Risk Metrics models work is that financial returns are normally distributed with mean equals zero while variance of data denoted squared log return form which is used in exponential weighted moving average (EWMA) model. However, this model has few limitations. Value-at-risk (VAR) is defined as; the probability of losses when exposed to the market. A value at risk is the probability of losses or at certain confidence levels the

Sci.Int.(Lahore),28(4),311-319,2016 ISSN 1013-5316;CODEN: SINTE 8

maximum losses. At α= 95%, 99%, d-day (daily, weekly or monthly).

Value at risk can be written $\text{VAR}_{\alpha,d}$ leads to $(\Delta_d P_t < -\text{VAR}_{\alpha,d}) = \alpha$ can be transformed:

$$Prob\,([\Delta_d P_t - \mu_t]/\sigma_t < [-\text{VAR}_{\alpha,d} - \mu_t]/\sigma_t) = \alpha \quad (1)$$

While

$[\Delta_d P_t - \mu_t]/\sigma_t = Z_t\,(Normal\ Standard\ Variate)$

This can be written as:

$$Prob\,(-Z_t < [-\text{VAR}_{\alpha,d} - \mu_t]/\sigma_t = \alpha \quad (2)$$

For standard (normal) $Variate\ Z_t$,

$$Prob\,(-Z_t < -Z_\alpha) = \alpha \quad (3)$$

For α = 100% then,

$$-\text{VAR}_{\alpha,d} - \mu_t/\sigma_t = -Z_\alpha \quad (4)$$

So standard method to calculate VAR of returns is derived as:

$$\text{VAR}_{\alpha,d} = Z_\alpha \sigma_t - \mu_t \quad (5)$$

Being measure of risk VAR is suitable for short term risk (daily, weekly and monthly) therefore, $\mu_t = 0$ and value of Z_α can be obtained by using standard table or through excel using (=NORMSINV (5%) for 95% confidence interval or =NORMSINV (1%) for 99% confidence interval or so) while σ_t is the standard deviation of respective time (daily, weekly and monthly).

OVERVIEW OF ASIAN EMERGING STOCK MARKETS

In this research, we are considering Standard & Poor's indices of frontier and emerging markets for selection of Asian frontier and emerging markets. These frontier and emerging markets includes 1. Pakistan 2. India 3. Malaysia 4. Hong Kong 5. Singapore 6. Korea and 7. Taiwan. A brief economic overview of Asian emerging markets are given in table 1.

Table 1: Summary of economic outlook of selected Markets as on 2014:

	Pakistan	India	Malaysia	Hong Kong	Singapore	South Korea	Taiwan
Population (million)	182.1	1,252	29.72	7.188	5.47	50.22	23.37
GDP ($US billions)	236.6	1,877	312.4	274	297.9	1305	489.21
Inflation (%)	8	9.13	2.1	3.6	0.9	1.2	0.33
GNI per Capita ($)	1,380	1,570	10,400	38,420	55,182	25,920	20,925
Unemployment rate (%)	6.7	8.7	3.1	3.5	2.1	2.7	4.2
Exports ($US billions)	25.6	442	230.7	456.4	296.4 (2012)	557.6	306.4
Imports ($US billions)	33.01	616.2	193	520.6	190.1 (2012)	516.8	268.2
Foreign Currency Reserves ($US billions)	13.6	298.1	134.9	311.2	277.8	345.7	420.7
Total number of listed companies	581	4087	909	1615	774	686	758
Stock market capitalization ($US billions)	69	1499	201.5	3089	811	1309	899

Source: World Bank/IMF

Table 2: Descriptive Statistics of Market Returns

	INDIA	MALAYSIA	HONG KONG	KOREA	PAKISTAN	SINGAPORE	TAIWAN
Mean	0.012976	0.006922	0.005461	0.004507	0.014194	0.005296	0.003880
Median	0.017903	0.010296	0.008692	0.010542	0.023221	0.011255	0.007631
Maximum	0.285177	0.127032	0.199731	0.167075	0.245399	0.164718	0.196881
Minimum	-0.209081	-0.165142	-0.218212	-0.173892	-0.461052	-0.227510	-0.176970
Std. Dev.	0.080103	0.037347	0.067631	0.049640	0.079787	0.057908	0.057075
Skewness	-0.246594	-0.729795	-0.385569	-0.597140	-1.649274	-0.425086	-0.278419
Kurtosis	3.825818	6.831118	4.263505	5.390901	12.98500	5.096923	4.251525
Jarque-Bera	4.626046	84.03932	10.95550	35.71357	552.9034	25.59939	9.381911
Probability	0.098962	0.000000	0.004179	0.000000	0.000000	0.000003	0.009178
Sum	1.557105	0.830680	0.655277	0.540863	1.703306	0.635488	0.465642
Sum Sq. Dev.	0.763565	0.165982	0.544300	0.293237	0.757549	0.399042	0.387643
Observations	120	120	120	120	120	120	120

Above table 2 shows combine monthly return's descriptive statistics of seven selected emerging markets from 2004 to 2014. If we look at the values of skewness of each selected market all are negative. Standardize signs define skewness as if skewness is positive this means a small number of extreme gains and frequent small losses while negative skewness sign indicates small number of extreme losses and often small gains. But in financial time series negative skewness

314 ISSN 1013-5316;CODEN: SINTE 8 Sci.Int.(Lahore),28(4),311-319,2016

considered as normal. In many markets positive mean return does not matter because number of times participants get negative returns. Kurtosis values are also important to observe. In all selected emerging markets kurtosis is very high especially KSE-100 which is far higher than other markets kurtosis values and CNX-500 kurtosis value is closer to 3 but higher than 3 showing fat-tail risks but lower than other selected emerging markets. However, in all frequency daily weekly and monthly fat-tail risk remain high to low respectively except KSE-100. Kurtosis values are greater than 3 (leptokurtic kurtosis) in each financial market which tells emerging markets produce more unexpected returns. By combining these two findings of negative skewed distribution with leptokurtic behavior it simply tells that negative extreme events in these emerging markets are more likely compare to positively extreme events.

EMPIRICAL RESULTS

Sharpe ratio was introduced by a Nobel Prize winner William Sharpe in 1966. Sharpe ratio is now the one of the most important measure of adjusted-risk returns (Sharpe, 1970). More comprehensively it can be defined as: $Sharpe\ Ratio = \frac{Ri-Rf}{\sigma i}$

Where: R_i is expected index return (daily, weekly, monthly)

R_f is risk free rate (government T-Bills)

σ_i is standard deviation of expected index returns.

Sharpe ratio tells about excess return an investor will get against extra volatility of keep an investment and helps in comparing one market returns with other, one portfolio with other through adjusted risk. Higher the Sharpe Ratio means better the market/portfolio is. It can be rated in Likert scale format, Sharpe ratio value > 0 is considerable, value ≥ 1 is good, value ≥ 2 is very good, and value ≥ 3 is excellent (Sharpe, 1994).

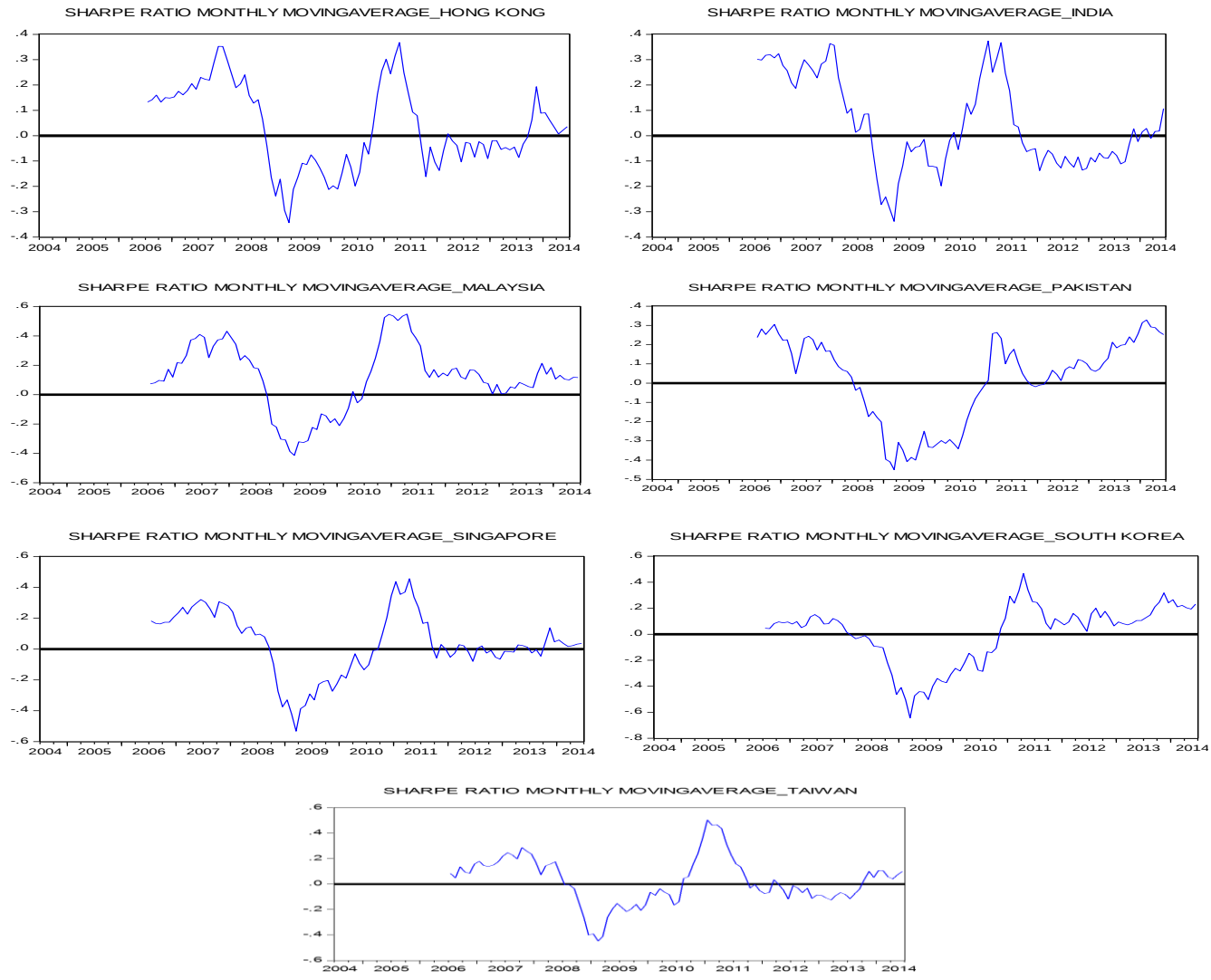

Figure 1 Sharpe Ratios Moving Average

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Above figure 1 show monthly Sharpe ratio moving average. X-axis shows years start from 2004 to 2014 while Y-axis shows Sharpe ratio +3 to -3. Monthly graphs show a more comprehensive picture because these are showing 50 days moving average. When we look at the graphs of moving average these show steady upward trend from 2004 to 2008 in all emerging and frontier markets like daily and weekly graphs. Hong Kong, India, Pakistan, Singapore and South Korea's Sharpe ratio moving average monthly graph show a bullish trend. While in case of Malaysia it is more bullish from start comparatively to other. A mix trend of bullish and bearish movements can be seen till 2007 followed by a good recovery till 2008 where a financial crisis slams this bullish trend towards a bearish and Sharpe ratio becomes almost 3. This could not sustain for a longer term because of a small financial crunch again struck in 2011. From 2012 the recovery period to onwards moving average shows a mix trend of bull and bear. A good recovery is seen in 2009 where Sharpe ratio moving average in every emerging and frontier market (more than 2 in Pakistan case) except South Korea which is more bearish while Taiwan is bearish and is in negative side in 2012-2013 and bullish in 2014.

Table 3: Sharpe Ratios

Monthly	Pakistan	India	Malaysia	Singapore	Hong Kong	Taiwan	South Korea
2004	0.050398	0.569202	0.390106	0.328126	0.363395	0.045112	0.138818
2005	0.453342	0.284259	-0.08164	0.150586	0.035165	0.050835	0.046617
2006	0.040779	0.300688	0.359631	0.24981	0.202714	0.270844	0.112643
2007	0.221683	0.349302	0.53635	0.290693	0.484231	0.146464	-0.01443
2008	-0.55463	-0.96388	-1.19414	-1.12833	-0.97188	-1.07019	-1.00087
2009	-0.14424	0.677705	0.782386	0.728641	0.600217	0.834459	0.416619
2010	0.122393	0.089665	0.337359	0.150154	0.012826	0.154617	0.135375
2011	-0.13396	-0.29677	-0.05127	-0.22453	-0.27737	-0.29634	-0.0245
2012	0.289098	0.093594	0.149843	0.121571	0.15424	0.073471	0.155434
2013	0.307642	-0.07426	0.154044	0.017337	0.084322	0.128202	0.364154
2014	0.289496	0.382124	-0.03744	0.072298	-0.08749	0.210671	0.202383
Average	0.941999	1.41163	1.345217	0.756355	0.600374	0.548145	0.532243

Above table 3 shows the monthly Sharpe ratio values of selected emerging markets from 2004 to 2014. If we look at the each year monthly values of each emerging market, it portrays a good picture of overall adjusted returns. However, in 2008 Sharpe ratio of each market is negative and shows a huge distress, this is primarily because of the financial crisis hit all over the world, but the financial crisis impact over Pakistan is less relative to other selected emerging markets. Same does happen in 2011 but comparatively for lesser time and India shows a less attack of this financial distress. A good recovery is made in 2009 and 2010 by all selected emerging markets. Overall India and Malaysia have done better compare to other markets on average. Pakistan stood third in this list of adjusted returns. Remaining years monthly Sharpe ratio value show a mixed trend, some markets are performing good while other are not, but the average monthly Sharpe ratio values tell a more precise and positive picture of markets where all markets perform very good especially Malaysia, India, Pakistan, South Korea and Taiwan over a longer period of time. The Sharpe ratio values of India, Malaysia are > 1 and closer to 2 which is considered good (discussed above) while Pakistan, Singapore, Hong Kong, Taiwan and South Korea's Sharpe ratio values are < 1 which are also considered acceptable.

Table 4: Ranking of Markets on the Basis of Average Sharpe Ratios:

Countries	India	Malaysia	Pakistan	Singapore	Hong Kong	Taiwan	South Korea
M/Sharpe Ratio	1.41163	1.345217	0.941999	0.756355	0.600374	0.548145	0.532243

Above table 4 shows ranking of markets on the basis of Sharpe ratio from highest to lowest on daily, weekly and monthly basis. Table shows on daily basis Malaysia Sharpe ratio is highest among all of the selected emerging and frontier markets with 6.479425 followed by India, Pakistan, South Korea, Singapore, Hong Kong and Taiwan respectively. It can be explained like Sharpe ratio value > 0 is considerable, value ≥ 1 is good, value ≥ 2 is very good, and value ≥ 3 is excellent (Sharpe, 1994). On the basis of earlier said criteria, India out performed and Hong Kong stood last but acceptable in daily basis. However, on a weekly basis there is little change Taiwan stood last while Hong Kong above it. In long run Sharpe ratios are higher than of daily and weekly but India stood first while South Korea is last.

316 ISSN 1013-5316;CODEN: SINTE 8 Sci.Int.(Lahore),28(4),311-319,2016

Table 5: Ranking before risk adjustment

	Mean		Std. Dev.		Skewness		Kurtosis
PAK	0.014194	MAL	0.037347	PAK	-1.649274	PAK	12.985
IND	0.012976	KOR	0.04964	MAL	-0.729795	MAL	6.831118
MAL	0.006922	TAI	0.057075	KOR	-0.59714	KOR	5.390901
HON	0.005461	SIN	0.057908	SING	-0.425086	SIN	5.096923
SIN	0.005296	HON	0.067631	HON	-0.385569	HON	4.263505
KOR	0.004507	PAK	0.079787	TAI	-0.278419	TAI	4.251525
TAI	0.00388	IND	0.080103	IND	-0.246594	IND	3.825818

Table 6: Ranking after risk adjustment (Monthly):

	Mean		Adj_Ret		Sk_Adj_Ret		Kr_Adj_Ret
PAK	0.014194	MAL	0.1853429	IND	-0.05262091	IND	0.003391693
IND	0.012976	PAK	0.1778987	HON	-0.01416348	HON	0.001280871
MAL	0.006922	IND	0.1619914	TAI	-0.01393583	PAK	0.001093107
HON	0.005461	SIN	0.0914554	SIN	-0.01245866	SIN	0.001039058
SIN	0.005296	KOR	0.0907937	MAL	-0.00948486	MAL	0.001013304
KOR	0.004507	HON	0.080747	PAK	-0.00860621	TAI	0.000912614
TAI	0.00388	TAI	0.0679807	KOR	-0.00754764	KOR	0.000836038

Above tables 5 and 6 show that the ranking of each economy on the basis of average returns, adjusted returns, skewness adjusted returns and kurtosis adjusted returns on a daily, weekly and monthly basis. If we look at all frequencies mean returns Pakistan dominates followed by India. However, a little variation is ranking exist afterwards, even in before risk adjustment or after risk adjustment

Table 7: Value-at-Risk at 5% significance level (Daily)

VAR - 95%	Hong Kong	India	Malaysia	Pakistan	Singapore	South Korea	Taiwan
2004	-0.01394	-0.01161	-0.00962	-0.01465	-0.01088	-0.02121	-0.01868
2005	-0.01561	-0.01719	-0.0086	-0.02991	-0.01034	-0.01736	-0.01304
2006	-0.01459	-0.02625	-0.00877	-0.02842	-0.01389	-0.01895	-0.01656
2007	-0.02646	-0.02428	-0.01698	-0.01845	-0.02257	-0.02371	-0.0213
2008	-0.05143	-0.04368	-0.02267	-0.02797	-0.03498	-0.04035	-0.0342
2009	-0.03303	-0.032	-0.01339	-0.02828	-0.02662	-0.02591	-0.02463
2010	-0.01831	-0.01558	-0.00874	-0.01512	-0.01358	-0.01615	-0.01678
2011	-0.02595	-0.01974	-0.01199	-0.01641	-0.01846	-0.02835	-0.02206
2012	-0.01674	-0.01495	-0.0067	-0.01143	-0.01159	-0.01683	-0.01573
2013	-0.01553	-0.01724	-0.00921	-0.01526	-0.01029	-0.01357	-0.01171
2014	-0.01508	-0.01286	-0.00632	-0.01251	-0.00888	-0.01111	-0.00932

Above table 7 shows the daily Value-at-Risk (VAR) at α= 5%. Hong Kong in 2008 probability of losses is higher comparatively to other markets though all markets have high values of losses at 95% confidence interval this is because of financial crisis. Followed by 2009 where all markets losses values are high at 95% confidence interval. Hong Kong and Pakistan values of losses are higher compared to other emerging markets at 95% confidence. This shows losses would be higher in these two markets compare to rest.

Table 8: Value-at-Risk at 1% significance level (Daily)

VAR - 99%	Hong Kong	India	Malaysia	Pakistan	Singapore	South Korea	Taiwan
2004	-0.01972	-0.02207	-0.0136	-0.02072	-0.01539	-0.03	-0.02641
2005	-0.01642	-0.02431	-0.01217	-0.0423	-0.01463	-0.02455	-0.01844
2006	-0.02064	-0.03713	-0.0124	-0.04019	-0.01964	-0.0268	-0.02342
2007	-0.03743	-0.03434	-0.02401	-0.0261	-0.03192	-0.03353	-0.03013
2008	-0.07274	-0.06178	-0.03207	-0.03956	-0.04947	-0.05707	-0.04836

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2009	-0.04671	-0.04526	-0.01894	-0.04	-0.03765	-0.03664	-0.03483
2010	-0.02589	-0.02203	-0.01236	-0.02138	-0.0192	-0.02284	-0.02373
2011	-0.0367	-0.02792	-0.01696	-0.02321	-0.02611	-0.04009	-0.0312
2012	-0.02367	-0.02115	-0.00947	-0.01617	-0.01639	-0.02381	-0.02224
2013	-0.02196	-0.02439	-0.01303	-0.02159	-0.01455	-0.0192	-0.01656
2014	-0.02133	-0.01819	-0.00894	-0.01769	-0.01256	-0.01572	-0.01318

The table 8 above shows the daily Value-at-Risk (VAR) at α= 1%. In 2008 Hong Kong probability of losses is higher comparatively to other markets followed by India, though all markets have high values of losses at 99% confidence interval this is because of financial crisis. This trend proceeds in 2009 where all markets losses values are high at 99% confidence interval except Pakistan. Hong Kong and India values of losses are higher compared to other emerging markets at 99% confidence interval. This shows losses would be higher in these two markets compare to rest.

Table 9: Value-at-Risk at 5% significance level (Weekly)

VAR - 95%	Hong Kong	India	Malaysia	Pakistan	Singapore	South Korea	Taiwan
2004	-0.03224	-0.03659	-0.02371	-0.03794	-0.02202	-0.04158	-0.04301
2005	-0.02595	-0.04167	-0.02056	-0.07744	-0.02043	-0.03132	-0.03247
2006	-0.03043	-0.0715	-0.02056	-0.0741	-0.02792	-0.0379	-0.03436
2007	-0.05739	-0.05656	-0.03981	-0.03872	-0.04902	-0.05576	-0.04938
2008	-0.09802	-0.09988	-0.05427	-0.09098	-0.07607	-0.0876	-0.08287
2009	-0.06816	-0.07247	-0.03515	-0.07225	-0.06367	-0.04301	-0.06031
2010	-0.04097	-0.03645	-0.02482	-0.03378	-0.03347	-0.03471	-0.03846
2011	-0.06436	-0.05039	-0.02798	-0.03643	-0.04824	-0.05656	-0.04819
2012	-0.03969	-0.03578	-0.0161	-0.02808	-0.02628	-0.0388	-0.03576
2013	-0.03458	-0.04211	-0.02295	-0.04151	-0.0278	-0.03217	-0.02435
2014	-0.0368	-0.03542	-0.01447	-0.03346	-0.02168	-0.02588	-0.02151

Table 9 above shows the weekly Value-at-Risk (VAR) at α= 5%. In 2008 India, Hong Kong, Pakistan, South Korea and Taiwan probability of losses are higher comparative to Malaysia and Singapore at 95% confidence interval this is because of financial crisis. This trend proceeds in 2009 and 2011 where all markets losses values are high at 99% confidence interval except Pakistan. Hong Kong and India values of losses are higher compared to other emerging markets at 95% confidence interval. This shows losses would be higher in these two markets compare to rest. These markets can be ranked on the basis of highest to lowest losses values in following order: India > Hong Kong > Pakistan > South Korea > Singapore > Taiwan > Malaysia.

Table 10: Value-at-Risk at 1% significance level (Weekly)

VAR - 99%	Hong Kong	India	Malaysia	Pakistan	Singapore	South Korea	Taiwan
2004	-0.0456	-0.05175	-0.03354	-0.05365	-0.03114	-0.05881	-0.06083
2005	-0.0367	-0.05894	-0.03181	-0.10953	-0.02889	-0.04429	-0.04592
2006	-0.04304	-0.10112	-0.02908	-0.1048	-0.03949	-0.0536	-0.0486
2007	-0.08117	-0.08	-0.05631	-0.05477	-0.06933	-0.07886	-0.06984
2008	-0.13863	-0.14127	-0.07676	-0.12867	-0.10758	-0.1239	-0.11721
2009	-0.09639	-0.1025	-0.04972	-0.10218	-0.09004	-0.06083	-0.08529
2010	-0.05794	-0.05156	-0.03511	-0.04778	-0.04733	-0.04909	-0.0544
2011	-0.09102	-0.07127	-0.03957	-0.05152	-0.06823	-0.08	-0.06816
2012	-0.05614	-0.0506	-0.02278	-0.03972	-0.03717	-0.05487	-0.05057
2013	-0.04891	-0.05956	-0.03246	-0.05871	-0.03932	-0.0455	-0.03444
2014	-0.05205	-0.05009	-0.02047	-0.04732	-0.03067	-0.0366	-0.03041

Table 10 above shows the weekly Value-at-Risk (VAR) at α= 1%. In 2008 India, Hong Kong, Pakistan, South Korea and Taiwan probability of losses are higher comparative to Malaysia and Singapore even at 99% confidence interval this is because of financial crisis. Above table tells that there is 99% confidence that values of losses of each market will not

318 ISSN 1013-5316;CODEN: SINTE 8 Sci.Int.(Lahore),28(4),311-319,2016

exceed what is given in the table. This trend proceeds in 2009 and 2011 where all markets losses values are high at 99% confidence interval except Pakistan. Hong Kong and India values of losses are higher compared to other emerging markets at 99% confidence interval. This shows losses would be higher in these two markets compare to rest. These markets can be ranked on the basis of highest to lowest losses values in following order: India > Hong Kong > Pakistan > South Korea > Singapore > Taiwan > Malaysia.

Table 11: Value-at-Risk at 5% significance level (Monthly)

VAR - 95%	Hong Kong	India	Malaysia	Pakistan	Singapore	South Korea	Taiwan
2004	-0.04125	-0.06201	-0.04398	-0.03189	-0.02532	-0.03042	-0.09472
2005	-0.05372	-0.10481	-0.04361	-0.16391	-0.03865	-0.0336	-0.05952
2006	-0.05439	-0.12362	-0.0454	-0.11726	-0.05843	-0.02573	-0.07736
2007	-0.09428	-0.10745	-0.06739	-0.11552	-0.09008	-0.05919	-0.07607
2008	-0.13877	-0.20307	-0.08752	-0.12037	-0.13147	-0.10014	-0.13633
2009	-0.15122	-0.18897	-0.06753	-0.27776	-0.14788	-0.15243	-0.10749
2010	-0.091	-0.06577	-0.04327	-0.09053	-0.05997	-0.09412	-0.08815
2011	-0.15443	-0.10339	-0.06242	-0.07815	-0.09746	-0.08748	-0.08477
2012	-0.11039	-0.10377	-0.03716	-0.06044	-0.08053	-0.0631	-0.09831
2013	-0.07514	-0.0779	-0.03564	-0.0837	-0.06249	-0.04008	-0.03171
2014	-0.07552	-0.09575	-0.0302	-0.05936	-0.05838	-0.05866	-0.02976

Table 11 above shows the monthly Value-at-Risk (VAR) at α= 5%. Though the results are not far different in term of losses compared to daily and weekly values of VAR, in 2008 India, Hong Kong, Pakistan, South Korea and Taiwan probability of losses are higher comparative to Malaysia and Singapore even at 95% confidence interval this is because of financial crisis. Above table tells that there is 95% confidence that values of losses of each market will not exceed what is given in table. This trend proceeds in 2009 and 2011 where all markets losses values are high at 95% confidence interval except Pakistan. Hong Kong and India values of losses are higher compared to other emerging markets at 95% confidence interval. This shows losses would be higher in these two markets compare to rest. These markets can be ranked on the basis of highest to lowest losse values in following order: India > Hong Kong > Pakistan > South Korea > Singapore > Taiwan > Malaysia.

Table 12: Value-at-Risk at 1% significance level (Monthly)

VAR - 99%	Hong Kong	India	Malaysia	Pakistan	Singapore	South Korea	Taiwan
2004	-0.05834	-0.0877	-0.06221	-0.0451	-0.03581	-0.04302	-0.13396
2005	-0.07598	-0.14824	-0.06168	-0.23182	-0.05466	-0.04752	-0.08418
2006	-0.07693	-0.17483	-0.0642	-0.16584	-0.08263	-0.03639	-0.10941
2007	-0.13335	-0.15197	-0.09531	-0.16338	-0.12741	-0.08372	-0.10758
2008	-0.19626	-0.2872	-0.12378	-0.17025	-0.18594	-0.14162	-0.19281
2009	-0.21388	-0.26727	-0.0955	-0.39285	-0.20914	-0.21558	-0.15202
2010	-0.1287	-0.09302	-0.0612	-0.12803	-0.08481	-0.13312	-0.12467
2011	-0.21842	-0.14623	-0.08829	-0.11053	-0.13784	-0.12373	-0.11989
2012	-0.15613	-0.14676	-0.05256	-0.08549	-0.1139	-0.08924	-0.13904
2013	-0.10627	-0.11018	-0.05041	-0.11837	-0.08838	-0.05669	-0.04485
2014	-0.1068	-0.13541	-0.04271	-0.08395	-0.08257	-0.08296	-0.04209

Table 12 above shows the monthly Value-at-Risk (VAR) at α= 1%. In 2008 India, Hong Kong, Pakistan, South Korea and Taiwan probability of losses are higher compard to Malaysia and Singapore even at 99% confidence interval this is because of financial crisis. Above table tells that there is 99% confidence that values of losses of each market will not exceed what is given in the table. This trend proceeds in 2009 and 2011 where all markets losses values are high at 99% confidence interval except Pakistan. Hong Kong and India values of losses are higher compared to other emerging markets at 99% confidence interval. This shows losses would be higher in these two markets compare to rest. These markets can be ranked on the basis of highest to lowest losses values in following order: India > Hong Kong > Pakistan > South Korea > Singapore > Taiwan > Malaysia.

CONCLUSION

In this study, we calculate value at risk of Asian emerging stock markets. This study also calculates the Sharpe ratios of selected Asian emerging markets, which indicate potential

Sci.Int.(Lahore),28(4),311-319,2016 ISSN 1013-5316;CODEN: SINTE 8

risk associated with these markets. This research rank Asian emerging equity markets on the basis of Sharpe ratios. This study goes further and rank emerging stock markets on a risk adjusted basis so that investors can get in-depth knowledge before investment in these markets. This research makes its primary focus on calculating value at risk of these stock markets at various significant levels of daily, weekly and monthly financial data series of Asian emerging markets. On these calculation of value at risk various investors (individual, groups and financial institutions) can get benefit of either short, medium or long term investments in these markets.

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