Chapter 2
Review of Literature

Literature review was undertaken on the Randomness of Asset Prices, Efficient Markets, Financial Volatility, Extreme value Historical Volatility Estimators, Idiosyncratic Volatility & Forecasting Volatility in Stock Market returns, besides using traditional Financial Models to data set found in standard Financial Management Textbooks.

2.1 Tracing the Randomness in Asset Price Paths and Efficient Markets.

French Mathematician Louis Bachelier in 1900 performed rigorous analysis on stock market returns and established that stock returns are statistically independent, which implies forgetfulness or memory-less property in stock market returns, and thereby making it difficult to predict tomorrow's return based on today's stock prices. He was of the view that stock prices exhibit simple arithmetic Brownian motion as observed in liquids and gases and states of nature.

John Burr Williams in 1938 proposed that stock prices are indeed based on their economic fundamentals, in his work on “Intrinsic Value” of a stock.

John Maynard Keynes opined that stock price behaviour being speculative in nature proposed the “Beauty Contest Analogy”, wherein stock analysts generally recommend not the stocks they consider best but what the other analysts consider best. He also said that in the long run these speculations will finally achieve Convergence in tune with the Intrinsic Value, but in the long run he said we are all dead.

Advent of Computing prowess in the 1950's made it feasible for researchers to undertake rigorous empirical analysis on enormous data sets.
Maurice Kendall, a British Statistician in 1953, documented the property of statistical independence in weekly returns of British Stock Markets.

Harry Roberts in 1959 found evidence of statistical independence on Dow Jones Industrial Index.

Eugene Fama in 1965 furnished evidence of stock returns being statistically Independent, in support of the Random Walk Model in stock prices and stated that the techniques as employed by technical analysts and chartists had no predictive power on stock prices in future based on historical prices.

Paul Samuelson in 1965 & Benoit Mandelbrot in 1966 stated that the randomness in stock prices can be expected from a well-functioning market. This development bore its roots in the development of the Rational Expectation Theory of Macroeconomics, and that investors are rational and competitive in the "Fair Game" of Investment decision making.

Eugene Fama in 1970 published a paper “Efficient Capital Markets”- A review of theory and empirical work and contributed to future research by defining three forms or levels of Market Efficiency namely the Weak form, semi-strong form and the strong form of efficient markets. In the weak form of market hypothesis he proposed that future returns cannot be predicted based on past returns, whereas in a semi-strong market efficiency form, the stock prices reflect all publicly available information based on the Company's economic Fundamentals which included public domain market data in the weak form as well as financial company reports, economic forecasts, company news, information and tweets. In the Strong form of the efficient market hypothesis considered the highest level of Market Efficiency stock prices fully reflect all public and private information which could involve insider trading.

Fama stated that weak form precludes only Technical Analysis from being profitable; while the semi-strong form precludes usage of both the Technical & Fundamental Analysis for profit booking and that the strong form implies that
even those insiders having privileged information cannot expect to earn superior returns.

Sanford Grossman & Joseph Stiglitz in 1980 proposed that Market Frictions also play a key role which includes costs involved in performing security analysis and trading which may impair market efficiency; hence it would be better to define market efficiency in terms of generalized and continuous terms with swift adaptability of prices akin to greater informational efficiency.

While 1970's empirical research strongly supported the semi-strong level of market efficiency, but some anomalies like" Small Firm Effect", "January Effect", "Monday Effect" and the like were observed in the stock behavior in the late 1970's and early part of 1980's. These price anomalies could be attributable to asset pricing models to be mis-specified or it may be due to market frictions as observed by today's financial economist.

Robert Shiller in 1981 argued that stock returns being highly volatile vis-a-vis payment of aggregate dividends, which was in support of Keynesian view that stock prices are more often than not driven by speculation rather than by economic fundamentals.

Werner Debondt & Richard Thaler in 1985 showed evidence of “Mean Reversion" phenomena in stock returns and stated that individual stocks displayed apparent overreaction over a longer horizon of three to five years, which meant that stocks which performed well in the long horizon of 3 to 5 years were inclined on reverting to their means over the subsequent 3 to 5 years resulting in negative returns and vice-versa.

Lawrence Summers in 1986 found evidence of the stock prices in displaying short and long swings away from their intrinsic values and hence it is difficult to decipher short horizon returns.

Behavioral Finance evolved in the late 1980's to counter these so called inefficiencies which dispensed with the traditional assumptions of Investor's
Utility Maximization maxim and Rational expectations theory by proposing that it is the heuristic biases or cognitive illusions which shroud human behavioral patterns in Stock Market investing coupled with arbitrage limits depicting inefficient markets, responsible for observing deviation of stock prices from its Intrinsic fundamentals.

Fama & Kenneth French in 1988 corroborated the evidence of “Mean Reversion" patterns in aggregate returns and found that stocks earn larger returns during more stressed and difficult Economic conditions. Efficient Market theory also argued that a few individual's cognitive blunders would not majorly impact or influence stock markets as stocks which may be either undervalued or overpriced are bound to invite rationalistic traders who would be keen on buying undervalued ones and selling overvalued stocks.

Andrei Shleifer & Robert Vishny and etal observed that these market inefficiencies would anyhow exist for an ephemeral time frame and traders who are quick in exploiting such arbitrage opportunities will chance upon such price gaps and as a result the normal equilibrium will be restored on the price front due to such arbitrage acts. Internet bubble of late 1990's and stock market crash of 1987, was attributable to corrections in stock price which will take effect only after this mispricing issue of the assets becomes large and noise traders would be at a loss for confidence to trade and due to inaction of these noise traders the rational traders may have to bear the brunt of the incremental risk on account of noise traders not participating in such trading.

Burton Malkiel in 2003 analyzed the Internet bubble and said that at higher prices of internet & technology stocks, there is euphoria in the market leading to attracting more capital from investors through Initial Public offer (IPO) subscriptions thereby indicating that resource allocation playing a key role in stock market investments.

Efficient Market Theory and its proponents could be considered appropriate at least on two major fronts
1) As regards Short frequency data (Days/Weeks/Months) or in short run stock prices are quick enough to assimilate new information which serves as a reasonable approximation to the variability in the stock's Intrinsic Worth.

2) There seems to be variability in stock prices across different markets and countries. Rather than seeking an apt explanation to capital market efficiency, researchers and academicians ought to focus on conditions that tend to explain and enhance informational efficiency of capital markets.

2.2 Financial Volatility in Financial Econometric Time series

Barndorff-Nielsen & Shephard in 2003 and Andersen & etal in 2003, stated that Financial volatility is a latent factor and hence cannot be directly observable, making it more difficult to predict stock prices.

Nisson in 1991 employed Japanese Candle Sticks charting techniques using the intraday Stock price information on the Open, High, Low and Closing stock prices of individual stocks and market indices.

There are mainly two types of volatility, namely idiosyncratic volatility (Residual Variance/Unique Risk/ Company Specific risk) on account of microeconomic factors which can be termed as Diversifiable or Unsystematic Risk and the other one being Market risk or systematic risk or non-diversifiable risk.

2.2.1 Idiosyncratic Volatility

In 2003,2006 & 2007, Malkiel & Xu observed strong positive correlation between value weighted idiosyncratic volatility and portfolio returns for the stocks listed in Standard & Poor's 500 index during a study of a 45 year period.
ending 1996. They further observed that the increased influx of Institutional Investors was the cause for increased volatility in stock market as increased capital inflows led to increased expectations of growth in earnings by the firm employing these funds to boost retained earnings based on enhanced projected growth in future earnings, which propels the idiosyncratic volatility to increase further. Beta which measures the sensitivity of asset returns in relation to market index movements was considered a pertinent measure of market risk and higher the beta higher the stock returns and higher the stock returns higher will be the idiosyncratic volatility.

Goyal & Santaclara in 2003 reported on their study of stocks enlisted in the Canadian Stock Markets during the period July 1962 to December 1999, and found that idiosyncratic volatility and portfolio returns were positively correlated.

Fu in 2009 reported for US stock markets for the period 1963 to 2006, that by employing GARCH (General Autoregressive conditional heteroscedasticity) model he found that idiosyncratic volatility was positively correlated with stock portfolio’s returns.

Bali, Cakici, Yan & Zhang in two distinct studies undertaken in 2005 & 2008, for differing periods between 1958 to 2004, found that there is no correlation between idiosyncratic volatility and portfolio returns by employing CAPM (Capital Asset Pricing Model).

Ang, Hodrick, Xing & Zhang published reports during 2006 to 2009 on their study on US Stock Markets during the period 1963 to 2003 exhibited negative correlation between Idiosyncratic Volatility and expected return on the stock portfolio, by employing Fama French three factor model.

2.2.2 Harry Markowitz, (1952 -1954) father of Modern Portfolio Theory enunciated the “Efficient Frontier of Risky Assets” by employing the Mean-Variance Criterion to stock data. William Sharpe was sharp enough to point out that since the diversifiable risk can anyway be diversified away what one
needs to focus on is the Market risk or the Non-diversifiable risk. He concluded that it's the market which offers returns to investors and beta is what one needs to focus on for investment purposes.

2.3 Price Range Historical Volatility Estimators.

Besides the traditional or classical historical volatility estimators which are computed using inter day closing prices of stocks, many studies were undertaken by researchers by carefully exploiting all available intraday price information as to opening price, high price, low price and the closing daily stock prices with a view to garner evidences on the stock volatility conundrum. Alizadeh, Brandt and Diebold in 2002, employed the Maximum Likelihood principle for stochastic volatility models and they were of the opinion that lognormal returns on the stock approximates Normal or Gaussian distribution.

Parkinson in 1980, Garman and Klass in 1980, Rogers & Satchell in 1991 and Yang Zhang in the year 2000 computed efficient risk metrics to measure historical volatility, of which Yang Zhang volatility estimators turning out to be more efficient among these four computations as mentioned above, which turned out to be not only an unbiased estimate of historical volatility but also was independent of the drift term.

Shu & Zhang in 2006 reported that these price range estimators performed well when an asset price is said to adhere to a continuous Geometric Brownian Motion or the so called Random Walk Theory.

2.4 Forecasting Stock Market Volatility in returns.

Akgiray and etal in 1989, employed the Exponential Weighted Moving Average (EWMA), to forecast volatility on New York Stock exchange stocks. This model albeit being useful in forecasting a financial econometric time series they concurred that GARCH (General Autoregressive Conditional
Heteroscedasticity) Model exhibited best performance in this volatility forecasting exercise.

Tse in 1991 employed EWMA, ARCH & GARCH Models for a three year period ending 1989 for studying stock return volatility in the Japanese Stock Exchange and they were of the opinion that EWMA performed the best when it came to forecasting Volatility.

Nelson in 1992 employed the ARCH (Autoregressive Conditional Heteroscedasticity) Model and found that despite the model being severely mis-specified this model performs the best for forecasting volatility employing high frequency data such as the daily stock price information, but was poor in its forecasting ability for out-of-sample forecast for both in the medium term and long run conditional volatility.

Tse & Tung in 1992 studied the stocks listed in the Singapore Stock Exchange by considering monthly data set frequency, and were also of the opinion that EWMA Model best suited for the Singapore Markets.

Brailsford & Faff in 1996 found the GJR Model to be the best for forecasting Australian Stock Markets.

Franses & Vindijk in 1996 suggested QGARCH (Quadratic General Autoregressive Heteroscedasticity) to possess best forecasting ability on stock returns.

Wash & Tsou in 1998 studied the Australian Index for a two year period ending 31st December 1995 and concurred that EWMA Model is the best suited for forecasting volatility.

Chong, Ahmad & Abdullah in 1999 observed that EGARCH Model was best suited in forecasting one year ahead volatility in stock returns for it was the skewness or asymmetry which was a common embedded feature in stock return.
Blair & etal in 2001 employed the volatility index (VIX), model for studying the intraday returns on S&P Index for 11and half years which they considered it to be the best unbiased estimate for forecasting volatility in stock returns.

Awartani & Corradi in 2005 observed that GARCH Models had better predictive power which incorporated the asymmetries or skewness as was evident in stock returns volatility.

Wilhemsson in 2006 investigated forecasting ability of GARCH (1, 1) Model in S&P 500 Index Futures using nine different innovations/shocks.

Evans &McMillan in 2007 compared nine different models on stock market returns for 33 economies and concurred that GARCH Model outperformed others when it came to forecasting volatility in stock returns.

Chuang, Lu & Lee in 2007 found that GARCH Model with t distribution as an innovation worked well in Forex markets.

Galdi & Pereira in 2007 made a comparative study of EWMA, GARCH, VaR, and Stochastic Volatility models and concurred that VaR (Value at Risk) Model was the best suited in forecasting volatility in stock returns.

Patev, Kanaryan& Lourdi in 2009 studied the Bulgarian Stock Markets and concluded that both EWMA with an Innovation of GED (General Error Distribution) function and EWMA with t distribution worked the best in forecasting volatility of stock returns in the Bulgarian Stock Exchange.

2.5 Gann Analysis: William Delbert Gann used Astrology as an unveiled secret in predicting accurately stock prices for intraday traders.
2.6 Portfolio Optimization Model

Sharpe's portfolio optimization model, both in case of short sales not allowed and short sales allowed, Fama's Model of decomposition of excess returns and other pertinent models on asset pricing and its volatility can be found in standard financial management textbooks.