

## Chapter 2

# Investment Management Risk

### ABSTRACT

*Proposed method is applied to Investment Management for portfolio selection to achieve investment objectives controlling risk. DMAIC framework applies stochastic techniques to investment risk management. Optimisation constructs Efficient Frontier of optimal portfolios with expected return in a predefined range with a determined increment. Simulation calculates and measures the portfolio return, Variance, Standard Deviation, Value at Risk (VAR), Sharpe Ratio and Beta of Efficient Frontier portfolios; Six Sigma capability metrics of investment process are calculated versus specified limits. Analysis allows for selection of the best Efficient Frontier portfolio with maximum Sharpe Ratio. Simulation sensitivity analysis identifies the riskiest asset. Portfolio revision considers options to improve the portfolio and replaces the asset with an option to reduce risk. Portfolio execution implements the revised portfolio. Ongoing portfolio management evaluates portfolio performance on regular basis and if required, revises the portfolio considering changes in the market and investor's position.*

### INTRODUCTION

This chapter presents the Portfolio Management application class of the method. It is applied to Financial Industry to manage the market risk of an investment portfolio.

Bernstein and Damodaran (1998) elaborated the investment process emphasizing the importance of the process; in particular, that the process is

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generic regardless of what the investment philosophy is or which investment strategy is applied, or what assets are involved. Also, Maginn et al. (2007) presented and defined Investment Management as an ongoing process.

The financial industry has accepted and successfully applied Six Sigma in order to improve their processes and provide higher quality services to their customers. For example, Six Sigma introductory topics for financial professionals were published in September 2003 (Stamatis 2003). Hayler and Nichols (2006) showed how financial giants such as American Express, Bank of America, and Wachovia have applied Six Sigma, Lean, and Process Management to their service-based operations by providing specific, real-world examples and offering step-by-step solutions. Also, Tarantino and Cernauskas (2009) provided an operational risk framework by using proven quality control methods such as Six Sigma and Total Quality Management (TQM) in financial risk management to forestall major risk management failures.

Asset & Liability Management (ALM) has originated from the duration analysis long while ago (Macaulay 1938, Redington 1952). Subsequently, ALM has evolved in a powerful and integrated tool for analysis of assets and liabilities in order to value not only the interest rate risk but the liquidity risk, solvency risk, firm strategies and asset allocation as well (Bloomsbury 2012). The frontier of ALM is based on stochastic optimisation and Monte Carlo Simulation (Bourdeau 2009). Mitra and Schwaiger (2011) published ALM quantitative decision models. Also, Adam (2007) presented advanced ALM stochastic models.

The problem of asset allocation for portfolio optimisation was solved by Markowitz (1952; 1987) in the 1950's. Markowitz applied his award-winning Mean-Variance method. Nowadays, stochastic optimisation is used to resolve the optimal portfolio. Stochastic optimisation models in Finance are elaborated in a book edited by Ziemba and Vickson (2006). Also, advanced Financial Risk models are stochastic and use Monte Carlo Simulation. A comprehensive elaboration on general applications of Monte Carlo Simulation in Finance was published by Glasserman (2004).

Performance Evaluation and Risk Attribution are important aspects to emphasize. Plantinga (2007) discussed methodologies for measuring and evaluating the investment process performance considering Sharpe Ratio, Jensen's Alpha, Treynor Ratio, Information Ratio and downside risk measures. Lawton and Jankowski (2009) edited a collection of today's most prominent industry professionals and academics works focusing on investment

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