

Chapter 5

Dynamic Portfolio Selection: Asset–Liability Management Model

ABSTRACT

In this chapter I recognize the importance of the stochastic programming as a significant tool in financial planning. The current practice of portfolio optimization is still limited to the simple formulation of linear programming (LR) or quadratic programming (QR) type. For that reason, relevant literature on asset-liability management (ALM) model has been reviewed and two different ALM approaches are compared: first piecewise linear function; and second a nonlinear utility function. This chapter shows that the mathematical programming methodology is ready to challenge the huge problem arising from LP portfolio optimization. A special emphasis was put on the shape of the investors' payoff functions in asset price equilibrium. The results underpin our claim that the nonlinear ALM model generated better asset allocation. An algorithmic construction of ALM model is developed in Wolfram Mathematica 9.

*Your child does not seem to have a learning impediment, but he does not seem to want to speak. The schoolmaster pressures you to start considering “other options,” namely therapy. You argue with her to no avail (she is supposed to be the “expert”). Then, suddenly, the child starts composing elaborate sentences, perhaps a bit too elaborate for his age group. I will repeat that linear progression, a Platonic idea, is not the norm. (Nassim Nicolas Taleb, *The Black Swan*, 2007)*

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INTRODUCTION

Due to the development of new branches of financial services and financial products, financial business is becoming more and more complicated, resulting in greater risks. In addition, the financial industry is getting more involved in the economy, both nationally and globally. Nowadays, the financial market could easily drive the global economy in recession and led to more and more loss. But these losses are not due to market risk or credit risk, but instead are due to operational risk. Why?

According the Basel II we recognize three main categories of financial risk: market risk, credit risk and operational risk. Market risk is mainly from the fluctuations of asset prices in the financial market. Credit risk corresponds to the default of counterparties or business institutions involved in the financial market. Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk. According to Yang (2009), “operational risk covers a wide range of events and can result from various sources, where managerial issues normally play significant parts. It can result from human or machines; can be hidden in calculations or documentations; can be external or internal. “

In support let us recall the story of the largest single individual fraud: the Madoff story.

On 11th of December 2008, the former chairman of the NASDAQ stock exchange and business owner of the Wall Street firm Bernard L. Madoff Investment Securities LLC, Bernard Lawrence Madoff was arrested by the FBI on the allegation of a \$50 billion fraud, the biggest investor fraud ever attributed to a single individual. This fraud operated as a Ponzi scheme, a rather simple scheme, which pays investors with their own money or the money collected from new investors. For example, assume a client, promised a 15% annual return, and gave Bernie \$10 million to invest on January 1. Bernie deposited the client's money in his own bank account. As more clients invested over the course of the year, the amount in Bernie's bank account grew. If the client decided to cash in the entire investment on December 31, Bernie wrote the client a check for \$11.5 million from the company's bank account. Then DiPascali and several loyal investment fund employees fed price data from the previous 12 months for stocks, options, and Treasury Bills into a computer to derive a long list of trades that indicated a \$1.500.000 profit.

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