Chapter 2.18
Effective DMSS Guidance for Financial Investing

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ABSTRACT

Investment decisions have a significant impact on individuals, groups, organizations, the economy, and society. As a result, many formal methodologies and information systems have been designed, developed, and implemented to assist with financial investing. While these tools can improve decision making, none offer complete and integrated support for financial investing. This article seeks to close the support gap by offering a theoretical decision making support system for financial investing and illustrating the system's use in practice. The demonstration indicates that the theoretical system can improve the process of, and outcome from, investing.

INTRODUCTION

Financial decisions are some of the most challenging and important decisions made daily by individuals, groups, organizations, and other entities. These decisions are complex and, at best, semi-structured, and the selected actions will have a substantial impact on the well-being of these entities, in particular, and the economy, in general.

A large amount of available quantitative data support financial decision making, and many rigorous models capture financial phenomenon (R C Merton, 1995). Various information systems are available to deliver the model's embedded expertise to the investor (C. Zopounidis & M. Doumpos, 2000). Vellido et al (1999) reviewed neural network applications in finance, concluded

that the literature is rich with neural network applications, and suggested that future work should explore the combining of knowledge-based techniques with neural network techniques. A review of articles on the subject of finance in the journal *Expert Systems with Applications* highlighted a pattern of knowledge-based work in the 1980s and early 1990s and machine learning work from the mid-1990s till now (Roy Rada, 2008).

Yet, most of the models, and thereby the information system delivery, focus on an aspect of the financial situation and typically are tailored to specific categories of investors. Such a fragmented and incomplete approach to financial analysis may not provide the investor with the specific and precise guidance needed for effective decision making in practice (Bob Berry, 2004).

This article examines the issue of effective guidance for financial investing. First, the relevant literature is reviewed. Next, the financial investing approaches inspired by this literature and the pertinent decision support gaps in the approaches are identified. Then, the article offers a decision making support system that can close the support gaps and provide specific and precise guidance for financial investing in a complete and integrated manner. The article concludes with an examination of the implications for financial decision making, in particular, and for financial engineering, in general.

FINANCIAL ENGINEERING

Financial investing may be seen as a three step process of collecting data about assets, evaluating assets, and buying and selling assets into and from a portfolio. Usually, investors will seek professional advice to assist in the investment process. Typically, the professional's organization employs technical experts, or financial engineers, to develop tools that help financial professionals in the advisement process.

Financial engineers, broadly speaking, design new financial instruments and create solutions to financial problems. In particular, financial engineering includes these four areas (J M Mulvey *et al.*, 1997):

1. Corporate Finance (new instruments to secure funds, engineering takeovers and buyouts)
2. Trading (develop dynamic trading strategies)
3. Investment Management (repackaging and collaterization)
4. Risk Management (insurance, hedging, and asset management)

Risk management may in turn be decomposed into (J M Mulvey et al., 1997):

- strategic asset management (via multi-stage stochastic optimization) and
- operational asset management (via immunization models).

Often, financial engineering is accomplished with the assistance of optimization, statistical, and econometric approaches. Sometimes, these approaches assume the problem is well-posed and has a single objective. Financial decisions, however, could involve:

- the existence of multiple criteria,
- conflicts among criteria,
- ill-structured evaluation, and
- political and social factors involved with human decision-making.

Management scientists, economists, and others have developed additional models to deal with these financial complexities.

Investors and the investment professionals typically do not have the knowledge about, or interest in, the financial models to effectively utilize these tools in practice. Consequently, financial

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