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A Beta-return Efficient Portfolio Optimisation Following the CAPM

An Analysis of International Markets and Sectors

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Abstract

Purpose

The most widely used but also extensively debated method for pricing security return is the capital asset pricing model (CAPM). In combination with Markowitz's (1959) statement on the reduction of unsystematic risk through diversification, this dissertation focuses on the development of a risk-return efficient equity allocation.

Design/methodology/approach

A quantitative research design is used which deductively employs the market index model and other grand theories as the foundation within the research process. A repeated cross-sectional analysis of the Global Stock Market is used to increase the validity and reliability of the findings to answer the research questions. The philosophies behind this approach are those of a functionalist, positivist and objectivist. The secondary data prohibits from biases connected with its sampling.

Findings

First of all, the study found proof that noticeable differences exist between countries and supersectors in regards to the beta-return relationship. Secondly, the analysis of the data allows for a risk-return efficient equity allocation. Thirdly, the predictability of future single stock performance was weak and stock picking or market timing cannot be supported by the implemented beta-return ratio.

Research Limitations

Even though the proxy is comprehensive it cannot be regarded as perfect because emerging economies are missing. Also, the statistical significance is limited due to the nature of the cross-sectional approach.

Finally, the validation of the findings is critical as the research about international and cross-sector stock market behaviour is scarce.

Practical Implications

The results of this work enable institutional and large private investors to optimise their stock portfolios through a beta-risk efficient diversification across sectors and countries.

Originality/value

This dissertation analyses one of the most comprehensive data sets available. Furthermore, it investigates more countries and industry sectors than all of the literature found on this topic.

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Chapter 1: Introduction

1.1 Chapter Introduction

This chapter delves into the background of this area of interest by giving a brief review. The reasons for conducting this research are explained and the goal of this work is stated, including the formulation of the research questions. Finally, the structure of this study is placed at the disposal.

1.2 Background and Problem Foundation

> "There is no such thing as a free lunch" (Milton Friedman)

This quote was popularised by the same-titled book of the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel (henceforth: Nobel Prize) laureate Friedman (1975) who is best known for his contributions to price and monetary theory. This statement reflects the economic key concept of opportunity costs. Mankiw (2011) argues that when one likes to get one special thing, usually one must give up another. Regarding a portfolio the opportunity cost of higher returns is a higher risk exposure. Markowitz (1959), who was strongly influenced by his PhD-supervisor Friedman, states in his pioneering monograph about investment diversification:

> "A good portfolio is more than a long list of good stocks and bonds. It is a balanced whole, providing the investor with protections and opportunities with respect to a wide range of contingencies. The investor should build toward an integrated portfolio which best suits his needs." (Markowitz 1959, p.3).

The reasons a portfolio should be well-diversified have not become less important in recent years as the widely discussed study of Brinson *et al.* (1991) demonstrates. The researchers give evidence that the asset allocation is the most important factor for a long-term investment success and should be chosen over stock picking and market timing. This has been supported by the findings of Ibbotson & Kaplan (2000). While this

kind of research focused on the whole investment portfolio including various asset classes, this dissertation concentrates on equity portfolios.

Based on the findings of Sharpe (1964), who created the Capital Asset Pricing Model (CAPM) for which he gained the Nobel Prize, the outcome of this study supports institutional and wealthy private investors to optimise their stock portfolios. Furthermore, the conducted research broadens the knowledge of academics and students on international stock markets.

The diversification across countries and sectors will be of special interest to reduce the unsystematic risk, because asset classes, countries and especially sectors show specific differences in their behaviour of risk and return.

The major hindrance to optimisation is the systematic risk of stocks. Sharpe (1964) recognised that a single factor can explain the cross-sectional differences of stock return – Beta, the covariance of the stock and the market return. This theory has been a hot subject to numerous studies which tested its empirical validity. If the theory holds true it should be possible to construct a risk-return efficient portfolio which integrates the reduction of systematic and unsystematic risk. While the unsystematic risk should be eliminated by diversification, the systematic risk should be reducible by the use of the beta-return ratio, a measure implemented within this work.

1.3 Aims and Objectives

The overall aim of the research is to construct a portfolio that earns a higher return and simultaneously comprises a lower systematic risk than the (global) market portfolio. Furthermore, the investigation uncovers imbalances between different economies and sectors in regard to investment advantageousness. This requires an examination of the global equity market to answer the following research questions:

RQ 1: Is it possible to determine differences among the international stock markets regarding the beta-return relationship?

RQ 2: Do industry-sector-specific differences exist with regard to the beta-return relationship?

RQ 3: What are the implications for an effective and efficient equity asset allocation?

RQ 4: Is it effective to build a future oriented investment strategy upon an ex-post data/return analysis?

1.4 Structure

Following the introductory part, the key findings and results of previous studies build on or driven from grand fundamental theories on the studied topic are presented and critically evaluated within the literature review. In chapter 3, the methodology used for this study is illustrated, including the approach, strategies, and methods. Chapter 4 presents the data analysis and the discussion on the findings. Finally, Chapter 5 provides the conclusions of the research conducted, its limitations and an outlook. Figure 1 illustrates the process and structure of this dissertation.

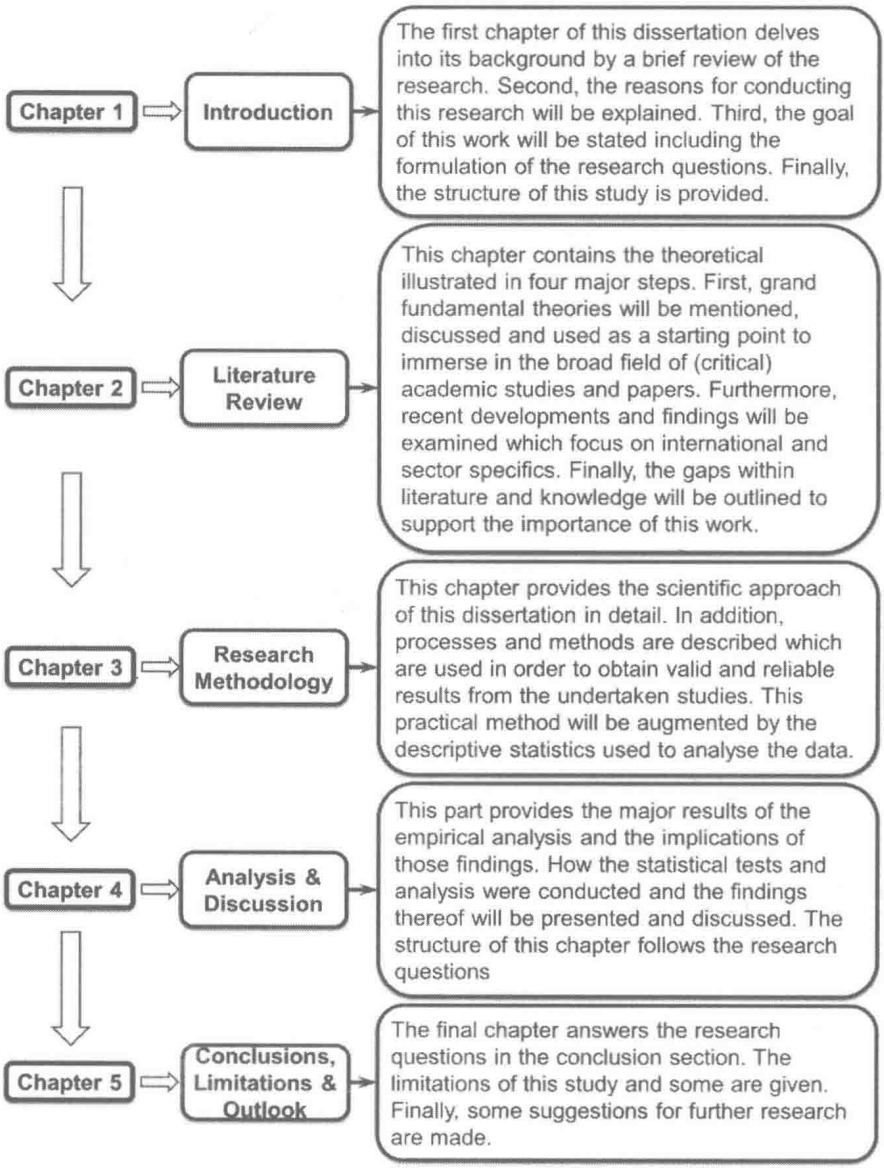

Figure 1: Disposition of the dissertation

Chapter 2: Literature Review

2.1 Chapter Introduction

This chapter illustrates the theoretical framework of this dissertation in four major sections: Firstly grand fundamental theories on the cross-section of stock returns are discussed. Secondly deductive academic studies are critically reviewed. Thirdly, recent developments and findings are examined, focussing on international and sector specific aspects of the risk-return relationship. In the fourth section, gaps within the literature are outlined to support the importance of this dissertation.

2.2 Fundamental Theory

This work builds on different theories and important areas of study. As the existence of **efficient markets** is a basic assumption for asset-pricing models in general its analysis is conducted. Then, the importance of diversification and stock-picking is illustrated by having a close look at the **modern portfolio theory**. This is followed by a critical review of the **CAPM** which is deduced from the aforementioned theories in order to allocate the best securities within a portfolio. This will include the area of **Behavioural Finance** which tries to explain market anomalies. Furthermore, alternative **asset-pricing theories** which have been developed by the opponents of the CAPM are highlighted. Finally, international and sector specific research is presented in the section on **recent development**.

2.2.1 Efficient Markets

Market efficiency is the basic assumption for asset pricing models. Cohen *et al.* (2009) proved that a joint hypothesis between the CAPM and market efficiency approximates the pricing of stocks well at price level for both growth and value securities. Therefore, this dissertation