Index Tracking in the Structure of Fund of Funds based on Cointegration

# Abstract

Index tracking funds have grown significantly in previous decade and attracted more and more investors as an outperforming passive investment vehicle. There are two main different ways to track indices. One is called full replication, funds can take long position on all the constituents as the same weights of an index. The other tracking method is known as sample replication, funds only buy part of the stocks from a family of index stocks using different analytics tools like correlation, mixed integer programming and cointegration. In this paper, our goal is to construct a portfolio to track S&P 500 in a structure of fund of funds (FoF) using cointegration analysis. In contrast with traditional index funds, we do not buy constituent stocks directly to mimic index, we buy sector ETFs. S&P 500 consists of 11 different sectors and industries, there are numerous sector ETFs on the market. We can construct an index fund by purchasing sector funds to track S&P 500 deploying cointegration analysis to make sure long run equilibrium. In FoF structure, we can cut transaction cost enormously and reduce turn over rate, which are essential for an index fund. Index funds hold stocks directly for both full and sample replication methodologies.

# Introduction

In general, there are two different equity portfolio management philosophies, active and passive. Active investment style is aiming to beat the market based on professional financial analysis and portfolio manager’s skills. On the contrary, the goal of passive investment is to match the market performance over a long period of time. Index tracking fund is a typical passive product, whom mission is to mimic a specified benchmark index passively with buy-and-hold strategy. Index tracking funds have grown significantly in previous decade and attracted more and more investors as an outperforming passive investment vehicle. There are two main traditional methods to track indices. One is called full replication, funds can take long position on all the constituents of an index in the respective weights with buy-and-hold strategy. The other tracking method is known as sample replication or called optimization. Funds purchase a sample of stocks that could represent for the overall performance of an index. In additional to traditional hold stocks, there is another alternative method so called synthetic portfolio to replicate an index without holding stock directly. In this paper, our goal is to construct a portfolio to track S&P 500 in a structure of fund of funds (FoF) by using cointegration analysis. As an approach of synthetic tracking portfolio, we buy sector ETFs to mimic index. S&P 500 consists of 11 different sectors and industries, there are numerous sector ETFs on the market. We can construct an index fund by purchasing sector funds to track S&P 500 deploying cointegration analysis to make sure long run equilibrium. In FoF structure, we can cut transaction cost enormously and reduce turn over rate, which are essential for an index fund.

# Statement of Problem

There are 11 individual sectors under S&P 500, Consumer Discretionary, Consumer Staples, Utilities, Technology, Health Care, Financial, Energy Telecom, Industrials, Material, Real Estate.

To our knowledge, we realize that there should be a relationship between various macroeconomics indicators

and credit card delinquency rate, however, we do not know how the economic variables a\_ect the delinquency

rate quantitatively. Therefore, in this paper, we are going to discover how the credit card delinquency rate

is explained by a set of macroeconomics factors and explore the determinant one through empirical analysis.

We select a set of \_ve explanatory variables are civilian unemployment rate, the interest rate on credit card

plans, real disposable personal income, total consumer credit, using the time series data from the US. These

four independent variables are able to reect the job market situation, total debt level of credit supply, and

the repayment ability. And the four variables

# Literature Review

# Research Design

# References