

Running head: QUANTITATIVE INVESTMENT

Empirical Study of Multi-factor Alpha Strategy and Machine Learning in

A-share Market

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## INTRODUCTION

### A Select Annotated Bibliography of Quantitative Investment

My research will begin with a brief introduction of what is quantitative investment. And then the basic theory it based on. However, to design a better quantitative investment strategy, we need to study from others and do some improvement.

Quantitative investment is a new rising method of investment which combines financial data with mathematics and computer technology. This strategy is based on the theory of Efficient Market Hypothesis (EMH) which tells us the price of security has reflected all the information about the security both public and undisclosed. But actually in the Chinese A-share market it is not. So market participants have an opportunity to arbitrage by a quantitative strategy. To design a quantitative investment strategy, we often based on the Fama-French five-factor asset pricing model. This model this is the basic model for variables selection. What's more, with the development of big data analytic techniques, machine learning algorithms are gaining more attention in various application fields, including stock market investment. Thus a quantitative investment strategy with machine learning would perform much better.

Past studies have already shown so many basic theories. But we still need more empirical studies on it. Especially in the model design of quantitative investment, we don't have perfect model. Thus based on the papers of basic theories and some empirical studies, designing a better model is the main goal of my study.

*scope of bibliography*



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Chong, E., Han, C., & Park, F. C. (2017). Deep learning networks for stock market analysis and prediction: Methodology, data representations, and case studies. *Expert Systems with Applications*, 83, 187-205.

With the development of big data analytic techniques, machine learning algorithms are gaining more attention in various application fields, including stock market investment. This is mainly because machine learning algorithms do not require any assumptions about the data and often achieve higher accuracy than econometric and statistical models; for example, artificial neural networks (ANNs), fuzzy systems, and genetic algorithms are driven by multivariate data with no required assumptions. This paper offers practical insights and potentially useful directions for further investigation into how machine learning can be effectively used for stock market analysis and prediction. And from the results we can see that a quantitative investment strategy with machine learning can be much better. My strategy should base on it.

Fan, X., Li, H., & Zhu, Z. (2014). A quantitative investment model based on multi-fractal theory and support vector machine. *2014 International Conference on Computing, Management and Telecommunications* (ComManTel).

Quantitative investment is a new rising method of investment which combines financial data with mathematics and computer technology. To design a quantitative investment, we construct the whole quantitative investment system first. Then we do qualitative analysis of financial market with multi-fractal method to see whether there



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exist fractal characteristics. Finally, we use support vector machine (SVM) to do quantitative analysis to predict changes in financial assets. The author chose Shanghai Composite Index as research target, test the model with five years of data and do error analysis on the output of the model. Although my research is on individual indices not market indices, the specific process designed by the author is a very meaningful for strategy design.

Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. *Journal of financial economics*, 116(1), 1-22.

To improve the model, study directly from Fama-French is indispensable since their models helped them got Nobel price. A five-factor asset pricing model directed at capturing the size, value, profitability, and investment patterns in average stock returns performs better than the three-factor model. While the five-factor model's main problem is its failure to capture the low average returns on small stocks whose returns behave like those of firms that invest a lot despite low profitability. The model's performance is not sensitive to the way its factors are defined. With the addition of profitability and investment factors, the value factor of the FF three-factor model becomes redundant for describing average returns in the sample we examine. So this paper gives us a hint that different share of stock market may use the three-factor model especially middle and small capital stocks.

