

# Analysis of Fundamental Indexation as an Efficient Approach to Active Investing

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## Abstract

For many years researchers have been arguing on whether active investing is superior to passive investing by giving theoretical and empirical rationale underlying their beliefs. A desire to over-perform passive investing by utilising fundamentally-justified methodology has led to the development of numerous active and semi-active strategies, such as Fundamental indexation established in 2005 by Arnott *et. al.* In their research, the authors suggested constructing investment portfolios by assigning the weights of each asset concerning the values of its fundamental indicators. This approach has met heavily critique for the lack of theoretical rationale, by not being able to connect the values of selected fundamental indicators to the future performance of the portfolio. In this research, the thesis of passive investing superiority has been challenged by constructing an active investing strategy based on Fundamental Index described by Arnott *et al.* (2005) – Modified Fundamental Index and testing it on the UK stock exchange companies. The resulted portfolio showed superior performance compared to the cap-weighted index while also having lower risks and higher diversification. Also, I suggested some ideas for further research concerning MFI.

*Keywords:* Fundamental indexation; value drivers analysis

JEL classification: G11

For decades researchers and practitioners have had an intense discussion, whether the active or passive approach to investing is superior, giving solid rationales for both sides of the argument. The difference between those is in a way, how investments are managed concerning an overall market or what is called “index”. However, during recent years, many argue that active investing is much more inferior regarding performance comparing to simply replicating an index<sup>1</sup>. In other words, there is no point in performing complex financial analysis for investment valuation purposes; one can’t do better than the overall market does.

The goal of current research is to check the hypothesis whether active investing is superior to

passive investing by developing and utilising fundamental indexation strategy for the retail industry. It utilises a financial analysis of a certain business model throughout the industry to establish a solid theoretical rationale for fundamental index strategy.

The objectives of the current research are as follows:

- To identify the theoretical rationale underlying fundamental indexation and critically evaluate typical approaches, as well as parameters used for fundamental index construction;
- To outline value creation factors as an essence of fundamental indexing;
- To develop a fundamental index for the retail sector by mostly relying on value creation factors;
- Back testing of a strategy developed and checking, whether active investment might be superior over passive.

<sup>1</sup> One of the most popular valuation “guru” A. Damodaran in his recent article “Active Investing: Rest in Peace or Resurgent Force?” has argued that it is not possible for an active investor to beat an index on a constant basis.

## Literature Review

“Fundamental Indexing”, as a new technique, was firstly introduced by Arnott *et al.* (2005). The underlying logic is to construct a portfolio in which each share from the universe of shares similar to a conventional index is weighted according to a series of fundamental indicators. Fundamental Indexing is a trademark of Research Affiliates, LCC.

The theoretical rationale underlying fundamental index supports the thesis that it is an active strategy. Chen C. *et al.* (2007) stated that market prices are a noisy approximation of fundamental values, and as far as they tend to revert to fundamental values, weighting shares according to fundamental characteristics will generate excessive returns comparing to the cap-weighted index. Siegel (2006) calls this Noisy Market Hypothesis (NMH), which is in contrast with Efficient Market Hypothesis. Treynor (2005) and several other researchers state that conventional cap-weighted indices overweight overpriced stocks and underweights underpriced.

After Fundamental Index firstly appeared, some researchers recognised that it is a value investing strategy. Clifford (2006) states that the Fundamental Index is an active strategy with a value tilt. He also proves the point by pointing out Fundamental Index underlying assumptions. Despite disagreement followed by Arnott, Hsu and Campollo, it is still widely recognised as a value strategy by many researchers and practitioners<sup>2</sup>.

The most popular approach to identifying value creation factors or value drivers is a simple decomposition of valuation techniques and claiming each separate indicator a value creation factor.

Different researchers by utilising various approaches come to a different list of value creation factors. Trusova N. (2014) by utilising an EVA-based approach to valuation described by Koller *et al.* (2010) considers ROIC, WACC, Invested Capital and organic growth rate being the main value drivers. With further analysis, she also decomposes those into Sales, COGS components, SG&A, turnover ratios and WACC components. By deepening this approach, Fro-

ova *et al.* (2016) suggest further constituents which form aggregate indicators stated above: price and quantity of product sold, the structure of assets a company possess etc. I agree with both researchers in their findings. What is far more important, both researchers emphasise the importance of the industry aspect on overall value creation factors. However, by utilising the EVA approach, which has been derived from trivial DCF approach, the actual value is a subject for tremendous uncertainties. As Greenwald *et al.* (2001) have stated, “Profit margins and required investment levels, which are the foundations for the cash flow estimates, are equally hard to project accurately into the future”. Hence, this makes DCF extremely vulnerable regarding long-term forecasting, as the quality of forecasts is worsening with increased modelling period. As an alternative, I suggest utilising stochastic, rather than discrete models for valuation purposes. However, distribution parameters justification issue would still exist.

Kogdenko and Melnik (2012) divide all the factors into external and internal groups. Macroeconomic, regional, industrial and market factors represent the external group. The internal group consists of financial and non-financial factors, among which are client satisfaction indicators, management efficiency and internal business processes indicators. Zolotukhina (2015) names factors according to the following stages: purchases, production, sales, marketing, finance, management, IT, innovations and PR. Even though I fully agree with those value construction factors, it seems to be a serious issue to quantify and access them freely for most of the companies worldwide. Also, I agree with Zolotukhina that 20 per cent of factors defines 80 per cent of the value (Pareto principle).

Fundamental index technique might be enhanced by replacing conventional parameters with more sophisticated measures of a firm’s performance, its capital structure and other areas of possible value creation. Also, in contrast to the approach established by Arnott *et al.*, only a composite index would be established as only by considering all the related issues, true value indicator might be established. Rather than just showing “earnings” or “book value” market, this index we can view as the closest approximation to the fundamental values market indicator.

<sup>2</sup> For example, Blitz and Swinkelz (2008) came to this conclusion in their research.

## Methods

The goal of current research is to prove the thesis that an active strategy based on fundamental indexation approach might constantly outperform passive strategy on a risk-adjusted basis. I employed a *Sharpe-ratio* as a measure of return considering riskiness of the investment

Returns of shares and covariance between them are exogenous variables; that is, we can only change weights to change the values of portfolio return and standard deviation and accomplish targets stated. Considering the fundamental indicators should be used for weights identification, the resulting weight vector can be calculated as follows:

$$\overline{w}_f = \begin{pmatrix} f_{11} & \cdots & f_{1j} \\ \vdots & \ddots & \vdots \\ f_{i1} & \cdots & f_{ij} \end{pmatrix} \times \overline{F}^T, \quad (1)$$

where

$\overline{w}_f$  – vector of weights in fundamental portfolio,

$f_{ij}$  – the value of  $j^{th}$  fundamental indicator for  $i^{th}$  company,

$\overline{F}^T$  – is a vector of coefficients which transforms fundamental values for each company into weights.

As a consequence of (1), we might outline two important steps in identifying the weight vector according to each goal:

1. Identification of fundamental indicators for index construction;
2. Identification of appropriate coefficients for a coefficient vector.

As I already stated before, the fundamental index developed in this paper is intended for portfolio construction of retail food equities. Hence, the indicators forming the weights as well as the values for F-vector might be significantly different for other industries or other instruments portfolios, such as bonds. For the model construction purposes, I used the European food retailers' data. I excluded other regions due to the different level of competitiveness and slight differences in its business models. That is, even though the indicators applied might be of use, the F-vector might be significantly different. For the current research, I chose the UK food retail industry due to the availability of information about indus-

try constituents, an actual number of companies trading at the stock exchange and transparency of business model.

The index is intended to be rebalanced on an annual basis as most fundamentals are available with this frequency; so, for a model construction purposes, we can utilise annual data. The period of data to construct an index is from the 1<sup>st</sup> of January 2005 to the 1<sup>st</sup> of January 2014. It covers all stages of a business cycle and also includes the crisis period of 2008. From the 1<sup>st</sup> of January 2014 to the 1<sup>st</sup> of January 2017 I suppose using the back testing of a model developed would be performed.

Also, there is a limitation implied in this model that the companies cannot be shorted, so the weights in the weight vector can only be positive. However, the possibility of negative coefficients for the coefficient vector still exists.

Usually, regression analysis techniques largely represented the statistical methods. Stochastic models are used for testing the performance of the final model considering various assumptions; for instance, Monte-Carlo simulation is performed for estimating possible results. For modelling purposes, Microsoft Excel software is used with Palisade@Risk add-in preinstalled, allowing stochastic building models. We can use SPSS software for regression analysis and hypothesis testing purposes.

Choice and justification of fundamental variables for portfolio construction are probably one of the most important and challenging issues of current research. As I stated before, initial fundamental index (Arnott *et al.*, 2005) has been based on fundamentals utilised in conventional multiples, such as Earnings, Sales and Book Value of Equity. Even though these fundamentals are assumed to be heavily used in various approaches to valuation, there might be issues regarding the predictability power of these. For instance, the Sales value in 20×1 might not be a good predictor of stock performance in 20×2.

In articles mentioned earlier, undervalue creation factors researchers use established valuation approaches and use its components as a value creation factors. Even though these statements are reasonable, it is still important to mention that only future values of the majority of such indicators contribute to value creation, while present and past values only influence stock's past performance. Hence, to define possible outper-

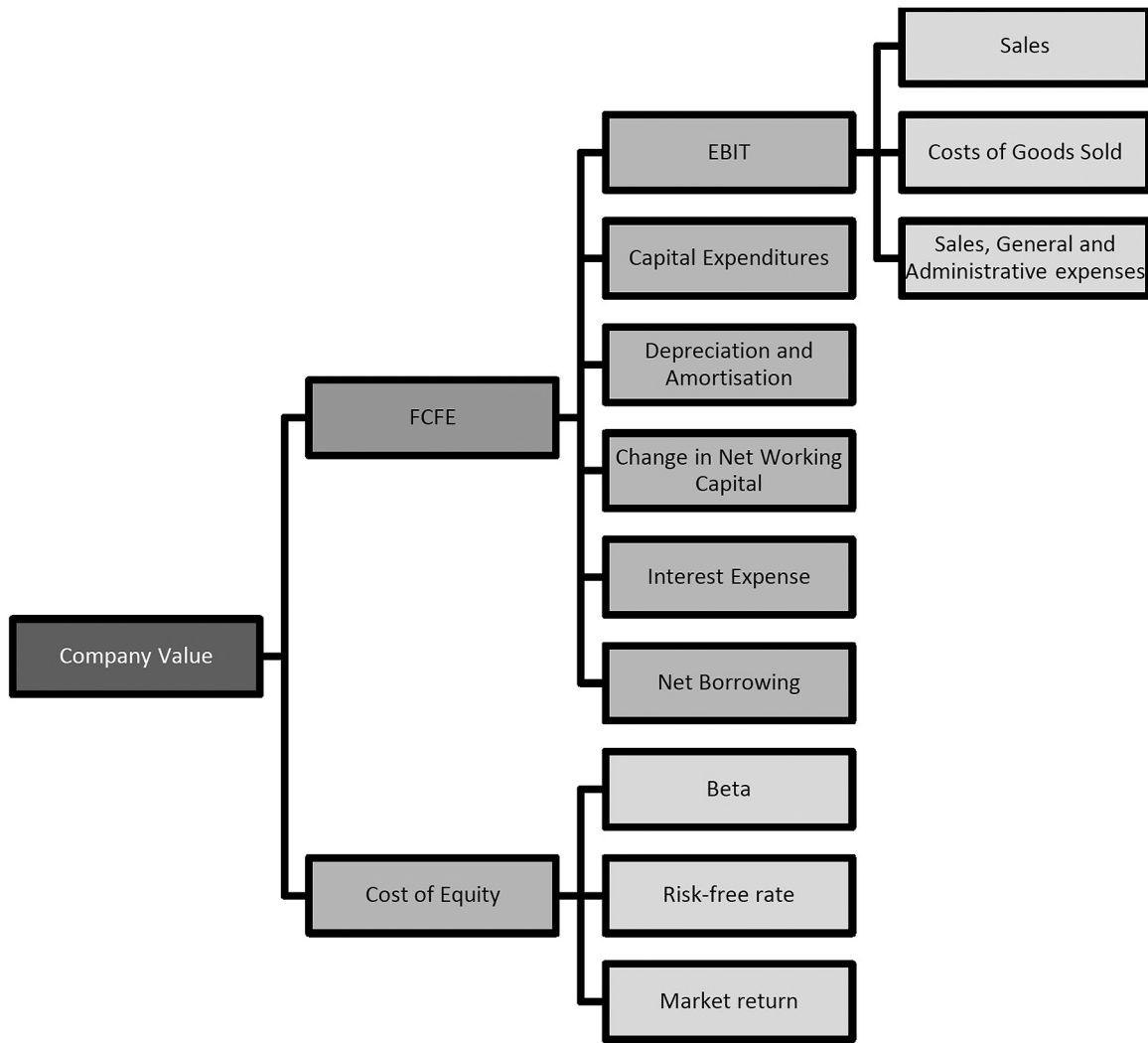


Fig. 1. Value components tree according to FCFE discounting approach.

formers, one should focus on factors that outline possibilities for future growth.

So, to construct a portfolio aiming at better performance, the goal is to find a proxy of future values for value creation factors. For key value drivers identification, I used the DCF approach (FCFE-based modification) decomposition due to the following reasons:

1. It is heavily reliant on fundamentals of the company and to the significant extent ignores current market attitude;
2. The concept of this is closely related to the conclusions about future value creation potential stated above;
3. FCFE approach doesn't allow performing a valuation for a firm with unstable cash flow patterns; however, by focusing on its components rather than an absolute value, we are avoiding absolute values and focusing on company's potential.

The suggestion is to filter the fundamentals already suggested in the scientific literature which are utilised in DCF valuation and find proxies that influence the future values of these fundamentals being its leading indicators. The following filters will apply: (1) the fundamental importance of an indicator considering the business model in a food retail industry and justification of appropriate proxy and (2) constructed multi-collinearity issues of a model.

The first criterium is based on the fundamental importance of a certain indicator in a particular industry. To justify such importance, various business processes of the retail food industry, as well as accounting policies in this respect have been reviewed and analysed to express a reasonable opinion. The first criteria also address the issue mentioned that a certain indicator could not be treated similarly for companies from different sectors and industries. This issue exists



in a conventional fundamental index, where all companies are weighted according to earnings, without any adjustment for the sustainability of these earnings, its quality and efficiency of a company. By addressing this issue, the model is constructed for a specific industry only but is of higher reliability and accuracy. Also, proxies are being justified from a fundamental standpoint to better suit the purposes of fundamentals values prediction.

The second criteria address the issues of multi-collinearity. As a final weight is being constructed using an additive model, there is a possibility of two variables being closely connected. That is, if COGS proxies are closely connected to sales proxies, that would be a mistake to include both of these indicators into the model. The reason is, multi-collinearity appears in cases where a certain factor is accounted for two times. While this holds true, if there are no signs of fundamental evidence of multicollinearity between two particular indicators, this issue would not be addressed.

Value components tree according to FCFE discounting approach is represented below.

The reason for such model is to pick companies according to proxy values of future fundamentals. It is obvious that for companies in the same geographical and business conditions, some factors mentioned above are of the same value; that is, market returns and risk-free rates will stay the same regardless of which company we would pick. So proxies of different values for each company should be picked rather than taking the values of macro indicators.

Larrabee (2012) names different studies that collectively prove that the majority of portfolio performance comes from allocation between asset classes rather than selecting a particular asset. That is, insignificant portion of returns are explained by factors that are unique for each company, while the majority of returns explained by factors that are typical for the whole industry. Even though we cannot eliminate these as those are systematic risks, it is possible to increase or decrease exposure to certain factors by switching the weights of securities in the portfolio.

As a result, there are 14 proxies for future values of free cash flow to equity-based valuation model components that I will use in the current model:

Table 1  
F-vector values

<b>F-vector</b>	
Indicator	Value
GM change	3.66
D/E	0.00
Interest rate and Risk-free dif	0.49
Av. Beta	1.95
Remaining Useful Life	-
Revenue growth on the Disposable income growth regression slope coefficient	-
Revenue growth on the Population growth regression slope coefficient	0.04
Trading area	1.61
SG&A expenses to Revenue growth	-
COGS on AI	-
Inventory Turnover Change	-
AP turnover change	-
Fixed assets growth	3.77

1. Revenue growth on Disposable income growth regression slope coefficient;
2. Revenue growth on Population growth regression slope coefficient;
3. Trading area growth;
4. SG&A expenses growth to Revenue growth;
5. COGS growth on Agricultural Index growth regression slope coefficient;
6. COGS growth on Functional currency exchange rate growth regression slope coefficient;
7. Average gross profit margin;
8. The average change in Inventories turnover;
9. The average change in Accounts payable turnover;
10. Fixed assets remaining useful life ratio;
11. Fixed assets growth;
12. Debt to equity ratio;
13. The current difference in the cost of debt and risk-free rate;
14. Average beta.

Then, I constructed the correlation matrix has been for these variables. The only indicators that are in strong correlation are COGS growth on Agricultural Index growth and COGS growth on Functional currency exchange rate growth regression slope coefficients. The possible fun-

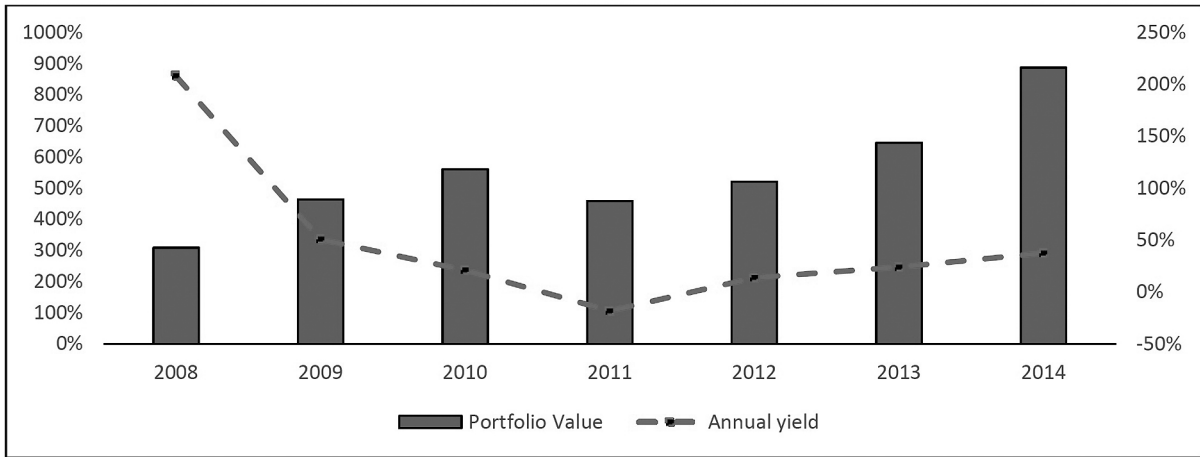


Fig. 2. Fundamental index portfolio dynamics from 2008 to 2014.

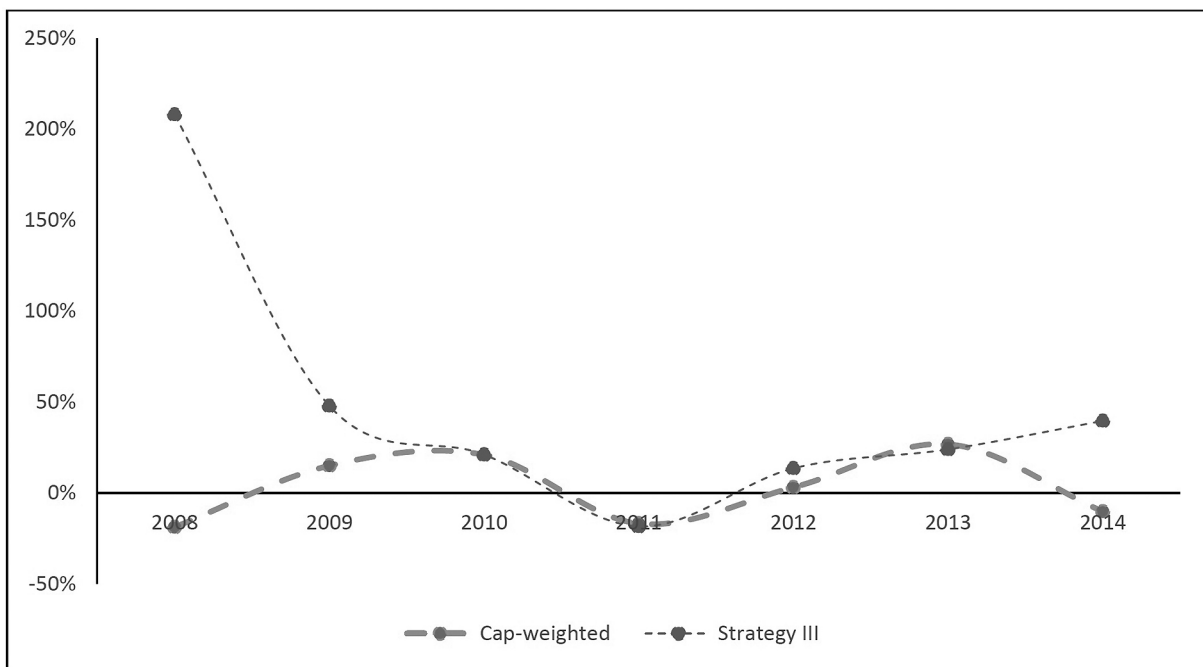


Fig. 3. Strategies return comparison from 2008 to 2014.

damental explanation is that the exchange rate can be linked to the commodities markets, in particular, agricultural commodities. While this might not constantly hold, we might assume that the movements in Agricultural Index influence the exchange rate (Investopedia, 2016), hence, COGS growth on Functional currency exchange rate growth regression slope coefficients will be excluded from the model. Overall, all coefficients have very low correlation coefficients, which means that there are no signs of multicollinearity.

The next step is an F-vector construction by utilising the fundamentals suggested.

From the equation (1), by knowing the matrix of fundamentals for the period from 2007 to

2014<sup>5</sup>, and having the goal to achieve the highest Sharpe Ratio, we can define the optimal values for F-vector by utilising the Solver add-in for Microsoft Excel.

The return graph for the strategy using these F-vector values are as follows.

This strategy yields a 36.57 per cent annual return. The standard deviation of this is 0.32, the Sharpe ratio for this strategy equals to 0.72 with 13.36 per cent risk-free rate assumption. The concentration ratio for this strategy equals 0.059.

Overall, the Strategy is viewed to be the most efficient from the point of view of modern port-

<sup>5</sup> 2015 and 2016 were excluded for the purpose of after-forecasting period model backtesting.

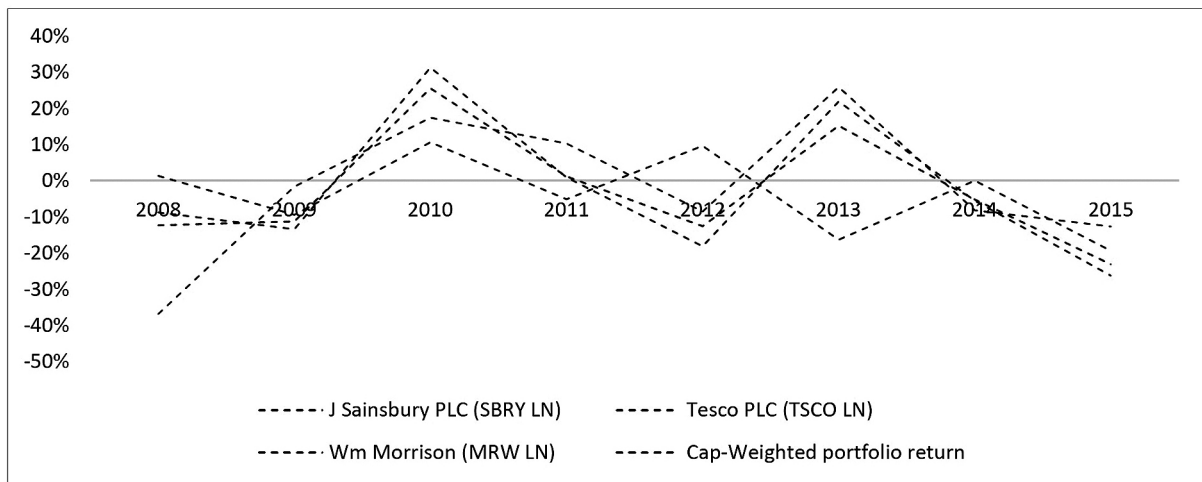


Fig. 4. Cap-weighted portfolio annual return dynamics, %.

folio theory as it maximises the Sharpe ratio. Because it has a high standard deviation, it still provides a possibility to combine it with other investment vehicles to adjust risk/return preferences according to one's needs. In the following references, this will be referred to AFI (adjusted Fundamental Index).

To enhance the model accuracy, it is suggested for the model to be rebalanced after each period to better account for stock relations and estimation of the explanatory power of indicators. Overall, the results of back-testing are seemed to be positive, which arise the questions about the further efficiency of the model in a particular market rather than on the general sample of all stocks.

The next step is to apply the Modified Fundamental Index to the universe of food retail public companies operating in the United Kingdom to form a portfolio based on the strategy described above. Than this portfolio performance should be compared to the performance of the common cap-weighted portfolio to see if it yields better results and thus if the hypothesis of the superiority of MFI active strategy over the passive one holds.

Firstly, I will review the UK food retail market to identify the current situation and to analyse companies' comparative position. This analysis will facilitate the application of the strategy from the fundamental standpoint and will contribute to the further evaluation of differences in indicators values for constituent companies.

The largest part of a retail food market in the UK belongs to supermarkets and hypermarkets, which collectively account for more than 65 per

cent of total sales volume<sup>4</sup>. As of 2016, market size exceeds USD 200bn with a CAGR of approximately 1.2 per cent.

Considering the degree of rivalry at the UK market, it can be characterised as high. There are several large chains of supermarket, hypermarket and convenience stores that control most of the market while keeping the competition quite high. The highest competition driver is negligible switching costs for consumers due to the unified nature of products. At the same time, expanding its presence is still limited due to the lack of geographic regions not already covered with its chains and high CAPEX to open a new hypermarket.

Four major players on the market tend to control most of its share, namely:

- Asda Stores Limited
- J Sainsbury Plc
- Tesco Plc
- Wm Morrison Supermarkets Plc

The UK food retail market that is largely represented by supermarket chain companies has only three public companies. Nevertheless, an investor that is interested in including the UK food retail exposure to his or her portfolio has numerous possible combinations of structuring such an investment. So the next step is to analyse the performance of the cap-weighted index out of these companies and to compare it to the portfolio constructed according to the MFI methodology.

At first, we can construct a market capitalisation-weighted index out of these three companies

<sup>4</sup> MarketLine Industry Profile. Food Retail in the United Kingdom.

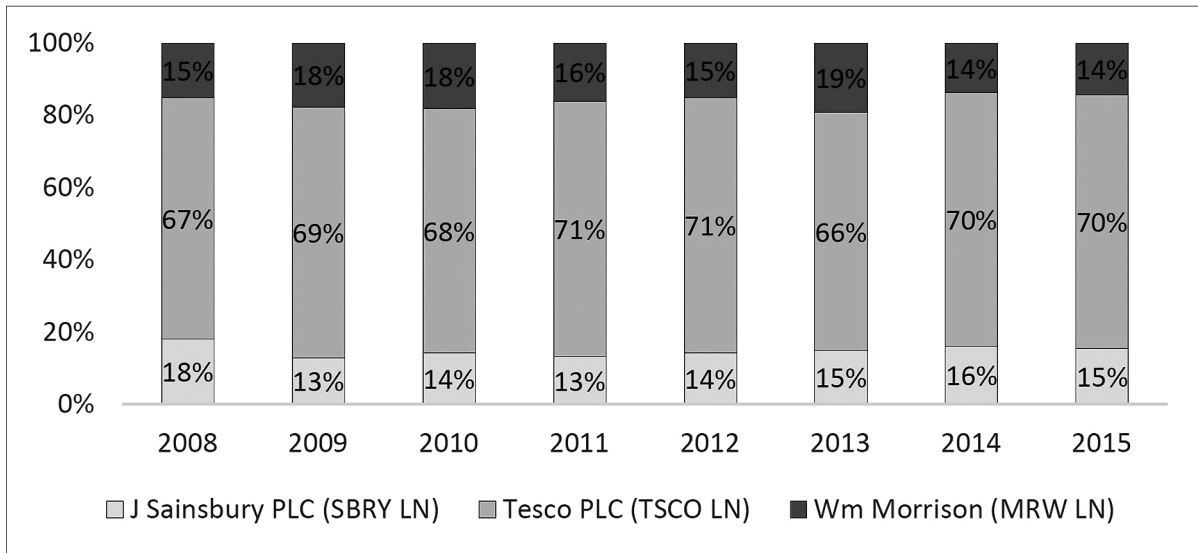


Fig. 5. Cap-weighted portfolio structure per share, %.

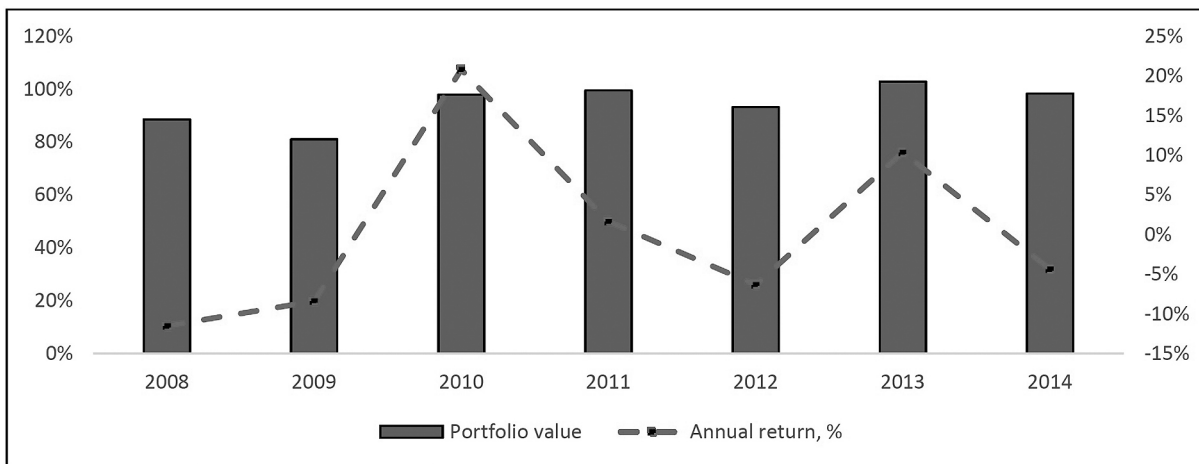


Fig. 6. MFI based portfolio value dynamics, %.

and analyse returns of such a portfolio as well as its structure.

Conventional cap-weighted portfolio of these companies had demonstrated poor performance throughout the whole testing period. Its average annual return equals -11.3 per cent, changing from -23 per cent p.a. in 2015 to +26 per cent in 2010. Considering the standard deviation of returns, its overall Sharpe ratio throughout the testing period equals -0.7, which means that for each pound invested into this portfolio, investor got an additional negative return. Obviously, such an investment cannot be called successful considering its riskiness and demonstrated returns.

Let's than analyse the structure of this portfolio throughout the whole period of testing.

As we can see, the largest part of this portfolio throughout all period has been allocated to Tesco

shares, while other companies have collectively only allocated 30 per cent of all the funds. In this respect, we can assume that such a portfolio has a lack of diversification as the excessive allocation of funds in a single asset increases unsystematic risks. Also, from Figure 5, we see that Tesco had the poorest average performance out of three companies which explains poor overall portfolio performance.

Next, we can evaluate the performance of a portfolio based on MFI approach.

Even though this portfolio also has a negative average return of -0.2 per cent, it has much higher results comparing to the conventional portfolio. It also has a close range of return values – from -20 per cent in 2015 to 21 per cent in 2010 that also contributes to a higher Sharpe ratio value of -0.15. Hence, this portfolio demonstrates much higher results comparing to the conventional one



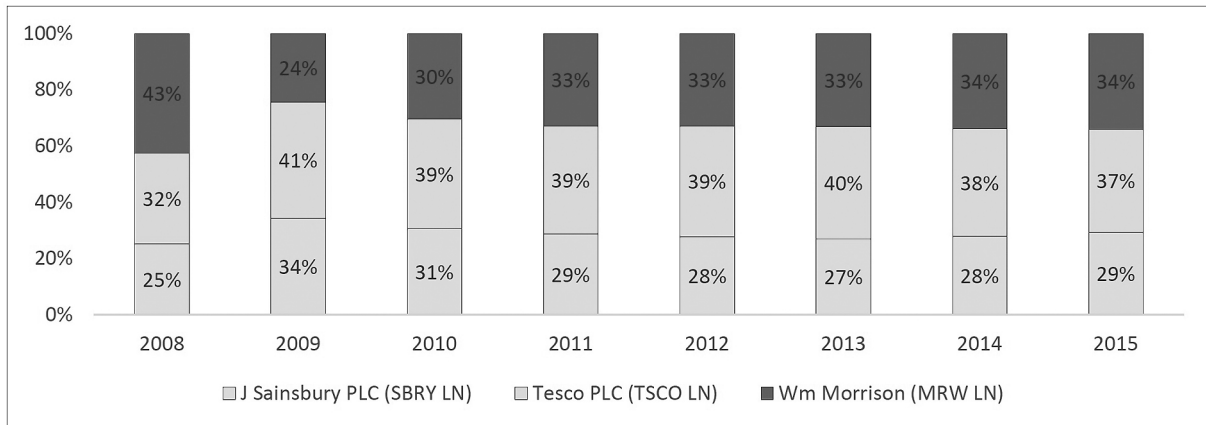


Fig. 7. MFI based portfolio structure per share, %.

while also taking into account the associated risk of the portfolio.

MFI portfolio structure is much more diversified, as each company accounts for about 1/3 of the total portfolio, which provides much higher diversification benefits. The reason is that fundamental parameter values of these companies are not that different, which gives them a reasonable share in the total portfolio. There is, however, a higher portion of Tesco at the market, which might also be justified considering its high gross profit margins as well as the closer connection of revenue with a disposable income of a population.

In general, there is evidence of MFI-based strategy being superior to the conventional index strategy. The main reason is its higher degree of diversification, which also might vary depending on the values of fundamental indicators used for the construction of this portfolio.

## Conclusions

For many years, there was an argument of whether active or passive investing is superior, with each side supporting their opinion with solid empirical and theoretical evidence. Many versions of active strategies, as well as the whole approach to passive strategies, have been changing, leading to the establishment of hybrid approaches, smart-beta strategies etc. In 2005, Arnott *et al.* have developed an approach that has been called Fundamental Indexing, in which authors suggest to weight assets in the portfolio according to their fundamental metrics, such as sales, net income, asset base value etc. This approach has been heavily criticised from a theoretical, as well as practical standpoint due to the lack of a conceptual base and proven em-

pirical inefficiency. In this research, the thesis of passive investing superiority has been challenged by establishing an active investment approach based on Fundamental Indexing which has been called Modified Fundamental Indexing. It was designed to overcome the weakest point of initial methodology, the lack of connection between fundamental indicators used for portfolio construction and future portfolio performance. Specifically constructed for the food retail industry based on the European company's data, Modified Fundamental Indexation while applied to the UK stock market demonstrates higher average annual return with lower standard deviation which also leads to a relatively higher Sharpe ratio and overall superiority over the cap-weighted index which is viewed to be a passive investing approach.

The established methodology has practical and theoretical value. Firstly, its positive testing results together with overall concept prove that active investing can be superior to passive while we consider different aspects of related investment assets. Secondly, the whole approach to deriving fundamental indicators and relative coefficients for this methodology can be used not only to rebalance F-vector and construct a better portfolio but also as an instrument for financial analysis of fundamental indicators concerning their influence on investment performance. Finally, MFI, with necessary adjustments, can be used by investment and portfolio managers as a tool to construct efficient active portfolios based on a solid fundamental base. Still, MFI has its weak points and fields for development which are considered to be further researched by the author.

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Анализ фундаментальной индексации как эффективный подход к активному инвестированию

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*Аннотация.* На протяжении многих лет исследователи спорят о том, является ли активное инвестирование лучше пассивного, давая теоретическое и эмпирическое обоснование, лежащее в основе их убеждений.

Стремление переоценить пассивное инвестирование, используя фундаментально обоснованную методологию, привело к разработке многочисленных активных и полуактивных стратегий, таких как фундаментальная индексация, основанная в 2005 г. Робертом Арноттом, Я. Хсу и Ф. Муром. В своем исследовании авторы предложили строить инвестиционные портфели путем присвоения весов каждому активу относительно значений его фундаментальных показателей. Этот подход был подвергнут серьезной критике за отсутствие теоретического обоснования, поскольку он не позволял увязать значения отдельных фундаментальных показателей с будущими показателями портфеля.

Тезис о превосходстве пассивного инвестирования автор статьи оспаривает с помощью построения активной инвестиционной стратегии на основе фундаментального индекса, описанного в Arnott et al. (2005), – Модифицированный Фундаментальный Индекс (МФИ) – и протестированного на данных компаний, которые котируются на Британских фондовых биржах. Портфель показал более высокие показатели по сравнению с взвешенным по капиталу индексом при более низких рисках и более высокой диверсификации. Кроме того, автор предложил некоторые идеи для дальнейших исследований, касающихся МФИ.

*Ключевые слова:* фундаментальная индексация; анализ стоимостных драйверов

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