ERASMUS UNIVERSITY ROTTERDAM
Erasmus School of Economics

Master Thesis Financial Economics

The Performance of Value and Fundamentally-Weighted Investment Strategies in Emerging Markets.

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Abstract:

This paper reviews the literature investigating the existence of value premium and the performance of fundamental indexing in emerging markets. This paper proposed some ways how to enhance returns by using fundamental indexing and adjustment value strategies based upon the growing importance of intangibles in the share of the company assets. Econometric analysis and sorting were made on panel data of public companies in emerging markets. Recommendations were made for investing in adjusted value strategies and fundamental indexing in particular with the use of internally developed intangibles. The data for 32,726 public companies in 90 countries were taken from Reuters Eikon, cleaned up in Excel, MySQL, EmEditor, and studied with Stata.

We have found that the value premium in emerging markets has underperformed in the recent year 2020, which could be partially explained by the Covid-19 crisis, in similar way as it has in previous years such as 1990 and 2000. We have found that on emerging markets, the performance of fundamental indexing is significantly explained by both the value premium with positive sign and by the size premium with negative sign. We also have found that the fundamental index has outperformed the value index and growth index for emerging markets, with significant positive yearly alpha of 3.38% from RAFI FI and insignificant positive yearly alpha of 0.97% from MSCI value weighted. Another finding is that in emerging markets both fundamental index and value strategies which incorporate adjusted book value weighting for internally developed intangibles do not produce a higher alpha than the original strategy without adjustment. The adjustments resulted in alphas which are actually lower than before.

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1 Motivation

Right now, during the pandemic period, especially sharp states the problem of effective allocation of the investor's resources on the market. Investors need to understand much better if the company is worth allocating money in a time of high risks. We will use recent empirical and theoretical results about value premium and fundamental indexing from developed markets to test them on a large sample of companies from developing (emerging) countries to draw conclusions about the existence of such premia. This paper could be useful mainly for investors who look to the emerging markets to create more efficient and diversified portfolios that generate more substantial risk-adjusted returns and for the researchers to identify new research opportunities in emerging markets.

2 Relevance of the research question

Does value premium still exist in the developing market? And if no, how can we enhance such a premium? Many people in the press and research field report that currently value stocks underperform growth stocks, even though just recently it had outperformed. The examples of such articles are: FT "Covid condemns value investing to worst run in two centuries", Morningstar "Value vs. Growth: Widest Performance Gap on Record", Lehner Investments Blog "Is value investing dead?" and etc. To give a sense of why it is an interesting topic we need to first clarify what value stocks and growth stocks are.

The economic reasoning which underlies this effect was popularized by Ben Graham (1949) in his book "Intelligent investor", he stated that it is because investors tend to overreact to bad news without looking at real fundamentals, and because of that, stocks lose their price, but in the long-run when investors realize that they have made mistake and they will buy it back so the price reverse to its intrinsic value. So, in short - value stocks are a typical name for a broad range of categories of stocks that are underpriced relative to their fundamentals. The other way around goes for overvalued stocks for which investors tend to overreact to good news and then realize their mistakes and price them correctly, so growth stocks is a typical name for stocks that are overpriced relative to their fundamentals.

Of course, there are other possible explanations for this effect, for example, there could be the case that the value stocks are priced correctly, creating a "value trap". And there also could be the case that some growth stocks are priced correctly, so the investors which have expected some growth in the future end up to be right. One of the possible explanations of the value trap could be the company fraud or opportunistic behavior of the CEO which expropriates gains or shareholders' money. One of the anecdotal examples could serve the Luckin Coffee scandal when there were facts that the company was systematically misreporting its revenues. [(8)] SEC has charged 180 million of fees when the company has

raised 864 million in stocks and debt and said that the company can decrease this amount by paying back its stockholders who are being harmed. So, the SEC charges the company (i.e., the company's shareholders) and the company raised more debt to pay back this charge, so in the end, the only one who has suffered in this situation is common investors. This also raises the question if SEC fulfills its role as the protector of investors. [50] It is not only an example of the value trap, but also an example of fraudulent behavior of the business in developing markets which we are going to study more closely in this thesis. For example, from personal experience, I can pinpoint some examples in the Russian oil-gas industry wherein the biggest governmental companies' top-management have expropriated billions of rubles. [38]

So, because of those examples investors need to be careful when investing in developing markets, because typically the quality of institutions is quite low in those countries and even audit from the big four is not always the save option, because their main responsibility is not fraud detection and there are a lot of examples of laws in Russia and China for example, where auditors from others countries are not allowed to even to conduct an audit without special permission from government agencies. So, this issue can of course create some problems in our research because not all annual reports should be believed in, especially if they are made in local accounting standards. For example, in Russian-GAAP there is no such definition as "the consolidated annual report" so any annual report which is not used IFRS as accounting standards should be treated with cautions because it could be the case for example that company is moving its debt and liabilities to the subsidiaries away from parent company who reports the annual report, and audit firm will still sign such annual report. Nonetheless, Capital IQ, Reuters Eikon, Bloomberg, and other data source providers are still collecting such data and some investors are still trying to use such data to try to understand how the company is doing and will be doing, which is of course a mistake because such investors are ending up by losing money.

It is important to understand that "value vs growth" is often only used for initial sorting, but in the end, most practitioners who are not doing factor investing do not separate stocks to value and growth stocks and always look at the company-specific situation. [5] Anecdotal evidence of that for example the famous value investor Warren Buffett own right now 5% of all stocks of the "Apple". On the question about why would he invest money into something which a lot of people can consider a "growth stock", he answered that actual user base of apple and it's loyalty provide much more easily predictable data to predict any returns in the future, than even some manufacturing companies. [7] When the growth stock outperforms value stocks, typically this is the case when growth is not fully captured in the fundamentals and is very hard to measure.

In the more modern literature, the value effect is typically captured by creating a portfolio by shorting companies with low BE/ME and by buying companies with high BE/ME. But there are also very big

discussions about whether BE/ME is an appropriate measure of the company's underlying fundamentals or not because BE is just the sum of previous retained earnings. We will try to address those issues by adjusting BE and ME with the use of internally developed intangibles.

We are going to consider possible adjustments in the calculation of BE/ME to understand if we can explain the recent underperformance of value stocks. The current trend of the rising share of intangibles in the balance sheets of the companies (Figure 1) may help us to understand this question.

The intangibles have existed long before the third Industrial Revolution, in terms of patents, recipe secrets, and broadcasting rights, etc. — the first movie with Mickey Mouse was first shown in May 1928 (Plane Crazy), the Coca-Cola company was first established in January 1892, and was first patented as medicine, Edison patented the first commercially successful bulb in 1879, there are a lot of very old businesses who were not able to exist without their great innovations long before current times, but now such innovations have increased their importance in the annual reports, at least some researchers are stating that.

The main problem with internally developed intangibles is that there is no easy way to estimate the true value of them even for the business insiders i.e. management of the company, so many researchers are using approximations which leads to the incorrect estimations of the assets. “The literature is very contradictory in this topic” Lutz Kaufmann and Yvonne Schneider (2004) — and we will try to address this issue and study it, in relation to the developing markets.

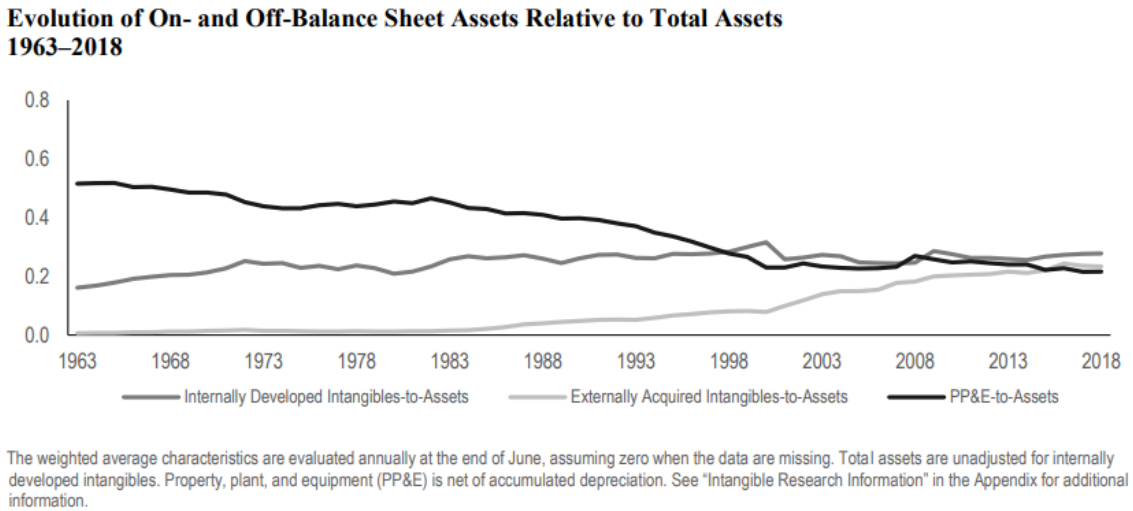


Figure 1

Another solution which we are going to try to use to enhance the performance of value investing is fundamental indexing. Fundamental indexing is when stocks are weighed in the portfolio not according

to their market capitalization, but according to their fundamentals like revenue, operational profit, net profit, amount of people employed, etc.

The reason why we want to study the use of fundamental indexing is that investors are not always rational and they can be irrational for a very long time, which creates some problems from the portfolio point of view if we are building it upon market valuation weights. Because the higher the market capital related to some particular companies, the higher the chances that there is a mistake in some particular companies valuation, which eventually will bring the whole portfolio down because companies with the largest market size are going to have the greater impact on performance and volatility with comparison to other companies on the index.

So, the research question which we want to study is whether there is any additional return on value premium in the developing markets after taking into account dividends. Does the value premium still exist? And we will try to enhance that performance by using fundamental indexing and information about internally developed intangible assets.

3 Literature review

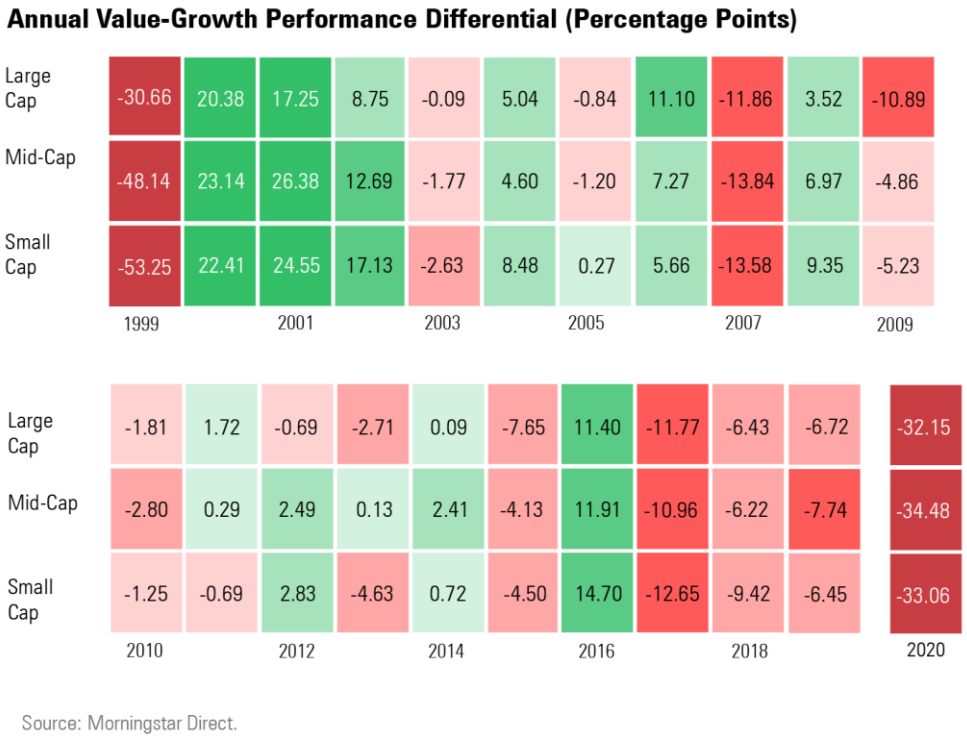
3.1 Value premium

Stattman (1980) has found that Book Equity to Market Equity (BE/ME) has a positive relationship with average returns for US stocks. Rosenberg, Reid, and Lanstein (1985) have found similar results for the NYSE stock exchange. Fama and French (1992) (1993) have shown that BE/ME works much better together with size anomaly in predicting stock returns. So, one can define value premium as either just BE/ME trading strategy as it is, or as BE/ME trading strategy controlling for other factors like size premium for example.

Fama and French (1996) later in their work postulated that value premium could exist because of the distress risk. Firms with lower BE/ME have higher financial distress, it could be measured in a lot of different ways for example Kothari, Shanken, and Sloan (1995) are arguing that the existence of this premium could be because of the survivor bias. There are a lot more firms (they were studying Compustat dataset) with high BE/ME who survived distress compare to the companies with low BE/ME. Another explanation that partially could explain the value effect was given by Black (1993) and by MacKinlay (1995) they assumed that this premium exists because some researchers tend to do data snooping. They are trying to find some variable that affects the average return in the dataset without any pre-planning or logical explanation.

Lakonishok et al. (1994), Haugen (1996) have a different explanation based on growth extrapolation for this effect which is causing the overpricing of the growth stocks and underpricing the value stocks. Their explanation is very close to the loss aversion bias (or in other words Prospect Theory) which was found in the behavioral finance field and first identified by Kahneman and Tversky (1979).

Regarding the recent poor performance of the value premium (see Picture 1), if we think that the market price always reflects the fair value of the company, then depending on how we measure the value premium – it can indeed underperform from time to time. The following reasoning is true for any measure, including book equity which is not an ideal measure of underlying assets.



Picture 1

If we for example look at the data of the annual "value minus growth" performance, supplied by Katherine Lynch (2021) [(33)] (Picture 1) we can see that the similar underperformance had happened before during the dot-com bubble where a lot of growth firms were completely overpriced. This is raising the question could it be the case that we are currently in a stock market bubble, which was similar to the 1999 and 2007 crises. Picture 1 shows results for the same HML method which was used by Fama and French (1993) where they have constructed portfolios adjusting for firm size and then average the results. In our research, we are mainly focused on BE/ME as the most widely used measure by researchers Fama and French (1993) and Lakonishok, Shleifer, and Vishny (1994).

3.2 Intangible assets

Recently, some researchers like Baruch Lev and Anup Srivastava (2019) and Savina Rizova and Namiko Saito (2020) have argued that we need to adjust book value, because assets are not priced frequently enough, and not all assets and liabilities are reflected in the book value. Generally, we can say that accounting rules are “very conservative” in estimating book value. (In IAS papers more often used the term “Prudence” which is part of the “faithful representation” which in return one of the important parts of the Fundamental qualitative characteristics of any financial reporting) [(26)]

Some researchers like Baruch Lev and Anup Srivastava (2019) argue that the increasing importance of internally developed intangibles is the biggest error in estimating the book value of the company. There is no one opinion about internally developed intangibles, for example, Savina Rizova and Namiko Saito (2020) have tried to predict expected stock returns by adjusting for internally developed intangibles and they did not found significance in internally developed intangibles. They have advised and argued that internally developed intangibles are too noisy measure to make any reasonable predictions.[1]

Typically, IFRS and US-GAAP give big freedom to the professional judgment in accounting concerning the internally developed assets, but at the same time, those standards are designed in such manners so it would be hard for management to inflate assets without real value under them. Some researchers like Baruch Lev and Anup Srivastava (2019) have argued that the inappropriate valuation of internally developed assets will cause inappropriate valuation of the companies. Should we put expenses such as R&D, training, marketing, etc. into the costs or should we capitalize them for appropriate valuation?

Proponents of capitalization argue that companies are using the results of such costs in the future so they should not be counted as plain costs. This raises a never-ending debate between researchers and practitioners, from the corporate finance side and the accounting side. In most of the accounting practices, most of the capitalized costs are not allowed to go into the assets and be depreciated in form of the new intangibles if they at least were not “marked to market” — so was properly evaluated or bought which is the most reliable way to estimate fair value in accounting. Mark to market is hard to do for most of the internally developed intangibles because it is very hard to find the market for internally developed intangibles that the company currently owns.

This happens because most of the intangibles are not broadly used and very company-specific, for example, if a company goes bust it will be very hard to sell “best management practices", “instructions on how to hire people" etc. Some assets in the form of capitalized costs like “money spent to train

[1] They have measured the internally developed intangibles by capitalizing R&D and some SG&A.

people" will even completely vanish, because technically the company does not own its personnel and if the company as we have said will go bust, people will just start searching for a new job.

For our research, we are more interested in International Financial Reporting Standards (IFRS) because most of the exchanges in developing markets and Europe are using their rules or using local GAAPs which are generally copied from IFRS. So let's look at the IAS 38[(48)(27)]: Internally Developed Intangible Assets are classified either as Research or as Development.
"The Research is an original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding." –Research costs should be never capitalized.

Development costs should be expensed in the year the cost has been incurred unless they meet the criteria for capitalization. i.e., recognized as an intangible asset (sometimes called 'deferred development expenditure'). The criteria for capitalization under IFRS are as follows:
The entity must demonstrate the following: (PIRATE)

1) How the intangible asset will generate Probable future economic benefits into the entity. This is demonstrated by the existence of an external market or by how the asset will be useful to the business if it is to be used internally.
2) The management has the Intention to complete the intangible asset and use or sell it.
3) The availability of adequate technical, financial, and other Resources to complete the development and to use or sell the intangible asset.
4) The business entity has the Ability to complete and use or sell the intangible asset.
5) Technical feasibility: there is technical know-how on how to complete the asset for the intended use or sale.
6) Expenditure: the cost to be incurred during the asset's development can be measured or estimated reliably.

The research costs should never be capitalized and it is easy to understand why, because we are not able to measure knowledge of people because human capital is something that does not go to the balance sheet of the companies. After all, companies do not own peoples' knowledge, so even if we would be able to measure it, it should not go to the balance sheet. And again, the only possible carrier of developing knowledge is people.

The main point of demonstration of such standards is to show that for the companies it is possible to capitalize R&D costs if they can prove the economic feasibility of such values. US-GAAP has an even stricter approach to this. IT companies in the countries which are using US-GAAP are not allowed to capitalize R&D costs, with some exceptions. The costs recognitions are different between them, IFRS and US-GAAP allow subsequent capitalization of costs if recognitions criteria are met — both standards

have different criteria, advertisements are expenditures in both standards, but US-GAAP allows to defer costs until the advertisement has happened, any of the following costs are must be expensed: internally generated goodwill, customer lists, start-up costs, training costs, and relocation or reorganization. (43) The main point of this discussion is that companies are already capitalizing on some intangibles which they think are appropriate to capitalize, but in other cases, the expenses just continue to be expenses.

When even the most knowledgeable person in the business — the "insider" (CEO, CFO, etc.) is not able to appropriately identify some assets in R&D or marketing expenses, how then researchers and investors can even try to identify that without conducting an audit? Some researchers have associated R&D with value destruction, in our previous work "The Impact of Managerial Flexibility on Value" [RU] (2020) we also have studied R&D costs and also have found a strong association with value destruction which was measured by EVA-spread. We suspect that according to Savina Rizova and Namiko Saito (2020), the only sphere where adjusted value strategies could potentially produce significant differences is in the IT industry. In their dataset data availability about R&D for the USA market also was quite bad which they have used as an argument why internally developed intangibles are too noisy a variable; and for emerging markets data availability even worse. So, our first hypothesis with that regard is that adjusted value strategies are not going to produce any significant risk adjusted return results, different from the results of existing adjusted value strategies in developing markets.

3.3 Fundamental indexing

The next research question which we want to address is the use of Fundamental Indexing (Fundamentally based indexes) to enhance value investment strategies in emerging markets. Different weighting is not a new idea, but Fundamental Indexing has emerged relatively late, the first scientific paper about this topic was Arnott, Hsu, and Moore (2005). The creator of such indices Robert D. Arnott also patented this approach.

In their papers, they develop the idea of giving weights of stocks in an index based on fundamentals like Revenue, Book Equity, Cash Flow, Book Equity, Cash Dividends, Amount of people, etc. — anything rather than market capitalization. In their article, they have explained how to construct the index, and what is the performance of fundamentally weighted indexes, compare to the market-cap-weighted ones. They rebalance indexes annually as of January 1st. The yearly outperformance on the sample period between 1962 and 2003, was on average 1.91% higher than S&P 500 and 2.13% higher than the Reference Capitalization index. All excess returns also were significant. Sharpe ratio of the fundamentally weighted index was 0.441, for reference cap 0.288, and for S&P 500 it was 0.304.

Note, that the overwhelming number of the indexes are constructed with the use of market-weight, the most popular examples are the S&P 500 and Russell 1000. What CAPM says is that markets are efficient

and that investors are not able to do any better than investing in the market as a whole. Fama French even received the Nobel prize in 2013 for the Efficient-market hypothesis. In his work Fama (1970) he first prescribed three types of market efficiency.

But in the same year 2013, Robert Shiller also received the Nobel prize for the series of articles in 1980 that argued that the market is inefficient. They were not the first articles in the Behavioral Finance field, but those helped to show how important psychology and decision-making biases are when we are trying to understand the market. Behavioral Finance is the field which is concentrated on the idea that markets are inefficient: see Robert J. Shiller (2003), Nicholas Barberis and Richard Thaler (2003), Malcolm Baker and Jeffrey Wurgler (2007). So even among the most famous researchers, the efficient-market hypothesis is a hot topic of debate.

And the main problem with CAPM and market-weighting is that real markets in the short-term could be inefficient, and if they are inefficient in the short-term, then with the market-weighted index you will overweight overpriced stocks and underweight underpriced stocks. So basically, the whole mean-variance optimization which as was first described by Markowitz (1959), will lead to sub-optimal results, because it has assumptions of efficient market hypothesis.

The mean-variance optimization is important to understand because we are using it to build an optimal portfolio that balances risks and returns. Arnott et al. (2005) have stated, that unfortunately return predictions is very hard as well as possible volatility, so this is the reason why fundamentals such as sales, gross profit, cash flow, dividends, number of employers employed were taken as the main weighting factors to make the value of indexes closer to the possible intrinsic value and market portfolios based on fundamentals closer to mean-variance optimal portfolio.

According to Arnott, Hsu, and Moore (2005) market capitalization in stocks tends to be correlated with high trading, so market cap-weighting indexes are overweight highly traded stocks and underweight low traded stocks, because of that it allows to keep transaction costs very low. The classical market-cap-weighted portfolios do not need regular rebalancing, because if the stock price goes down by 20% the weight in market capitalization also falls by 20%, the only case when you need to do rebalancing (in that case it is called reconstitution) is when a new company is introduced in the index because it becomes large enough or when one of the companies which already in the index becomes bankrupt, losses it’s market capitalization or disappear thought merger.

This is a little bit more complicated for Fundamental Indexing which implies some difficulties in rebalancing because fundamentals are fluctuating. Thus you also need to know how often to rebalance. Typically it is 1 year because it is not so often to imply any serious transaction costs and at the same

time it is enough to rebalance stocks in time when the new information available. But this works only for fundamentally weighted long strategies, in the cases of absolute returns (or in other words when we have a market-neutral strategy) when we take shorts positions it could hit the portfolio very hard if we are reconstituting just annually and does not do at least any quarterly rebalancing because the shorts positions are riskier over the long run, and sometimes even if you end-up right you still can lose money, because of the margin calls.

This is implying that for example for the new RAFI LONG/SHORT index with which Arnott from Research Affiliates was helping, the rebalancing rule was set as often as each month [(16)], which end up in the expense ratio of 0.95% [(41)], whereas for Schwab Fundamental International Large Company Index ETF which does not short anything the expense ratio is just 0.25% [(49)]. To give a relative understanding of how big/small it is the average expense ratio for Fundamental ETF according to ETF.com is 0.49% [(14)] the expense ratio for SPY: SPDR S&P 500 Trust ETF is 0.095% [(15)] for Vanguard's S&P 500 ETF it is 0.03% [(51)].

Another problem with fundamental indexing is that it has a higher turnover than market-cap indexes, but Hsu and Campollo (2006) answer on that critic that Fundamental Indexes indeed have higher turnover, 10-12% compared to the 6-8% in market-weighted indexes. But at the same time Fundamental Indexes have the turnover in the most liquid stocks, whereas market-cap indexes have turnover in the most illiquid stocks.

Because of such rebalancing rules for fundamental indexes, some researchers like David Blitz and Laurens Swinkels (2008) have argued that fundamental indexes should not be allowed to count as passive investment strategy, but rather as an active investment strategy.

However, even opponents of fundamental indexation like Paul D. Kaplan (2008) admit that market-cap weighing on the sector level can be quite volatile, and rational investors would want to stick to some arbitrarily assigned asset weight. But that raises the question if investors would be completely rational when assigning arbitrary weights to sectors or asset types because, over different time frames, they could be both right and wrong.

For example, if we look at the share of different sectors in GDP overtime for developed countries like Belgium, Finland, France, Japan, Netherlands, Spain, United Kingdom, United States, etc. (in Figure 2) — for all of them the economic trends are the same, the decrease in the Agricultural sector, the rise and subsequent fall in the Manufacturing sector and growth of services especially in the last years.
It is interesting to discuss these findings concerning assigning weights to sectors when investing because obviously in the long run and market-cap weighting and fundamental indexing are going to follow the

true distribution of changes in the industries over time, no matter how exactly real weights of sectors are going to change.

But in the short-run market-cap indexes weighting changes too drastically which will produce drag into some sector-specific risks for investors in the short time, states Arnott et al. (2005). Figure 3 and Figure 4 are great examples of such drag in the industry weighting, in this sense, fundamental indexes are more well protected against such drag, even though some authors like Paul D. Kaplan (2008) has argued that because fundamentals are determinants of market price, they will also cause the drag. But we would argue that market prices are explained by many determinants and we can use fundamentals to save us from irrational bets from other investors because the irrational behavior of some investors is also a determinant of the market price. So, there is nothing worse for revenue, cash flow, and dividends to be determinants of the market price, because, in the end, we are trying to protect our sector weighting only from irrational investors which will drive price far away from intrinsic value.

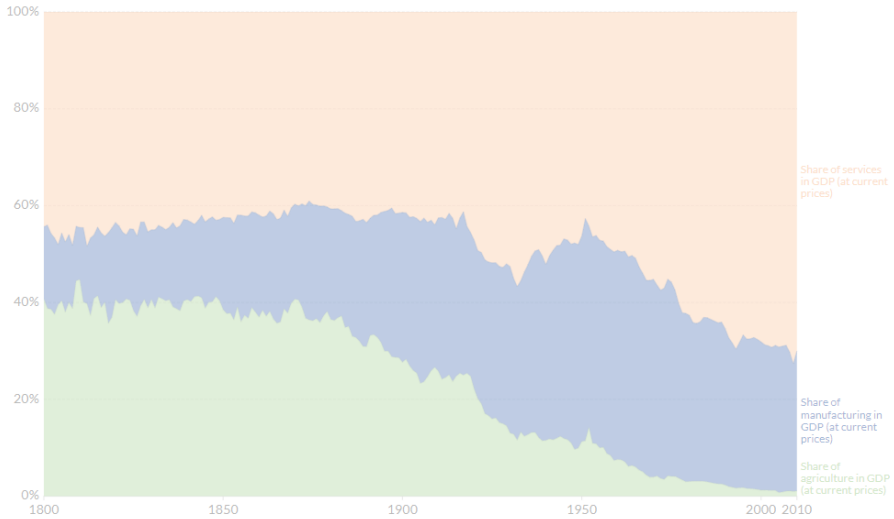


Figure 2 – Shares of different sectors in GDP in Sweden economy over time. The data collected by Aghion, Philippe, Durlauf, Steven (2014) [13]

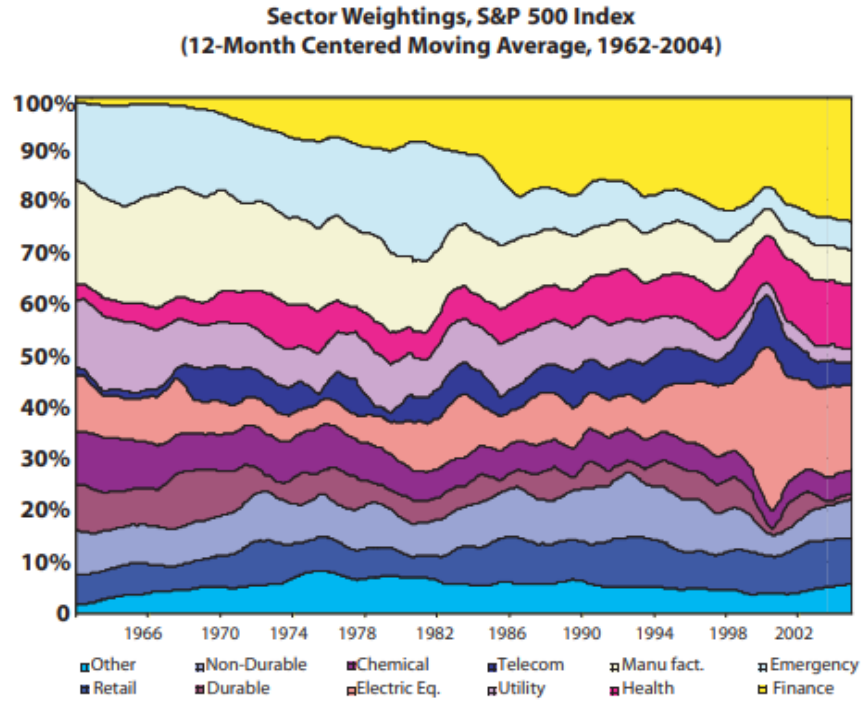


Figure 3 – provided by Arnott et al. (2005)

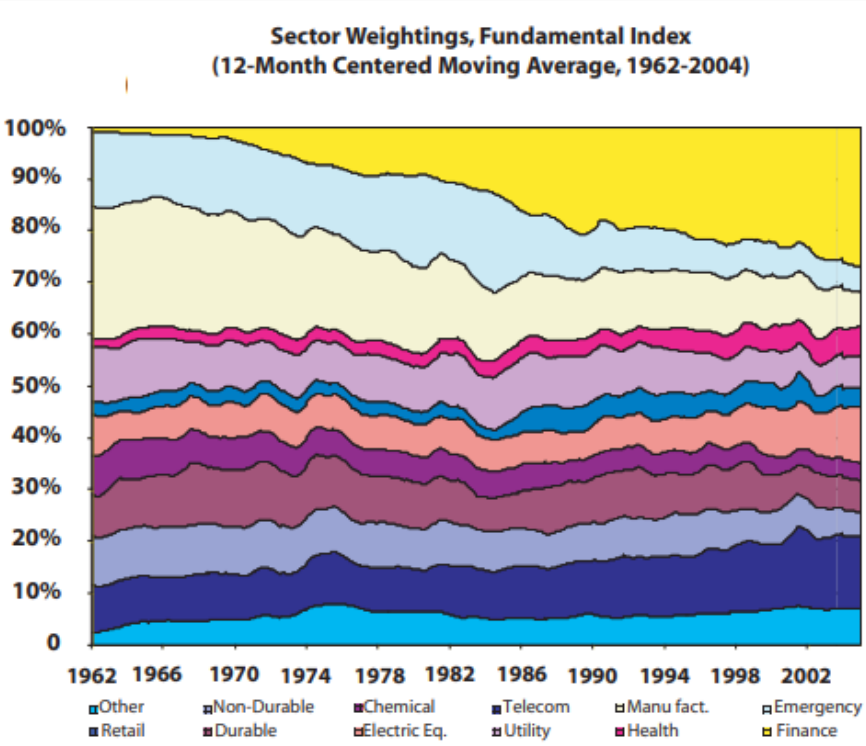


Figure 4 – provided by Arnott et al. (2005)

However, some researchers like Perold (2007) disagree that market-cap-weighted indexes produce any drag in the true weighting of the sectors. There is no one opinion about the difference between fundamental indexing and market-cap-weighted indexes because it is a discussion of does "one"

believes in “noisy market hypothesis” or not. The term noisy market hypothesis was created by Jeremy J. Siegel (2006) and just means that market prices do not always fully reflect true value.

But again, it is not an easy discussion, because in real life it is hard to predict the true weight, and this also partially another argument against fundamental indexing. John C. Bogle (2007) in his book “The little book of common sense investing” has said: “Owning a diversified portfolio of stocks and holding it for the long term is a winner’s game. Trying to beat the stock market is theoretically a zero-sum game (for every winner, there must be a loser), and after the substantial costs of investing are deducted, it becomes a loser’s game.” “Common sense tells us — and history confirms — that the simplest and most efficient investment strategy is to buy and hold all of the nation’s publicly held businesses at very low cost.”

So, by following that sense we should just choose the index with the lowest cost like S&P 500 for example, which is not a fundamental index. But on the other side of the coin here is Michael Burry’s opinion that says that any type of passive investing brings down price discovery which could end up in huge losses for passive investors.

3.4 Fundamental indexing in developing markets

The main topic of our research is of course fundamental indexing and value investing in developing markets. The developing markets have some very interesting properties which differentiate them from developed markets. Firstly, this is an important and huge part of the investment universe and second, the quality of institutions in the developing market is quite bad compared to the developed world. It is interesting to discuss a comparison between fundamental indexing and market-cap-weighted indexes in that regard.

The bad price discovery which was mentioned by Michael Burry is especially important for developing markets. To give some sense - some countries even have restrictions on short trading of stocks. Fundamental indexing is still prone to the problems of bad price discovery, but at least investors will likely lose less from direct fraud of this type on the developing market. And this is one of the reasons why Robert D. Arnott, Jason Hsu, and Philip Moore (2005) in their research did not use net income as one of the fundamentals because it is much easier to fake — not all researchers agree on that, because in the case of emerging markets it is not always a good idea to invest in companies without net profits or good cash flow to investors.

For example, Miziolek & Zaremba (2017) when they have investigated the effect of fundamental indexation on emerging markets of Poland, Russia, and Turkey between 2002-2015 have used net income as well sales, dividends, book value to form a portfolio with higher risk-adjusted returns than

standard capitalization-weighted portfolios after controlling for trading costs. They have compared CAPM market portfolio with Fundamentally Constructed index, and they have found that the mean excess return on the capitalization-weighted portfolio equal to 0.36% per month and excess return on the fundamentally weighted portfolios have ranged from 0.43% to 1.01%. They also calculated alphas which were strictly positive for all portfolios and ranged from 0.05% to 0.63%, however, most of the alphas were not significant. Also, they have found that the standard deviation for the market portfolio is 8.74% and for fundamentally indexed portfolios it is between 9.14% and 12.01%. It is contradicting with findings of Arnott et al. (2005) who found that fundamentally indexed portfolios are less risky. Sharpe ratios of all fundamental portfolios were higher compared to the capitalization-weighted portfolio. After controlling for trading costs, they did not find a big difference between results with and without trading costs. All portfolios have shown positive information ratios ranging from 0.04 to 0.72 after controlling for trading costs.

Another article that has studied emerging markets specifically was Heng-Hsing Hsieh (2013). The author has studied the performance of fundamentally weighted index for the emerging market between 1996 and 2010, by using S&P EM as a comparison. The fundamentals which he has used were book value, total earnings, total dividends, and gross sales. He has reported a return of 14.35% for the fundamental composite index and a 13.83% return over market proxy. He also has built a large-cap index, but it does not have showed significant outperformance compared to the market proxy, 24.22% std. dev. for fundamental composite and 25.16% std. dev. for market proxy.

Important to note that he also has adjusted for possible trading costs, but did not report them for market proxy. Overall, for all fundamentals, the cumulative returns were higher than for market proxy. Sharpe ratio for the market proxy is 0.281, whereas for the fundamental composite it is 0.331. The author also notes that the biggest performance has been shown by the sales index with the Sharpe ratio of 0.497. He also has performed attribution analysis by using the Fama French 3-factor model. After controlling for the 3-factor model, fundamentally weighted indexes incur significantly negative monthly risk adjusted returns (alpha): -0.4% for book value index, -0.3% for earnings index, -0,3% for dividends index, 0.5% for revenue index (which was an exception) and -0.3% for composite index. R square for almost all regressions were 95%. To give a sense of how much the factors have explained the performance - the composite index in the regression have had the significant beta coefficient of 0.0336 for the HML and the significant beta coefficient of 0.114 for SMB.

An article which has studied fundamental indexing worldwide was Walkshäusl and Lobe (2010). They have used Thomson Financial DataStream to obtain monthly returns for their stocks from 1982 to 2008, and also, they have converted all their data in dollars. They have studied the effect of each portfolio separately but also constructed the composite portfolio of fundamentals by combining book value, cash

flow, dividends, and sales. The authors did not study emerging markets directly as a whole, they rather have studied the effect in each country of the world with sufficient data; so, in total, they have studied 50 countries, from which 22 were emerging countries. They have found an average return of 14.65% for composite portfolio, 11.89% for Reference market cap portfolio, volatility of 13.17% for composite portfolio, 14.42% for Reference market cap portfolio, the Sharpe ratios are 0.721 and 0.473 respectively.

3.5 Is fundamental indexing a hidden value strategy?

We have chosen fundamental indexation as one of our research questions because some authors, for example like David Blitz & Laurens Swinkels (2008), have argued that fundamental indexation is just a hidden value strategy. They show that by regressing the returns of RAFI 1000 (fundamental index which ranking stocks in the USA) on the returns of traditional market-factor indexes. In comparison to the CAPM over the 1962-2005 period the fundamental indexing strategy has produced the alpha of 0.19 per month, and in comparison, to the Russel 1000, it produced alpha of 0.26 percent per month over 1979-2005. When comparing the results with Fama French (1992) three factors model, they have found insignificant alpha of -0.02% per month and high exposure to the HML (High Minus Low) factor, and small underexposure to the SMB (Small Minus Big) factor. When using the three-factor model with Russell 1000, they have found alpha of 0.1% per month (1.2% per year) and similar high exposure towards Russell 1000 value-growth index.

They conclude that fundamental indexing is offering zero or little additional return after controlling for value tilt, but they also admit that fundamental indexation is much more convenient than just trying to follow value premium, because re-weight and ranking of investment universe according to some fundamentals, looks better than any traditional attempts to split investment universe to two pieces value and growth stocks.

If fundamental indexation is a more convenient value premium, then our research question which we want to address is this: Does fundamental indexation improve the performance of value premium strategies in emerging markets, or not? — The objective is to compare the performance of the fundamental indexation strategy with a traditional value strategy, and with a market-cap weighted benchmark portfolio. In our research we will try to complement the block of researchers on the emerging markets Miziolek & Zaremba (2017), Yulong Yang (2019), and Heng-Hsing Hsieh (2013), contributing by examining more recent data, by extending the dataset to more developing countries, by testing for the effectiveness the modern version of RAFI methodology, and by converting all accounting and market data from the local currency to the US dollars.

4. Research design

So far, we have identified several research questions:

1) Does value premium still exist in the developing markets?

To answer this question, we will look at the data set of Fama & French [20] collected specially for developing markets (they have collected such data from Bloomberg). We will look at the yearly as well as the monthly data to answer such a question.

2) Is there a way to enhance the value premium by using fundamental indexing?

Some researchers which we already have mentioned above, have argued that fundamental indexing is just a more elegant form of value premium investing. To investigate if fundamental indexing is producing significant additional returns adjusting for the risks, we will compare the performance of the Fama & French market portfolio together with the value premium against the performance of the RAFI fundamental index. [42]

Important to note that we are studying only value premium - not other factors. To compare datasets properly we will follow the literature and we will compare mean returns, standard deviations of monthly returns, Sharpe ratios, alpha from the 1-factor market model. Additionally, we will calculate Pearson correlation to give some sense of how much total returns are correlated.

3) Are fundamental ETFs the better way to invest compared to the common market-cap weighted ETFs after controlling for possible expenses ratio and turnover?

To check for that we will compare first the performance of the indexes [42][23][39], and then we will compare the performance of fundamental ETF on the developing market [28] and the performance of the market-weighted ETF on the developing market [29], taking into account their risks and their reported costs. The dividends will be reinvested, for both of them. We will compare monthly data. To compare datasets properly we will follow the literature and we will compare mean returns, standard deviations of monthly returns, Sharpe ratios, and alphas from the 1-factor market model.

4) Will the return of the fundamental index improve after the inclusion of the internally developed intangibles?

To perform this task, we are going to use the stock-level data from Reuters Eikon. We will construct our own fundamental index portfolios, and then we will compare the returns of our newly constructed indexes with the ones provided by MSCI and RAFI [42][23]. For index portfolio construction, we will follow the rules of the RAFI Emerging Markets Index [42].

The portfolio weight of the i^{th} company in the index based on Fundamental Value (FV_{it}) is called the "Fundamental Weight" of the company (FW_{it}), after adjusting for Free Float to control for the shares that investors can actually buy:

$$FW_{it} = \frac{FV_{it} * Free\ Float_{it}}{\sum_{i=1}^{N} (FV_{it} * Free\ Float_{it})}$$

Unfortunately, the Reuters Eikon does not report bid and ask prices in USD dollars, so it will be impossible in our case to adjust trading liquidity costs in our indexes for proportional bid-offer spreads. We will merge monthly return data with yearly companies' data, which in the end will allow us to calculate the monthly portfolio returns. The formula for calculating total monthly returns TR_t of each fundamental index is as follows:

$$TR_t = \sum_{i=1}^{i} (FW_{it} * TR_{it})$$

The use of monthly portfolio returns will allow us to use coherent risk and returns measures for the comparison of the different portfolios. We will compare all our newly constructed indexes with the use of mean returns, standard deviations of monthly returns, Sharpe ratios, Betas, and alphas from the 1-factor market model.

4.1) Fundamentals used for the weights

We will use all current fundamentals combinations that Research Affiliates currently provide with the index providers:

- RAFI fundamentals: Adjusted Sales (adjusted for financial leverage), Cash Flow, (Dividends + Buybacks), Book value
- FTSE RAFI fundamentals: Sales, Cash Flow, Dividends, Book value
- Russell RAFI fundamentals: Adjusted Sales (adjusted for financial leverage), Retained Cash Flow, (Dividends + Buybacks)

But in our datasets, we are not going to use Buybacks, because they are simply not available in Reuters Eikon.

In total we will construct the following indexes: Revenue Index, Net Income after tax index, Book value index, free cash flow index, dividend index, Adjusted Revenue index, adjusted cash flow index, adjusted cash flow index v2, adjusted book equity index, adjusted book equity index v2 – we want to evaluate each fundamental index on its performance to see if we can find significant outperformance.

The formulas for fundamentals are as follows:
Adj Revenue = Revenue * (Book Equity / Total Assets) – by using this formula we can adjust for possible financial leverage usage; it is especially important for financial companies because they are highly leveraged by their nature.

Adj Cash Flow = operating cash flow + R&D expenses – we add back R&D expenses as a part of the capitalization of internally developed intangibles.

Adj Cash Flow v2, this time instead of operational cash flow we will use Free Cash Flow, we are doing so because the availability of operating cash flow information on developing markets is quite low, therefore we will use version 2 as a robustness check. The availability of operating cash flow information is low because companies in emerging markets do not report a lot of information about CAPEX which is part of the operating cash flow formula.

Adjusted Book Equity = book equity + amortization payments of R&D. – The amortization payments are just the sums of all R&D expenses capitalized with the use of 6 years; this is also a similar methodology that is used by RAFI indices [(41)]. By doing that we are going to try to capture spending on the development of knowledge capital, for our opinion about capturing the spending on the development of organizational capital look in a footnote[2].
The main difference between different versions of adjusted book equity is that for version 1 we will use a condition that does not allow for amortization payments to be calculated if we do not have at least a full 6 years of capitalized R&D expenses.

Version 2 will use the condition that amortization payments can be calculated if the company has skipped some years of R&D expenses in between. It is important because data quality in the emerging market dataset is not the best, so we think that version 2 will perform better. We will include both of them as a robustness check.

Of course, when we are going to use Adjusted book Equity in any form in an index, we are not going to use for each company the first 5 years of data of the company's existence, because full amortization

[2] Note we are not going to follow the methodology proposed by Peters and Taylor (2017) or by Ayyagari, Demirguc-Kunt & Maksimovic (2018) with the capitalization of SG&A because we think that it is inappropriate to capitalize SG&A costs. The 30% capitalization rule of SG&A is a crude, inaccurate, and very arbitrary measure of internally developed intangibles, furthermore we think that 100% capitalization of R&D is already overestimating internally developed intangibles because not all R&D costs are ending up as successfully internally developed intangible assets, which is the main criteria for capitalizing costs in general.

payments of R&D are not available yet and we do not want to produce biased results. In general, we will follow the methodology of index construction provided by RAFI indices [41].

We will also construct our composite indexes almost similar as defined by RAFI formulas above and by practice in current research papers:

Composite v1 = Average (Revenue, Net Income After Tax, Book equity, Free Cash Flow, Dividends)
Composite v2 = Average (Revenue, Free Cash Flow, Book equity, Dividends)
Composite v3 = Average (Revenue, Net Income After Tax, Book Equity, Dividends)

Composite v4 = Average (Adj Revenue, Adj Book Equity v1, Adj Cash Flow, Dividends)
Composite v5 = Average (Adj Revenue, Adj Book Equity v2, Adj Cash Flow, Dividends)
Composite v6 = Average (Adj Revenue, Adj Book Equity v2, Adj Cash Flow, Dividends, Net Income After Tax)

Composite_v7 = Average (AdjRevenue, Adj Book Equity v1, Adj Cash Flow v2, Dividends)
Composite_v8 = Average (AdjRevenue, Adj Book Equity v2, Adj Cash Flow v2, Dividends)
Composite_v9 = Average (AdjRevenue, Adj Book Equity v2, Adj Cash Flow v2, Dividends, Net Income After Tax)

For each composite index, we will calculate the average across all fundamentals in the same year. This average each year is going to be the fundamental value of the composite index, according to which we will sort and rank our stocks. Only the best 1000 stocks will be included in the index.

We are going to reconstitute and rebalance our indexes yearly, without performing quarterly rebalancing, because the quality of quarterly data at the stock level is not good enough. In the Reuters Eikon dataset, yearly and quarterly accounting data are using different currency exchange rates from local currency to USD which makes them impossible to compare with each other. This is also exacerbated by the fact that for most of the companies the availability of quarterly data is low compare to availability of yearly data.

To prevent look-ahead bias we will lag all our yearly accounting data by at least 1-quarter after initial ranking to download the dataset, because of such reason and also because many companies in our dataset are reporting their results exactly at the end of the year, the reconstitution is going to be performed not in the June, but in March. The exception is going to be for the market cap proxy for which we will use a 1-month lag.

5. Data

5.1 Index level data

The data about the existence of the value premium on the developing markets we will take from the Fama-French dataset from their website. [20] They have constructed their returns in the dataset, with the inclusion of dividends and capital gains returns, on a yearly and monthly basis. Market return in the dataset is the region's value-weighted market portfolio minus the one-month T-bill rate.

They have constructed 5 factors by sorting stocks in a country into two market cap and three respective book-to-market equity (B/M), operating profitability (OP), and investment (INV) groups at the end of each June. Big stocks are those in the top 90% of June market cap for the country, and small stocks are those in the bottom 10%. The B/M, OP, and INV breakpoints for a country are the 30th and 70th percentiles of respective ratios for the big stocks of the country.

We are mainly interested in the SMB (Small Minus Big) and the HML (High Minus Low) factors. SMB (Small Minus Big) is the average return on the nine small stock portfolios minus the average return on the nine big stock portfolios.

$SMB_{(B/M)}$ = 1/3 (Small Value + Small Neutral + Small Growth) - 1/3 (Big Value + Big Neutral + Big Growth).

$SMB_{(OP)}$ = 1/3 (Small Robust + Small Neutral + Small Weak) - 1/3 (Big Robust + Big Neutral + Big Weak).

$SMB_{(INV)}$ = 1/3 (Small Conservative + Small Neutral + Small Aggressive) - 1/3 (Big Conservative + Big Neutral + Big Aggressive).

$SMB = 1/3 (SMB_{(B/M)} + SMB_{(OP)} + SMB_{(INV)})$

Note: Between July 1989 and June 1991, $SMB = SMB_{(B/M)}$, and between July 1991 and June 1992

SMB is the average of $SMB_{(B/M)}$ and $SMB_{(OP)}$

HML (High Minus Low) is the average return on the two value portfolios minus the average return on the two growth portfolios.

HML = 1/2 (Small Value + Big Value) - 1/2 (Small Growth + Big Growth).

Rm–Rf for July of year t to June of t+1 include all stocks for which they have market equity data for June of t. SMB, HML for July of year t to June of t+1 include all stocks for which they have market equity data for December of t-1 and June of t, (positive) book equity data for t-1 (for SMB and HML), non-missing revenues, and at least one of the following: cost of goods sold, selling, general and administrative expenses, or interest expense for t-1 (for SMB), and total assets data for t-2 and t-1 (for SMB).

The emerging markets countries in their dataset include: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Russia, Saudi Arabia, South Africa, South Korea, Taiwan, Thailand, Turkey, United Arab Emirates.

The dataset contains data for returns between 1990 and 2021 years. Their dataset provides information only at an aggregated level, so there is no information about specific emerging countries in their dataset.

As the main representative of the market-weighted cap indexes we will take the indexes and the data of such indexes from MSCI [39]. We also are going to get the data about the performance of MSCI ETFs from the iShares website, but mainly from Bloomberg terminal to make it more comparable with RAFI ETF. [29] The data is available between 2003 and 2021.

As the main representative of the fundamental indexes, we will take FTSE RAFI. The monthly performance of the fundamental indexes on developing markets we will take directly from the "Rafi" website [42]. As the fundamental ETF we will take Invesco FTSE RAFI ETF, the gross total returns about this ETF we will also derive from Bloomberg. [28]

For a more correct comparison with RAFI Fundamental Emerging Markets Index, we also would like to use Morningstar Emerging Markets Large-Mid Index. Unfortunately, Morningstar does not provide data about their indexes publicly so we will be using MSCI. The index methodologies of FTSE, MSCI, and Morningstar can be slightly different, but we are expecting the correlation between them to be 95-99.9%. To give some sense of possible differences in methodologies, this is the breakdown of market size rules (Table 1):

	Morningstar	FTSE	MSCI
Large-cap	Top 70%	Top 72%	Top 70%
Mid-cap	70-90%	72– 92%	70%-85%
Small-cap	90– 97%	92– 98%	85– 99%

Table 1 — *For more comparison information look at the Morningstar website [38]

Market size breakdown is important because the standard benchmark which is typically used for comparison uses only large and mid-cap companies. This is why it is important to use an appropriate index provider, but again in our case, it solely depends on data availability. All our data will be in USD from all sources.

5.2 Stock level data

For stock level data for the whole investment universe in developing markets, we will mainly use Reuters Eikon Datastream. Because of such a high amount of data for everything to work smoothly we will work with just annual fundamental data. We need individual stock data, because after adjustments all our sorting for fundamental indexes will change, so it is not enough to have just data at the index level. We will defer fundamental data by 1 quarter, to avoid forward-looking bias. And also to make any adjustments, we also need to work directly with stock-level data for the stocks who make up our fundamental indexes.

Below, we provide details about how we have obtained and sorted the data so future researchers can repeat our steps if needed. We have included filters of "Primary Quotes Only" and "Primary Issues Only" — which we have included because we want to have companies which are "main" for the business. For example, there is a very big oil and gas company in Russia called Gazprom this company have 25 subsidiaries, but we do not need all subsidiaries, because according to the IFRS parent companies are obligated to publish the results in the consolidation manner.

We did not include an "Active Only filter", because if we would include it we would not possess bankrupt companies so we would end up with attrition bias in our data. Of course many companies in developing countries even public ones have a very poor quality of data, there are many reasons for that: some China companies for example do not publish their reports in IFRS, but only in local accounting standards. Some companies from developing markets are listed in NASDAQ for example, and this is the reason why they sometimes could concentrate they reporting standards around US GAAP. So the main point is that we are not defended from the difference in accounting standards even across the companies from the same developing country because different exchanges can have different requirements to accounting standards. This is very hard to control in regressions and in fact, many researchers are just ignoring that fact considering it as irrelevant, so to escape from small sample bias, we have downloaded the data across all countries, because we are hoping that it will average out the effect of different accounting standards.

We did not include the filter "consolidated only" in Reuters Eikon, because unfortunately, it shows only companies included in "NASDAQ consolidated" completely ignoring companies in the developing market which is of course not appropriate for us.

Next, we have filtered the data by the "country issued" column where we have downloaded the data about all public companies in developing countries. According to the estimation of the World Bank the following countries are being considered as "developing": Argentina, Azerbaijan, Bahrain, Bangladesh,

Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Chile, China (Mainland), and etc. — in total we have obtained data about 81 countries in our dataset. The full list of countries which we have used is provided in the Appendix.

We have downloaded data piece by piece, by using "country issued" as a filter. Unfortunately, Eikon does not allow us to download more than 4000 tickets at once, and then we have used an extension of Reuters Eikon in Excel to download the data based on our tickets. In total, initially, we have received data about 32,726 publicly traded companies. For some companies, it was impossible to take out the data because of the internal mistake (DEX2 (5)) with queries of Reuters Eikon, the examples of such companies are as follows: ZNVKIF Medinvest-Ukraina PAT (Ukraine), National Investments Company Ltd (Tanzania), SMVina Co Ltd (South Korea), Evergent Investments SA (Romania), Wenling Zhejiang Measuring and Cutting Tools Trading Centre Co Ltd (China (Mainland)), etc. there are 9 of such companies overall they did not change any results so we just excluded them.

Reuters does not assign any time automatically for accounting data, so we have downloaded the Fiscal Year (FY) time-date based on Total Revenue (Revenue) publication date, because we need a time variable which indicates from which FY the annual report was. So, we are going to use the date of revenue item as the date when the company has published its accounting data. And if a company does not have revenue for the FY, then we do not have FY date as well. We consider revenue as a great indicator if company has annual report published at this FY or not, because technically there should be no annual report without revenue and also because we are not interested in the companies who does not have at least Revenue for the purpose of fundamental index construction.

We have deleted all cells with names like: "NULL", "NaN", "Error", and etc. Then we have deleted by using PHP and SQL all cells which do not contain any useful information for our research (we need at least market capitalization and time frame for descriptive statistics) — in the end, we have ended up with 28,658 companies.

Because of such a high amount of data, for everything to work smoothly we rank our companies using just yearly data, then we will separate those companies who have received at least one place in those 20 years in the ranking of 1000 companies based on market cap or fundamental value. Then, we download and merge yearly data with monthly returns data, of these companies who ended up in the 1000 best. Then we lag all our yearly fundamentals by quarter to avoid forward-looking bias and extend them forward for the next 18 months, until new lagged information from next fundamental value or market cap is available.

If lagged next year information is available earlier than 18 months, we just use the new information. — We are doing so, because some companies in our dataset can for example change their reporting dates, first they were reporting at the end of the 3rd quarter, but then suddenly they can change their Financial Year date and start reporting at the end of the 1st quarter, therefore there could be the cases when a company has up to 18 months before it has new Fiscal Year information available. We use just 18 months because if a company has lagged more than 18 months in the data, we would rather prefer not to include it in our rebalancing at all. After all, we consider such a situation as not normal, when the company changes its Fiscal Year date to more than 6 months from the previous Fiscal Year date. Important to note, that any extensions of the lagged information are not going more in the future than the last total return of the company, if the company is not existing anymore then we of course do not extend our lagged yearly information for this company anymore.

The main limitation of our merging method is of course that for some companies, we are not able to check if they have an available value of "total return" before downloading the data, so if the value of the total return is empty in the monthly return dataset, then the company just does not participate in the calculation of total index returns. Before merging all duplicates with the same RIC and time variables were deleted, for the yearly dataset duplicates were deleted before ranking as well.

Based on the condition that the company should has at least one rank between best 1000 companies in 20 years in fundamental ranking or in market cap proxy ranking, we have downloaded the monthly total returns for 9,280 companies. Then we have done the same ranking procedure separately for BE to ME ranking and separately downloaded another total monthly return for 6,448 companies (some companies can overlap between those two sets, but for our case, it does not matter, because in the case of overlapping we just overwrite the total returns for the company).

After the lagging and extension of yearly accounting data, we freeze the Fundamental Value of the stock at the 4th month of the year, and in the case of market capitalization we freeze it at the first month — and then we will extend such values again, we are doing so because for reconstitution the fundamental value or market capitalization must stay the same. Otherwise, we will end up with rebalancing at each monthly date, because some companies have different FY dates and rebalancing at each month in real-world would increase transaction costs which we want to avoid, even for market capitalization indexes reconstitution is typically made at yearly basis. [(23)]

We have deleted from our dataset some countries which have had too high inflation. Because such countries typically do not officially have daily currency exchange rates and so because of that Eikon starts calculating market capitalization and other fundamentals in USD terms incorrectly. The countries which we have deleted based on their "Immediate Parent HQ Country": Venezuela, Argentina,

Zimbabwe, Sudan, Lebanon, Libya, Liberia, Zambia, Nigeria, Syria. And also based on their "Country issued": Venezuela, Argentina, Zimbabwe, Sudan, Lebanon, Zambia, Nigeria, Syria.

Note that we did not delete the whole subset of frontier countries in our dataset of emerging countries, because we are trying to have as high coverage of the developing markets universe as possible to draw a fundamental conclusion about the existence of value premium and performance of fundamental indexes. We did not use the subset of developing countries that researchers typically use in their studies, because all of them are typically using different countries in their dataset. For example, Fama French, RAFI EM, MSCI EM — all of them are using different set of countries in their developing markets datasets. We think that it is inappropriate from the research point of view to choose just 20+ countries and to just work with them because it creates small sample bias and incomparable results. Walkshäusl and Lobe (2010) also partially confirm that idea by concluding in their research, that "an arbitrarily selected domestic fundamental index is not likely to beat the respective capitalization-weighted index".

We also did not delete any penny stocks from our dataset, because none of the previous researchers like Researcher Affiliates (which RAFI methodology we are following) nor Fama French have deleted any penny stocks in their methodologies. And also because it is inappropriate to delete penny stocks if you consider analysis conducted on developing markets, because in USA research methodology for example penny stocks typically are considered to be less than 5 dollars, but if we calculate the average ratio from of the price for a penny stock to average net wage for the USA at the end of 2021 it is going to be 0.14%, but if we change the denominator to the average wage in Nigeria then it is going to be 3%! And it is not even the worst case. (the numbers are taken from Numbeo)

So, in other words, to buy one penny stock for an average person living in Nigeria he needs to spend up to 3% of his monthly wage which is of course a very considerable amount in relative terms. This is why from real investor's point of view on developing markets it does not matter if the company has penny stock or not because most of the companies in developing countries should have a low price of the stock because otherwise their compatriots just would not be able to invest.

We also have deleted the seventy-five highest monthly stock returns (for included stocks from the sorting), because some of them were not realistic and distorted our portfolio return results. We also have considered the use of winsorizing, but then we thought that it would not be realistic from a real investment point of view (having an investable index).

5.3 Descriptive statistics

Here we provide some descriptive statistics (Table 2) to give a sense of why we have slightly changed the formula in Adjusted Cash Flow v2 and also why we have so many Composite Indexes. Because the data availability of Operating Cash Flow (OperatingC~w) and also for R&D is quite low on the developing market, therefore any calculations with the use of operating cash flow and with the use of R&D should be treated cautiously.

Variable	Obs
RICname2	308,125
TotalRevenue	269,891
TotalAssets	269,041
TotalEquity	269,031
CompanyMar~p	224,751
FreeCashFlow	132,339
OperatingC~w	35,128
OperatingI~e	269,516
NetIncomeA~s	269,594
R_and_D	81,947
Dividends	164,188
FreeFloat	210,352

In line with previous researchers, we also report the descriptive statistic of the portfolio weights of industries for the Composite index v1 (ranked on by Average (Revenue, Net Income After Tax, Book equity, Free Cash Flow, Dividends)) and the Market Cap index at the end of 2020 in Figure 5.

Table 2

As we can see market cap index is overweight IT and Health Care sectors, whereas the Fundamental composite index is overweight in Industrials and Consumer Discretionary. It gives some insides about why just recently value stocks have been hit hard by the Covid-19 crisis, compared to the growth stocks. Because IT and health sectors were just as fine, whereas sectors which constitute the biggest share of fundamental indexes were hit the most by the pandemic.

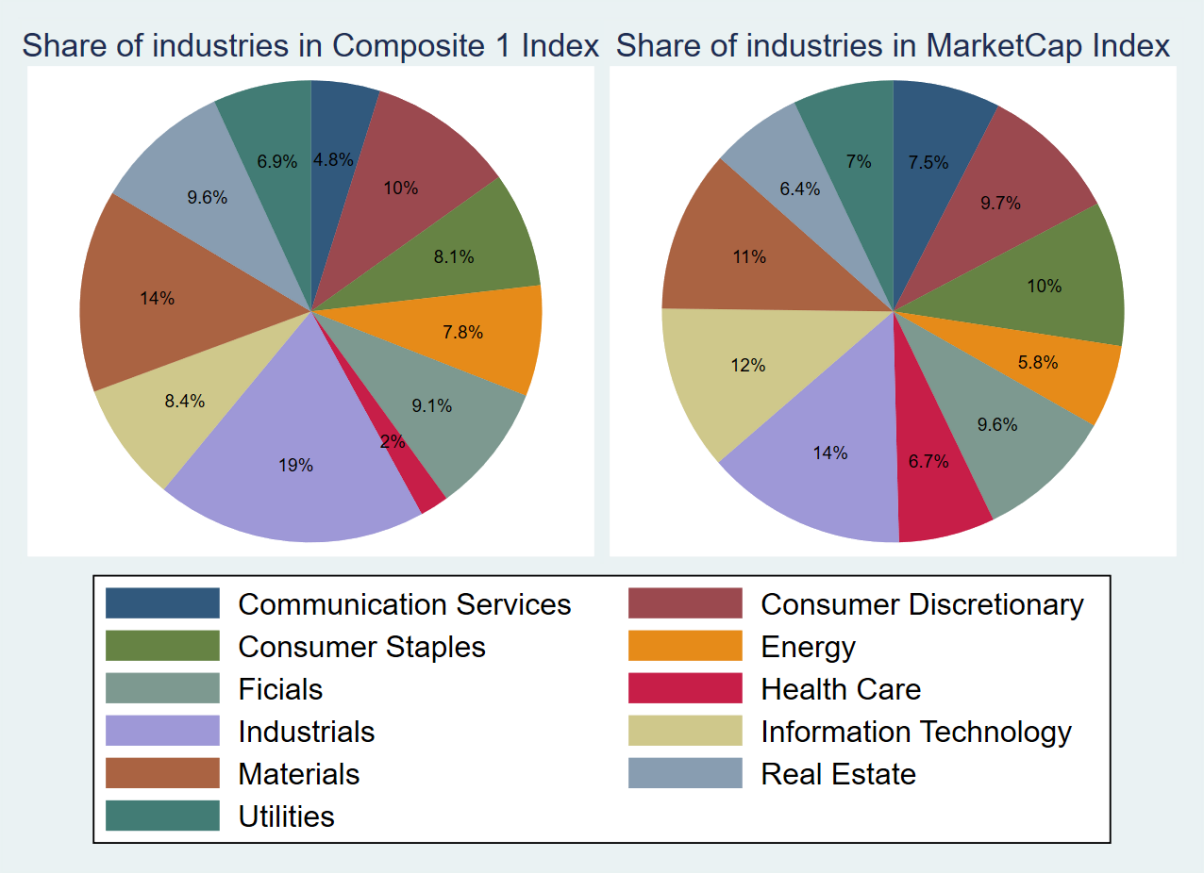


Figure 5 — Share of industries of different Indexes at the end of the year 2020

We also show the top 10 companies by rank for Market Cap Proxy (Table 3) and Composite index v1 (Table 4) at the end of 2020. Note that the weight in the index is adjusted for the Free Float, so even if some company can have the first rank by index, the real share in the index always will be adjusted for free float.

Rank	Name of the company	Weight in index	RIC name
1	Saudi Arabian Oil Company	0.39%	2222.SE
2	Tencent Holdings Ltd.	3.71%	0700.HK
3	Alibaba Group Holding Ltd.	6.77%	BABA.K
4	Samsung Electronics Co Ltd	3.46%	005930.KS
5	Taiwan Semiconductor Manufacturing Co Ltd	3.55%	2330.TW
6	Ping An Insurance Group Co of China Ltd	2.49%	601318.SS
7	Kweichow Moutai Co Ltd	0.98%	600519.SS
8	China Mobile Ltd	0.63%	0941.HK
9	PetroChina Co Ltd	0.07%	601857.SS
10	AIA Group Ltd	1.70%	1299.HK

Table 3 – Top 10 companies by rank for Market Cap Index at 2020 with their weights in the index

Rank	Name of the company	Weight in index	RIC name
1	Saudi Arabian Oil Company	0.10%	2222.SE
2	PetroChina Co Ltd	0.21%	601857.SS
3	China Petroleum & Chemical Corp	0.61%	600028.SS
4	Samsung Electronics Co Ltd	3.06%	005930.KS
5	Gazprom PAO	1.57%	GAZP.MM
6	Ping An Insurance Group Co of China Ltd	2.58%	601318.SS
7	China State Construction Engineering Corp Ltd	0.91%	601668.SS
8	China Mobile Ltd	0.68%	0941.HK
9	NK Rosneft' PAO	0.22%	ROSN.MM
10	Hon Hai Precision Industry Co Ltd	1.67%	2317.TW

Table 4 - Top 10 companies by rank for Composite v1 Index at 2020 with their weights in the index

6. Empirical research

6.1 Does fundamental indexing is really just hidden value strategy?

In Table 5 we can see the monthly performance of the F&F five factors during the whole sample period from July 1992 until April 2021. In Figure 6 we can see the performance of five factors identified by F&F across years for the developing markets. If we look at the performance of the value factor (HML) we can see that the results of such a strategy have been deteriorating since the exception for Emerging Markets, we can see it visually in Figure 6, as well as in Table 6 across time.

From 1992.07 until 2021.04	Mkt-RF	SMB	HML	RMW	CMA
Mean return	0.68%	0.09%	0.59%	0.18%	0.24%
Yearly mean return	8.21%	1.12%	7.10%	2.12%	2.82%
Std Dev of monthly return	6.20%	2.00%	2.24%	1.43%	1.78%
Yearly Std Dev	21.48%	6.93%	7.77%	4.96%	6.16%
Max monthly return	17.98%	6.52%	6.20%	8.05%	6.53%
Min monthly return	-27.23%	-7.89%	-11.54%	-4.44%	-6.22%
Sharpe ratio for the whole portfolio	0.296				

Table 5 — Performance of the market portfolio and different risk factors

	1990-1995	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020
HML Mean monthly return	0.58%	0.74%	1.63%	0.84%	0.01%	0.31%
HML Yearly mean return	6.93%	8.84%	19.54%	10.09%	0.08%	3.72%
HML Std Dev of monthly return	4.28%	2.90%	2.65%	1.37%	1.34%	1.94%
HML yearly Std Dev	14.84%	10.05%	9.18%	4.74%	4.64%	6.74%
Max monthly return	12.96%	5.99%	6.20%	3.57%	3.29%	5.43%
Min monthly return	-14.35%	-6.06%	-11.54%	-2.43%	-3.03%	-2.98%

Table 6 — Performance of the HML factors each five years

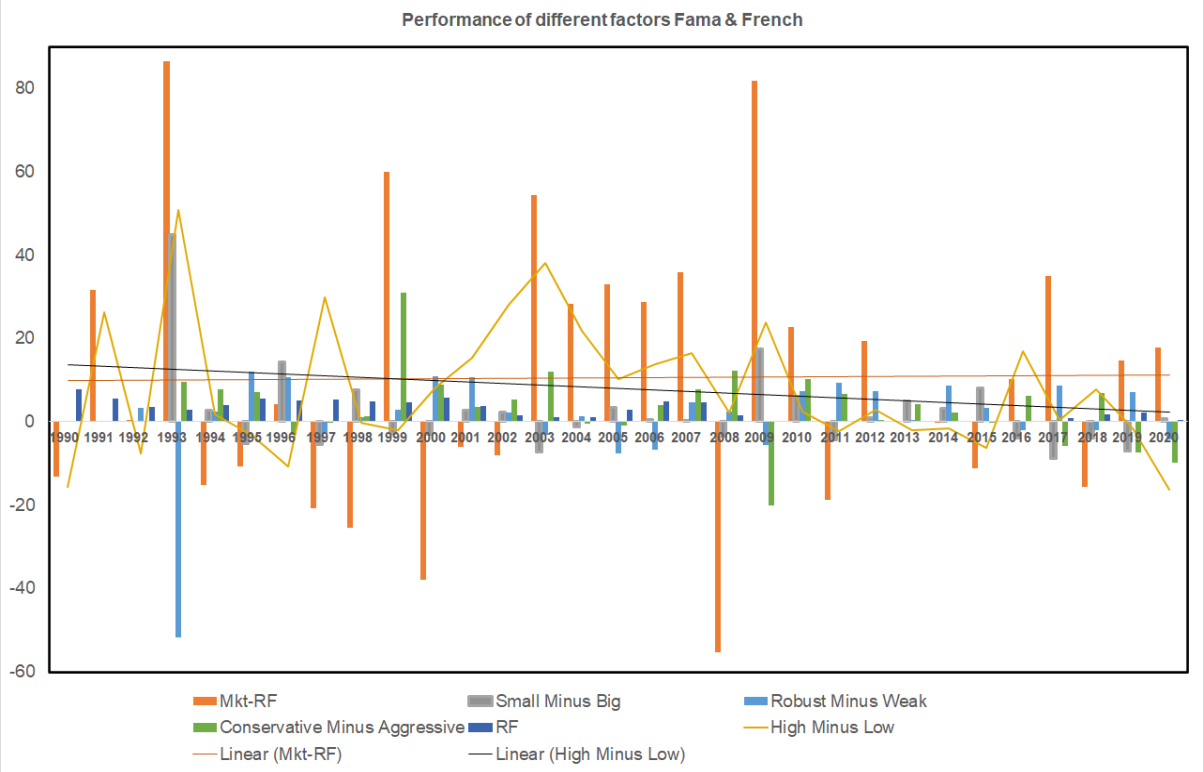


Figure 6 — Visualized yearly performance of Fama French market portfolio and factors

To give a sense that it is not attributed to the performance of the market overall in Figure 6 we can see the same factors, but with the market portfolio. If we compare the linear trend line of the market performance with the linear trend line of the HML premium we can see that the performance has been deteriorating slowly, and in the latest years have become even negative. We can suggest that at least markets in some sense have become partially effective, by incorporating the information about value premium in returns so they have become very close to zero because markets are not ready to pay premium anymore for the value risk. If we calculate the total returns of the Fama 5-factors portfolio, we will receive the Sharpe ratio of 0.295 if we calculate it from the year when the info about all factors was available.

If we would look at the monthly performance chart of the same HML factor in Figure 7. We can see that HML had underperformed during crises in 1990, 2000, and at the start of 2020. We can suggest that this happened because people at this time were much more scared to hold any low market to book stocks. If we look at the VIX chart this is also were the time of the most volatile periods in the market.

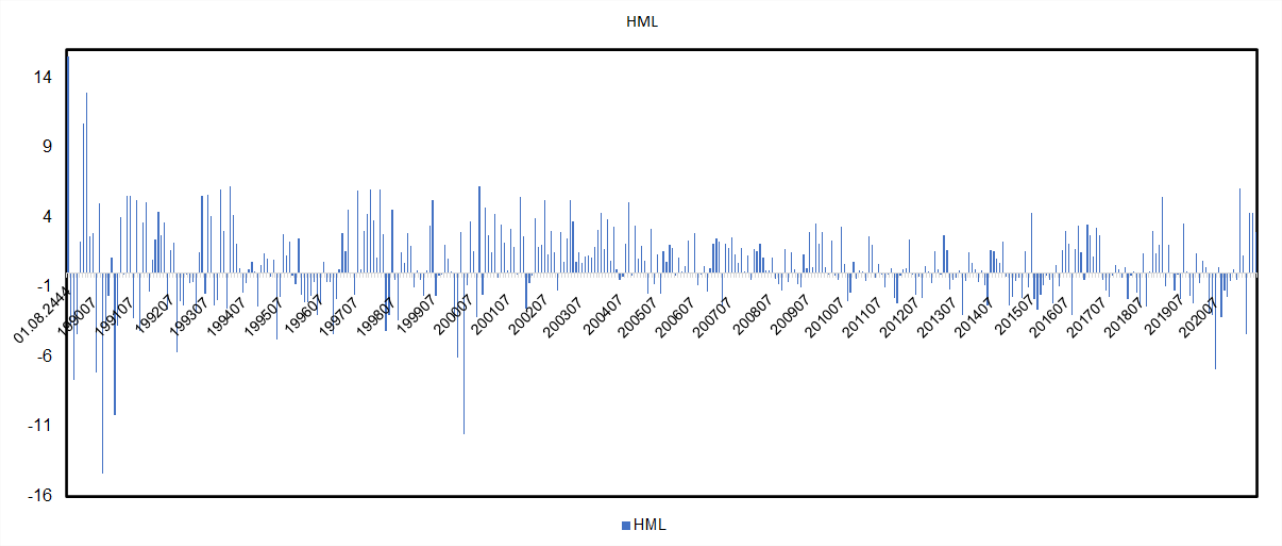


Figure 7 — monthly performance of HML factor

To understand to which factors the performance of RAFI Fundamental Index is the most attributed to, we run RAFI FI (and RAFI FI ETF) against FF 5 factors portfolio in linear regression. The results are presented in Tables 7 and 8.

From 1996.05 until 2021.04	Mean return	Yearly Mean return	Std Dev of monthly return	Yearly std dev	Max monthly return	Min monthly return	Coefficients	P-value	*F*
RAFI FI	1.14%	13.69%	7.06%	24.46%	18.98%	-27.80%	-0.001	38.31%	904.41
Mkt	0.79%	9.51%	6.20%	21.48%	17.98%	-27.23%	1.08	0.00%	*Adj R^2*
SMB	0.00%	-0.06%	2.00%	6.93%	6.52%	-7.89%	-0.19	0.02%	0.95
HML	0.65%	7.79%	2.24%	7.77%	6.20%	-11.54%	0.32	0.00%	
RMW	0.20%	2.44%	1.43%	4.96%	8.05%	-4.44%	0.05	56.80%	
CMA	0.27%	3.25%	1.78%	6.16%	6.53%	-6.22%	0.08	18.06%	
RF	0.17%	2.03%	0.17%	0.59%	0.56%	0.00%	0.95	8.67%	

Table 7 – RAFI FI against five factors of FF 5 factors portfolio + RF rate

From 2009.06 until 2021.04	Mean return	Yearly Mean return	Std Dev of monthly return	Yearly std dev	Max monthly return	Min monthly return	Coefficients	P-value	*F*
RAFI ETF	0.43%	5.18%	5.74%	19.87%	16.68%	-18.91%	-0.003	7.90%	361.05
Mkt	0.68%	8.15%	5.04%	17.46%	12.15%	-16.97%	0.98	0.00%	*Adj R^2*
SMB	0.07%	0.87%	1.49%	5.18%	4.19%	-3.36%	-0.40	0.00%	0.94
HML	0.18%	2.16%	1.96%	6.79%	6.06%	-6.89%	0.42	0.00%	
RMW	0.27%	3.23%	1.17%	4.04%	2.66%	-3.02%	-0.29	2.23%	
CMA	0.10%	1.19%	1.43%	4.94%	5.89%	-3.95%	0.20	8.43%	
RF	0.04%	0.47%	0.06%	0.22%	0.21%	0.00%	1.36	49.22%	

Table 8 – By Rafi ETF we mean - Invesco Ftse Rafi Emerging Markets Ucits ETF (the dividends are recapitalized)

From those results, we can see that the performance of RAFI FI and RAFI ETF is mainly attributed to the market factor, and to the SMB and HML premium – all coefficients are significant. Whereas SMB

premium even goes in with negative coefficient meaning that, the Fundamental Indexes are using less SMB premium available on the market. So in other words, RAFI FI prefer big company's over small company's the opposite of what SMB proposes to do, which could be partially explained by the fact that RAFI FI is adjusting their index for Free Float and Trading costs and F&F in their portfolio are not doing that. But again, the comparison is not full enough, because F&F uses short positions and RAFI FI is not using them. Also interesting to note that the mean return of SMB premium is negative in Table 7, and even close to zero in Table 8.

If we compare the performance between Fundamental Index and F&F market return + HML premium we can see that this performance looks almost the same in Figure 8, if we calculate the Pearson correlation it is 94,7%. We can see that researchers who have stated that fundamental indexing is just a hidden value strategy were right.

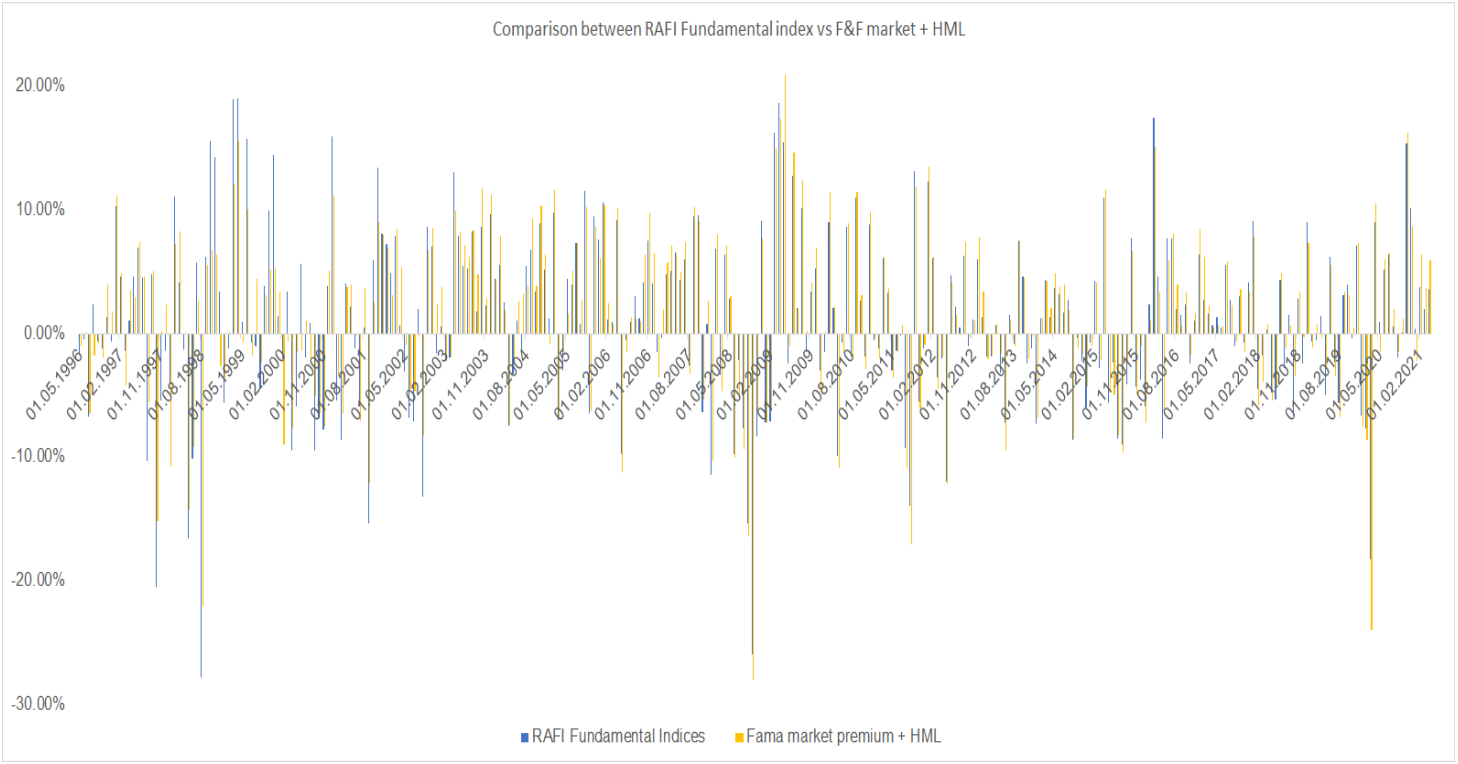


Figure 8 — visual comparison of RAFI FI and Fama Market + HML on a monthly basis

In Table 9 we present a comparison of monthly returns & risks characteristics for RAFI Fundamental Index, and F&F market return + HML, and F&F market return + HML + SMB.

From 1996.05 until 2021.04	Mean return	Yearly Mean return	Std Dev of monthly return	Yearly std dev	Sharpe ratio	Min monthly return	Max monthly return
RAFI FI	1.14%	13.69%	7.06%	24.46%	13.77%	-27.80%	18.98%
Mkt + HML	1.44%	17.30%	6.81%	23.59%	18.69%	-27.90%	20.90%
Mkt + HML + SMB	1.27%	15.23%	6.57%	22.74%	16.76%	-27.87%	20.54%

Table 9 — comparison between EM RAFI FI and Fama market return + HML

Possible underperformance of RAFI FI in our comparison could be partially explained by liquidity adjustments made by RAFI. Also important to note, that RAFI FI is not making any short position in the index which we are using for comparison, whereas the F&F portfolio does this in each factor.

6.2 Comparison of different indexes and ETFs

To understand if fundamental indexing is better compared to the market-weighted indexing on the emerging markets, we first need to compare two indexes RAFI Fundamental Index and MSCI Emerging Markets. They are quite the same in the sense that both of them invest in large + mid-cap companies. But the definition of large + mid-cap companies is somewhat different - we already covered that question in Table 1 when we compared different index providers for market-cap indexes. In the RAFI methodology, they define the top of the 86% companies by cumulative fundamental weight, as a substitute for the large + mid-cap. In the MSCI methodology, they define the top 85% by cumulative market cap as the large + mid. Comparison of the indexes performance we can see in Table 10.

For all of the indexes, except RAFI — the index provider is MSCI. The beta and alpha have been calculated with the assumption of CAPM that MSCI EM Standard is an optimal market portfolio, even though it is maybe more accurate to consider IMI (Large+Mid+Small Cap) index as a market portfolio because the investment universe is bigger, but IMI index severely underperforms, so it is no sense to compare it with RAFI FI. We also have included a 5-factor portfolio to give a sense if that value premium from the F&F perspective is just one part of the other five factors identified by F&F. And we also have included equal sector weighting to show you the performance of another very old idea of weighting.

From 1999.01 until 2021.04	EM Standard (Large+Mid Cap)	RAFI Fundamental Index	MSCI EM Value	EM VALUE Weighted	EM IMI VALUE IMI	MSCI EM IMI GROWTH	EM GROWTH Standard	EM Equal Sector Weighted Standard	EM Diversified Multiple 5-Factor Standard
Mean return	0.98%	1.31%	0.95%	1.09%	0.97%	0.93%	1.01%	1.02%	1.22%
Yearly mean return	11.7%	15.8%	11.4%	13.1%	11.7%	11.2%	12.1%	12.3%	14.7%
Std dev	6.2%	6.7%	6.3%	6.6%	6.3%	6.5%	6.4%	5.7%	5.9%
Yearly std dev	21.6%	23.4%	21.8%	22.7%	21.8%	22.4%	22.0%	19.9%	20.4%
Sharpe ratio	13.5%	17.4%	12.8%	14.6%	13.3%	12.3%	13.7%	15.4%	18.4%
Max monthly return	17.1%	19.0%	18.0%	19.4%	18.7%	20.3%	16.7%	15.7%	16.4%
Min monthly return	-27.4%	-26.0%	-27.1%	-27.4%	-27.3%	-28.0%	-27.6%	-24.1%	-25.1%
Beta	1	1.054	0.994	1.035	0.994	1.024	1.007	0.914	0.914
Alpha	-	0.28%	-0.03%	0.08%	0.00%	-0.07%	0.02%	0.13%	0.33%
Yearly alpha	-	3.38%	-0.31%	0.97%	-0.01%	-0.81%	0.27%	1.53%	3.94%
p-value	-	0.33%	69.33%	25.24%	99.33%	29.33%	71.73%	0.14%	0.05%

Table 10 — Standard means (Large + mid-cap), if it is written "weighted" it means that the index has been constructed according to some weighting parameters (not just common market capitalization weighting).

The RAFI FI has a higher return, but at the same time it is accompanied by the higher risk if we look at the standard deviation for example (which is contradicts with Arnott findings but supports Miziolek & Zaremba findings) or other market measures of risk as Beta, but the alpha is still positive and highly significant. So, at the index level, RAFI FI is outperforming MSCI EM on a risk-return adjusted basis. As expected, the only significant alphas came from RAFI FI, Equal Sector weighted index and 5-factor index. It is interesting to note, that such performance for Fundamental Indexes is happening because of the weighting, not because of the value premium in its classical sense alone. We can see it in Table 4 and also in Figure 9 where we are showing the compounded total return of the MSCI value index with comparison to RAFI FI.

And even if we try to make them more comparable in methodological terms Figure 10 and Table 10, by comparing indexes only from one supplier (in our case MSCI) we would still see that Value weighting (from MSCI) outperforms classical value strategy with a significant margin (but the alpha is not significant in such case). Need to clarify that MSCI values indexes are constructed with the use of z-scores in which all stock universes are sorted according to growth and value factors, but for value weighting, the only thing which they do is reweight indexes with value factors, without the use of the market cap.

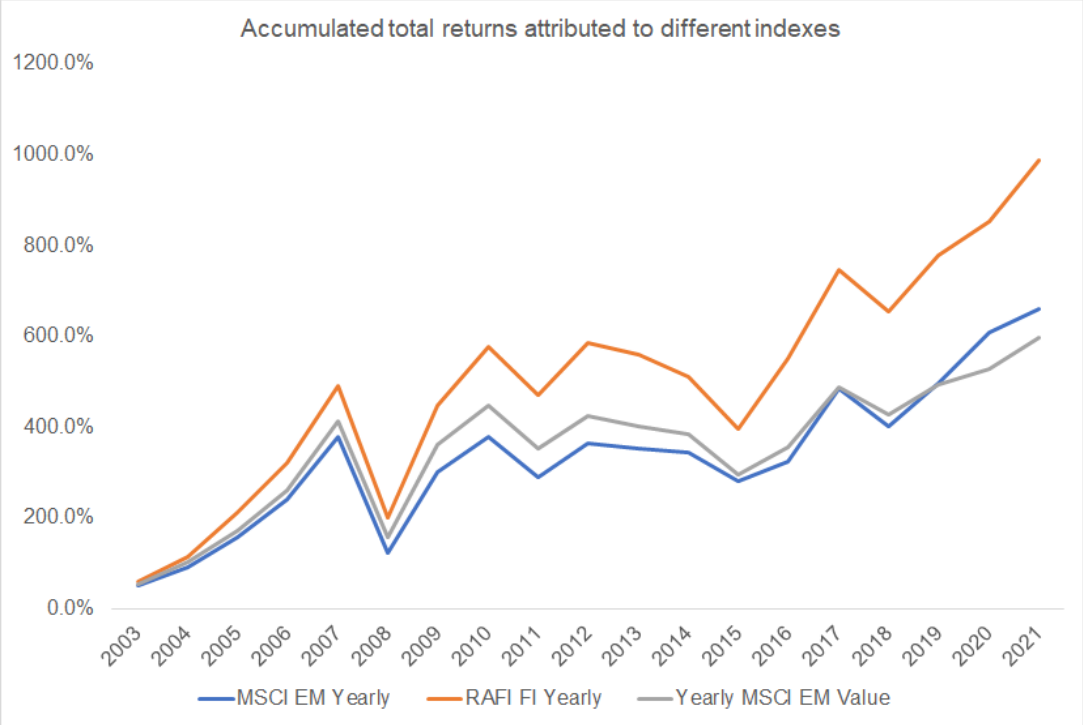


Figure 9 – Comparison of yearly accumulated total returns, between different indexes.

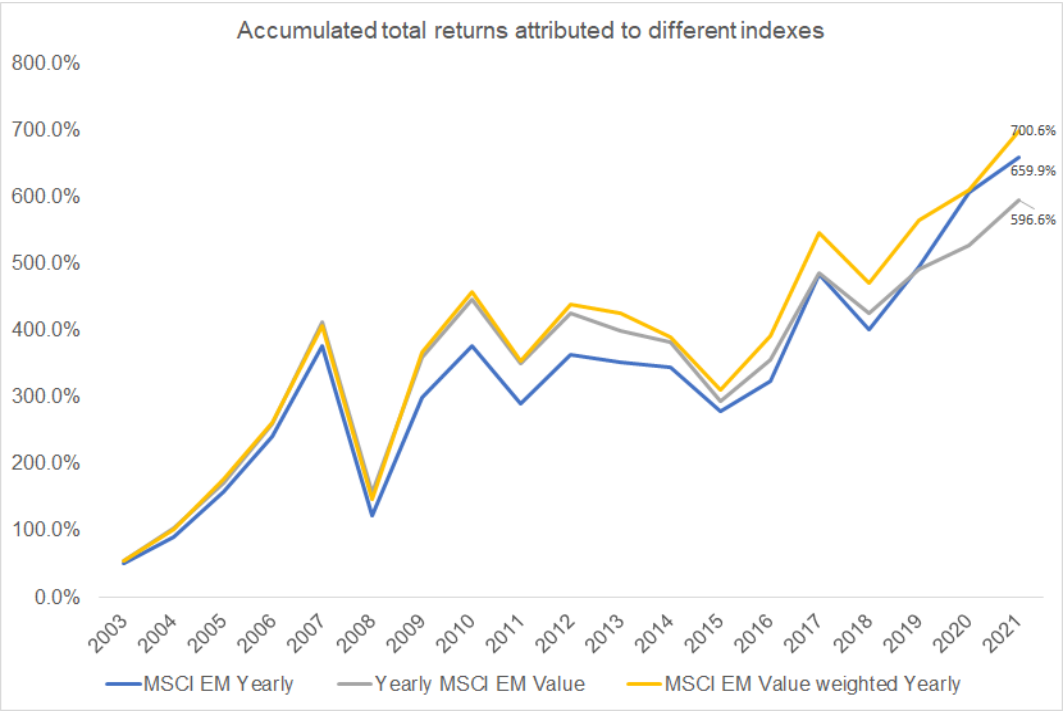


Figure 10 – Comparison of yearly accumulated total returns, between different indexes.

The problem with such comparison is that indexes are not investment vehicles and they do not count all expenses and turnover which is required by the strategy, so it would be fairer to compare the end-result performance of the ETFs which uses the indexes as the benchmarks. We have downloaded the total accumulated returns from Reuters Eikon from 01/02/2010 and until 05/31/2021, which we show in Figure 11 together with returns of the indexes.

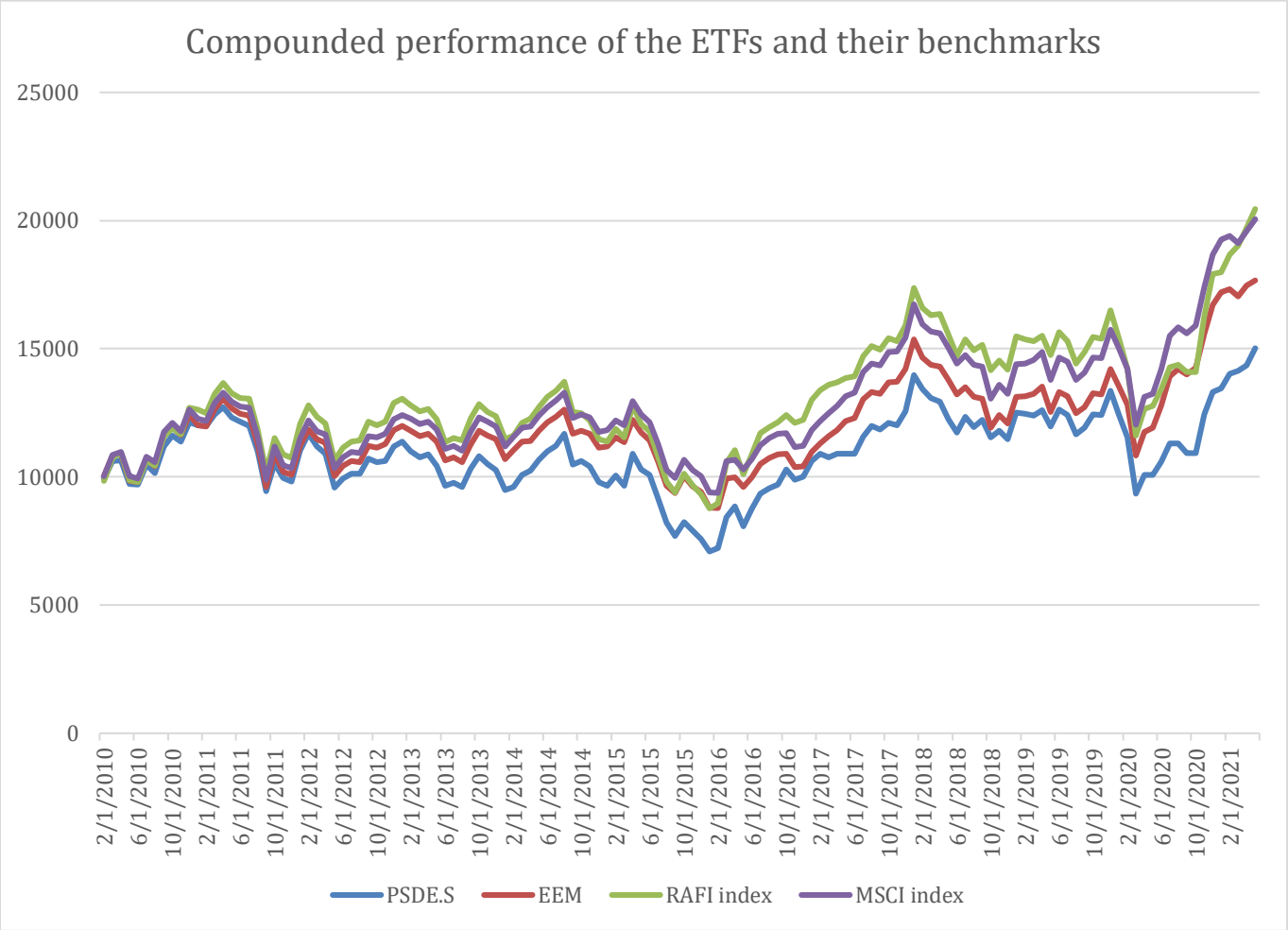


Figure 11

Then we have compared their performance in Table 11.

From 2010.02 until 2021.05	iShares MSCI EM ETF	Invesco FTSE RAFI EM UCITS ETF
Mean return	0.55%	0.46%
Yearly mean return	6.61%	5.56%
Std dev	5.14%	5.73%
Yearly std dev	17.8%	19.8%
Sharpe ratio	10.72%	8.09%
Max monthly return	13.43%	16.68%
Min monthly return	-15.42%	-18.91%
Beta	1	1.06
Yearly Alpha	-	-1.25%
Alpha	-	-0.0010
p-value	-	43.18%

Table 11

The return is lower for fundamental ETF, as well as the Sharpe Ratio. MSCI ETF has a higher risk-adjusted return compared to RAFI ETF. RAFI ETF has a negative alpha and the results are highly insignificant. We can also note by looking at Figure 11 that cumulative underperformance of RAFI index had happened just recently and mainly because of the Covid-19 crisis, the same effect we have seen while looking at the behavior of Fama & French value premium. But at the same time, if we look at the cumulative performance of RAFI ETF, we can see that it underperformed since its exception in 2010 which is also in line with Arnott et all (2019) and other researchers who observe that value underperforms in cumulative returns since 2007 crisis. This also could be partially explained by the amount of money invested in the strategy, as Fundamental ETFs need to be much more cost-efficient and to have a higher amount of money invested to lower their expense ratios. Also important to note, that the difference in performance between the RAFI index and RAFI ETF is very large.

6.3 Comparison of performance at the stock level data

The results of our indexes constructed from the stock level data are provided in Table 12 and Table 13. In the Appendix for the robustness check, we also report our results of the stock level indexes against MSCI EM and MSCI EM IMI to give a better sense of how our investment universes are different.

Interesting to note that the Revenue Index in line with Heng-Hsing Hsieh (2013) and Miziolek & Zaremba (2017) has outperformed other fundamentals by the mean return. But a little bit different in our case is that the Sharpe ratio has been the highest for the Dividend indexes.

The worst performance by Sharpe Ratio has been shown by Adj Cash Flow but this is because operating cash flow is not widely available in our developing market dataset; we are providing the results of Operating Cash Flow here only for robustness check. Also, interesting to note that almost all Fundamental Indexes have shown some positive Alpha with results being insignificant at 10% level only for BE, Net Income (which is surprising), and for Adj Cash Flow indexes.

From 04.2001 until 04.2021	Mean return	Yearly mean return	Std dev	Yearly Std dev	Sharpe ratio	Max monthly return	Min monthly return	Beta	Alpha	Yearly alpha	p-value
Market Cap index	1.2%	14.0%	5.0%	17.2%	21.4%	19.1%	-23.8%	1	-	-	-
Revenue Index	1.4%	16.7%	5.2%	17.9%	25.0%	15.0%	-25.1%	0.96	0.3%	3.3%	3.77%
Net Income Index	1.2%	15.0%	4.8%	16.7%	23.6%	17.2%	-25.5%	0.91	0.2%	2.3%	10.72%
BE Index	1.2%	14.7%	4.9%	16.9%	22.9%	15.2%	-23.1%	0.91	0.2%	2.0%	19.49%
Free Cash Flow	1.3%	15.7%	4.8%	16.6%	25.1%	16.2%	-21.5%	0.80	0.4%	4.4%	3.70%
Dividend index	1.3%	15.1%	4.4%	15.3%	26.0%	12.5%	-22.0%	0.83	0.3%	3.5%	0.83%
AdjRevenue index	1.4%	16.5%	4.9%	17.0%	25.8%	14.3%	-23.6%	0.91	0.3%	3.8%	1.65%
Adj Cash Flow	1.2%	14.2%	5.5%	19.1%	19.5%	23.2%	-20.2%	0.91	0.1%	1.4%	57.36%
Adj Cash Flow 2	1.3%	15.3%	4.8%	16.5%	24.6%	14.9%	-21.2%	0.87	0.3%	3.1%	5.18%
Composite index v1	1.3%	16.0%	5.0%	17.4%	24.4%	14.5%	-24.1%	0.94	0.2%	2.8%	5.91%
Composite index v2	1.3%	16.1%	5.0%	17.5%	24.4%	14.5%	-23.8%	0.94	0.2%	2.8%	5.76%
Composite index v3	1.3%	15.8%	5.0%	17.3%	24.3%	14.6%	-24.0%	0.94	0.2%	2.7%	6.49%
BE to ME (Book equity weighting)	1.9%	22.4%	6.0%	20.7%	29.3%	31.6%	-21.4%	0.91	0.8%	9.6%	0.24%
BE to ME (Market cap weighting)	2.4%	28.3%	7.0%	24.1%	32.4%	32.5%	-21.2%	1.06	1.1%	13.5%	0.03%

Table 12 — Composite v1 = Average (Revenue, Net Income After Tax, Book equity, Free Cash Flow, Dividends). Composite v2 = Average (Revenue, Free Cash Flow, Book equity, Dividends). Composite v3 = Average (Revenue, Net Income After Tax, Book Equity, Dividends).

For robustness check, we also report our self-constructed BE to ME portfolios, which are being constructed with ranking "Book Equity to Market Equity" and then being weighted with Book Equity, or with Market Cap (for this calculation Market Cap is being lagged by quarter, not by one month). We have not done any winsorizing of BE to ME before ranking, as doing "MSCI prime value" for example because we thought that winsorizing is not appliable for real investments. And we also did not adjust for trading costs, for the reason being explained in Research Design. Because of those two reasons, we advise treating such high results of BE to ME ranking with caution. A visual examination of the data also showed that the highest amount of monthly returns at the stock level in our data was being attributed to the BE to ME portfolio, probably because of the combination of different causes: not controlling for the penny stocks, not controlling for trading costs, non-winsorizing before ranking. And again, this problem is specific only for BE to ME ranking, because we have not done winsorizing. But for our main goal - to compare for the effectiveness of adjusted Book Equity this still should be enough.

The year in Table 13 starts from 2006 because we need to amortize the first five years of R&D to receive unbiased results for Adjusted Book Equity and for Composite Indexes which uses Adjusted Book Equity. This time also all fundamental indexes have shown positive alpha, but none of the fundamental indexes have shown significant alpha, even the Revenue index which is quite surprising. This could be attributed to the two main factors, the first one is that the main performance has already happened before 2006, and also to the fact that we just simply do not have enough data points, to calculate returns with the significant p-value. But important to note, that in the Appendix when comparing the results against

MSCI and MSCI IMI all alphas have been positive and significant, so the argument about not having enough data points is not good enough.

From 04.2006 until 04.2021	Mean return	Yearly mean return	Std dev	Yearly Std dev	Sharpe ratio	Max monthly return	Min monthly return	Beta	Alpha	Yearly alpha	p-value
Market Cap index	0.9%	11.2%	5.0%	17.5%	16.8%	19.1%	-23.8%	1	-	-	-
Revenue Index	1.0%	11.8%	5.1%	17.7%	17.6%	15.0%	-25.1%	0.94	0.1%	1.3%	47%
Net Income Index	0.8%	10.2%	4.9%	17.0%	15.6%	17.2%	-25.5%	0.90	0.0%	0.1%	93%
BE Index	0.9%	10.5%	4.9%	17.1%	15.9%	15.2%	-23.1%	0.90	0.0%	0.3%	84%
Free Cash Flow	0.9%	11.2%	4.7%	16.4%	17.8%	16.2%	-21.5%	0.84	0.1%	1.7%	37%
Dividend index	0.9%	10.9%	4.5%	15.7%	18.1%	12.5%	-22.0%	0.83	0.1%	1.6%	32%
AdjRevenue index	1.0%	11.6%	4.9%	16.8%	18.1%	14.3%	-23.6%	0.89	0.1%	1.6%	34%
Adj Cash Flow	1.0%	11.9%	5.0%	17.2%	18.1%	14.6%	-20.2%	0.81	0.2%	2.8%	28%
Adj Cash Flow 2	1.0%	11.8%	4.7%	16.4%	19.0%	14.9%	-21.2%	0.85	0.2%	2.3%	21%
AdjBE index v1	0.9%	10.5%	4.9%	17.1%	16.0%	15.1%	-23.1%	0.90	0.0%	0.4%	83%
AdjBE index v2	0.9%	10.5%	4.9%	17.1%	16.0%	15.1%	-23.1%	0.90	0.0%	0.4%	83%
Composite index v1	0.9%	11.1%	5.0%	17.3%	16.8%	14.5%	-24.1%	0.92	0.1%	0.8%	63%
Composite index v2	0.9%	11.3%	5.0%	17.4%	17.1%	14.5%	-23.8%	0.93	0.1%	0.9%	58%
Composite index v3	0.9%	11.2%	5.0%	17.3%	17.0%	14.6%	-24.0%	0.92	0.1%	0.9%	60%
Composite index v4	0.9%	10.8%	4.8%	16.8%	16.8%	14.4%	-22.7%	0.88	0.1%	0.9%	61%
Composite index v5	0.9%	10.8%	4.8%	16.8%	16.8%	14.4%	-22.8%	0.88	0.1%	0.9%	61%
Composite index v6	0.9%	10.7%	4.8%	16.8%	16.6%	14.7%	-23.1%	0.88	0.1%	0.8%	66%
Composite index v7	0.9%	10.9%	4.8%	16.8%	17.0%	14.4%	-22.7%	0.89	0.1%	1.0%	57%
Composite index v8	0.9%	10.9%	4.8%	16.8%	17.0%	14.4%	-22.7%	0.89	0.1%	0.9%	57%
Composite index v9	0.9%	10.8%	4.8%	16.8%	16.8%	14.7%	-23.0%	0.89	0.1%	0.8%	62%
BE to ME (Book equity weighting)	1.6%	19.3%	6.3%	21.8%	24.2%	31.6%	-21.4%	0.92	0.8%	9.0%	2%
BE to ME (Market cap weighting)	2.1%	24.6%	7.0%	24.2%	28.2%	32.5%	-21.2%	1.06	1.1%	12.8%	0%
Adjusted BE to ME (Book equity weighting)	1.6%	19.3%	6.3%	21.8%	24.2%	31.4%	-21.5%	0.92	0.7%	9.0%	2%
Adjusted BE to ME (Market cap weighting)	1.9%	23.3%	6.8%	23.5%	27.3%	32.2%	-21.2%	1.04	1.0%	11.7%	0%

Table 13 — Composite v4 = Average (Adj Revenue, Adj Book Equity v1, Adj Cash Flow, Dividends). Composite v5 = Average (Adj Revenue, Adj Book Equity v2, Adj Cash Flow, Dividends). Composite v6 = Average (Adj Revenue, Adj Book Equity v2, Adj Cash Flow, Dividends, Net Income After Tax). Composite_v7 = Average (AdjRevenue, Adj Book Equity v1, Adj Cash Flow v2, Dividends). Composite_v8 = Average (AdjRevenue, Adj Book Equity v2, Adj Cash Flow v2, Dividends). Composite_v9 = Average (AdjRevenue, Adj Book Equity v2, Adj Cash Flow v2, Dividends, Net Income After Tax). Adj BE = BE + amortization R&D payments. Adj BE v2 = BE + amortization R&D payments v2.

If we compare the difference between results in Table 12 and Table 13 we can see that results of the value premium are deteriorating, as well as the results of fundamental indexes. By looking at Table 13 to estimate the effect of adjusted book value on the performance, we can see that the performance of risk-adjusted return (nor at Sharpe Ratio nor Alpha) is significantly improving for any stand-alone fundamental value, or any Composite index or any BE to ME ranking. For the BE to ME the results at

Sharpe Ratio and Yearly Alpha even have deteriorated. Also, interesting to note, that even if we take 0.5% of the expense ratio from each yearly alpha of our indexes, most of the alphas will still remain positive the exceptions are the Book Equity indexes and Net Income index.

Because our results between MSCI EM and our market proxy have been very different, as well as the conclusions based on them - we have decided to additionally run MSCI EM and all our constructed indexes again five factors to understand the source of that outperformance. The results are in Table 14 and Table 15.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
VARIABLES	MSCI EM	MSCI EM IMI	Market Cap	Total Revenue	Net Income After Taxes	Total Equity	Free Cash Flow	Dividends	Adj Revenue	Adj Cash Flow	Adj Cash Flow2	Composite v1	Composite v2	Composite v3	BE to ME 1	BE to ME 2
Mkt	1.0105***	1.0185***	0.7477***	0.8076***	0.7499***	0.7548***	0.7045***	0.6645***	0.7796***	0.8556***	0.7735***	0.7839***	0.7868***	0.7858***	0.7026***	0.8439***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
SMB	-0.2218***	-0.1138***	-0.1637*	0.0705	-0.0877	-0.0710	-0.0795	0.0352	-0.0061	0.0939	-0.0540	-0.0142	-0.0027	-0.0111	0.1986	0.1538
	(0.0000)	(0.0000)	(0.0689)	(0.3520)	(0.1562)	(0.2665)	(0.3694)	(0.6299)	(0.9307)	(0.4485)	(0.3819)	(0.8388)	(0.9696)	(0.8671)	(0.1159)	(0.3191)
HML	-0.0070	-0.0076	-0.1417	0.1956**	0.1502**	0.1821**	0.2825***	0.2908***	0.1191	-0.2364*	0.0185	0.1727**	0.1682**	0.1751**	0.6273***	0.6923***
	(0.6880)	(0.6240)	(0.1599)	(0.0219)	(0.0307)	(0.0114)	(0.0048)	(0.0005)	(0.1330)	(0.0897)	(0.7887)	(0.0284)	(0.0380)	(0.0192)	(0.0000)	(0.0001)
RMW	0.0523**	0.0282	-0.0735	0.1720	0.1502*	-0.0531	0.3229**	0.1542	0.1014	0.2696	0.2078**	0.0908	0.0813	0.0797	-0.5275***	-0.3360
	(0.0199)	(0.1596)	(0.5702)	(0.1162)	(0.0926)	(0.5640)	(0.0120)	(0.1442)	(0.3195)	(0.1323)	(0.0204)	(0.3684)	(0.4337)	(0.4052)	(0.0040)	(0.1319)
CMA	-0.0184	-0.0174	0.0232	0.0047	-0.1189	0.0505	-0.0289	0.0112	0.0838	0.2877*	0.0315	0.0182	0.0293	0.0290	-0.4045**	-0.3319
	(0.3918)	(0.3652)	(0.8520)	(0.9639)	(0.1659)	(0.5681)	(0.8136)	(0.9119)	(0.3922)	(0.0952)	(0.7128)	(0.8508)	(0.7691)	(0.7528)	(0.0214)	(0.1218)
RF	1.2181***	1.0486***	0.9371	1.1950	1.1625	0.1083	1.1515	0.9985	0.6159	-0.8187	0.3396	0.7374	0.7088	0.7565	-2.5408	-1.6969
	(0.0000)	(0.0000)	(0.4104)	(0.2140)	(0.1384)	(0.8935)	(0.3054)	(0.2815)	(0.4912)	(0.6024)	(0.6644)	(0.4059)	(0.4375)	(0.3686)	(0.1127)	(0.3859)
Constant	-0.0008**	-0.0006*	0.0045**	0.0035**	0.0031**	0.0038***	0.0029	0.0031*	0.0046***	0.0049*	0.0045***	0.0038**	0.0039**	0.0036**	0.0126***	0.0144***
	(0.0255)	(0.0525)	(0.0231)	(0.0362)	(0.0204)	(0.0072)	(0.1381)	(0.0518)	(0.0030)	(0.0688)	(0.0010)	(0.0139)	(0.0139)	(0.0128)	(0.0000)	(0.0000)
Observations	241	241	241	241	241	241	241	241	241	241	241	241	241	241	241	241
R-squared	0.9963	0.9970	0.8106	0.8749	0.9054	0.9009	0.8011	0.8418	0.8807	0.7079	0.9025	0.8873	0.8818	0.8979	0.7434	0.7147
pval in parentheses																
*** p<0.01, ** p<0.05, * p<0.1																

Table 14

Most of the fundamental indexes significantly overweight the value premium factor, taking excess value risk, but still for most of the fundamental indexes the alphas are positive and significant. For our market proxy, the alpha is also significant and higher compared to the alphas of MSCI EM and MSCI IMI, we can

see that our larger investment universe proposes additional diversification benefits compare to the investment universe of MSCI EM or EM IMI. Some fundamentals like Free Cash Flow attribute part of their performance to the RMW factor (Robust minus weak), but in that case the fundamental the does not generate any significant alpha. Adjusted Cash Flow v2 (Free Cash Flow + R&D) has higher R-squared compared to the Free Cash Flow, with the same attribution part of the performance to RMW and significant alpha. This does not quite hold for the data which starts from 2006, because Free Cash Flow stops to have attribution to the RMW. Also, very interesting is the performance of the BE to ME indexes. They both take very high exposures to the Value Factor (we can even call it deep value in some sense because even compared to the fundamentals the exposure is quite big), but despite this fact, the alpha is still big and highly significant. Very important to note that most of the fundamentals do not have significant alpha, compared to their own market proxy in Table 12 and 13, which means that Fundamental Indexes do not outperform the benchmark in their own investment universe. Similar results we have in Table 15 and Table 16 after controlling for five factors, very small number of alphas from fundamental indexes are higher that alpha of market cap proxy index.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
VAR	MSCI EM	MSCI EM IMI	Market Cap	Total Revenue	Net Income After Taxes	Total Equity	Free Cash Flow	Dividends	Adj Revenue	Adj Cash Flow	Adj Cash Flow 2	True Book Value v1	True Book Value v2	Com v1	Com v2	Com v3	Com v4	Com v5	Com v6	Com v7	Com v8	Com v9	BE to ME 1	BE to ME 2	adj BE to ME 1	adj BE to ME 2
Mkt	1.00***	1.01***	0.76***	0.76***	0.75***	0.74***	0.76***	0.67***	0.74***	0.72***	0.76***	0.74***	0.74***	0.74***	0.74***	0.75***	0.74***	0.74***	0.74***	0.74***	0.74***	0.74***	0.65***	0.78***	0.65***	0.79***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SMB	-0.24***	-0.13***	-0.15	0.10	-0.06	-0.03	0.02	0.05	0.05	0.16	0.01	-0.03	-0.03	0.02	0.03	0.02	0.00	0.00	-0.00	-0.02	-0.02	-0.02	0.28*	0.18	0.28*	0.18
	(0.00)	(0.00)	(0.17)	(0.23)	(0.36)	(0.63)	(0.76)	(0.54)	(0.47)	(0.18)	(0.92)	(0.62)	(0.62)	(0.80)	(0.67)	(0.73)	(0.96)	(0.96)	(0.95)	(0.79)	(0.79)	(0.71)	(0.05)	(0.28)	(0.05)	(0.27)
HML	0.01	0.00	-0.21	0.28***	0.09	0.26***	0.02	0.24**	0.18**	0.17	0.01	0.26***	0.26***	0.26***	0.27***	0.26***	0.20**	0.20**	0.18**	0.21**	0.21**	0.20**	0.75***	0.78***	0.75***	0.67***
	(0.70)	(0.84)	(0.13)	(0.01)	(0.30)	(0.00)	(0.77)	(0.03)	(0.05)	(0.28)	(0.91)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.04)	(0.01)	(0.01)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)
RMW	0.06***	0.04	-0.01	0.11	0.13	-0.00	0.11	0.14	0.08	0.30	0.17*	0.00	0.00	0.10	0.09	0.08	0.05	0.05	0.06	0.05	0.05	0.06	-0.68***	-0.45*	-0.68***	-0.48*
	(0.01)	(0.11)	(0.94)	(0.38)	(0.22)	(0.98)	(0.22)	(0.30)	(0.50)	(0.11)	(0.07)	(0.99)	(0.99)	(0.42)	(0.46)	(0.50)	(0.61)	(0.61)	(0.56)	(0.63)	(0.63)	(0.58)	(0.00)	(0.08)	(0.00)	(0.05)
CMA	-0.05**	-0.04*	0.08	-0.08	-0.09	-0.02	0.02	0.03	0.02	0.12	0.01	-0.01	-0.01	-0.07	-0.07	-0.05	0.02	0.02	0.02	0.00	0.00	0.00	-0.55**	-0.44*	-0.54**	-0.34
	(0.02)	(0.06)	(0.63)	(0.52)	(0.37)	(0.88)	(0.82)	(0.80)	(0.83)	(0.50)	(0.92)	(0.88)	(0.88)	(0.56)	(0.55)	(0.66)	(0.83)	(0.84)	(0.86)	(0.99)	(0.99)	(1.00)	(0.01)	(0.07)	(0.01)	(0.15)
RF	1.10***	1.04***	1.44	1.05	0.95	0.39	0.27	1.11	0.61	-1.16	-0.07	0.39	0.39	0.68	0.68	0.75	0.46	0.46	0.53	0.36	0.36	0.45	-3.19*	-2.09	-3.16*	-1.46
	(0.00)	(0.00)	(0.30)	(0.32)	(0.29)	(0.64)	(0.71)	(0.31)	(0.51)	(0.45)	(0.93)	(0.64)	(0.64)	(0.49)	(0.50)	(0.42)	(0.59)	(0.59)	(0.53)	(0.66)	(0.66)	(0.59)	(0.09)	(0.32)	(0.09)	(0.48)
Alpha	-0.0006*	-0.0005	0.0035	0.0029*	0.0022	0.0026*	0.0036***	0.0025	0.0033**	0.0046*	0.0043***	0.0026**	0.0026**	0.0028*	0.0029*	0.0028*	0.0028**	0.0028**	0.0027*	0.0030**	0.0030**	0.0029**	0.0146***	0.0165***	0.0146***	0.0150***
	(0.06)	(0.10)	(0.12)	(0.09)	(0.13)	(0.05)	(0.00)	(0.15)	(0.03)	(0.06)	(0.00)	(0.05)	(0.05)	(0.08)	(0.07)	(0.06)	(0.05)	(0.05)	(0.05)	(0.02)	(0.02)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)
Obs	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181
R-sq	1.00	1.00	0.79	0.88	0.91	0.92	0.93	0.84	0.90	0.74	0.93	0.92	0.92	0.89	0.89	0.90	0.91	0.91	0.91	0.92	0.92	0.92	0.75	0.75	0.75	0.75
pval in parentheses																										
*** p<0.01, ** p<0.05, * p<0.1																										

Table 15

If we look at the dataset from the 2006 year, we can see that this time Market Cap Proxy does not have significant alpha, but even if we consider it significant only Free Cash Flow, Adj Revenue, Adj Cash Flow 2 have higher and significant alpha compare to this insignificant alpha of market proxy index. Also, important to note that if we will compare the alpha of MSCI EM and MSCI EM IMI – with Market Cap Proxy we still can see an effect of the difference in the investment universe after controlling for F&F five factors. Most of the fundamental indexes still have high exposure to the HML factor, but still, almost all of them show significant alpha, but again this difference still could be attributed to the difference in investment universe which we have compared to the F&F factors universe. It is also interesting to look at BE to ME index, most of them have very high exposure to the value factor, and this time most also show significant negative exposure to the RMW and CMA (Conservative minus aggressive) factors, so the main companies which BE to ME choose to invest are making aggressive investments, have weak (non-robust) operating performance and very undervalued by the market (HML factor), but even though the alpha is still quite high. But again, we advise to treat such results for BE to ME indexes with cautious because we did not control for trading costs.

When we look at the performance of the internally developed intangibles in explaining total returns after the five-factor model, we cannot see any significant difference between nor fundamentals, nor composite portfolios, nor BE to ME indexes. For the BE to ME indexes the alpha is even worse than it was without adjustment for internally developed intangibles. The R^2 also is not increasing after the inclusion of internally developed intangibles.

7 Conclusion

First, we have found the existence of a value premium in the developing markets, and we also have found that due to the Covid crisis value premium has severely underperformed in the recent year as it was during crises in 2000 and 2008. Our first hypothesis has been confirmed. We have "a feeling" based on what we have seen after each crisis that the value premium will come back to show a positive return after the Covid crisis, at least in the next year at the index level.

Second, we have found that the fundamental index does not outperform the Fama French market return + HML factor even though their returns are highly correlated and their behavior is somewhat similar during crises. We also have found that the Fama French 5 factor index possesses a superior risk-adjusted return compared to the fundamental indexes and the market-cap-weighted indexes. Our second hypothesis has been rejected.

Third, we have found that fundamental ETFs have been performing worse than market-cap-weighted ETF during the whole period since exception, especially when the Covid crisis has hit. During the Covid crisis, many value companies have fallen much more sharply than growth companies and because of that, cumulative returns for the fundamental indexes have become even worse than it was before compared with market-cap-weighted indexes. It is important to understand because in the research field the average return is typically used as the main measure of performance comparison, but in reality, what people get is a cumulative return. (Because stocks are following geometric Brownian motion). We have a feeling that a fundamental ETF will likely outperform the market-cap-weighted ETF only if the expenses ratio will become much lower for the realization of such strategy. Our third hypothesis has been rejected.

Fourth, adjustments to the book equity which have been made with the use of internally developed intangibles have not produced any significant results different from the case when we did not capitalize internally developed intangibles, and even if there were some differences most of them were with the lower risk-adjusted return. Our fourth hypothesis has been confirmed. The reason for such results is mainly because of the limited data availability about R&D which makes capitalization very noisy and also because companies actually can capitalize some intangibles if recognition criteria are met in accounting standards, which are again typically ignored by corporate finance practitioners. Another reason for such results is that it is very hard to estimate the value of internally developed intangibles by being in the position of a non-insider.

We have contributed to the literature about value investing mainly by investigating the behavior and performance of value premium and fundamental indexing on developing markets. We also have contributed to the block of literature about developing market: Miziolek & Zaremba (2017), Yulong Yang (2019), Heng-Hsing Hsieh (2013), Walkshäusl and Lobe (2010) by investigating the existence of value premium, with the use of newer data until 2021.04, and by investigating the possibility of using fundamental indexing in emerging markets after controlling for possible trading costs (at the index level data) and by adjusting book equity and testing on significance with the use of internally developed intangibles in returns (at the stock level data).

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Numbeo website: Country price ranking

Appendix

From 04.2001 until 04.2021	Mean return	Yearly mean return	Std dev	Yearly Std dev	Sharpe ratio	Max monthly return	Min monthly return	Beta	Alpha	Yearly alpha	p-value
MSCI EM	1.0%	12.3%	6.1%	21.1%	15.0%	17.1%	-27.4%	1	-	-	-
Market Cap proxy index	1.2%	14.0%	5.0%	17.2%	21.4%	19.1%	-23.8%	0.73	0.4%	5.0%	0.3%
Revenue Index	1.4%	16.7%	5.2%	17.9%	25.0%	15.0%	-25.1%	0.78	0.6%	7.1%	0.0%
Net Income Index	1.2%	15.0%	4.8%	16.7%	23.6%	17.2%	-25.5%	0.75	0.5%	5.8%	0.0%
BE Index	1.2%	14.7%	4.9%	16.9%	22.9%	15.2%	-23.1%	0.75	0.5%	5.4%	0.0%
Free Cash Flow	1.3%	15.7%	4.8%	16.6%	25.1%	16.2%	-21.5%	0.70	0.6%	7.1%	0.0%
Dividend index	1.3%	15.1%	4.4%	15.3%	26.0%	12.5%	-22.0%	0.66	0.6%	7.0%	0.0%
AdjRevenue index	1.4%	16.5%	4.9%	17.0%	25.8%	14.3%	-23.6%	0.75	0.6%	7.3%	0.0%
Adj Cash Flow	1.2%	14.2%	5.5%	19.1%	19.5%	23.2%	-20.2%	0.75	0.4%	5.0%	4.0%
Adj Cash Flow 2	1.3%	15.3%	4.8%	16.5%	24.6%	14.9%	-21.2%	0.74	0.5%	6.2%	0.0%
Composite index v1	1.3%	16.0%	5.0%	17.4%	24.4%	14.5%	-24.1%	0.77	0.5%	6.5%	0.0%
Composite index v2	1.3%	16.1%	5.0%	17.5%	24.4%	14.5%	-23.8%	0.77	0.5%	6.6%	0.0%
Composite index v3	1.3%	15.8%	5.0%	17.3%	24.3%	14.6%	-24.0%	0.77	0.5%	6.4%	0.0%
BE to ME (Book equity weighting)	1.9%	22.4%	6.0%	20.7%	29.3%	31.6%	-21.4%	0.81	1.0%	12.5%	0.0%
BE to ME (Market cap weighting)	2.4%	28.3%	7.0%	24.1%	32.4%	32.5%	-21.2%	0.94	1.4%	16.8%	0.0%

Table 16 – Results of regressing our indexes against MSCI EM Standard (Large + Mid Cap)

From 04.2001 until 04.2021	Mean return	Yearly mean return	Std dev	Yearly Std dev	Sharpe ratio	Max monthly return	Min monthly return	Beta	Alpha	Yearly alpha	p-value
MSCI EM IMI	1.0%	12.3%	6.1%	21.2%	15.0%	17.8%	-27.7%	1	-	-	-
Market Cap proxy index	1.2%	14.0%	5.0%	17.2%	21.4%	19.1%	-23.8%	0.73	0.4%	5.0%	0.3%
Revenue Index	1.4%	16.7%	5.2%	17.9%	25.0%	15.0%	-25.1%	0.79	0.6%	7.1%	0.0%
Net Income Index	1.2%	15.0%	4.8%	16.7%	23.6%	17.2%	-25.5%	0.75	0.5%	5.8%	0.0%
BE Index	1.2%	14.7%	4.9%	16.9%	22.9%	15.2%	-23.1%	0.75	0.4%	5.4%	0.0%
Free Cash Flow	1.3%	15.7%	4.8%	16.6%	25.1%	16.2%	-21.5%	0.69	0.6%	7.1%	0.0%
Dividend index	1.3%	15.1%	4.4%	15.3%	26.0%	12.5%	-22.0%	0.66	0.6%	7.0%	0.0%
AdjRevenue index	1.4%	16.5%	4.9%	17.0%	25.8%	14.3%	-23.6%	0.75	0.6%	7.3%	0.0%
Adj Cash Flow	1.2%	14.2%	5.5%	19.1%	19.5%	23.2%	-20.2%	0.76	0.4%	4.9%	3.9%
Adj Cash Flow 2	1.3%	15.3%	4.8%	16.5%	24.6%	14.9%	-21.2%	0.74	0.5%	6.2%	0.0%
Composite index v1	1.3%	16.0%	5.0%	17.4%	24.4%	14.5%	-24.1%	0.77	0.5%	6.5%	0.0%
Composite index v2	1.3%	16.1%	5.0%	17.5%	24.4%	14.5%	-23.8%	0.77	0.5%	6.6%	0.0%
Composite index v3	1.3%	15.8%	5.0%	17.3%	24.3%	14.6%	-24.0%	0.77	0.5%	6.3%	0.0%
BE to ME (Book equity weighting)	1.9%	22.4%	6.0%	20.7%	29.3%	31.6%	-21.4%	0.81	1.0%	12.4%	0.0%
BE to ME (Market cap weighting)	2.4%	28.3%	7.0%	24.1%	32.4%	32.5%	-21.2%	0.94	1.4%	16.8%	0.0%

Table 17 – Results of regressing our indexes against MSCI EM IMI (Large + Mid + Small Cap)

From 04.2006 until 04.2021	Mean return	Yearly mean return	Std dev	Yearly Std dev	Sharpe ratio	Max monthly return	Min monthly return	Beta	Alpha	Yearly alpha	p-value
MSCI EM	0.7%	8.6%	6.2%	21.5%	10.2%	17.1%	-27.4%	1	-	-	-
Market Cap proxy index	0.9%	11.2%	5.0%	17.5%	16.8%	19.1%	-23.8%	0.72	0.4%	5.0%	1.6%
Revenue Index	1.0%	11.8%	5.1%	17.7%	17.6%	15.0%	-25.1%	0.77	0.4%	5.2%	0.2%
Net Income Index	0.8%	10.2%	4.9%	17.0%	15.6%	17.2%	-25.5%	0.75	0.3%	3.7%	0.8%
BE Index	0.9%	10.5%	4.9%	17.1%	15.9%	15.2%	-23.1%	0.76	0.3%	3.9%	0.4%
Free Cash Flow	0.9%	11.2%	4.7%	16.4%	17.8%	16.2%	-21.5%	0.73	0.4%	4.8%	0.0%
Dividend index	0.9%	10.9%	4.5%	15.7%	18.1%	12.5%	-22.0%	0.67	0.4%	5.2%	0.3%
AdjRevenue index	1.0%	11.6%	4.9%	16.8%	18.1%	14.3%	-23.6%	0.74	0.4%	5.2%	0.0%
Adj Cash Flow	1.0%	11.9%	5.0%	17.2%	18.1%	14.6%	-20.2%	0.68	0.5%	6.0%	1.3%
Adj Cash Flow 2	1.0%	11.8%	4.7%	16.4%	19.0%	14.9%	-21.2%	0.73	0.5%	5.5%	0.0%
AdjBE index v1	0.9%	10.5%	4.9%	17.1%	16.0%	15.1%	-23.1%	0.76	0.3%	4.0%	0.3%
AdjBE index v2	0.9%	10.5%	4.9%	17.1%	16.0%	15.1%	-23.1%	0.76	0.3%	4.0%	0.4%
Composite index v1	0.9%	11.1%	5.0%	17.3%	16.8%	14.5%	-24.1%	0.76	0.4%	4.6%	0.3%
Composite index v2	0.9%	11.3%	5.0%	17.4%	17.1%	14.5%	-23.8%	0.76	0.4%	4.8%	0.3%
Composite index v3	0.9%	11.2%	5.0%	17.3%	17.0%	14.6%	-24.0%	0.76	0.4%	4.6%	0.2%
Composite index v4	0.9%	10.8%	4.8%	16.8%	16.8%	14.4%	-22.7%	0.74	0.4%	4.4%	0.2%
Composite index v5	0.9%	10.8%	4.8%	16.8%	16.8%	14.4%	-22.8%	0.74	0.4%	4.4%	0.2%
Composite index v6	0.9%	10.7%	4.8%	16.8%	16.6%	14.7%	-23.1%	0.74	0.4%	4.3%	0.2%
Composite index v7	0.9%	10.9%	4.8%	16.8%	17.0%	14.4%	-22.7%	0.74	0.4%	4.5%	0.1%
Composite index v8	0.9%	10.9%	4.8%	16.8%	17.0%	14.4%	-22.7%	0.74	0.4%	4.5%	0.1%
Composite index v9	0.9%	10.8%	4.8%	16.8%	16.8%	14.7%	-23.0%	0.74	0.4%	4.4%	0.1%
BE to ME (Book equity weighting)	1.6%	19.3%	6.3%	21.8%	24.2%	31.6%	-21.4%	0.83	1.0%	12.2%	0.0%
BE to ME (Market cap weighting)	2.1%	24.6%	7.0%	24.2%	28.2%	32.5%	-21.2%	0.94	1.4%	16.6%	0.0%
Adjasted BE to ME (Book equity weighting)	1.6%	19.3%	6.3%	21.8%	24.2%	31.4%	-21.5%	0.83	1.0%	12.2%	0.0%
Adjasted BE to ME (Market cap weighting)	1.9%	23.3%	6.8%	23.5%	27.3%	32.2%	-21.2%	0.91	1.3%	15.4%	0.0%

Table 18 – Results of regressing our indexes against MSCI EM Standard (Large + Mid Cap)

From 04.2006 until 04.2021	Mean return	Yearly mean return	Std dev	Yearly Std dev	Sharpe ratio	Max monthly return	Min monthly return	Beta	Alpha	Yearly alpha	p-value
MSCI EM IMI	0.7%	8.8%	6.2%	21.6%	10.3%	17.8%	-27.7%	1	-	-	-
Market Cap proxy index	0.9%	11.2%	5.0%	17.5%	16.8%	19.1%	-23.8%	0.72	0.4%	4.9%	1.8%
Revenue Index	1.0%	11.8%	5.1%	17.7%	17.6%	15.0%	-25.1%	0.77	0.4%	5.1%	0.2%
Net Income Index	0.8%	10.2%	4.9%	17.0%	15.6%	17.2%	-25.5%	0.75	0.3%	3.6%	0.9%
BE Index	0.9%	10.5%	4.9%	17.1%	15.9%	15.2%	-23.1%	0.75	0.3%	3.8%	0.4%
Free Cash Flow	0.9%	11.2%	4.7%	16.4%	17.8%	16.2%	-21.5%	0.73	0.4%	4.7%	0.0%
Dividend index	0.9%	10.9%	4.5%	15.7%	18.1%	12.5%	-22.0%	0.66	0.4%	5.1%	0.3%
AdjRevenue index	1.0%	11.6%	4.9%	16.8%	18.1%	14.3%	-23.6%	0.74	0.4%	5.1%	0.0%
Adj Cash Flow	1.0%	11.9%	5.0%	17.2%	18.1%	14.6%	-20.2%	0.68	0.5%	5.9%	1.3%
Adj Cash Flow 2	1.0%	11.8%	4.7%	16.4%	19.0%	14.9%	-21.2%	0.73	0.5%	5.4%	0.0%
AdjBE index v1	0.9%	10.5%	4.9%	17.1%	16.0%	15.1%	-23.1%	0.75	0.3%	3.9%	0.3%
AdjBE index v2	0.9%	10.5%	4.9%	17.1%	16.0%	15.1%	-23.1%	0.75	0.3%	3.9%	0.3%
Composite index v1	0.9%	11.1%	5.0%	17.3%	16.8%	14.5%	-24.1%	0.76	0.4%	4.5%	0.3%
Composite index v2	0.9%	11.3%	5.0%	17.4%	17.1%	14.5%	-23.8%	0.75	0.4%	4.7%	0.3%
Composite index v3	0.9%	11.2%	5.0%	17.3%	17.0%	14.6%	-24.0%	0.76	0.4%	4.5%	0.2%
Composite index v4	0.9%	10.8%	4.8%	16.8%	16.8%	14.4%	-22.7%	0.74	0.4%	4.3%	0.2%
Composite index v5	0.9%	10.8%	4.8%	16.8%	16.8%	14.4%	-22.8%	0.74	0.4%	4.3%	0.2%
Composite index v6	0.9%	10.7%	4.8%	16.8%	16.6%	14.7%	-23.1%	0.74	0.3%	4.2%	0.2%
Composite index v7	0.9%	10.9%	4.8%	16.8%	17.0%	14.4%	-22.7%	0.74	0.4%	4.4%	0.1%
Composite index v8	0.9%	10.9%	4.8%	16.8%	17.0%	14.4%	-22.7%	0.74	0.4%	4.4%	0.1%
Composite index v9	0.9%	10.8%	4.8%	16.8%	16.8%	14.7%	-23.0%	0.74	0.4%	4.3%	0.1%
BE to ME (Book equity weighting)	1.6%	19.3%	6.3%	21.8%	24.2%	31.6%	-21.4%	0.83	1.0%	12.1%	0.0%
BE to ME (Market cap weighting)	2.1%	24.6%	7.0%	24.2%	28.2%	32.5%	-21.2%	0.94	1.4%	16.4%	0.0%
Adjasted BE to ME (Book equity weighting)	1.6%	19.3%	6.3%	21.8%	24.2%	31.4%	-21.5%	0.83	1.0%	12.0%	0.0%
Adjasted BE to ME (Market cap weighting)	1.9%	23.3%	6.8%	23.5%	27.3%	32.2%	-21.2%	0.92	1.3%	15.2%	0.0%

Table 19 – Results of regressing our indexes against MSCI EM IMI (Large + Mid + Small Cap)

List of countries in the "countries issued" filter from Reuters Eikon, which we have used in our end dataset:

India, Vietnam, China (Mainland), South Korea, Hong Kong, Taiwan, Israel, Singapore, Malaysia, Thailand, Indonesia, Philippines, Russia, Pakistan, Poland, Ukraine, Cyprus, Lithuania, Estonia, Brazil, Turkey, Costa Rica, Colombia, Czech Republic, South Africa, Mexico, Peru, Hungary, Bulgaria, Tanzania, Latvia, Kazakhstan, Montenegro, Romania, Egypt, Bolivia, Serbia, Bosnia and Herzegovina, Saudi Arabia, Bangladesh, Sri Lanka, Malta, Mauritius, Chile, Jordan, Togo, Panama, Uruguay, Georgia, Azerbaijan, Ivory Coast, Senegal, Slovakia, Kuwait, Qatar, Oman, Morocco, Kenya, North Macedonia, Bahrain, Slovenia, Tunisia, Croatia, Ghana, Botswana, Namibia, Burkina Faso, Benin, Niger, Iraq, Uganda, Malawi, Ecuador.