TALLINN UNIVERSITY OF TECHNOLOGY
School of Business and Governance
Department of Economics and Finance

Aleksi Salonen

Russell 3000 index's reconstitution event: correlation between liquidity and return

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Supervisor: Kalle Ahi, MA

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Aleksi Salonen ……………………………
(signature, date)
Student code: 166386TVTB
Student e-mail address: salonen.aleksi.as@gmail.com

Supervisor: Kalle Ahi:
The paper conforms to requirements in force

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ABSTRACT

Considerable attention has been drawn to index tracking funds ever since their popularity started to increase with a high speed from the early 21st century. Index tracking funds such as passive ETFs and passive mutual funds offer low cost products but rarely they have been criticised by their investment strategy. The reconstitution effect is a well studied topic but there is a common understanding of its diminishing trend. With very few studies derived from data only after 2010, hardly any capture up-to-date results. This paper empirically investigates the possible costs to these funds from their investment strategy. Furthermore, we study if the price pressure at the reconstitution event through change of trading volume is a reason to the performance of these funds. We find a little significance in the positive change in volume-return correlation. Yet, we find a major cost to index tracking funds rebalancing their portfolios close to reconstitution date.

Keywords: Russell 3000, index premium, liquidity, reconstitution effect

INTRODUCTION

Index tracking funds have gained a strong position amongst investment products. Access to readily diversified portfolios gaining market returns is convenient for investors without the knowledge or time to make more detailed investment decisions. Exchange traded funds' (ETFs') and mutual index funds' cost structure attract capital from all market participants providing diversified portfolio with relatively low costs. Buying index tracking fund, you pay one transaction fee instead of buying separately every underlying asset and therefore, gain cost efficiency, despite small manager fees typical to funds. The advantage for a single investor is that they pay transaction costs when purchasing ETF or Mutual index fund. Although, when these funds adjust their portfolios, there will be transaction costs but buying in bulk lowers the cost per investor.

The perks of previously described funds have been noted by the investors. In 2017, there were $8 trillion invested into passively managed funds. To put this into context, it counts for approximately 20% of all invested funds whereas, 10 years prior the share was only 8%. From the $8 trillion, half is US equity funds, where it counts 43% of the total US equity funds (Sushko et al. 2018).

Index reconstitution event is especially fruitful venue to observe the market efficiency. Furthermore, the Russell 3000 index reconstitution allows to study different characteristics' effects on the implied abnormal returns at the event of inclusion/exclusion, as the added stocks are not previously listed in major indexes. Index tracking funds have relatively large ownerships in their underlying assets, which means that the inclusion event will create a significant demand shock on the markets for the stocks added.

The study aims to find possible correlation between initial liquidity and implied abnormal returns at the reconstitution of Russell 3000 index within a timeframe of 2016-2018. We will be studying short term effects in both, inclusion and exclusion events. For liquidity measure the daily stock turnover is used whereas, for changes in asset pricing we will be making estimations for each stock based on their historical performance and matching that benchmark against implied returns at the event of reconstitution.

The particular index is chosen for a few reasons: Firstly, easily accessible data, Russell publishes the constitution and reconstitution lists from the 3000 index annually. Secondly, unlike many other major indexes, the universe where new stocks are picked from or dropped to, consists of no widely followed indexes which results as less liquidity providers in the event of reconstitution. That is, for example, when a stock is added to Russell 1000, it almost always moves from Russell 2000 to Russell 1000 index (unless the event of IPO) which creates a large supply for the shares at the moment of index funds' adjustment time window.

The first chapter, theoretical overview, is divided into four subchapters to cover build a theoretical framework for our research. The first two subchapters cover two main modern asset pricing literature subjects, market efficiency and asset pricing theories. Third subchapter will discuss liquidity which is an objective of this study together with price movements and in the last part of first chapter we will derive these theories into reconstitution effect and cover previous researches that focuses on the topic of this paper. Second chapter introduces data and methodology. In the beginning, we shortly discuss the main objectives in the Russell reconstitution policy and move on to our sample data. Lastly, we introduce the methodologies used in the research. Third chapter covers empirical results which are discussed further in the second subchapter.

1. THEORETICAL OVERVIEW

Index tracking fund’s manager’s performance is being measured by tracking error. That is, the difference between the objective index’s return and funds return. The paradigm for the investor is that the index tracking funds are concerned with the tracking error more than fund’s performance itself, whereas, the investor would like to maximize their profits.

Empirical reults show that there is an index premium in the price of all the index’s underlying assets. This premia expected to be added into the price of an inculded stock at the event of inclusion. It hardly tells anything about the company’s fundamentals as the Russell’s index reconstitution is driven purely by the market capitalization.

1.1. Market efficiency

Eugene Fama stated in his Nobel Prize winning lecture “Two Pillars of Asset Pricing” (2014) that there are two branches of research creating the pillars for modern asset pricing literature. The first pillar comprises efficient capital markets and the second is research on asset pricing models. In this chapter we will cover the theoretical framework on efficient capital markets, while the following chapter will be on asset pricing models.

Efficient capital markets remain a fundamental, and yet one of the most disputed theory in the field of financial research. Efficient markets theory makes a few assumptions and simplifications that creates its rather vague concept. Firstly, it assumes that markets allocate capital efficiently. That is, the most profitable investments get the funds provided on the markets. Secondly, operational efficiency guarantees that transactions are carried out efficiently. Thirdly, information flows efficiently, and all the available information is reflected immediately in the market prices (Fama, 1970).

Bacheliere's random walk theory started the long history of research on efficient capital markets in the early 20th century. However, the empirical research does not support the randomness of market prices and widely accepted theory on the topic is suggested by Eugene Fama (1965, 1970). Efficient market hypotheses' information efficiency requires further simplification. In order for the market to be efficient, any new information should be reflected into market prices. These conditions are sufficient, yet not necessary.

(1) No transaction costs
(2) All information is free of charge and available to all market participants
(3) All agree on the effects of new information on the price of an asset

If the abovementioned criteria are fully met, the information is reflected in its entirety on the current price of an asset. However, in practise the markets are not this frictionless. Nevertheless, capital market can be efficient without fulfilling these conditions. For instance, investors give different weights to different aspects when it comes to new information. Resulting, the target price for investors might differ after a new piece of information on the asset. This does not make markets inefficient. Markets are not inefficient as long as a single investor cannot make consistently correct approximations on the implication of information on asset's price and profit excess returns from it (Fama 1970).

Fama separated the market conditions into three testable forms of market efficiency. These conditions remain generally accepted forms of market efficiencies and are based on information set θ_t, at time t.

(1) The Weak Form of Efficient Market Hypothesis, where the information set available θ_t, at time t, composes only from historical information on the price of an asset. Meaning, the information reflected on a stock price concludes only information from the past. Therefore, technical analysis does not work in weak form of efficiency. The test for weak form of efficiency focuses on time series correlation in return of a stock.
(2) The Semi-Strong Form of Efficient Market Hypothesis, where the information set available θ_t, at time t, is wider. It is an extended version of Weak Form since it has wider information, but the problem is that the information set θ_t is mistaken to be all the information available. That is, in addition to information on stock returns in the past, all the information, such as financial reports, balance sheets etc., are reflected into the price of a stock. Consequently, fundamental analysis would be a waste of time in semi-strong form of efficiency.

(3) The Strong Form of Efficient Market Hypothesis, where the information set available θ_t, at time t, composes from all the information known at time t. Thus, there are no investors in monopolistic position to gain from inside information. Such a market form is usually tested by studying the returns earned by those in the position that grants an access to inside information i.e. executives of corporation (Fama, 1970., Jensen, 1978).

Index inclusion is an event that puts market efficiency into test. Markets are efficient if there is no possibility to make economic profits by trading, given the information available. Previous researches have highlighted the anticipation power's importance in the event of index reconstitution. It means that some market participants are more effective analysing the information available and make correct (although sometimes incorrect) analyses on which companies will be included/excluded.

1.2. Asset pricing models

This chapter focuses on the latter pillar in modern asset pricing literature suggested by Fama, asset pricing models. The modern asset pricing originates to Capital Asset Pricing Model (CAPM) of two main researches by Sharpe (1964) and Lintner (1965). In these literatures the common perspective is an asset's risk premium over the systematic risk. This theory became so remarkable in world of finance that latter studies are mainly tests of the model and further applied theories based on the CAPM.

According to CAPM, there is a linear relationship between risk and return. Intercept is the risk-free rate at the markets, with which all the market participants may borrow and lend money. Slope of the function is determined by the beta (β) coefficient which measures asset's sensitivity to systematic risk of the market. Thus, an investor may benefit from higher returns only if they are willing to take on more risk. Therefore, we may derive an equation for CAPM as follows:

$$E(R_i) = R_f + \beta(R_m - R_f) \tag{1}$$

Where $E(r_i)$ is expected return for an asset i, r_f is the risk-free interest rate available for everyone, β is the asset's sensitivity to systematic risk, r_m is the market risk. r_m-r_f equals the market risk premium.

This linear relationship pictured on the graph is known as the security market line. In the efficient market all assets lie on this line, meaning that the betas are precise and assets yield returns in proportion to their beta coefficients. Figure 1 visualizes the linear function of security market line. Om the figure we can have two assets, A and B, that do not lay on the security market line. These assets' expected return and beta do not have the same relation as those on the SML. Asset A yields higher return with lower risk (beta) which result in dominating position compared to those assets on the SML. Dominating position suggests undervaluation of the asset as it offers greater return against its risk than other assets. Asset B that lays below the SML yields lower returns with higher risk, resulting that assets on SML dominate asset B. This position suggests overvaluation of asset B as it offers lower returns against its risk. Efficient Market Hypothesis suggest that under-pricing caused by supply shock in an asset will be quickly eliminated by arbitrageurs.

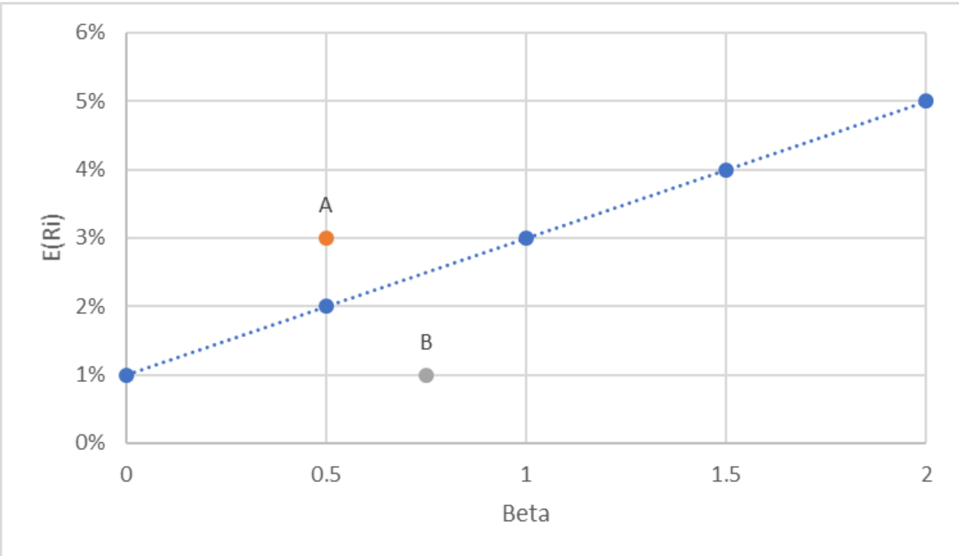


Figure 1 Security Market Line (SML)

These theories on the asset pricing models make a few simplifications on the market conditions:

(1) Investors seek maximum terminal wealth and base their portfolio decisions on the mean and variation

(2) Markets have no taxes or transaction costs
(3) Investors have the same approximation and understanding of the expectations on returns and joint probability distributions on portfolios
(4) Borrowing and lending money with risk-free rate is an available option for all investors (Black, Jensen, Scholes. 1972)

Sharpe (1964) was the first to create a theory on price of risk results. All the assets can be put on a graph based on their risk σ_i and expected return r_i, forming a map of investment opportunities. These points form a *capital market line* which represents the efficient capital market's investment opportunities. An investment plan is said to be efficient if there is 1) no other plan with same σ_i and larger r_i, 2) same σ_i with smaller σ_i or 3) smaller σ_i with larger r_i. This guarantees efficient pricing of assets since no one would buy an asset with same risk but lesser return for the same price, thus dominated asset's price needs to be adjusted in order to match its attributes. Also, an asset dominating the capital market line would not be priced similarly, since no one would buy assets it dominates.

Neoclassical finance suggest that shares are perfect substitutes to each other. Meaning, an investor is indifferent with which stock to hold. They are only considerate of the true value of the stock. If there is a mispricing, the investor is ready to buy/sell the stock for even a slightest profit. The theory also assumes that the investors are aware of the real value of the stock and that they follow the market price, at all times. Demand shock causes transitory price pressure on the share price at the inclusion event as the index tracking funds adjust their portfolios simultaneously. Empirical evidence supports the close-to-perfectly elastic stocks. These findings challenge more traditional theories ever since CAPM.

Counterargument to the neoclassical finance derives from imperfect substitutes hypothesis. Chen (2006) argues that the price increases in index inclusions are driven by the rightward shift in the demand curve of a stock after addition. This research supports earlier studies' e.g. Shleifer (1986) similar findings.

Petäjistö (2010), researched the price elasticities for small-cap index (Russell 2000's stocks) and large-cap index (S&P 500's stocks), concluding that small cap stocks have much smaller price elasticity (-0.43) than large-cap stocks (-0.84). This outcome suggests that Russell 3000's price elasticity would be something in between those two as it represents 98% of the US equity market, including stock both in small- and large-caps.

1.3. Liquidity

Amihud, Mendelson & Pedersen (2006) simplifies the complex, even elusive concept of liquidity as follows: “liquidity is the ease of tranding a security.” Liquidity can be considered as an immediate cost of selling an asset one is holding. When an investor is considerate about the net return after trading costs, they should require higher return for an asset with expectedly higher trading costs.

In this study the liquidity objective is assumed to have, by a generally accepted and supported, inverse relationship between trading costs and trading volume. That is, the trading volume increases, decrease the trading cost itself providing more liquid asset to the owner. That is know as the liquidity premia.

Liquidity measures vary greatly. Many previous studies use the bid-ask spread as the liquidity measurement. In this study, change in trading volume is used not only beacause it is easily accessible, but because quoted spread data does not measure transaction costs. Fialkowski (1994) found that there was a significant difference between quoted and effective spread in NYSE.

Investors, such as hedge funds, aim to predict future market movements to profit from by becoming liquidity providers at the event of demand shock. These liquidity providers taking on risk to hold stock and provide liquidity later on, must be compensated with higher returns. According to the financial economietrics, the temporary increase in liquidity offered is links with predictability of future price movements of the stock (Hendershott & Seasholes, 2014).

Liquidity is a major factor in asset pricing and functions as an x factor in this study’s regression model.

1.4. Index inclusion effect

Russell reconstitutes its indexes once a year. Unlike other major equity index S&P 500 which has no continuous pattern with inclusions and exclusions but reconstitutes usually one stock at the time, based not only by market capitalization but industry representation and other attributes. Russell bases its stock selection only by free floated market capitalization, i.e. market capitalization of those shares available to the public. May is the ranking month for upcoming reconstitution. Russell announces the exact dates for the process early. The ranking day is in mid-May and the reconstitution lists are published in June after market close on Fridays, the final one after market close on the last Friday of June.

As mentioned in the introduction, these funds hold a remarkable amount of capital. Now, let's picture an event of index inclusion. Before the event the stock has a certain level of liquidity. When it gets included into a major index, the funds following that index will adjust their portfolios according to the reconstitution and place their purchase orders as close to the inclusion event as possible in order to minimize the tracking error. This extra demand for this stock is abnormal compared to its historical demand.

Several hypotheses try to explain the index reconstitution effect. Most common ones are the transitory price pressure and permanent index effects on the stock. The first mentioned comes from the market efficiency theory as the stock faces a demand shock. The latter is permanent liquidity provision for the stock.

Harris & Gurel (1986) find that suppliers of stock can demand premium price for supplying liquidity during prise pressure on the stock. Price pressure hypothesis argues that the stock price will face a full reversal after index funds have adjusted their portfolios and demand shock disappears. However, there is empirical evidence both, supporting and arguing against the full price reversals.

Amihud and Mendelson (1986) suggested that the value of stock is the present value of future cash flows minus present value of future transaction costs. As we pointed out earlier in sub chapter 1.2, the higher liquidity reduces future transaction costs and therefore, increases the intrinsic value of the stock, *ceteris paribus*:

$$Value = PV(cash\ flows) - PV(transaction\ costs) \tag{2}$$

Edmister, Graham & Pirie (1996) argued further that the initial liquidity will determine the level of abnormal return at the event of inclusion. In their study they used relative bid-ask spread to measure liquidity and find an inverse relationship between initial liquidity and abnormal returns. Meaning, that stocks with initially lower level of liquidity will benefit most from the event as they measured the post-event trading volumes against the changes in stock value. They suggest it is caused by the increased interest in the stock by investors and institutions, but also due to the arbitrage trading of index futures and index options markets.

Given these theories and previous researches we suggest following hypotheses:
H1: Stocks added to index will experience positive abnormal returns around reconstitution
H2: Stocks deleted from index will experience negative abnormal returns around reconstitution
H3: There is a positive correlation between the change in trading volume and abnormal return on the stock

2. Data and Methodology

2.1. Russell reconstitution policy

Russell 3000 is designed to represent the investible US equity markets. Because the continuous change of the markets, the index is being updated systematically to keep the index reflecting the representation of markets. Annual full reconstitution makes it possible yet preventing excessive turnover. Russell considers companies' free float market cap, to represent the capitalization of stocks available to public, i.e. market cap subtracted by the control ownership. This free float market cap determines the weight a stock is given in the index.

Russell indices' reconstitutions follow same pattern annually. So called Russell universe, i.e. all the US stocks eligible for their indices, is ranked by their free-floating market cap in May. This rank day falls usually on early May, for example in 2019 it falls on the first Friday of May. In June, Russell publishes preliminary index lists for inclusions and exclusions, followed updates throughout the Fridays of June. The final list will be announced on the last Friday of June and will become effective after market close on that day.

Exception to this annual reconstitution is IPOs that are added on quarterly basis. It gives a more precise market representation of the markets for the index without causing unnecessary turnover. These additional index additions are done during 3^{rd}, 4^{th} and 1^{st} quarters as the reconstitution takes place on 2^{nd} quarter.

2.2. Sample Data

Russell index reconstitution event has the same timeline every year. The stocks in Russell universe in May, for example, in 2019 it is May 10^{th}. June is a transition month for the reconstitution as Russell announces the upcoming constitution lists part by part on Fridays in June. The final one will take effect on the market close on the last Friday in June.

The sample consists of stocks included and excluded in 2016-2018 to grasp the up-to-date reconstitution effect. There were 901 stocks from which 691 had sufficient data. Many included stocks are recent IPOs which result in insufficient data due to no historical data. Also, some excluded stocks have gone bankrupt or included in merger/acquisition which results insufficient data since the stock has no data after or at the time of reconstitution. Stocks added to Russell 3000 are often either small-cap stocks or IPOs of any size.

The data is gathered on two sets of information, stock prices to measure return on stock and daily volume to measure liquidity. Since the stocks relevant to reconstitution are relatively easy to foresee early on, we use the reconstitution year’s two first months, January and February, for calculating the expected return on the individual stock. Similarly, we use January’s and February’s mean volume as the benchmark for measuring the changes in liquidity. The one-point in history is used so that different time windows measured are comparable to each other. If we would use monthly change from previous month, the previous abnormally large changes might still be affecting as excess supply or demand on the stock in that time window. This way we may observe the hypothesized improvement in liquidity opposed to initial level as a higher trading volume.

1.3 Methodology

First, we observe the monthly CRi (Cumulative Return on stock i). For this we calculate returns throughout the year as cumulative values and then calculate the per cent change in the price between each month end and month beginning. From those individual stocks CRi's we may derive mean returns on additions and deletions as stock portfolios for each year. Despite the rather long-period of a month we are using this, it should imply some hypothesized pressure on the stock prices.

Secondly, we calculate the per day mean return on each month for all our six sub-samples. We use market data to adjust the returns as we want to be looking at the abnormal part of the return on these stocks when studying reconstitution effect and since the compared data are in different points in time, we need to exclude external factors out of the equation. As market data, we will be using the objective index return as it represents not only 98% of the US stock market but also the index these stocks are included to/excluded from. We deduct the adjusted closing price change of Russell 3000 index from daily adjusted closing price changes of individual stocks in our sample and so, get the market-adjusted returns and exclude any market movements from the calculation that would falsify the figures. First adjustment is as follows:

$$Market - adjusted\ returns = \frac{\mathrm{Pi}_t - Pi_{t-1}}{Pi_{t-1}} - \frac{P(Market)_t - P(Market)_{t-1}}{P(Market)_{t-1}} \qquad (3)$$

Where Pi_t is price of stock i at time t, pi_t is price of stock i on previous day, $\mathrm{P(Market)}_t$ is value of Russell 3000 index at time t and $\mathrm{P(market)}_{t-1}$ is value of Russell 3000 index at previous day. This will result in data sample of daily returns in percentages adjusted by market movements in order to make the different points in time comparable to each other.

We need to find statistical significance results for our outcomes and for that we use t-statistics two-tailed test. We choose confidence level of 0.95 and as we have two-tailed test our alpha will be 0.025 as α=(1-confidence level)/2. Following table shows the sample size and corresponding critical value for the sample.

Table 1 Critical values for sample

	n	Critical value
Addition2018	146	2.26
Addition2017	143	2.26
Addition2016	129	2.27
Deletion2018	95	2.28
Deletion2017	83	2.28
Deletion2016	74	2.29

The t-value from this test should be larger than sample's critical value in order to reject the null hypothesis. The t-statistic test is calculated as follows:

$$T - Stat = Mean/(\frac{\sigma}{\sqrt{n}}) \tag{4}$$

Next, we need to establish a comparison values when studying abnormal returns for a stock. Estimation for stock returns are calculated from time series of previous returns. This is done for each individual stock by calculating the mean daily change of stock price, using market-adjusted closing prices of the day. We use January and February's mean return as an expectation value for future returns. Abnormal daily mean return is calculated as follows:

$$AR_i = \frac{1}{n}\sum_{i=1}^{n} R_i - E(R_i) \tag{5}$$

The main calculation considering this study is the market adjusted CARi. Cumulative Abnormal Return on *i* will show where is the opportunity to gain from price changes and where trading comes with a high cost for index funds. We adjust the returns by Russell 3000 index returns just as we did earlier. Then we calculate cumulative returns that are considered to be abnormal since the figure is returns above market returns. CARi is calculated as follows:

$$CARi = \sum_{i=1}^{n}(Ri - R_{Market}) \tag{6}$$

Our liquidity measure is the trading volume of a stock. We derive monthly mean trading volumes to match with returns. Similarly to calculating the expectation values for stock price changes, we use January and February's mean as comparison value to changes in trading volume for our sample. We calculate percentage change from the average trading volume during the approximation period to see the change from the initial level of liquidity that hypothetically affect the stock price:

$$\Delta Trading\ Volume = \frac{\bar{V_i} - \bar{E(V_i)}}{\bar{E(V_i)}} \tag{7}$$

Where the V_i-$E(V_i)$ is the difference of mean trading volume of i in selected point in time deducted by the mean expected trading volume of i. $E(V_i)$ is the mean expected trading volume of i. The equation gives us the change in trading volume as percentage, which will be our liquidity measurement.

We also calculate the monthly changes in trading volume to see how the monthly changes through the reconstitution timeline. Furthermore, we will need these calculations for regression analysis against monthly CARi's. We compute the mean changes in percentages as follows:

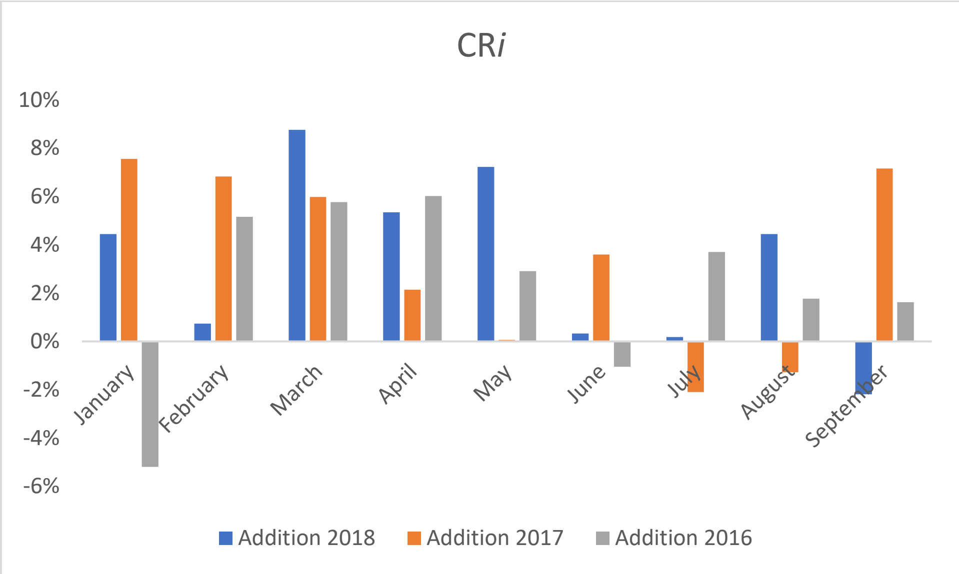
$$\Delta Volume = \frac{1}{n}\sum_{i=1}^{n}\frac{(Volume_t - Volume_{t-1})}{Volume_{t-1}} \tag{8}$$

We will study the relationship between changes of liquidity and cumulative abnormal return over market returns. Due to multi variable characteristic of reconstitution effect on stock returns we control for liquidity changes and both, inclusion and exclusion effect. In order to find the relationship for multiple independent and one dependant factors, we will be using multiple regression analysis. We control the independent variable of liquidity ΔV as the change in mean trading volume for a month. For calculating the data, we use methods determined by equation (6) Inclusion and exclusion effects are controlled with dummy variables that get the value of 1 on the inclusion/exclusion month and 0 in every other month. Abnormal cumulative return is our dependant variable. Values for dependant variable are calculated as equation (6) states. Time window is chosen to be March-September for each year in our sample.

3. Results

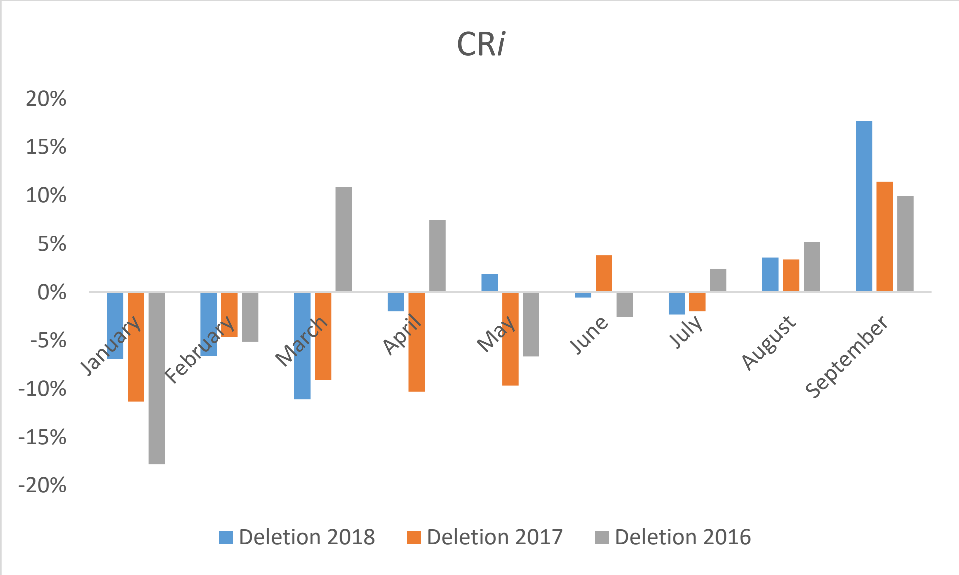
3.1 Empirical Results

Figure 2 Mean cumulative return for added stocks 2016-2018



The Figure 2 illustrates cumulative return on our sample of added stocks. As may be observed from the figure, there is no clear pattern that would occur every year similarly. Although, we may see that returns are higher before the effective reconstitution of the Russell 3000 index. What is exceptional in this sample is the 2016 year's January which is strongly negative, whereas 2017 and 2018 experienced equally strongly positive returns. January's average CR was 2.27% over the three years course. The CR increased on average in February to 4.24% within our sample and continued to increase in March, peaking at 6.84% in a month. After March the returns started to decrease and in April the CR was 4.5% on average. May's CR was again slightly lower at 3.4% in a month. The month of reconstitution lists publishing, June, had very modest CR of 0.96% on average. The sample's lowest CR was recorded in July with just 0.6% return. In August the returns started to increase again to 1.65% and further in September to 2.2%. Highest positive return occurred in March 2018 with CR of 8.76% in a month whereas, the largest negative return was the exceptional return in January 2016 with -5.2% in a month.

Figure 3 Mean cumulative return for deleted stocks 2016-2018



The Figure 3 illustrates similar calculations for deleted stocks than the Figure 2 on additions. Here the trend looks more consistent among our sample. Year beginning carries strongly negative cumulative returns and it slowly starts to increase and in September CR is strongly positive every year. The average CR in January was -12.01%, the highest of the year averages. February's mean return was -5.45% and continued to smooth to 3.11% in March. April's CR was -1.58 but then the ranking month's, that is May, CR dropped to -4.8% again. In June the CR was positive for the first time with 0.23% and in July it returned to negative again with -0.63%. The returns in August and September were strongly positive with 4.04% and 13.02%, respectively.

Equation (5) gives us market-adjusted daily returns which are then further matched against the expected returns that are calculated from historical time series prior to our examination period of March-September.

Figure 4 Average daily abnormal return over market returns for added stocks 2016-2018

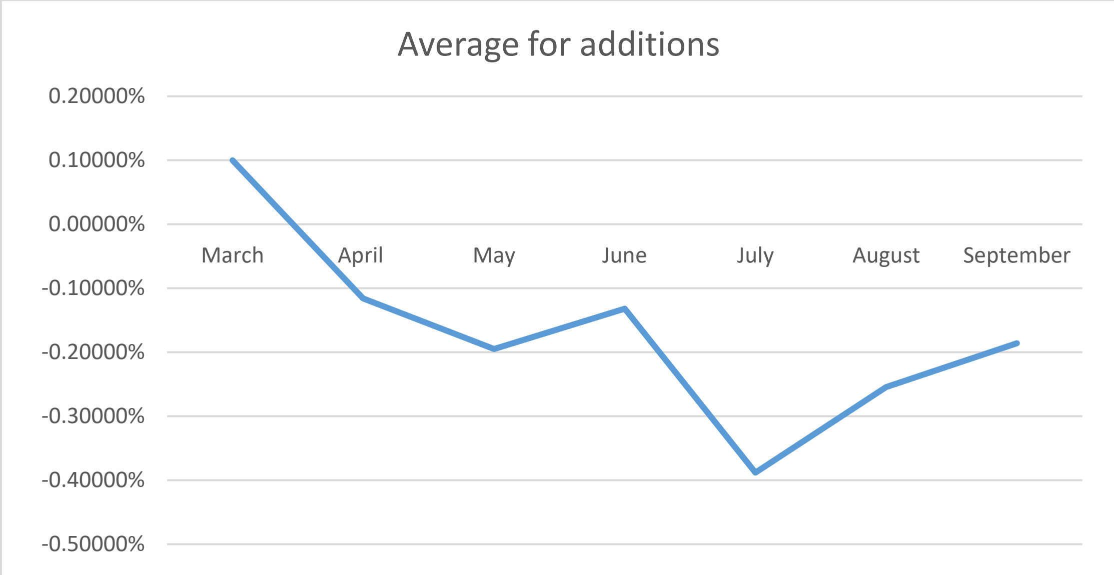


Figure 4 illustrates the mean daily abnormal return of the sample adjusted with market changes over mean expected returns over the returns on market. We only find significant results on March, July & September 2018 and April, May, July & August 2017 from the whole sample. The plotted curve is downwards sloping until the returns pick up again after hitting year-bottom in July.

Figure 5 Average daily abnormal return over market returns for deleted stocks 2016-2018

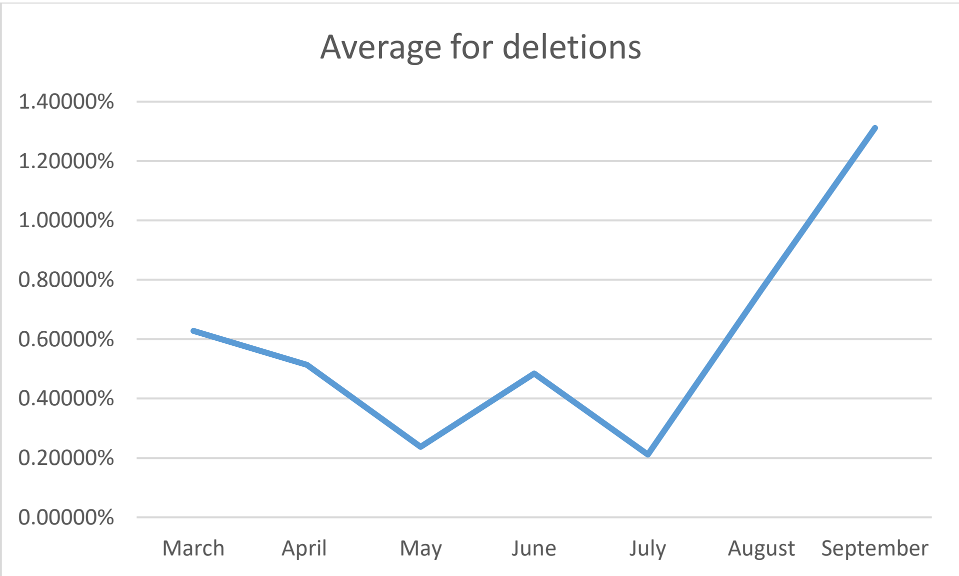


Figure 5 shows the deletions' performance over expected returns calculated by using market-adjusted data as equations (5) describe. Statistical significance is found in April-August -18, June-September -17 and March, April, August & September -16. August being the only month with significant findings from all the three years, the is little consistency in that. The curve is the same shape than in figure (above), just the changes are of different magnitude.

To grasp the month's accumulated return, we calculate CARi over market returns according to Equation (6) for every month for additions and deletions separately and plot a figures below:

Figure 6 Monthly cumulative abnormal return over market returns for added stock 2016-2018

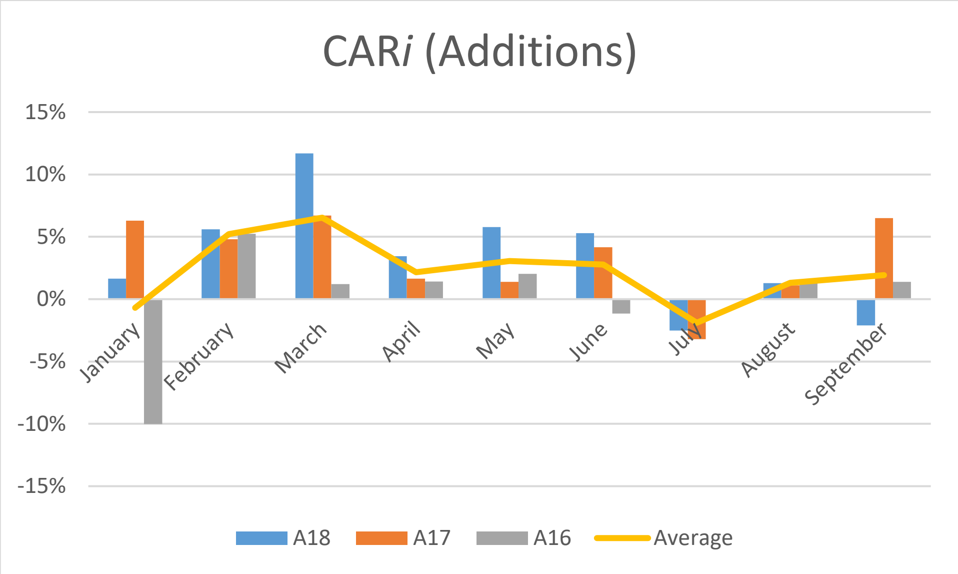


Figure 6 shows the mean CARi's for each year's added stocks. The results suggest abnormal returns for every month except July on average for the three years course. Notably large inconsistency within our sample is the January 2016 where CAR was around -10%. We find statistical significance for many months but not every month. The by month CAR and their significance levels are illustrated in

Table 2.

Table 2 Monthly CARi's for added stocks by monthly year's averages,

	A18	A17	A16
January	1.65%	6.30%***	-10.01%
February	5.60%***	4.80%***	5.25%***
March	11.68%***	6.70%***	1.21%
April	3.44%**	1.65%	1.41%
May	5.77%**	1.39%	2.03%
June	5.28%***	4.16%***	-1.15%
July	-2.52%*	-3.21%***	0.05%
August	1.30%	1.10%	1.56%
September	-2.11%	6.50%***	1.38%
October	-5.40%***	-4.44%***	-3.70%***

Where * shows significance at 10% confidence level, ** significance at 5% confidence level and *** shows significance at 1% confidence level.

Figure 7 illustrates cumulative abnormal returns over the market return for our sample's deleted stocks. The abnormal returns are strongly negative as hypothesized until June when it just intercepts the y-axis' 0, just to turn back to negative for July. After July, the returns shoot up to reach +12% in September. We find statistical significance for the sample data is show in Table 3. We find significant results from majority of the sampled months.

Figure 7 Monthly cumulative abnormal return over market returns for deleted stocks 2016-2018

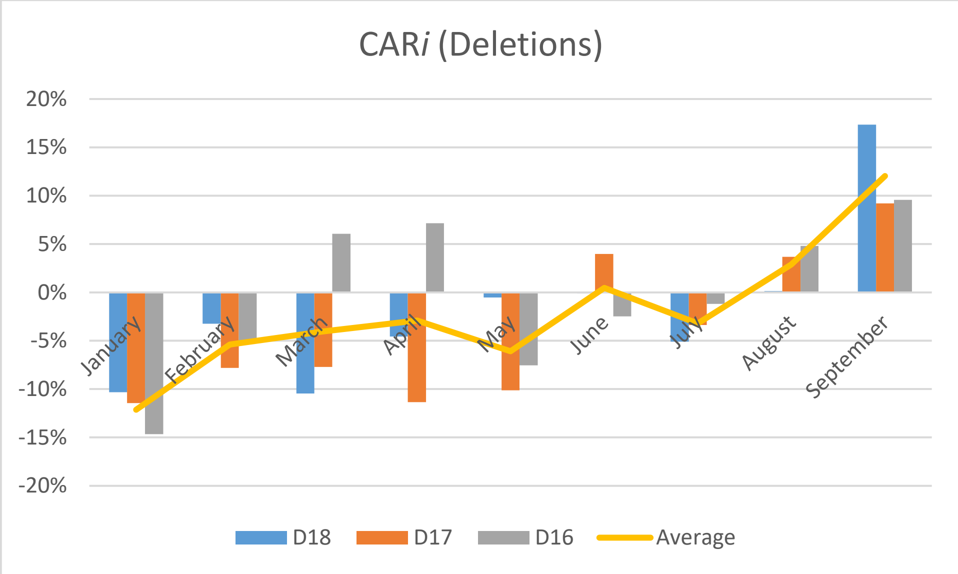


Table 3 Monthly CARi's for deleted stocks by monthly year's averages

	D18	D17	D16
January	-10.31%***	-11.44%***	-14.65%***
February	-3.23%*	-7.81%***	-5.12%**
March	-10.44%***	-7.71%***	6.07%*
April	-4.56%**	-11.33%***	7.16%*
May	-0.54%	-10.13%***	-7.54%***
June	-0.10%	3.97%*	-2.46%
July	-5.09%***	-3.38%	-1.17%
August	0.13%	3.68%	4.81%*
September	17.34%	9.20%***	9.57%***
October	3.47%	-2.43%	-6.19%**

Where * shows significance at 10% confidence level, ** significance at 5% confidence level and *** shows significance at 1% confidence level.

For liquidity measurement we use the change in stock's trading volume. First, we calculate the volume as change from the expected volume derived from historical data as in equation (8). Trading volume for added stocks are traded in March and April at +92% and +75%, respectively after which it shoots up and reaches the highest point in June, averaging approximately +500%

from the expected level of trading volume. In July the volume drops to +150% level and continues to decline in August to +118% until increasing again in September to over +200%.

Figure 8 Implied volume of added stocks in respect to expected volume

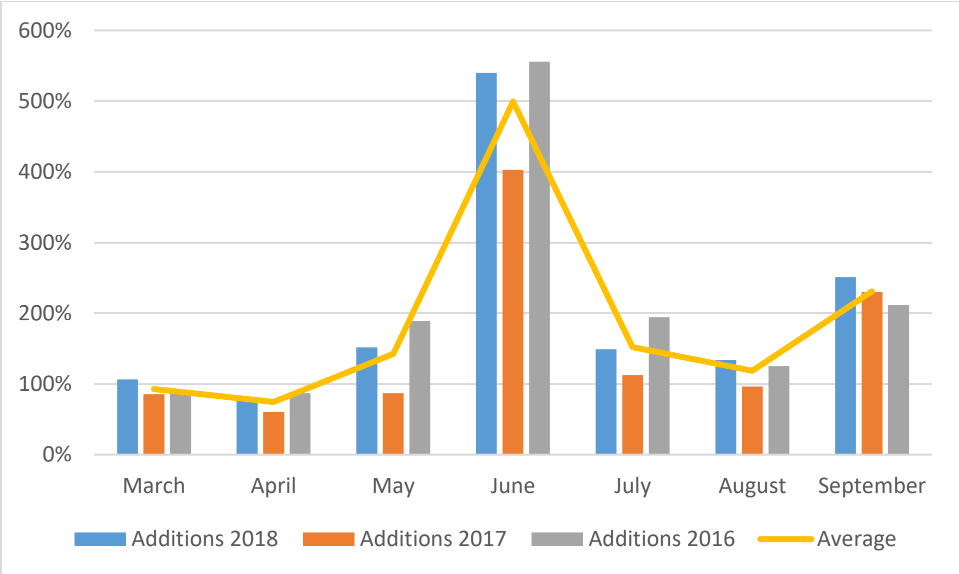
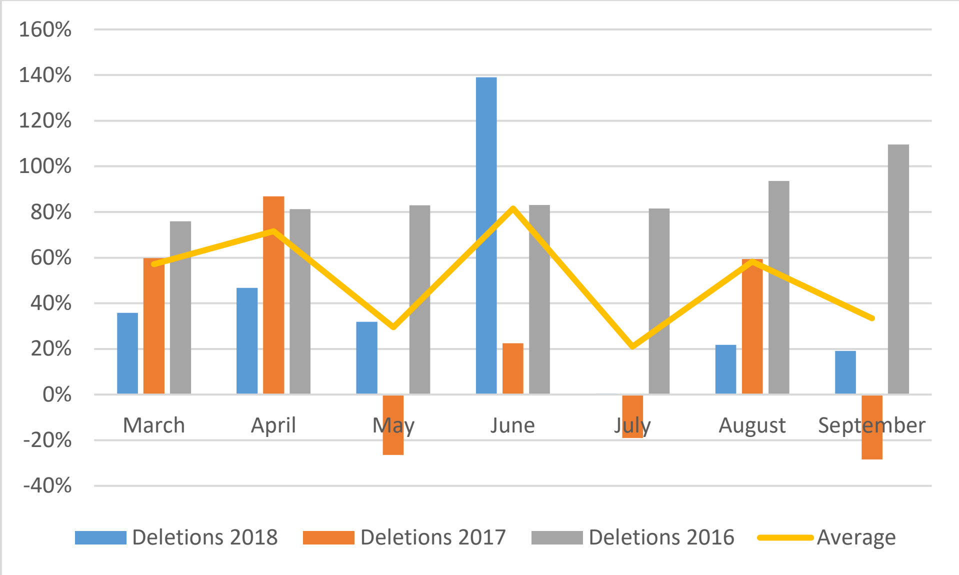


Figure 9 illustrates the implied trading volume within our sample of deleted stocks. The changes in volume are more moderate than with added stocks, yet the average change remains positive throughout the time window. Exeption to rest of the sample is year 2017 when the volume dropped below the expected level of trading in May, July and September by -26%, -19% and -28% respectively. The average change has constant volatility, changing direction every month.

Figure 9 Implied volume of deleted stocks in respect to expected volume



For regression analysis we compute the monthly changes in volume respective to previous month's trading volume as in equation (8). First we plot the number into a figure and take a look at the results for added and deleted stocks separately:

From Figure 10**Error! Reference source not found.** we may observe how the trading volume changes in respect to the previous month's volume. The change remains positive within our sample of added stocks until after June that is, the main month for rebalancing portfolios. In July the change is negative due to the very high increase in June. In August the change return to positive on average and continues to increase relatively constantly towards September. The peek in June averages +205% with added stocks and the bottom in July, being the only month with negative change, averaged -41%.

Figure 10 Monthly volume changes for added stocks 2016-2018

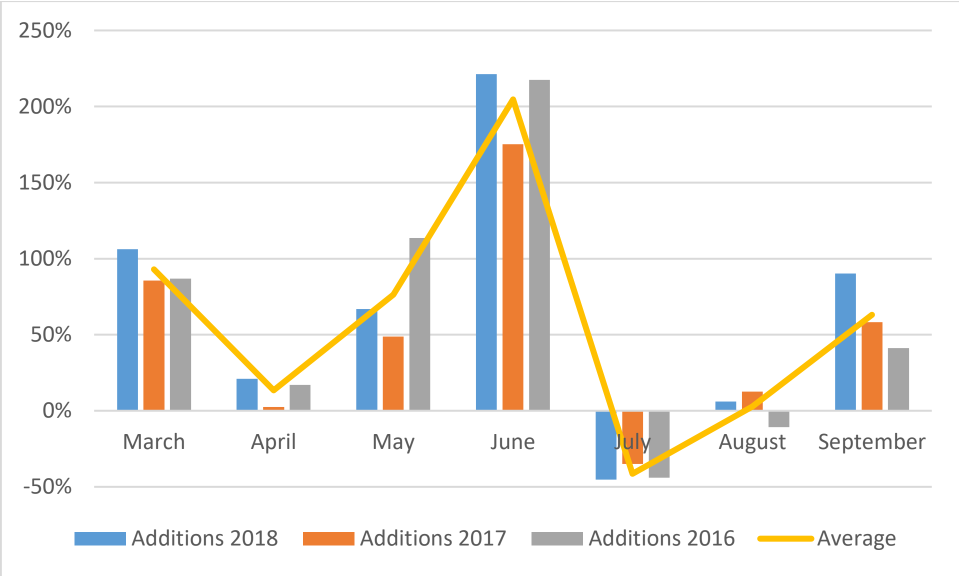
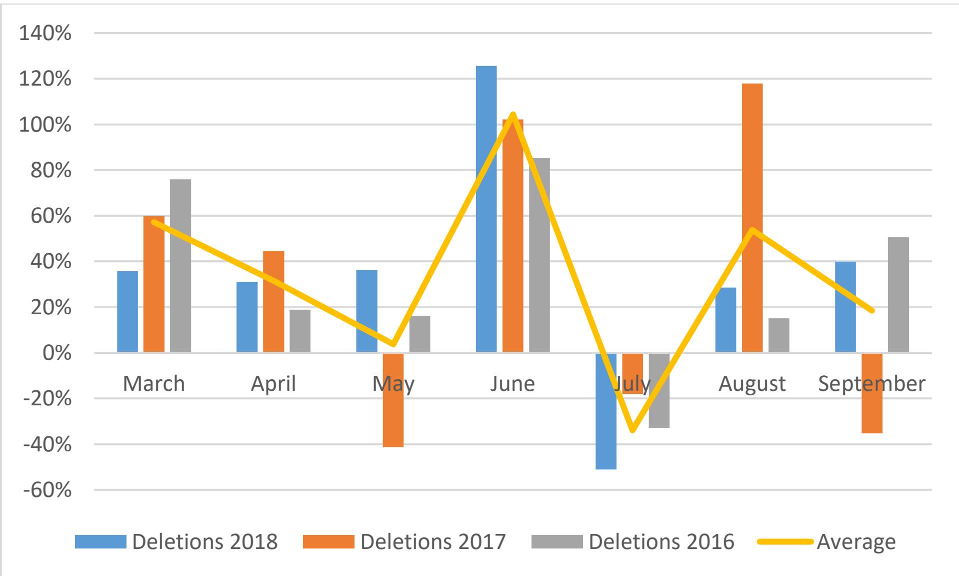


Figure 11 Monthly volume changes for deleted stocks 2016-2018



Monthly changes of trading volume for deleted stocks plotted in

Figure 11 looks somewhat similar to Figure 10 if we take a look at the average line through the time window. With deleted stocks the volume increases from previous month every month except in July, as well as we observed with added stocks. With deleted stocks the changes are more modest, reaching the peak in June at +104%. The bottom takes place in July with -34% change from June's peak. These similarities suggest that investors' interest in both, additions and deletions, follow same trendline through the time window.

Finally, we test the hypothesis of positive correlation between change in volume and cumulative abnormal return. We run a multi variable regression using dummy independent variables for deletion and addition effects, getting values 1 in June (effective reconstitution) and 0 for every other month. Third independent is change in trading volume to control for the liquidity correlation against the dependant variable, CARi. The results of regression are in

Table 4 where * means significance at confidence level 90%, ** significance at 95% confidence level and *** at 99% confidence level.

Table 4 Correlation coefficients

	Coefficients
Intercept	-0.10%
Addition	-5.17%
Deletion	-2.38%
Volume	3.93%*

The coefficients in

Table 4 imply that CARi has significant correlation with change in trading volume at 90% condifence level. When there is an increase in trading volume, CARi is increased by 3.93% from that change. For addition and deletion effects we find no correlation with CARi.

3.2 Discussion

We succeed to find hypothesized price movements within our sample, consistent to prior researches such as Edmister et al. (1996), Petäjistö (2010). The magnitude of returns at the reconstitution time window falls well under the previous research's findings, which is consistent with trend of diminishing abnormal returns due to reconstitution suggested by Petäjistö (2010), Kamal et al. (2012) and many other.

Looking at the cumulative returns in Figure 2, the most unanticipated finding is the reconstitution month's modest returns, especially compared to other months. The higher returns on months prior to reconstitution could be explained by Kamal et al. (2012) researches' argument for information value. That is, market has anticipated the forthcoming reconstitution and made its purchases for additions already. Another argument for the diminishing returns and changed timing of the price changes has made by Petäjistö (2010). The shrinking index premia capitalized into stock price at the index addition is due to increased popularity of index tracking funds that was followed by a rush of arbitrageurs, but a bit late. The increasing arbitrage capital continued to increase after the smoothening of the increased indexing.

Yet there are some unexpected cumulative returns in the sample of deletions seen from Figure 3. The returns start from well below the zero line and starts to almost linearly to increase, breaking to positive side in June just to fall negative in July again. From August on the returns are strongly positive. It seems that the to be deleted index premia is diminishing from the price before the reconstitution, which implies the market's ability to anticipate deletions the same way as additions. The September's price increase is anticipated by the theory of price correction after the price pressure relieves and the priced adjusts

Figure 4 is supporting the previous findings about market including the anticipated liquidity premia due to index inclusion during the first quarter of the fiscal year. The expectation return over market return is calculated from January-February data and later market-adjusted returns are matched against the expectation value. Every month's mean daily abnormal return is negative except March, suggesting that market-adjusted returns are averaging highest in January-March. For what comes to deleted stocks, we can see same sort of anticipation from markets, since the abnormal returns are positive for our time frame as Figure 5 shows. Different from addition sample, there is clearly no price adjustment implying forthcoming reconstitution in March as we saw with addition sample.

First quarter's performance is supported by Kamal et al. (2012) argument of transparency in index's stock picking process. This enables organizations such as hedge funds and investment banks to predict additions/deletions. Thus, the index premia is included/excluded in the stock price well before the actual reconstitution or the official preliminary index constituents lists are published by the indexing company, Russell in this case. Hence, the expectation period's returns were so high with our sample.

For what is an interesting objective for funds and fund investors is the cumulative return over the market returns over the time window. From CAR we can conclude not only possible investment opportunities but also the cost to passively managed index funds doing their portfolio rebalancing as close to the reconstitution as possible. As Madhavan (2003) the returns prior to reconstitution represent cost to the funds rebalancing their portfolios close to the effective reconstitution of the index. Figure 6 shows the consistent positive cumulative return on the stocks objective to anticipated addition. The CAR turns negative after effective reconstitution which further suggests that the effective moment holds the most cost to rebalancing the portfolios. Although, after July the CAR turn positive again, stocks returning towards the prices at the index reconstitution moment. Figure 7Figure 7 illustrates cumulative abnormal returns over the market return for our sample's deleted stocks. The abnormal returns are strongly negative as hypothesized until June when it just intercepts the y-axis' 0, just to turn back to negative for July. After July, the returns shoot up to reach +12% in September. We find statistical significance for the sample data is show in Table 3. We find significant results from majority of the sampled months.

Figure 7 plots the cumulative abnormal returns for the deleted stocks. We may observe the negative returns for the sample until the effective new index constituents list. After which it turns back negative for July but shoots up and turns strongly positive after that. The significantly negative CAR represents high costs to index tracking funds and some arbitrage opportunities for those taking short position in this sample portfolio until June and after that switching into long position to gain from the price reversal from August on. These findings support our hypotheses 1 & 2, therefore we do not reject these hypotheses.

Clearly, an anticipation of forthcoming additions would result in significantly lower costs for these funds. Yet, the performance of the fund managers is often measured by the tracking error instead of yield. Chen et al. (2006) concluded that reconstitution caused some 1.3% loss on the indices' market caps through arbitrage. The study used S&P500 and Russell 2000 indices which represent high-cap and low-cap stocks respectively and funds tracking them lost $1-2.1 billion combined. Similarly, Russell 3000 represents both high- and low-cap stocks.

Finally, a significant result was found from regression between change in volume and abnormal returns only at 90% confidence level. This supports our hypothesis 3 about positive correlation between these two variables. An increase in trading volume improves liquidity of a stock through reduced trading costs in the future. This is supported by previous researches such as Edmister et al. (1996), arguing that the increased trading volume is not transitory but clearly an improvement of liquidity for the added stocks. This fits in the valuation methodology suggested by Amihud and Mendelson (1986), as the present value of future transaction costs decreases.

These findings of positive cumulative abnormal return for to be added stocks and negative for to be deleted stocks represents remarkable costs to funds rebalancing their portfolios close to the day reconstitution becomes effective. Although, the phenomenon can be profited from, it will be a cost to investors investing in index tracking funds measuring the performance by tracking error, not returns or yield.

These investors are working to predict these reconstitutions to buy long to be added stock and sell short the to be excluded ones. From the index tracking fund point of view, it is good that there are liquidity providers at the time of desired portfolio rebalancing. Nevertheless, there is a price to be paid to liquidity providers, and it’s steep.

To end the discussion, we would like to point out possible incompleteness of methods/data used in this study. The relatively short period of data used might be a bit optimistic, yet we decided to use past three years to grasp the up-to-date effects. This subject has been studied quite much but there is very little research done during the past years with only recent data. And as previous researches have claimed a diminishing trend of returns from index inclusion, we saw fit to take shorter sample period. From the methods, the expectation period might be hazardous since it is so close to the reconstitution that companies’ anticipation power will easily predict upcoming reconstitutions from that far. That said, the methods and analysis fulfil the purpose of this study.

CONCLUSION

This research aims to find returns around the Russell 3000 index’s reconstitution to figure out the expectations for returns due to the event and possible costs for the index tracking funds from the pre event and post event price movements of stocks included in the reconstitution, either through index addition or deletion. The results show that index tracking funds, adjusting their portfolios at the close of effective reconstitution pay a high price for the strategy. Stocks to be added into index yield high abnormal returns before the inclusion and the price experiences a small downwards correction after inclusion. The very opposite happens to to be deleted stocks. When funds still hold these stocks, the price is declining until reconstitution, after which it makes an upwards correction after the funds have dropped it off from their portfolios.

A little significance was found from the correlation between change in trading volume and abnormal return, which was unexpected. The regression constant does not differ from zero significantly, suggesting if there is no change in trading volume, the expected CAR is not affected. With a correlation coefficient of 3%, the relation is positive and significant on the lowest confidence level tested.

The results imply that there is some arbitrage opportunity with Russell 3000 reconstitution event. Based on these results we suggest an investment strategy of taking a long position in to be added stocks and short position in to be deleted stocks until the reconstitution and after that switch to the opposite positions, short just added stocks and long just deleted stocks. This long position should be from the beginning of January until the end of June (effective new constituent list). Short position similarly from January to June. In the end of July, convert the positions to opposite ones and hold until the end of October. This strategy would have yielded, on average, +16% in that time over our three-year sample period.

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APPENDICES

Appendix 1. CAR*i*

	A18	A17	A16	Average
January	1.64779%	**6.29920%**	-10.00619%	-0.68640%
February	**5.60651%**	**4.80479%**	**5.24851%**	5.21994%
March	**11.68986%**	**6.69941%**	1.21078%	6.53335%
April	**3.44991%**	1.64541%	1.40999%	2.16844%
May	**5.77547%**	1.38925%	2.02759%	3.06410%
June	**5.28802%**	**4.16420%**	-1.14829%	2.76798%
July	-2.52019%	**-3.20805%**	0.04536%	-1.89429%
August	1.29535%	1.09544%	1.56370%	1.31816%
Septembe	-2.11217%	**6.50183%**	1.37528%	1.92164%

Table 5 Mean cumulative abnormal returns for added stocks

Appendix 2. CAR*i*

	D18	D17	D16	Average
January	**-10.30644%**	**-11.43695%**	**-14.64629%**	-12.12989%
February	-3.23196%	**-7.80771%**	-5.11542%	-5.38503%
March	**-10.44268%**	**-7.71193%**	6.06511%	-4.02983%
April	-4.55854%	**-11.32807%**	7.15619%	-2.91014%
May	-0.53786%	**-10.13097%**	**-7.53799%**	-6.06894%
June	-0.09525%	3.96851%	-2.45821%	0.47169%
July	**-5.09401%**	-3.38437%	-1.17110%	-3.21649%
August	0.13060%	3.67667%	4.80935%	2.87221%
Septembe	17.34288%	**9.20175%**	**9.56707%**	12.03723%

Table 6 Mean cumulative abnormal returns for deleted stocks

Appendix 3. Change in trading volume

Volume Δ	A18	A17	A16	D18	D17	D16
March	106.20%	85.63%	86.84%	35.75%	59.81%	75.96%
April	21.04%	2.55%	17.02%	31.12%	44.48%	1.29%
May	66.94%	48.69%	113.51%	36.28%	-41.29%	-1.48%
June	221.36%	175.24%	217.41%	125.65%	102.21%	-2.40%
July	-45.26%	-34.97%	-44.04%	-51.08%	-17.97%	-1.49%
August	6.04%	12.55%	-10.78%	28.54%	117.83%	1.07%

Table 7 Change in trading volume (mean changes)

Appendix 4. CR*i*

	January	February	March	April	May	June	July	August	September
Addition 2018	4.44184%	0.73278%	8.75668%	5.34919%	7.23020%	0.32171%	0.17596%	4.44896%	-2.18468%
Addition 2017	7.56077%	6.83292%	5.98479%	2.14043%	0.05844%	3.60371%	-2.08914%	-1.27232%	7.15283%
Addition 2016	-5.19672%	5.16260%	5.76516%	6.01478%	2.90262%	-1.04732%	3.70478%	1.76507%	1.61982%
AVG	2.26863%	4.24277%	6.83555%	4.50146%	3.39708%	0.95936%	0.59720%	1.64723%	2.19599%
	January	February	March	April	May	June	July	August	September
Deletion 2018	-6.91732%	-6.61354%	-11.09367%	-1.97078%	1.88533%	-0.56932%	-2.31539%	3.58637%	17.67380%
Deletion 2017	-11.31025%	-4.61033%	-9.10360%	-10.26866%	-9.64494%	3.80219%	-1.99053%	3.38433%	11.42018%
Deletion 2016	-17.81337%	-5.11790%	10.87335%	7.49709%	-6.63854%	-2.55507%	2.42718%	5.15725%	9.96182%
AVG	-12.01365%	-5.44726%	-3.10797%	-1.58078%	-4.79938%	0.22593%	-0.62624%	4.04265%	13.01860%

Table 8 Cumulative return by month and averages

Appendix 5. Regression coefficients

	Coefficients
Intercept	-0.00104045
Addition	-0.05173097
Deletion	-0.023783838
Volume	0.039308047

Table 9 Regression coefficients