

# **Initial excess returns and long-term price performance of initial public offerings: Evidence from the Finnish markets**

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## **Abstract**

This thesis explores initial excess return and three-year aftermarket performance of initial public offerings in Finland. The initial return, defined as the difference between the issue price and the first trading day closing price, is explored separate from and including the allocation of the issues. The evidence is gathered from 72 initial public offerings issued between 1993 and 2016. The results show that there exists a significant abnormal initial return on sample IPOs, which turns negative when shares are allocated according to the oversubscription of the issues. The evidence also shows that the IPOs underperform the benchmark market index over the three years following the first trading date. Additionally, I study the speculative bubble hypothesis based on the results that indicate positive correlation between unallocated first day returns and degree of oversubscription of IPOs.

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## 1. Introduction

The phenomenon of underpricing, whereby initial public offerings are on average priced lower than their first recorded closing price on the market, is well-documented in multiple studies across different countries. In fact, Brealey and Myers (1991) dubbed it one of the 10 greatest puzzles in financial research (Mok and Hui 1998). The existence of underpricing in initial public offerings has been recognized since the early 1900s (Chambers and Dimson 2009). For a long time however, there existed no widely accepted explanation on the reasoning behind the phenomenon, as portrayed by Roger G. Ibbotson (1975), in his study where he quoted the underpricing as a mystery. Since then, perhaps the most widely recognized explanation to the phenomenon is the winner's curse hypothesis, originally introduced to the concept of IPOs by Kevin Rock in 1986. In this hypothesis, IPOs are systematically priced at a discount to their expected true value in order to attract uninformed investors and secure sufficient demand for the issues (Rock 1986). An alternative, well-recognized explanation to the underpricing is the inefficiency of the aftermarket to correctly price IPOs according to their intrinsic value on the short-term (Aggarwal and Rivoli 1990).

Another puzzling characteristic of initial public offerings is the long-term aftermarket price-performance following the offer. The general consensus of studies conducted in multiple different markets is that IPOs underperform the relevant index over the long run. This has previously been documented by Keloharju (1993) on the Finnish markets, by Ritter (1991) on the US markets, by Chan et al. (2002) on Chinese markets and by Gajewski and Gresse (2006) on European markets, just to name a few. There are also a few notable exceptions to this rule. For example, a study by Thomadakis et al. (2012) find that 254 IPOs issued in Greece between 1994 and 2002 significantly outperform the market index over 36 months following the initial offering. It thus seems that the tendency of IPOs to underperform the index is the standard, and deviations from this norm are time- and market-specific. I examine the characteristics of the Finnish markets during 1994-2016 and compare them to studies over different timeframes in order to find predictability in general IPO under- or over-performance. I find that hot-issue periods, defined by Ibbotson and Jaffe (1975) as periods with an abnormally high short-term aftermarket performance, coincide with periods of overall market enthusiasm and higher than average IPO activity. This increased activity is realized in the form of exceptionally high oversubscription and number of IPOs filed. Similarly, the long-term underperformance is increased during hot-issue periods. These results give justification to the speculative bubble hypothesis, whereby initial irrational enthusiasm regarding new issues will eventually lead to the bubble bursting.

This thesis is inspired by the study conducted by Matti Keloharju in 1993. In his study, Keloharju finds that on average initial public offerings on the Finnish stock market between 1984 and 1989 are underpriced relative to their subsequent market price on the first day of trading, resulting in a positive initial excess return. However, he finds that an uninformed investor could not have realized these returns due to the allocation bias, whereby the investor will get a proportionally larger order of underperforming IPOs due to oversubscription of hot issues. Additionally, he finds that there exists on average, a three-year underperformance following the initial trading date of the IPO. He implies that this puzzling result may be due to over optimism resulting from the exceptionally active IPO-market in Finland during the time-period.

Keloharju's study was conducted during a time of significant IPO activity on the Finnish markets. The study includes a period of five and a half years, during which a total of 91 firms issued an initial public offering. For perspective, the number represents over 90% of all IPOs issued in Finland between 1960 and 1992 (Keloharju 1993). There exist significant differences in IPO underpricing across different time periods as documented on the U.S. markets by Loughran and Ritter (2004) and on the UK markets by Chambers and Dimson (2009). I examine whether the heavily diminished returns due to allocation and the subsequent poor long-run aftermarket performance in Keloharju's study, were caused by the extraordinary nature of the IPO market in Finland during the late 1980s, or whether it is still a persistent phenomenon on the Finnish markets.

This paper has two main objectives. First, I study initial excess returns of Finnish IPOs and the related winner's curse. I seek explanations for the consistency of the underpricing phenomenon by comparing the nature of the market in the study with previous studies. I find that the degree of underpricing, as well as the degree of oversubscription, are positively correlated with the number of IPOs filed.

Second, I study the long-term aftermarket performance following the first trading day of an initial public offering. I compare the nature of the market during the timeframe of the study to other literature in order to find consistencies with periods of high and low IPO activity and related aftermarket performance. I find, that the long-term aftermarket performance is poorer for IPOs filed during the exceptionally active years of the dot-com bubble. Furthermore, I find correlations between all three aspects studied, the degree of oversubscription, the excess initial return and the 36-month aftermarket underperformance. I study the speculative bubble hypothesis, which seems the most fitting explanation for the initial enthusiasm regarding IPOs and the eventual fall in their prices.

## 2. Characteristics of the IPO market in Finland

### 2.1 Legislations and practices in initial public offerings

Initial public offerings in Finland are generally separated into three subscriber categories; public, personnel and institutional. Public and personnel issues are similar in nature, except for the usually lower price and included lock-out period of the personnel issue.<sup>1</sup> The investor issue is fundamentally different from the two and requires a substantial minimum subscription and accreditation. The latter of these generally acquires the bulk of the issued shares and the final offer price in the book-building method is derived from institutional demand (Hasselgren 2018). In Finland, the final offer price could be a fixed price or a price range, where the final price is determined through institutional demand by the book-building method (Gajewski and Gresse 2006). I study the returns from the point of an uninformed individual investor without accreditation, who therefore takes the issue price as a given.

The initial excess return of IPOs is measured from the time in between the first day of issue and the first trading date. I refer to the listing prospectuses of several of the sample firms and the *Securities Markets Act 746/2012* for the listing process on the Finnish markets. The subscribed amount of an initial public offering must be paid in full between the first day of issue and the last day of issue. However, due to oversubscription the issue period is often cut short early, which is why I assume that all issues are subscribed, and fully paid, on the first day of issue. In the case of oversubscription, the sum that falls outside of the allocated amount is paid back, on average, a week after the allocation has taken place, which usually approximately coincides with the first trading date.<sup>1,2</sup> During the time between the issue date and the first trading date, the entire sum is losing the opportunity cost of investing the money on to the market index. The average time between the offer date and the first trading date of the IPOs in the sample is slightly over 25 days and it has decreased from the 3 months at the turn of the decade between 1980 and 1990 (Chowdhry and Sherman 1996). Though, the time between the offering and first aftermarket price varies significantly in the sample, there is a noticeable decreasing linear trend over time in the length of the listing process, likely due to the development of stock market mechanisms. According to the findings of Mok and Hui (1998) a longer time period between the offer date and the first trading date results in higher degree of underpricing. However, my results seem to indicate no relationship between the two.

An overwhelming majority of the sample IPOs are oversubscribed during the time period of the study. This finding is consistent with many earlier studies across multiple markets; for a comprehensive reference see a study conducted across different markets by Chowdhry and Sherman (1996). In the event of oversubscription, the offering period will often be terminated prematurely. Subscribers will then receive a portion of the shares according to the degree of oversubscription and the issue-specific allocation rules. In general, smaller subscription amounts are rationed to a lesser degree than larger ones on the Finnish markets, and there often exists a minimum amount of shares that will be granted regardless of subscription size.<sup>1</sup> For example, the relatively recent initial public offering by Vincit Oyj, was 5.6 times oversubscribed, meaning that an average subscription was only able to realize 17.9% of their total subscription amount. However, a small subscription of 220 shares was allocated 105 (47.7%) of the shares subscribed.<sup>2</sup> This remains consistent to the findings from 1984-1989 by Keloharju (1993), where he presents the allocated portion as a decreasing logarithmic curve relative to the size of the subscription. Due to the lack of data available regarding specific allocation rules and the relative amounts of subscriptions of different size-classes, I only consider the average allocation of each issue.

In order to increase the scope of the study, listings on both, NASDAQ OMX Helsinki (OMXH) and NASDAQ First North (FN), were included in the sample. The First North marketplace started operating in Helsinki in 2007. It was created in an attempt to facilitate the listing process for small companies who do not yet qualify for the requirements of listing on the main market. There are some fundamental differences between the IPO listings on the FN and the main market, most notably the much lower size requirements and the exemption of companies from EU-Directives on the FN marketplace. (Nasdaq 2019)

The two different markets are not considered separately in this study. As a result, there are a few important details to consider when interpreting the results. Out of the 72 IPOs considered in this study, 12 were initially listed on NASDAQ First North. The companies listed on the First North market have a smaller average market cap and are, in general, less liquid than listings on the main market. Out of the total of 6 undersubscribed issues, 2 were listings on the FN market. There seems to be a significantly smaller degree of oversubscription on the First North market: an average of 222.6%, compared to 1021.21% on all markets (including FN).

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<sup>1</sup> I consider the listing prospectuses of several of the sample firms

<sup>2</sup> Based on an empirical finding from participating in the IPO of Vincit Oyj in 2016

Additionally, the FN listings decrease the average beta of the entire sample (0.31 vs. 0.63 in the entire sample). This is likely due to their lower liquidity and not on lesser systematic risk, as documented previously by Dimson (1979).

## **2.2 The nature of the market during the timeframe of the study**

Since the advent of the Helsinki stock market in 1912 until the present day in 2019, a total of 491 firms have listed on either OMXH or the Finnish First North market, averaging an annual listing phase of approximately 4.5 IPOs (Kock 2013). The 22 years included in the sample of this study average 6.5 listings annually, which is not significantly different to the overall listing phase of the Finnish stock markets, especially considering the development of the stock market and the economy as a whole. There are large periodic variations in IPO underpricing and overall activity, which is why there are some notable periods within the timeframe of the study that require increased attention.

The sample size includes the dot-com bubble of the early 2000s, the financial crisis of 2008, the Eurozone crisis of the early 2010s and the unprecedented era of negative interest rates.

The economic boom of the end of the last century and the early 2000s, reflected on the Finnish IPO markets as a rate of offerings that has not been replicated since. From 1998 to the end of 2000, 60 (33 of which are in the sample) firms filed for an offering on the Helsinki Stock Market, representing almost half of all IPOs in the sample (Kock 2013). During this time, the investor interest toward these IPOs was also high, with the average offering oversubscribed over 14 times compared to an average of less than 10 times in the entire sample. Likewise, the average offering had a first day excess return of over 28%, compared to approximately 15% in the entire sample. Studies from other markets also suggest significantly higher-than-average initial returns during this timeframe (Loughran, Ritter 2004). As the name suggests, the dot-com bubble's greatest initial returns worldwide were dominated by aspiring technology companies going public as the internet and related industries quickly gained momentum (Ljungqvist, Wilhelm 2003). Finland was no exception; high initial returns were most notably achieved by Nokia's subcontractors and other software firms. After the burst of the bubble, the IPO activity halted to a crawl with only 2 IPOs filed over the following 4 years, and subscription amounts falling significantly, as infamously portrayed by the IPO of QPR Software Oyj in 2002, which was only 0.0011 times subscribed.

Though the 2008 financial crash was similar in nature to the dot-com bubble, the surge of the stock markets and subsequent crash thereof was not reflected on the Finnish IPO market nearly as strongly. The Finnish IPO market took a long time to recover from the burst of the bubble at the end of the dot-com bubble and it once again came to a long halt due to the financial crash and the following Eurozone problems. It seems that the IPO market in Finland has only recently started to truly pick up momentum since the early 2000s. Graph 2.2 visualizes the annual differences in the number of initial offerings filed and the simultaneous development of the comprehensive benchmark index.

Graph 2.2: The development of OMXH PI and number of initial public offerings in the sample



The y-axis represents simultaneously the value of the OMXH PI and the number of IPOs filed per year (x1000). The bars represent the number of initial offerings and the line graph the development of the benchmark index. Note: the graph does not represent all IPOs filed in Finland during this timeframe, only the ones considered in the sample as explained in more detail in section 3.

### 3. Data and Methods

The initial public offerings in Finland between January 1, 1994 and January 1, 2017 are gathered from Thomson Financial Securities Data. The dataset includes 115 IPOs, but the data is not complete in many cases and requires corrections as noted also by Loughran and Ritter (2004). The data was altered as follows: 12 IPOs were excluded, because they were not listed on either OMXH or First North, 3 entities were excluded, because they did not offer their shares to the public, and 28 were excluded due to a lack of subscription or price data. After eliminating the IPOs according to the reasoning above, a total of 72 IPOs were left in the sample, out of which 60 were listed on the main market and 12 on First North. The selected range of the timeframe is from 1993, until the end of 2016 in order to observe the 36-month aftermarket price development. However, the first applicable IPOs were only filed in 1995.

The aftermarket price data following the IPO was gathered from Thomson Reuters Datastream. Unadjusted closing price was used to calculate the initial return for each IPO. Issues before 1999 were reported in Finnish markkas and have been converted to euros with a standard coefficient of 5.94573 FIM per EUR, consistent with the data from NASDAQ and Thomas Reuters Datastream (Statistics Finland 2019). For the following three-year price development, adjusted closing prices were used in order to account for share splits. I compare the price returns to the OMXH PI, which tracks all companies on Nasdaq Helsinki, weighted by their market capitalization. The transaction cost of selling IPOs in the aftermarket has been set at 1,2%, which is the 1989 - 2016 average cost, available to the uninformed investor, of selling domestic shares worth between 1000 and 100,000EUR, as buying no longer incurs additional costs in an IPO (Nordea 2019).

The data regarding whether an IPO was oversubscribed or undersubscribed, and if available, by how much, was gathered firstly from Thomas Reuters Eikon, then from the issuers' listing prospectuses and financial statements and finally from news articles. Out of the 72 IPOs, a total of 66 were oversubscribed and 6 undersubscribed. Not all IPOs contained data on the amount of over- or undersubscription, but for those that did, the average IPO during this timeframe was 997.9% subscribed. It should be noted, that some of the oversubscription data is only approximate and that public, personnel and institutional subscriptions have either been combined based on their respective weights or the source originally reported them as a whole. For the IPOs that lacked data on the degree of oversubscription, a median value (600%) of the oversubscribed issues' degree of oversubscription was used for robustness reasons.

The initial excess return was calculated as the change between the offer price and the first trading day price and adjusted for market changes of the OMXH price index between the time of the first offer date and the date of the first recorded trading price. The long-term aftermarket performance was calculated using both, a monthly rebalancing strategy and a 3-year holding strategy.

The average cumulative return is based on a holding strategy, where no rebalancing is done for the entire 783-day holding period following the first trading date. Because, the IPOs in the dataset are spread over a period of approximately 22 years, the market index is compared to each IPO separately and finally an average of all index-adjusted returns is reported. For example, the aftermarket period for Nokian Renkaat includes 783 days between 1995 and 1998, whereas the equivalent for DNA Oyj is set between 2016 and 2019, the index changes are therefore specific to each issue.

Firms that have been delisted (3 entities) or gone bankrupt (1 entity) have been truncated from the day that they have been delisted. Other truncations have been made to the two firms (DNA Oyj and Heeros Oyj), which did not yet at the time the study, have price data for the entire three years after the first trading date.

The equally weighted Beta of the portfolio containing the 72 IPOs is 0.63. Therefore, the IPOs have on average less systematic risk than the market. This measure is however slightly exaggerated due to the illiquidity of some of the stocks, especially on the First North, as explained before. Monthly data was used in calculating the betas in order to better account for the illiquidity. However, the beta for calculations, is assumed to be 1 as explained in section 5.

The initial excess return is calculated as follows:

$$ar_i = \frac{P_{it}(1 - TR) - P_{io}}{P_{io}} - \frac{PI_{it} - PI_{io}}{PI_{io}}$$

Where  $ar_i$  is the initial excess return for IPO  $i$ ,  $P_{it}$  is the closing price on the first day of trading and  $P_{io}$  is the offer price.  $TR$  is the transaction cost, where an average has been used for all issues.  $PI_{it}$  is the closing value of the OMXH Price Index on the first trading date of IPO  $i$  and  $PI_{io}$  is the value of the price index at the offer date of IPO  $i$ . Unlike in Keloharju (1993), no risk-free cost is considered here, because the IPOs are subscribed by paying the unallocated sum up front.<sup>1, 2</sup>

Abnormal equally weighted return for stock  $i$  for month  $t$ :

$$ar_{it} = r_{it} - r_{mt}$$

Where  $r_{it}$  is the price change for stock  $i$  over month  $t$ , and  $r_{mt}$  is the return of the market index for month  $t$ . No transaction costs are considered in the rebalancing strategy in order to report comparable findings with the main reference study.

Average equally weighted abnormal return for  $n$  stocks for month  $t$ :

$$AR_t = \frac{1}{n} \sum_{i=1}^n ar_{it}$$

The cumulative return of the rebalancing strategy from month  $x$  to  $y$  is reported as follows:

$$CAR_{x,y} = \sum_{t=x}^y AR_t$$

I also report cumulative returns from holding each IPO for 783 days following the initial trading date, without rebalancing. These results are visualized in graph 5.2.

$$cr_i = \prod_{t=1}^{783} (1 + r_{it})$$

$$cmr_i = \prod_{t=1}^{783} (1 + mr_{it})$$

$$ARCR_t = \frac{\frac{1}{n} \sum_{i=1}^n cr_i}{\frac{1}{n} \sum_{i=1}^n cmr_i}$$

Where  $cr_i$  is the cumulative return for stock  $i$  for the 783 days of aftermarket prices and  $cmr_i$  is the corresponding market return for stock  $i$  over the timeframe.  $ARCR_t$  is the average relative cumulative return of  $n = 72$  stocks compared to the average market index for  $t$  days since the initial trading date, also commonly referred to as the wealth relative. The results are reported monthly in table 5.1, but are calculated with daily data.

## 4. Initial returns and allocation

### 4.1 Initial returns

The appendix includes statistics for firm-specific first-day returns. The average offering in the sample has a significantly positive first-day excess return of 15.12%. The average initial excess return is positive in 11 of the 15 sample years, the initial return is especially prevalent during the dot-com boom at the turn of the millennium, as evident from table 4.1. The initial excess return is also generally exaggerated during years, where the degree of oversubscription is high. This is consistent with Agarwal et. al (2006), who assert that investor demand is positively correlated with IPOs' first trading day returns. The adjusted Fisher-Pearson coefficient of skewness of the unallocated excess returns is 3.81, indicating no normality in the results. The results are highly skewed to the right, with an excess kurtosis of 14.57. There are three clear outliers in the positive direction, which is why the normality is better represented with these removed. When three of the highest values are removed, the average initial excess return settles at 5.88% and the results are approximately normally distributed with a skewness of -0.48 and an excessive kurtosis of 2.93.

The sample size is too small to perform a comprehensive industry study with meaningful results. I only study the technology- and industrial goods and services industries separately, since they represent respectively 29 and 14 of all 72 IPOs in the sample, and since the dot-com bubble was famously led by *tech and internet-related* IPOs (Loughran and Ritter 2004). This is also evident in my study, where 20 out of 33 IPOs between 1997 and 2000 were classified under the technology sector. The mean unallocated excess initial return for technology stocks is 29.67%, and 8.50% for industrial goods and services. The technology sector and the dot-com bubble cause the bulk of the sample's abnormal initial returns. This finding factors into the speculative bubble hypothesis as discussed later.

Table 4.1: Sample IPO initial excess returns sorted by offer year

Year	n	Initial excess returns			Mean subscription	Mean allocated initial excess return
		mean	max	min		
1995	2	0.040	0.078	0.001	1.35	0.032
1996	2	0.146	0.250	0.043	13.00	0.015
1997	6	0.106	0.486	-0.099	7.10	0.008
1998	7	0.144	0.363	-0.007	7.08	0.027
1999	16	0.337	2.473	-0.215	15.33	0.002
2000	10	0.289	2.533	-0.328	18.83	0.002
2002	1	-0.276	-0.276	-0.276	0.00	-0.274
2005	1	-0.056	-0.056	-0.056	4.47	-0.012
2006	3	0.024	0.040	0.008	2.30	0.009
2007	1	0.078	0.078	0.078	6.54	0.014
2012	1	0.079	0.079	0.079	1.85	0.043
2013	2	-0.033	0.023	-0.088	1.32	0.001
2014	5	-0.009	0.020	-0.075	1.70	-0.005
2015	9	0.016	0.230	-0.364	1.87	-0.020
2016	6	0.108	0.521	-0.109	4.14	0.004

Table 4.1. Due to the low number of observations in some years, the mean values may only consider one IPO and are thus biased. For the same reason the median values are not reported here.

According to the results, the issues that attract more interest, simultaneously realize greater initial returns in the aftermarket. The overall existence of underpricing across the entire sample indicates that IPOs are systematically underpriced as explained by Rock's (1986) definition of the winner's curse hypothesis. However, the winner's curse does not fully explain the positive relationship between an IPO's initial returns and the degree of oversubscription. When the initial returns are regressed against the subscription of the respective offering, a linear equation of the form  $f(x) = 0.05x - 0.02$  is generated, where  $f(x)$  is the initial excess return and  $x$  is the degree of subscription. The linear trend has an  $R^2$  value of 0.75. Similar results are also realized by Low and Yong (2011) on the Malaysian markets and Cornelli and Goldreich (2003) across 24 different countries. In light of these results, the most convincing explanation regarding the observed relationship between initial excess returns and IPO oversubscription is the speculative bubble hypothesis. It could be argued, that during overall market over-enthusiasm, such that generates economic bubbles, investors are more likely to speculate on IPOs and thus spike up the degree of oversubscription on the issues. Investors will not then be able to fulfill their desired order sizes due to excessive allocation resulting from the high degree of oversubscription. This leads to very high initial demand in the aftermarket as these investors are trying to fill their desired orders, increasing the initial excess returns and creating a speculative

bubble. This bubble will then have to eventually burst as the intrinsic values of the issues become apparent to the investors. The evidence of the burst of the bubble is discussed in more detail in section 5.2.

#### **4.2 Oversubscription and allocation**

Due to the general deficiency of rationing data, the findings regarding the allocation of the issues are to be interpreted with skepticism. However, even with the existing data, it can be stated with reasonable confidence that an average investor who subscribes to all issues is not able to realize returns that would significantly outperform the market index. When the initial public offerings are allocated according to the oversubscription of each issue, the excess initial return diminishes. The average allocated initial excess return for the entire sample is -0.12%. An uninformed investor could have realized approximately equal returns by investing their money on the OMXH price index for the issue period. The missing data points are substituted with the median of the oversubscription of the sample for robustness reasons. By using the mean coefficient of 997.9% [or the minimum 101.4%] instead, the allocated initial excess return is -0.18% [0.72%]. The average allocated initial return then seems to be almost indifferent to the degree of oversubscription of the unavailable data points, which decreases the adverse effect of lackluster data.

Because the initial abnormal returns are increased as the degree of oversubscription increases as discussed before in section 4.1, the allocated average returns should yield a result that is close to zero. For example, the three issues owing to the greatest initial first-day returns were all oversubscribed between 34 and 43 times, and their average allocated return that remained was only 2.6% (28.5% in the entire sample) of the original initial return. The average allocated return is -0.115% across the entire sample, according to which, the Finnish IPO markets appear to be operating surprisingly rationally during the time period, as an average subscriber of IPOs gets approximately the same return as the opportunity cost of investing on the market index.

## 5. Long-term aftermarket performance of IPOs

Table 5.2 shows the average performance of the rebalancing strategy for the 36 months following the initial trading date, and the returns of the holding strategy. Graph 5.3 shows the cumulative aftermarket performance of holding the sample IPOs for the 783 days following the initial trading date on the market. The initial return is excluded from the aftermarket performance, because the allocation is no longer applicable when investors can fulfill their desired orders in the aftermarket, and because the allocated initial excess returns are close to zero in the sample. The returns of both, rebalancing and holding strategies, significantly underperform the respective market index over the 36-month observation period. Over the 3-year time period, the rebalancing strategy rewards the investor with 80.43 cents for every euro invested on the OMXH PI index. Similarly, the holding strategy would leave the investor with a mere 77.25 cents for every euro invested on the market index. Interestingly, the average systematic risk of the sample, measured by beta, is only 0.63, even though for example, Aggarwal and Rivoli (1990) assert that the systematic risk of IPOs is generally higher than that of the market index. The lower beta in the sample is then likely due to infrequent trading and is not considered in the calculation of long-term returns, such as that I assume the beta to be 1 for each issue. Though simplified, assuming the beta as 1 has been deemed a practical model in situations where data is limited (MacKinlay 1997). An argument could be made, where the underperformance is the cost of the decreased systematic risk of the IPO portfolio. However, in light of all the other studies considered that imply consistency with long-term underperformance, this seems unlikely.

### 5.1 Speculative bubble hypothesis

Under the speculative bubble hypothesis, the offer prices of the issues are consistent with the underlying economic prospects of the issuer's business. Speculative investors who could not fulfill their orders due to allocation then increase the price in the aftermarket by immediately buying up to their desired order size, leading to a bubble. According to Tinic (1988) in his discussion on the speculative bubble hypothesis, "[...] the initial positive excess returns of the IPOs should be followed by negative excess returns as the bubble bursts sometime later." In his study in 1988, Tinic controversially remarks that there exists virtually no study that would support the long-term aftermarket underperformance that is required to confirm the existence of the speculative bubble. However, especially more recent literature commonly reports the existence of long-run underperformance of initial public offerings. For reference, Kooli and Suret (2002) list 15 studies from 13 different countries between 1965 and 1998, out of which only two have shown positive aftermarket performance [+2.0% in Korea during 1985-1988 (Kim et al. (1995) and +1.2% in Sweden

during 1980-1990 (Loughran et al. (1994)]. I report results that are consistent with earlier studies, such as those listed by Kooli and Suret (2002). On average, the issues are oversubscribed, have a high initial return and underperform the index. Most notably, the results indicate positive correlation between all of the above, which is amplified during years with higher number of IPOs filed. During the most active years of the sample between 1998 and 2000, the average IPO has a cumulative price performance of 0.59; 18 percentage points lower than in the entire sample. This makes logical sense; the higher the overall confidence in the economy, the more investors are willing to speculate on IPOs. This speculation results in high demand and seemingly high initial returns, which will sooner or later turn into disappointment as the intrinsic values of the underlying businesses become apparent. This is also the logic behind the speculative bubble hypothesis, which the results are in line with.

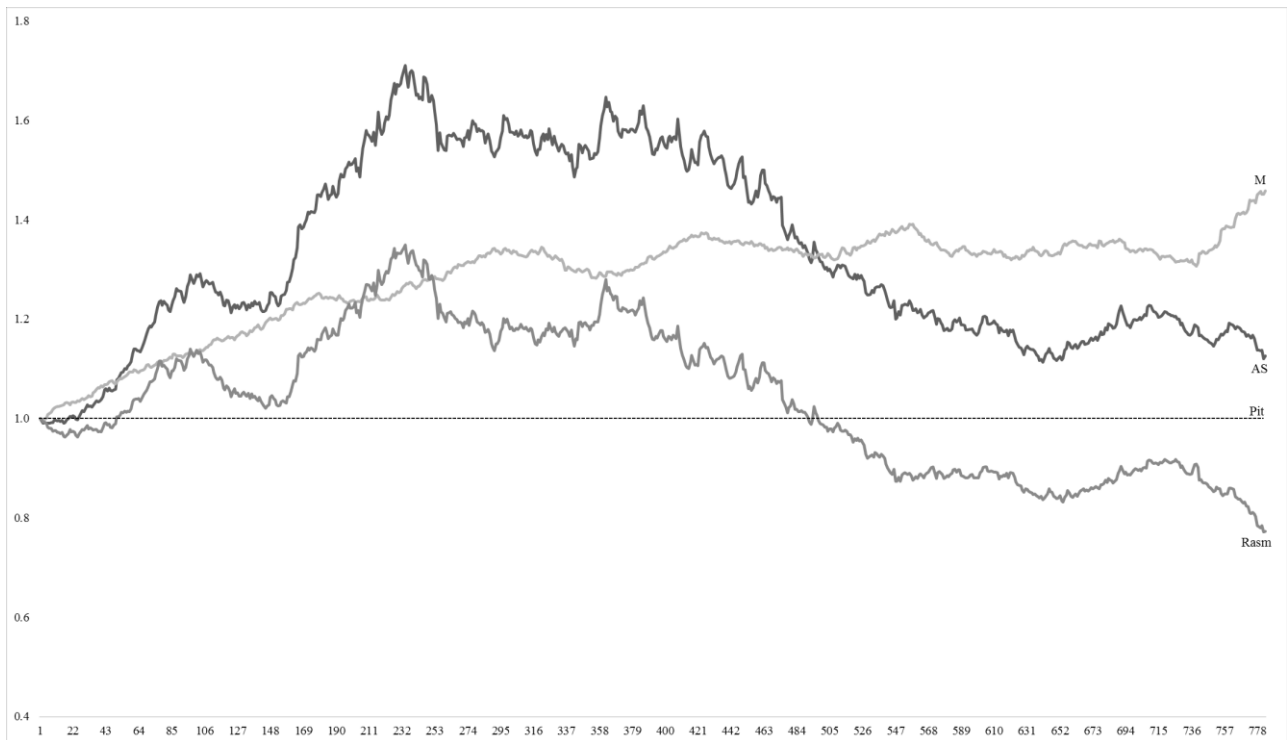
The underperformance seems to be more evident in longer time periods, and thus when interpreting studies reporting over- or underperformance of IPOs in the aftermarket, the timeframe should be considered carefully. For example, Mok and Hui (1998) fail to confirm the existence of the speculative bubble hypothesis, because their sample realizes positive returns in the aftermarket. However, they only consider 350 days after the initial trading date. In my results, the relative aftermarket performance of IPOs only turns in the negative direction after approximately 22 months following the initial trading date. Until this point, the IPOs seem to outperform the market index, indicating that it may take considerable time for the speculative bubble to burst.

Table 5.2: Average IPO aftermarket performance

Months in relation to first trading date	Cumulative 36-month holding period return	Cumulative return in relation to OMXH PI	Average abnormal return (AR <sub>t</sub> )	t-statistic (AR <sub>t</sub> )	CAR
1	1.0057	0.9739	-0.0265	-8.17	-0.0265
2	1.0548	0.9865	0.0035	0.86	-0.0231
3	1.1421	1.0408	0.0336	8.90	0.0106
4	1.2610	1.1201	0.0311	2.99	0.0416
5	1.2722	1.1069	-0.0060	-1.39	0.0356
6	1.2261	1.0466	-0.0257	-8.94	0.0099
7	1.2312	1.0259	-0.0092	-1.91	0.0007
8	1.4140	1.1350	0.0116	2.78	0.0123
9	1.5164	1.2300	0.0375	10.55	0.0498
10	1.5782	1.2750	-0.0100	-2.71	0.0398
11	1.6522	1.3055	0.0099	2.22	0.0496
12	1.5678	1.2090	-0.0491	-16.69	0.0005
13	1.5635	1.1745	-0.0146	-2.89	-0.0141
14	1.5805	1.1901	0.0180	3.66	0.0039
15	1.5581	1.1740	-0.0422	-10.06	-0.0383
16	1.5218	1.1777	-0.0147	-2.53	-0.0530
17	1.5804	1.2204	0.0046	0.73	-0.0484
18	1.5519	1.1696	-0.0215	-5.85	-0.0699
19	1.5253	1.1170	-0.0122	-3.10	-0.0821
20	1.4692	1.0853	-0.0111	-2.72	-0.0932
21	1.5000	1.1125	-0.0010	-0.25	-0.0943
22	1.3661	1.0184	-0.0347	-9.84	-0.1289
23	1.2940	0.9785	-0.0025	-0.73	-0.1314
24	1.2530	0.9277	-0.0337	-5.43	-0.1652
25	1.2078	0.8736	-0.0225	-5.77	-0.1877
26	1.2048	0.8906	0.0483	12.95	-0.1393
27	1.1787	0.8833	0.0011	0.33	-0.1383
28	1.1747	0.8858	0.0046	1.16	-0.1337
29	1.1243	0.8425	-0.0150	-3.71	-0.1487
30	1.1415	0.8410	-0.0013	-0.31	-0.1500
31	1.1783	0.8712	0.0268	9.49	-0.1232
32	1.1982	0.8944	-0.0091	-3.63	-0.1323
33	1.2053	0.9170	0.0126	2.68	-0.1197
34	1.1523	0.8604	-0.0260	-7.04	-0.1457
35	1.1737	0.8313	-0.0464	-9.97	-0.1920
36	1.1264	0.7725	-0.0037	-0.84	-0.1957

\*All months except for the 36<sup>th</sup> include 22 trading days, last is cut short at 13 days. The t-statistics are calculated against an estimated mean of 0.

Graph 5.3: 783-day holding period returns for the sample IPOs and the market index



M is the OMXH PI average cumulative return, AS is the average cumulative raw return of sample IPOs, Pit is the first trading day closing price and Rasm is the wealth-relative of sample IPOs compared to the OMXH PI market index. The x-axis is number of days from first trading date, and y-axis represents the relative price, where  $P_{it} = 1$ .

## 6. Conclusion

The evidence from 72 IPOs in Finland between 1995 and 2016, supports the winner's curse hypothesis where initial returns are significantly diminished when allocated according to the degree of oversubscription of each issue. The average initial excess return is 15.12% when unadjusted for allocation and drops to a negative 0.12% when adjusted for the degree of allocation. Initial excess returns of IPOs are a well-researched phenomenon across multiple markets and there exist only a few documented exceptions to this rule (Gajewski and Gresse 2006). According to Gajewski and Gresse (2006) and Rock (1986), the main explanatory factor regarding underpricing is information asymmetry. Meaning that initial public offerings are systematically and consciously priced lower than their true value in order to attract all desired investors. My results give no reason to refute this hypothesis, since the underpricing is present in more than two thirds of the sample offerings quite consistently across the entire timeframe. However, the simultaneous existence of the speculative bubble hypothesis can be argued according to the results, because the degree of underpricing is increased significantly during heightened IPO market activity. Similarly, the degree of oversubscription and consequent allocation of the issues is remarkably increased during hot-issue periods. An uninformed investor will have a hard time realizing any truly positive excess initial returns, because the issues with high initial return, are allocated to the degree that they practically break even.

In addition, the results show, that on average the 36-month aftermarket performance is significantly negative compared to the index in both, rebalancing and holding strategies. This result supports the speculative bubble hypothesis, whereby the aftermarket is not immediately rational in valuing IPOs, making the market susceptible to bubbles, which are expected to burst eventually (Mok and Hui 1998). Interestingly, the proposed hypothesis by Keloharju (1993), where he reasoned that the temporary over optimism of the Finnish IPO markets results in the otherwise puzzling long-term underperformance, is consistent with my findings when the time-periods of the sample are observed separately. Though far from the number of IPOs filed in the late 80s, the sample of this study includes the internet bubble of the turn of the century, which has a significantly greater number of IPOs per year than the rest of the sample. During the dot-com bubble (considered here as the years 1998, 1999 and 2000), the average 36-month holding period of the IPOs return falls 0.18 decimal points below the one reported in the entire sample. This finding supports the hypothesis that long-term inferior aftermarket performance of an IPO could be result of initially over-optimistic investors who are later disappointed by the true value of the prospects.

In the future, conducting a comprehensive valuation of each IPO issuer over the time of their measured aftermarket performance could give valuable information on whether the IPOs are initially valued irrationally high and how long it will take for them to revert to their true value, if ever. The aftermarket period should also be studied in more length to account for the inconsistent results between studies using a different aftermarket period length. Finally, literature on accurate allocated returns of initial public offerings is still very lackluster due to a general absence of data. For most accurate results, without significant improvements in data availability, a study will have to be conducted simultaneously as the IPOs are filed, which however poses some obvious challenges regarding time and sample size.

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# APPENDIX

Company name	Exchange	Offer date	Offer price (EUR)	First day closing price (EUR)	Initial excess return	Allocated initial excess return	Oversubscribed?	Subscribed	783-day cumulative return (%)	Beta
Nokian Tyres Plc	OMXH	9.5.1995	6.05	6.206	0.0782	0.0579	Yes	135.0%	496.21	0.637
Rauma Oy (Metso)	OMXH	30.5.1995	12.95	13.120	0.0009	0.0002	Yes	N/A	30.11	0.108
KCI Konecranes Oyj	OMXH	4.3.1996	11.44	13.791	0.2496	0.0192	Yes	1300.0%	132.03	0.874
Kauppakaari Oy (Talentum)	OMXH	10.6.1996	7.06	8.070	0.0434	0.0072	Yes	N/A	508.91	1.009
PK Cable Systems Oy	OMXH	21.3.1997	7.74	11.770	0.4857	0.0486	Yes	1000.0%	98.47	0.721
Nordic Aluminum Oyj	OMXH	17.4.1997	8.41	9.050	0.0101	0.0019	Yes	540.0%	21.55	0.337
Kyro Corp (Glaston)	OMXH	30.5.1997	4.54	6.223	0.2630	0.0263	Yes	1000.0%	82.39	0.573
Elcoteq Network Oyj	OMXH	17.11.1997	11.77	11.940	-0.0350	-0.0117	Yes	300.0%	209.72	1.344
Jaakko Poyry Oy (Poyry)	OMXH	24.11.1997	10.93	10.510	-0.0993	-0.0166	Yes	N/A	49.05	0.213
Metsae Tissue Oyj	OMXH	2.12.1997	9.25	9.250	0.0087	0.0015	Yes	N/A	16.22	0.278
A-Rakennusmies (Ramirent)	OMXH	15.4.1998	11.77	14.800	0.1732	0.0173	Yes	1000.0%	-3.05	0.007
PMJ Automec Oy (Valoe)	OMXH	20.4.1998	6.73	8.830	0.2565	0.0321	Yes	800.0%	-21.86	1.149
Sponda Oyj	OMXH	31.1.1998	5.89	6.530	0.1011	0.0084	Yes	1200.0%	-24.18	-0.142
JOT Automation Group Oy (Bititium)	OMXH	26.8.1998	15.14	15.305	-0.0075	-0.0025	Yes	300.0%	-50.34	1.342
Sonera Oyj	OMXH	19.10.1998	7.57	10.510	0.3628	0.0605	Yes	N/A	-39.39	1.281
Rapala Normark Corp	OMXH	16.9.1998	5.89	6.391	0.0506	0.0211	Yes	240.0%	-54.62	-0.096
Fortum Oyj	OMXH	1.6.1998	5.38	5.685	0.0745	0.0124	Yes	N/A	-16.44	0.032
Aldata Solution Oyj	OMXH	6.10.1999	9.30	11.200	0.1653	0.0276	Yes	600.0%	-39.29	1.808
Biohit Oyj	OMXH	2.6.1999	4.50	5.010	0.0954	0.0159	Yes	N/A	-49.10	0.401
Comptel Oyj	OMXH	20.11.1999	18.59	53.000	1.8220	0.0426	Yes	4282.0%	-87.17	1.193
Eirno Oyj	OMXH	1.3.1999	14.00	13.300	-0.0688	-0.0115	Yes	N/A	-33.73	1.028
F-Secure Oyj	OMXH	18.10.1999	7.70	27.450	2.4727	0.0727	Yes	3400.0%	-88.34	1.570
Marimekko Corp	OMXH	1.3.1999	7.25	6.150	-0.1379	-0.0689	Yes	200.0%	37.40	-0.069
Oyj Linos ABP (Visma)	OMXH	22.9.1999	9.00	9.680	0.0526	0.0053	Yes	1000.0%	-72.11	0.584

Table (1/3)

Company name	Exchange	Offer date	Offer price closing price		First day	Initial excess return	Allocated initial excess return	Oversubscribed?	Subscribed	783-day	
			(EUR)	(EUR)						return (%)	cumulative return (%)
Perlos Corp	OMXH	5.2.1999	9.50	11.920	0.2397	0.0399	0.0399	Yes	N/A	-49.66	1.241
Proha Oyj (Dovre Group)	OMXH	4.10.1999	7.80	6.100	-0.2155	-0.1658	-0.1658	Yes	130.0 %	-65.57	1.134
Sanitec Corp	OMXH	22.5.1999	11.00	12.700	0.1133	0.0189	0.0189	Yes	N/A	14.96	0.134
Stonesoft Oyj	OMXH	26.3.1999	6.50	6.560	0.0157	0.0015	0.0015	Yes	1052.5 %	6.71	1.446
SysOpen Oyj (Digia)	OMXH	13.9.1999	6.40	9.760	0.4139	0.0207	0.0207	Yes	2000.0 %	-71.31	0.711
Telesite Oyj	OMXH	1.3.1999	8.20	8.430	0.0157	0.0020	0.0020	Yes	800.0 %	-6.29	1.108
TH Tiedonhallinta Oy (Softreq)	OMXH	23.8.1999	5.10	5.030	-0.0135	-0.0022	-0.0022	Yes	N/A	-86.88	0.499
Tieto-X Oy (Digitalist Group)	OMXH	20.9.1999	5.75	5.580	-0.0576	-0.0115	-0.0115	Yes	500.0 %	-67.74	0.502
TJ Group Oyj (Innofactor)	OMXH	1.3.1999	8.50	12.500	0.4854	0.0167	0.0167	Yes	2900.0 %	-82.00	1.566
BasWare Oyj	OMXH	14.2.2000	6.62	24.000	2.5335	0.0633	0.0633	Yes	4000.0 %	-83.13	0.330
Belton Yhtiöt Oyj (Wulff Group)	OMXH	25.9.2000	6.00	6.000	0.1916	0.0319	0.0319	Yes	N/A	28.33	0.229
Eteplan Oyj	OMXH	10.4.2000	7.80	8.000	-0.0198	-0.0040	-0.0040	Yes	500.0 %	-58.75	0.080
Okmnet Oyj	OMXH	13.6.2000	7.00	7.000	-0.1062	-0.0177	-0.0177	Yes	N/A	-66.43	0.648
Satama Interactive Oyj (Trainer's House)	OMXH	29.2.2000	13.00	24.100	0.7870	0.0245	0.0245	Yes	3213.0 %	-98.09	0.948
Saunalahti Oy	OMXH	24.3.2000	9.00	6.510	-0.3279	-0.0546	-0.0546	Yes	N/A	-90.15	0.698
SSH Commun Sec Oy	OMXH	5.12.2000	16.00	14.850	-0.1819	-0.0260	-0.0260	Yes	700.0 %	-89.56	0.569
Tecnomen Oyj	OMXH	22.6.2000	8.20	9.000	0.0196	0.0020	0.0020	Yes	1000.0 %	-78.56	1.487
Tekla Corporation Oyj	OMXH	8.5.2000	5.00	5.090	0.0115	0.0019	0.0019	Yes	N/A	-71.32	0.436
Wecan Electronics Oyj (Sievi Capital)	OMXH	15.5.2000	9.00	8.980	-0.0184	-0.0031	-0.0031	Yes	N/A	-67.15	1.178
QPR Software Oyj	OMXH	21.2.2002	3.30	2.290	-0.2757	-0.2743	-0.2743	No	0.1 %	-76.42	0.878
AffectoGenimap Oyj	OMXH	12.5.2005	4.80	4.810	-0.0558	-0.0125	-0.0125	Yes	447.2 %	-23.49	0.547
FIM Group Corp	OMXH	3.4.2006	5.75	6.090	0.0404	0.0067	0.0067	Yes	N/A	33.00	1.307
Outokumpu Technology Oyj (Outotec)	OMXH	25.9.2006	12.50	12.870	0.0248	0.0108	0.0108	Yes	230.0 %	80.19	1.471
Salcomp Oy	OMXH	10.3.2006	3.20	3.190	0.0078	0.0080	0.0080	No	N/A	-57.99	0.954

Company name	Exchange	Offer date	Offer price (EUR)	First day closing price (EUR)	Initial excess return	Allocated initial excess return	Oversubscribed?	Subscribed	783-day cumulative return (%)	Beta
SRV Yhtiöt Oyj	OMXH	25.5.2007	9.00	9.900	0.0784	0.0120	Yes	653.9%	-33.33	0.842
Sijli Solutions Oyj	First North	2.10.2012	7.00	7.700	0.0788	0.0426	Yes	185.0%	172.72	0.564
Orava (Ovaro Kiinteistösjointus Oyj)	OMXH	24.9.2013	10.30	10.300	-0.0884	-0.0147	Yes	N/A	-38.64	0.891
Restamax Oyj (NoHo Partners Oyj)	OMXH	12.11.2013	4.59	4.970	0.0227	0.0172	Yes	132.1%	23.74	0.617
Herantis Pharma Oyj	First North	14.5.2014	10.50	10.590	0.0098	0.0097	Yes	101.4%	-47.03	0.401
Nexstim Oyj	First North	15.10.2014	6.35	6.200	-0.0139	-0.0023	Yes	N/A	-95.32	-0.261
Nixu Oyj	First North	20.11.2014	4.40	4.170	-0.0754	-0.0450	Yes	167.3%	199.76	0.355
United Bankers Oy	First North	22.10.2014	33.00	34.800	0.0163	0.0068	Yes	240.0%	6.90	0.735
Verkkokauppa.com Oyj	First North	25.3.2014	23.00	23.740	0.0198	0.0033	Yes	N/A	83.99	0.163
Asiakastieto Group OYJ	OMXH	16.3.2015	14.74	15.240	0.0317	0.0053	Yes	N/A	64.04	0.146
Consti Yhtiöt Oy	OMXH	30.11.2015	9.50	9.800	0.0219	0.0037	Yes	N/A	-36.73	0.727
Detection Technology Oy	First North	3.3.2015	5.20	5.070	-0.0407	-0.0068	Yes	N/A	291.52	-0.062
Evli Pankki Oyj	OMXH	16.11.2015	6.75	8.370	0.2297	0.0450	Yes	510.1%	-3.23	0.443
FIT Biotech Oy	OMXH	1.6.2015	1.56	1.040	-0.3642	-0.3643	No	95.8%	-100.00	-0.011
Kotipizza Group Oyj	OMXH	5.6.2015	5.00	5.190	0.0142	0.0141	No	92.9%	202.50	-0.196
Phlajalinnä Oy	OMXH	25.5.2015	10.50	11.500	0.0821	0.0137	Yes	N/A	4.35	-0.082
Piippo Oyj	First North	11.2.2015	7.50	8.380	0.0978	0.0978	No	49.5%	-27.80	0.169
Robit Oyj	First North	6.5.2015	5.70	6.190	0.0708	0.0118	Yes	N/A	-5.65	0.511
Suomen Hoivatilat Oyj	First North	7.3.2016	3.20	3.680	0.1126	0.0188	Yes	N/A	131.52	1.068
Lehto Group Oyj	OMXH	13.4.2016	5.10	5.900	0.1439	0.0240	Yes	N/A	-28.54	0.940
Tokmanni Group Oyj	OMXH	18.4.2016	6.70	6.700	-0.0120	-0.0020	Yes	N/A	17.16	0.746
Heeros Oyj	First North	18.10.2016	3.10	2.800	-0.1089	-0.1092	No	82.0%	-21.43	-0.005
DNA Oyj	OMXH	15.11.2016	10.10	10.100	-0.0109	-0.0018	Yes	N/A	106.73	0.323
Vincit Group Oyj	First North	27.9.2016	4.20	6.100	0.5207	0.0930	Yes	560.0%	-25.57	0.052