Explanatory Value of Risk Factors for Post-IPO Volatility

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Abstract

Since 2017, Swedish business magazine Affärsvärlden examines all Swedish IPOs and subsequently hand out risk flags divided upon 21 predetermined measures. These flags aim to highlight uncertainties connected to the maturity, suitability, IPO process and prospectus of respective companies. The purpose of this thesis is to analyse the explanatory value of independently determined risk factors on the ex-post volatility of companies going public. Data consists of 329 IPOs screened by Affärsvärlden between 2017 and 2021. Using linear regression, our results suggest that these risk flags as a cumulative measure is positively correlated with higher price variance. With respect to each category of flags, we find that risks connected to the listing process itself have a statistically significant correlation with higher variance, whereas maturity, suitability and prospectus information do not.

Keywords: initial public offering, risk factors, volatility, uncertainty
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1. Introduction

In initial public offerings (IPOs), the prospectus serves as the primary information source for potential investors. While the amount of information required to be declared depends on market regulations, larger Swedish and international exchanges require detailed information of potential risk factors (Directive 2017/1129). These risk factors can cover both internal and external factors, such as overall market risks or critical business dependencies. Such risk flags may provide considerable value to understand a business and value it. As such, they have been used in previous IPO research. For example, external risk factors have been linked to lower IPO valuations, and internal risk factors to long-term firm survival (Mousa, 2014). While the explanatory value of independent risk factors may vary, previous studies have argued that a greater amount of risk factors should indicate higher levels of risk, and subsequently affect IPO pricing (Certo et al., 2001).

However, current research often focuses on companies' own declared risk factors. While relevant, it does not provide a standardised set of measures, and factors which involve the listing process itself, or the accuracy and trustworthiness of information provided. This could, for example, include management's previous engagements and their success, the length and width of historical financial information provided, and the reputation of underwriters involved in the listing process. We believe that these types of risks are particularly interesting. Imagine you are considering investing in an IPO, and currently evaluating its price. If all material risks that could affect the valuation are appropriately described in the prospectus, you are subsequently able to account for that information in your valuation. If the prospectus information is lacking or ambiguous however, correctly valuing the company will be much harder, and likely dependent on clarifying information provided at a later point in time. Each investor is likely to interpret the information differently, creating a broader spectrum of projected values for the stock.

For IPOs and smaller companies in general, lack of information sources outside the prospectus, and access to analysis of said information, may be especially scarce. Swedish business magazine Affärsvärlden recognised this issue, stating that the interest in IPOs is big, but the coverage has major shortcomings. They highlight that banks and brokers almost never cover IPOs, IR-services are best seen as paid advertising, and the same issues are present for commissioned stock coverage. Since 2017, Affärsvärlden covers all Swedish IPOs

systematically, through a service named IPO-guiden. Apart from providing investment recommendations and company analyses, the service also investigates each IPO for potential risks connected to the listing. These risks are assigned in a standardised format, amounting to 25 different risk classifications divided into four categories. In contrast to their company analysis, which often is provided in conjunction with the risk flags, the primary focus of the flagging system is not the company's operations per se or its IPO valuation, but questions surrounding the listing itself and the firm's suitability for a listed environment. They should thus capture ex-ante uncertainty regarding the firm's performance and subsequently, how it should be valued. (Affärsvärlden, n.d.)

A large amount of IPO research has focused on short-term or long-term financial performance (Certo et al., 2009). While financial performance measures are interesting in relation to risk, it does not directly capture valuation uncertainty over time, as new information both could impact price positively and negatively. With Affärsvärlden's system in mind, the relationship is already established, companies with more flags perform worse in terms of stock development (Affärsvärlden, n.d.). This motivates our choice to research volatility. We believe that the combination of volatility and a broad set of risk factors classified by an external party could help explain what factors are most important when investors evaluate the quality of IPO information.

This study sets out to understand how uncertainty in asset valuations post-IPO can be understood by risks connected to the listing itself and the information provided. By contrasting Affärsvärlden's risk flags against volatility in the months following the initial IPO, we seek to understand if these risks can help explain valuation uncertainty, and what specific risks are most crucial in this sense. While some risk corresponds well to previously researched variables, it is the completeness of this set that makes it interesting. Each flag is assigned to a category by Affärsvärlden, either connected to the company's suitability for a listed environment, listing process or the prospectus, which we subsequently use to understand what investors should be particularly cautious about.

The theoretical approach is based on a group of articles enfolding the IPO-process and specifically the role of risk factors in relation to valuation, operational performance, and

volatility. Using regression analysis, we aim to research the risk flags' explanatory value of risk and uncertainty, by contrasting them against stock variance for the 100-day period following the IPO.

We contribute to existing research by studying how independently and systematically classified risks factors predict volatility, in contrast to a large body of literature focusing on companies own declared risk flags and its relation to operational performance and underpricing. Furthermore, we contribute to the small body of literature focusing on volatility as a measure of uncertainty and test a new set of variables to proxy this. Lastly, by dividing these risks into categories, we seek to understand if they hold different explanatory values.

2. Literature Review & Theory

This section covers the theory and literature which we base our study on. Firstly, we introduce the risk flagging system used as a basis for our tests. Secondly, we provide an overview of current theory on volatility and its relation to information flows and IPOs. Lastly, we provide context to previous studies focusing on ex-ante risks and how it relates to our field of study.

2.1. Literature Review

2.1.1. Affärsvärlden Risk Flags

Fundamental to the construction of this study is Affärsvärlden's risk flags. Presented below are all flags, excluding three retroactively handed out and not part of this study.

Table 1

Affärsvärlden Risk Flags

Flag	Risk Covered	Category
Immature company	Lack of structure, processes, and systems to manage a higher complexity and a larger organisation.	Maturity and Suitability
Large deal prior to IPO	Short-term influence on profit numbers and large changes to the company itself.	
CV with poor track record	Repeated incidents of bankruptcy, legal incidents, or other relevant factors amongst key personnel.	
Close personal or business ties among key personnel	Higher risk of business decisions being impacted by non-business interests. If positive aspects far outweigh the good ones, no flag is handed out.	
Weak finances	Uncertainty regarding how the business will be financed, or how much it will spend the following year. (Short-term financing)	
Large owner keen on selling in speculative companies	Selling, or having a short lock-up period in companies seeking external financing may indicate a lack of faith in the company's future.	
Weak incentives	Collective concept for different kinds of conflicts of interest.	
Overly focused on trends and external environment	"Sweeping" language and overuse of buzzwords instead of focus on own operations to attract unsuspecting investors.	
Future capital needs	Unrealistic, or lack of, information regarding long-term financing for unprofitable companies awaiting a breakthrough. (Long-term financing)	
Strange deals	Deals covered in prospectus are incomprehensible, strange or have unclear connection to business operations.	
Underpriced issuance prior to IPO	Issuance at significantly lower valuation may indicate large changes in the company in a short time which may indicate a lack of IPO-readiness. Could also be to allow certain persons to purchase at attractive prices.	Listing Process

Affärsvärlden Risk Flags

Flag	Risk Covered	Category
High issuance fee	May be caused by financial issues, disorder in the company or a wrongly priced IPO. Handed to all companies in the bottom quartile of their size class.	
Complex offering	Large price intervals, over-allotment options or difficulties to calculate total shares or net debt.	
Long waiting time	Increased risks connected to long-waiting times between IPO-subscription period and listing date. Handed to all companies in the bottom quartile of their size class.	
Choice of advisor (or lack of advisor)	Advisor not in proportion to size and quality, especially concerning if no advisor is listed at all.	
High guaranteed share in offering	Empirically connected to weak share price development, sign of weakness and desperation.	
Unclear choice of exchange	May indicate the firm has been rejected from some marketplace and can cause difficulties to withhold set time plans.	
Delayed listing process	Likely connected to issues in the company and/or listing process, such as issues with advisors, guarantees or listing requirements.	
Short financial history	Lack of information regarding financial history may be caused by being newly founded, restructurings or information purposely being withhold.	Prospectus
Lack of information	Lack of important information in prospectus. Examples include emission costs, conflicts of interests. Strongly misleading information also included.	
Hard-selling communication	Overall assessment of communication in prospectus, financial goals and investor relations. Could indicate an IPO being wrongly priced or of questionable quality if hard selling is necessary.	

Affärsvärlden's process for IPO flagging is relatively straightforward, and the starting point is always the listing company's prospectus. After that, an initial examination is conducted, focusing on capturing eventual flags and all basic information surrounding the offering. This examination results in an initial review, and the company is urged to provide any feedback quickly. Potential errors are corrected, and clarifications that shed new light on issues may be included in the final review. However, Affärsvärlden highlights that any new information provided is a weakness, as all relevant facts should be included in the prospectus. (Affärsvärlden, n.d.)

Most companies receive at least one flag, with an average of slightly more than two. The most common ones include *weak incentives, high issuance fees* and *lack of information*, while *strange deals*, and *unclear choice of exchange* are very uncommon. Affärsvärlden highlights that the flags could be compared to remarks during a property inspection, important to know

about but not something that has to stop a deal. However, real precaution should be taken when the flags start to add up. A clear relationship between the stock's development and the number of flags received has been established since the flagging systems inception. (Affärsvärlden, n.d.)

2.1.2. Company Information and Stock Price Volatility

To understand the relationship between information flows and volatility, it is of importance to understand the underlying mechanic behind shifts in stock prices. Stock price movements can be described as to follow a Wiener process, which is a stochastic process where the mean movement of any period is zero. The Wiener process describes what is called Brownian motion and helps formalise the theory of stock price movements as the result of information "shocks". It is established that the movement in stock price S, during period t, can be described as:

$$\Delta S = \epsilon\sqrt{\Delta t}$$

where the ϵ is normally distributed $\phi(0,1)$. The movements in stock prices in different time intervals are also independent, meaning that previous movements are of no use to predict future movements. By assuming the concept of perfect markets, the Wiener process helps model stock price behaviour by treating each price movement as the consequence of new information. The theory says that all available information will be accounted for in the stock price, thus new information shocks will alter the price. The movements in price can be measured as stock price volatility (Hull, 2015, Chapter 14).

Volatility as a measure for risk was academically introduced back in 1952 with Harry Markowitz development of what we now call modern portfolio theory. The general idea is that risk of investment can be seen as the magnitude of variance in returns of that investment. Markowitz mean-variance framework suggested that investors who seek to maximise utility need not only to factor in the expected return, but also the expected volatility of returns (Markowitz, 1952). Terminology when it comes to volatility can sometimes be vague, as both variance and standard deviation are used. Although closely related (standard deviation equals the square root of variance), variance is more common when making statistical inferences (Newbold et al., 2013).

Dating back to the 19th century, Ronald Fisher had already pointed at the opportunities of analysing the squared deviations of a mean, what we call variance, as he published *Statistical Methods for Research Workers*. The publication introduced several models and practices for statistical analysis and understanding of variance within data sets (Fisher, 1934). The empirical findings of Levy (1978) also support the usage of variance as an estimator of risk. In his research he finds that, using stock variance for firm *i*, σ_i^2, to explain returns above market expectancy, works better than using the stock-market beta β_i. Levy thus stated that "β only serves as a proxy to the true risk component σ^2".

Ben-Horim and Levy (1980) have also written about the classifications of risk and different categories of variance. Total variance of returns on a security is the sum of systematic and diversifiable variance. The relation between systematic and diversifiable variance can be interesting to look at when discussing diversification of risks when price movements post-IPO are uncertain.

When it comes to volatility and its relation to IPOs, Lowry et al. (2010) established volatility as a metric for pricing evaluation of IPOs. Several variables, including underwriter rank, tech dummies and the initial offerings size in shares were used as proxies for underwriters' ability to accurately estimate firm value. Primarily, the results suggested volatility where higher during periods when a greater proportion of firms were in high-tech industries, and on average younger. They concluded that "the volatility of initial returns is higher for firms that are more difficult to value because of higher information asymmetry". Furthermore, their findings also suggested that the variance of IPO returns is substantial and larger during hot IPO markets, i.e., return volatility is higher when many firms go public.

To understand and predict volatility, valuation uncertainty becomes the central concept. To test and quantify this uncertainty, a relevant proxy is needed. Loughran and McDonald (2013) dig deeper into the quality of information provided in prospectuses, and how it can be related to stock price volatility. Their study focused on language and tone by measuring frequencies of words from a six-sentiment word list (uncertain, weak modal, negative, positive, legal, and strong modal) in U.S S-1 forms (initial IPO filings). A link between volatility in the 60-day period after the IPO, and uncertain, weak modal, and negative words where found, suggesting

these words proxied uncertainty well. However, it should be noted that words in the three categories overlap. Their finding confirms the view that uncertainties in pre-IPO information affect ex-post volatility.

Epstein and Schneider (2008) proposed a new model to how investors process new information when there is uncertainty regarding its quality. They suggested that when investors process such information, they take a "worst-case" assessment of it. By studying market reactions to information published in the period following the 9/11 attacks, their findings firstly showed that investors require "compensation" when information quality is uncertain, and that the effect is increased when markets are more volatile in general.

Another proxy that has been used for valuation uncertainty is the shift of CEO for a company. Clayton et al. (2005) found that all types of changes in executive leadership led to higher ex-post volatility, with the most significance for forced departures where volatility on average increased by 24% the year following the event. The authors argue that changes such as new strategy and CEO ability may lead to uncertainty about firm's future cash flows, leading to more frequent revisions in expected firm value than in the past. (Clayton et al., 2005) This highlights the fact that when uncertainty regarding a company increases, so does volatility.

2.1.3. Risk Factors as Proxy for Uncertainty and Underpricing.

Several key IPO theories have highlighted that uncertainty should matter in initial returns of stocks. The primary observed phenomenon is what is known as underpricing. Rock (1986) developed a model for underpricing, dependent upon the existence of investors with superior information to that of all other investors. For uninformed investors to participate in the IPO, the price must reflect that and subsequently be underpriced. Greater uncertainty, thus, should lead to higher initial underpricing. Ritter (1984) developed an implication of this model and argued that if some periods are characterized by high uncertainty regarding firm values due to many high-risk offerings, they should also be characterized by high initial returns. The relation to how initial return subsequently varies after the listing, however, is not answered by these theories.

The usage of specific factors as a proxy for firm risk was done by Certo et al. (2001) by looking at prospectuses and their risk-segment as a predictor of underpricing, based on the assumption

that while their individual explanatory value varies, a greater amount of risk factors indicates higher levels of risk and subsequently affects the opportunity to correctly value the firm (Certo et al., 2001). Beatty & Zajac (1994) also use this as a proxy for risk in IPO firms, arguing that personal legal liability on top management ensures complete and unbiased disclosure of facts. Risk information in prospectus, in the form of a cumulative measure of number of paragraphs, has also been used as a control variable for short-term performance denoted as earnings per share and productivity (Welbourne et al., 2012). Common risks covered included supplier dependence, customer dependence, inexperienced management, and limited underwriter experience. The proxy's logic was explained as more risks mentioned could indicate more problems for the company.

Previous research has also used prospectus information to look for certain, predetermined risk categories, selectively creating a measure based on the risks deemed relevant for the cumulative risk variable. In a study of how Human Resources affect IPO performance, chosen categories included few years in operation, inexperienced management, inexperienced underwriters, and operationally oriented measures such as customer and supplier dependence (Welbourne et al., 1996). On a similar theme, indicators of management quality have been associated with less IPO underpricing, meaning that they positively affect the possibility to correctly value firms. Management quality is subsequently negatively correlated with post-IPO stock value run-ups, indicating that it serves as an effective signal of firm value (Cohen, 2005).

The research article by Mousa (2014) expands on previous research by looking at firm survival as a measure of performance in relation to risk factors. The research examines how differences among firm risk, divided upon internal and external risk factors, affect short-term investor valuations and long-term survival rates. Their research concludes that operational risk, management risk, and government regulation risk of the IPO are associated with an increase in the probability of firm failure. Moreover, their research finds no evidence for internal risk factors affecting IPO valuations. They conclude that 5 out of 6 IPO risk factors have a negative effect on either IPO investor valuation or long-term firm failure.

Khaled Abdou and Mehmet F. Dicle (2007) researched the underpricing phenomena during the internet bubble in 1996-2000. The research methodology specifically pinpointed the prospectuses connected to IPOs during that period, with the aim to investigate whether all risk factors were priced into the offering. Also, the paper aims to research the importance of risk

factors on IPO trading, by looking at both quantity and characteristics of risk factors in relation to underpricing. From the data gathered on the internet bubble, it is concluded that not all risk factors are regarded equally, for example "dependence of intellectual property and intangible assets" showed strong significance with underpricing, while "competition" showed no significance at all. The research also shows that some factors are not significant to any prediction of underpricing, and that investors are selective in valuing risk. The acknowledgement of varying valuation of specific risk factors is important for our study, as it introduces the concept of viewing specific risk indicators as opportunities and shows that risk categories can be of varying significance when predicting outcomes like valuation (Abdou et al., 2007). This knowledge opens for research on specific risk factors and their impact on other variables such as volatility.

2.2. Theoretical Framework

It is well established from previous research that stock prices reflect all available information to investors. One important part of this is material risks declared in the prospectus. These risks have been linked to underpricing (Abdou et al., 2007) and performance (Welbourne et al., 2012), and have in multiple instances been used as a proxy for overall firm risk (Certo et al., 2001; Beatty & Zajac, 1994). While they often have been used as a cumulative proxy, their individual explanatory values are less certain.

The suggestion that risk factors are of different significance to valuation, sometimes even positive (Abdou et al., 2007), leads us to also believe that risk categories may potentially have varying impacts on investor views. If the information presented prior to being publicly traded is faulty and or insufficient, the initial valuation will be less certain. Thus, with time, new information reduces uncertainty, and shifts the share price towards a more accurate valuation. Consequently, a larger valuation error will lead to a greater shift in share price after the IPO, which we refer to as stock price volatility.

We find that previous research has been effective in answering questions regarding the performance of firms post-IPO. It is understandable that operating- and price performance becomes central when looking at newly listed firms. However, as Markowitz (1952) pointed out in his study, the performance of investments comes with risk. The measurement of

investment risk is done by looking at the volatility of share prices, specifically variance as argued by the extensive research of Levy (1978). The few studies which have tried to proxy uncertainty (e.g., Loughran & McDonald, 2013; Clayton et al., 2005) have suggested volatility is affected. They do, however, not test a broad set of possible explanatory variables but rather test specific factors.

Regarding existing literature, which is mostly focused on performance, we find it relevant to contribute by looking at attempts to systematically flag for uncertainty prior to IPOs and contrast them with the variance of share prices as a measure of risk. While Loughran and McDonald (2013) studies one potential factor in tonality, research on post-IPO performance has studied far more types of risk factors, albeit primarily of operational character. It is important to research how factors that flag for information asymmetries prior to public trading can impact price movements, since stock prices are believed to follow a Brownian motion (Hull, 2015, Chapter 14). It is therefore relevant to focus on the size of price movements, instead of trying to predict gains or losses.

2.3. Hypotheses

As this study is relatively unique in its construction and usage of variables, our hypotheses are based on a combination of previous research and stock pricing theory. It is reasonable to believe that Affärsvärlden's classification system in its essence captures information uncertainties on a firm-specific level. As previous literature has shown that information asymmetry leads to more volatile initial returns (Lowry et al., 2010), we suspect that a higher number of risk flags should correspond to higher initial return volatility. However, it is also reasonable to assume that the explanatory value of each independent risk flag will vary, primarily based on how well they correspond to increased valuation uncertainty. With respect to the prospectus being the primary source of information for investors, the accuracy of its contents should be crucial to correctly value a company. The risks covered in *Maturity and Suitability*, and *Listing Process*, are not in the same way a direct proxy of lacklustre information, but rather indirect factors which could signal that such problems may be present. Further, uncertain language has previously been linked to higher volatility (Loughran & McDonald, 2013) and equivalent uncertainty should best be captured by the prospectus category and the lack of information and

hard selling communication flags. The same reasoning is strengthened by Clayton et al. (2005) findings that CEO shifts lead to long-lasting increases in volatility as they may lead to uncertainty regarding future cash flows, as such cash flow projections at the time of IPO are primarily based on the prospectus information.

H1: An increased number of risk flags will be positively correlated with initial return volatility.

H2: Risk flags concerning prospectus information will have a higher explanatory value for initial return volatility than maturity, suitability, and listing process.

3. Method

This section covers our research design, short descriptions of dependent and independent variables used and lastly our sample.

3.1. Research Design

Analysis of results is conducted by following the ordinary least-square linear regression model where our risk flags *FLAGS*, and three respective categories will act as independent variables, and the variance of stock prices *VAR*, will be our dependent variable. Also, the multiple regression uses two independent market capitalization dummies, and yearly dummies as control variables to validate the results. To test *H1*, Regression I will be defined as,

$$VAR_i = \beta_0 + \beta_1 FLAGS_i + \text{Control Variables}_i + \varepsilon_i$$

And to test *H2*, Regression II will be defined as,

$$VAR_i = \beta_0 + \beta_1 MATURITY_i + \beta_2 PROCESS_i + \beta_3 PROSPECTUS_i + \text{Control Variables}_i + \varepsilon_i$$

which will be used to test the relevant hypotheses and answer whether specific or categories of risk information can explain variance in stock returns after IPOs. We use a confidence interval of 0.95 and subsequent p-value of < 0.05 for rejection of the null-hypothesis when conducting our tests.

When conducting our regressions, the assumptions of no or little multicollinearity and homoscedasticity will be tested to validate our results. Multicollinearity describes a situation where two or more independent variables correlate very highly with each other. To test our model for multicollinearity, standard Pearson's correlation matrixes will be created for respective regression. Further, variance inflation factor tests will be conducted. Previous literature has suggested a level above 5 to be of concern, and 10 to be especially problematic (Kennedy, 1998, p. 190; Menard, 2002, p. 75). The regression model also assumes homoscedasticity, that the conditional variance of the error term is constant. To check for homoscedasticity in our model, a Breusch–Pagan (Breusch & Pagan, 1979) test will be conducted for both regressions. If the null hypothesis of homoscedasticity can be rejected, robust standard errors will be used in our regressions.

3.2. Variables

3.2.1. Dependent Variables

The dependent variable (*VAR)* in our study is the variance, σ_i^2, of stock returns post-IPO. Total variance of returns on a security *i*, σ_i^2 , is the sum of systematic and diversifiable variance, as specified in Equation 1. Where, β_i is the beta of security i, σ_m^2 is the variance of market rate of return, σ_{ui}^2 is the variance of the disturbance term.

(1) $$\sigma_i^2 = \beta_i^2 \ \sigma_m^2 + \sigma_{ui}^2$$

Using the Capital IQ database, we extracted the closing prices of each firm from the first trading day and the preceding 100 days. With all closing prices in place, we computed the daily percentage returns of each firm on each day. With daily percentage returns we could calculate the mean return during the 100-day interval, which we then used to calculate deviations and determine the variance of that period. The variance is presented as annualised total variance.

3.2.2. Independent Variables

FLAGS

Testing *H1* requires a measure of the cumulative number of flags each IPO received. Note that 4 flags are retroactive, and thus will not be part of our analysis. In addition,an IPO may receive more than 1 flag for a single category, which will then be counted twice.

Testing *H2* requires assigning each flag to a category, and then creating variables for these. The categorisation will be done in line with Affärsvärlden's own classification, however with the exclusion of retroactive flags as a category.

MATURITY

The variable measures risks and uncertainties concerning the company's management, owners and uncertainties concerning short- and long-term financing. The following items were included in the sum of flags for the category:

Flag	Maturity and Suitability
Immature company	
Large deal prior to IPO	
CV with poor track record	
Close personal or business ties among key personnel	
Weak finances	
Large owner keen on selling in speculative companies	
Weak incentives	
Overly focused on trends and external environment	
Future capital needs	
Strange deals	

The category provides relevance in several ways. Firstly, correctly disclosed, and realistic plans for financing is crucial to correctly estimate future capital needs and in turn if new issues are likely to occur. Poor track records, personal ties between key personnel and owners selling in speculative companies highlight concerns regarding management and raise questions regarding potential conflicts of interest.

In addition, management quality has previously been linked to IPO underpricing and post-IPO performance (Cohen et al., 2005). Affärsvärlden (n.d.) points out that flags for close business and personal ties only are brought up as a flag if the risks far outweigh the positive aspects. Large or strange deals impact cause uncertainties in business outlooks and give management opportunities to affect profit numbers short-term. Being overly focused on trends and external environment shifts focus, and Affärsvärlden points to this as a potential strategy to mislead unsuspecting investors.

PROCESS

The variable measures overall risk connected to the listing process prior to the IPO. The following items were included in the sum of flags for the category:

Flag	*PROCESS*
Underpriced issuance prior to IPO	
High issuance fee	
Complex offering	
Long waiting time	
Choice of advisor (or lack of advisor)	
High guaranteed share in offering	
Unclear choice of exchange	
Delayed listing process	

The category captures several uncertainties. Firstly, it captures any concerns with the quality of the listing. Delayed listing process, the choice of advisor, high fees, long waiting time and unclear choice of exchanged are all matters which directly or indirectly points to quality issues, within the company or its offering. The choice of advisor(s) has previously been used both as a control variable IPO performance (Welbourne et al., 2012) and has been linked to the degree of underpricing in IPOs and long-term performance. (Michaely & Shaw, 1994) Concerning long waiting times, Affärsvärlden (n.d.) gives out a flag for companies in the bottom 25% of their size class. Secondly, under-priced issuance prior to could either indicate large changes in the company in a short time, or that other motives where behind the issuance, either way causing uncertainty. High guaranteed shares points possibly point to desperation and complex offerings, such as large price intervals directly reveal uncertainty regarding an appropriate valuation.

PROSPECTUS

The variable measures the quality of the provided prospectus and presented financial history. The three included flags provide an external perspective of risks connected to the prospectus. The following items were included in the sum of flags for the category:

Flag	*PROSPECTUS*
Short financial history	
Lack of information	
Hard-selling communication	

The category provides relevance to the study as previous literature has indicated lack of information creates difficulties in valuing IPO companies correctly, which should then be reflected in post-IPO volatility. Previous literature has also suggested that poor performance post-IPO may be linked to overstated financials (Jain et al., 1994), which may be a reason to deliberately provide short financial history, and uncertain language in S-1 SEC filings has been linked to post-IPO volatility (Loughran et al., 2013).

3.2.3. Control Variables

High/Low Market Cap Dummy

Dummy variables are included for firms with High Market Cap (> SEK 1000m) and Low Market Cap (< SEK 100m). Each firm is given a one in respective category if its market cap at the point of listing corresponds to either cut-off. Market cap dummies are motivated as the mean size and median size of the IPO sample heavily deviated, influenced by a few large-cap listings (e.g., EQT, Traton), and as the market cap does not follow a normal distribution. The explanatory value is assumed to be higher from classifying the companies into categorial variables rather than using absolute values. Indirectly, the dummies also serve as control variables for exchange.

Year Fixed Effects

Dummy variables are included to control for time fixed effects. Each listing year from 2017-2021 is a dummy variable with 1 if the variable matches the observation year. The control variable set out to capture potential differences in variance stemming from hot IPO climates (e.g., 2017 and 2021) and overall market climate. This is especially relevant as previous literature has supported high volatility in initial returns over time (Lowry et al., 2010).

3.3. Sample

The sample used for this study contains IPOs listed between January 2017 and September 2021. Out of all the screened IPOs in Affärsvärlden's guide, we decided to exclude instances when the data was insufficient or outside the scope of our empirics. This approach results in the exclusion of screened IPOs that have insufficient trading data, were cancelled or delisted.

Delisted include firms that have been acquired by another company. We claim that the exclusion of such instances is important to achieve a dataset that is relevant to our research topic, and to maintain comparability between all datapoints in the set.

Table 2

Sample Selection Procedure	**Sample Attrition**	**Observations**
All reviewed IPOs (2017-01-09 - 2021-09-30)		353
Less firms with insufficient data	-14	339
Less cancelled listings	-8	331
Less delisted firms	-2	329
Final sample		**329**

4. Empirics and Analysis

4.1. Data Description

Table 3A

Sample Distribution – Years & Markets

# of IPO's	First North	Nasdaq Stockholm	NGM SME	Spotlight	Other	Total
2017	51	14	12	21	0	98
2018	21	8	7	18	0	54
2019	19	8	2	7	4	40
2020	21	6	3	11	3	44
9m2021	60	14	5	13	1	93
Total	172	50	29	70	8	329

Note: Other include (1) company from Merkur Market, (3) companies from Oslo Bors, (3) companies from First North Denmark and (1) company form Nasdaq Helsinki.

Above table illustrates the distribution of data points within our sample over stock markets and years. It is noteworthy that 52% of all measured IPOs within the sample are made on Nasdaq Firsth North. Also, 30% of IPOs are made in 2017, and 28% of IPOs within the first 9 months of 2021.

Table 3B

Sample Distribution - IPO Size

Sample	First North	Nasdaq Stockholm	NGM SME	Spotlight	Other	Total
No. Entities	172	50	29	70	8	329
Average IPO firm size (SEKm)	665	8018	80	82	2075	1641

The average firm had an IPO market cap of SEK 1.6bn, however highly affected by larger listings on Nasdaq Stockholm compared to smaller exchanges. Companies on Spotlight and NGM on average had an IPO market cap of below SEK 100m.

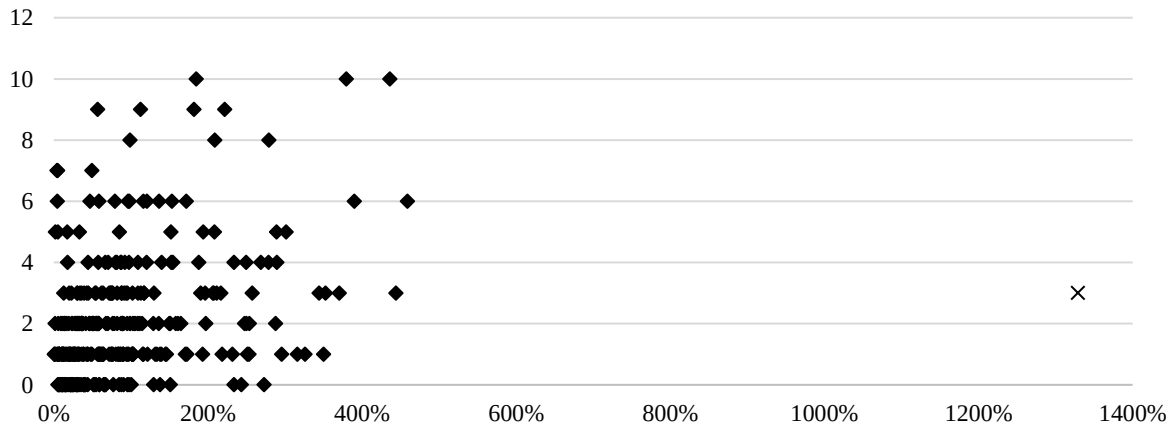
Table 4

Descriptive Statistics

	Obs	Mean	Std. dev.	Min	Max	25th perc.	75th perc.	Non-zero (%)
VAR	329	0.946	1.108	0.008	13.291	0.302	1.145	100%
VAR (Winsorized, p=.01)	329	0.918	0.889	0.020	4.361	0.302	1.145	100%
FLAGS	329	2.134	2.006	0	10	1	3	82%
High Market Cap Dummy	329	0.231	0.422	0	1	0	0	23%
Low Market Cap Dummy	329	0.319	0.467	0	1	0	1	32%
MATURITY	329	0.678	0.852	0	6	0	1	50%
PROCESS	329	0.872	1.132	0	6	0	1	54%
PROSPECTUS	329	0.432	0.691	0	4	0	1	34%

Figure 1

Sample Distribution – Number of Flags and Annualized Variance



Note: x-axis displays total annualized variance. y-axis displays number of flags recieved.

As Figure 1 shows, one outlier was detected in the dataset. To reduce the risk of skewness resulting from this, annualized variance has been winsorized at the 0.01 level (1%). Winsorized variance will be used for all regressions.

4.2. Empirical Results

Table 5

Regression I

Dependent Variable: VAR	
FLAGS	0.102**
	(0.030)
High Market Cap Dummy	-0.415**
	(0.065)
Low Market Cap Dummy	0.692**
	(0.112)
CONSTANT	0.575**
	(0.120)
Year Fixed Effects	Yes
N	329
R^2	0.345
Adj. R^2	0.330

Note: ** p<0.01, * p<0.05
Robust standard errors are reported in parentheses. Variance is winsorized at the 1st to 99th percentile.

Our variable of interest, *FLAGS*, shows a statistically significant positive coefficient in the model at a 1% significance level. A coefficient of 0.102 implies that each flag increases annualized variance by 10.2%. The direction is in line with our expectations. For our control variables, both our High Market Cap and Low Market Cap dummies are statistically significant at the 1% level with directions as expected. The coefficients of our control variable implies that size plays a significant role in explaining variance even when risk flags are considered.

Table 6

Regression II

Dependent variable: VAR	
MATURITY	0.018
	(0.048)
PROCESS	0.211**
	(0.056)
PROSPECTUS	-0.003
	(0.079)
High Market Cap Dummy	-0.486**
	(0.070)
Low Market Cap Dummy	0.689**
	(0.115)
CONSTANT	0.583
	(0.119)
Year Fixed Effects	Yes
N	329
R^2	0.362
Adj. R^2	0.344

Note: ** p<0.01, * p<0.05
Robust standard errors are reported in parentheses. Variance is winsorized at the 1st to 99th percentile.

Using categorial variables, we find that only *PROCESS* shows significant results. A coefficient of 0.211 implies that each flag in the category correspond to a 21.1% increase in annualized variance. This is significantly higher than corresponding coefficient for *FLAGS*, implying the risks included in *PROCESS* has a higher explanatory value. Regarding *MATURITY* and *PROSPECTUS*, no conclusions can be drawn from results.

4.3. Robustness Test Results

Results of VIF test and correlation matrixes can be found in Appendix 1. No values where of concern regarding collinearity. For validation of our results, robustness tests with adjustments to the original regression model can be found in Appendix 3. In total, five additional regressions where conducted, three for *Regression I*, and two for *Regression II*.

Regression I

Three additional regressions for validating the results in Regression I was conducted. Regression III adds dummies for exchange and emits market cap dummies. Regression IV uses the natural logarithm of market cap as a control variable instead of market cap dummies. Regression V uses categorial dummy variables for FLAGS. The variable of interest, *FLAGS*, was statistically significant at the $p<0.01$ in all three regressions. In Regression V, the coefficient for our dummy with 7 flags or above had a significantly higher coefficient (0.566) than for 2-6 flags (0.187). The models total explanatory value (Adj. R^2) was in the range of 0.291-0.323, slightly lower than in Regression I.

Regression II

Two additional regressions were conducted. As *MATURITY* and *PROSPECTUS* showed no significance, they will be omitted in control regressions. Regression VI adds dummies for exchange and emits market cap dummies. Regression VII uses the natural logarithm of market cap as a control variable instead of market cap dummies. *PROCESS* was significant at the $p<0.01$ level in both VI and VII with coefficients of 0.202-0.206, slightly lower than Regression II. The models total explanatory value (Adj. R^2) was in the range of 0.302-0.339, slightly lower than in Regression II.

4.4. Empirical Summary

The results from our first regression suggest that a higher number of assigned risk flags positively impacts the post-IPO volatility in the stock, which is in line with our first hypothesis. Results in our second regression are however not in line with our second hypothesis. Only *PROCESS* shows statistical significance. Further discussion regarding the implications of these results follows below.

5. Discussion

5.1. Variance and Number of Flags

The explanatory value of risk flags as a cumulative measure has could have several explanations. Firstly, the results suggests that Affärsvärlden's risk flags, and in extension the quality, accuracy, and completeness of information for IPOs serve as a good proxy for ex-ante uncertainty. More uncertainty should increase the risk of information shocks having more severe impacts on price, in line with established theory (Hull, 2015, Chapter 14). On the same theme, one could view Affärsvärlden's risk flags as a signal of lower information quality in the information concerning the IPO. Epstein & Schneider (2010) note that investors require "compensation" for poor information quality of the asset, in a similar way, the risk flags of Affärsvärlden make it harder to judge the quality of information provided. While the primary intuition of this would be that investors increase their risk premium and thus subsequently lower their estimated value of a stock, it could also lead to larger revisions once less ambiguous information becomes present for the market, such as after the first quarterly earnings report.

When it comes to modelling uncertainty, our research proposes an alternative to the uncertain,negative, and modal words used by Loughran & McDonald (2013). We arrive at similar results using different explanatory variables, risk-flags to partly proxy uncertain information in the IPO-process. Although the difference in independent variables, both results indicate a positive impact on volatility. We find this interesting and potentially see that the underlying effects of the words described in their study may overlap to some of the risk-flags assigned by Affärsvärlden.

The results can also be related to theory on underpricing (e.g., Rock, 1986; Ritter, 1984) and asymmetric information. It is possible that several risk flags as reported by Affärsvärlden indicate such asymmetries. For example, underpriced issuances prior to IPO's and complex offerings could both indicate there is such asymmetries present. This could be related to the research of Ian Welch (1989), which suggest that these underpriced firms potentially receive price corrections post-IPO, for example after future issuing or market responses to dividends. It is possible that our study reflects this phenomenon, by risk flags capturing initial underpricing and asymmetry, and variance capturing the correction post IPO.

5.2. Variance and Listing Process Category

Our results show that the prediction in *H2* is not reflected in the data sample. The regression in Table 2 with all three categories renders statistical significance only to the *PROCESS* risk flag category. The initial expectation was to see greater variance for the IPOs assigned with risk flags in the *PROSPECTUS*. The deviating result opens for discussion regarding what aspects may produce this outcome.

One reason may be linked to the Epstein & Schneider (2010) research, with regards to investors ambiguity when it comes to uncertainty and signalling. It is possible that uncertainty in prospectuses is partly accounted for prior to trading, meaning that the pricing of the IPO takes uncertainties into account. The reasoning could be that uncertain information has less effect on pricing when it is already stated to be unknown in the prospectus, therefore, pricing and expectation of investors is already adjusted. In the eventual case of new information to complement the prospectus, negatives will be partially expected, and positives devalued according to the findings of Epstein and Schneider (2010). The cumulative effect of these assumptions would be that the price correction from new information is lower when its absence is already noted and priced in the prospectus, potentially making the category less significant.

In contrast, uncertainties connected to the listing process may be appropriated differently, potentially because the risk flags describe unpredictability less apparent to the average investor. Potentially, risk flags such as *Complex Offer* might be harder to identify, and thus companies with these assigned flags generate larger shocks for the market to react upon. It can potentially be that, without Affärsvärlden's risk flag system, few investors consider details regarding the IPO process. If true, it would mean that these uncertainties could fly under the market radar and cause large price corrections when surfacing post-IPO.

Expanding on our discussion regarding information asymmetry in 5.1, an interesting risk included in the listing process category, is under-priced issuances prior to IPO. If it is not apparent as to why the value of the company has changed drastically in a short amount of time, investors might view this as a signal of information asymmetry, where the ex-ante owners are

the only ones who know the true value of the company. Although historical financial figures are not affected, this may raise concerns as to the legitimacy of market potential or earnings forecasts presented in the prospectus. The difficulty in evaluating the legitimacy of such information would be especially high in the initial months of trading, when possibilities to follow-up said goals are not available.

As a final note, one should also consider the fact that the prospectus category only covers 3 risk flags in contrast to the listing process category which covers 8, in addition to the original sample being relatively small. As our descriptive statistics show, companies on average receive more flags in the listing process category, which limits the possibilities to draw direct conclusions from the results in *H2*.

6. Conclusion

The purpose of this study has been to empirically test ex-post stock volatility on explanatory variables from business magazine Affärsvärlden's risk flag system. The sample consists of 329 companies listed primarily listed on Swedish exchanges between 2017-2021 and the data has been hand-collected from Affärsvärlden's IPO-guide.

We contribute to existing research by studying how independently and systematically classified risks predict volatility, in contrast to a large body of literature focusing on companies own declared risk flags, performance and underpricing. Furthermore, we contribute to the small body of literature focusing on variance as a measure of uncertainty and test a new set of variables to proxy this. We find that more uncertainty about an IPO's valuation, proxied by Affärsvärlden's risk flags, corresponds to higher variance in the 100-day period following the IPO. Furthermore, our findings suggest information uncertainty connected to the listing process itself is particularly important in understanding ex-post variance, which is surprising as previous literature has suggested information uncertainty stemming from prospectus are linked to higher volatility. In terms of practical contributions, our results suggest companies going public should be especially considerate of how they manage the listing process.

The study is subject to several limitations. Firstly, many other factors than those which Affärsvärlden cover could have significant effects on uncertainty and subsequent stock price variance. While the objective of the classification system is to uncover risks connected to the listing, it is not modelled to predict uncertainty per se. One example is that it does not directly take operational characteristics into account, such as key financial and accounting ratios. Another potential issue is risk of possible industry differences which bias the predictor value of the risk flags. However, the risk flags do for example, take uncertainty regarding short and long-term financing into account, aspects whose presence could differ highly between industries. Including industry specific dummy variables, would also potentially be misleading due to the small sample size.

Further, Affärsvärlden's process is largely based on subjective assessments. We cannot conclude that each company has been evaluated on a fair basis, although Affärsvärlden's

methodology and criteria are explicitly stated. Another limitation of the study is the timing of publication of information after the IPO. The 100-day period theoretically should enfold the publication of a quarterly report that provides investors with additional information to complement the prospectus, however it is possible that some companies release a yearly report within the period. The yearly report contains more information and thus it is possible that those companies experience a larger price correction, which can be seen as a bias that limits our study.

Further, we acknowledge that our regression model is not perfect, primarily as we identified it defies the assumption of homoscedasticity. While robust standard errors are used to account for this, it does not solve the underlying problem and thus results may lack comprehensiveness to answer the research question confidently. Also, our sample size is limited. This affects the possibility to draw conclusions from individual risk flags and to some extent the categorial variables as well. Further, the number of observations is much lower for firms with a high number of flags. As we are limited by the number of listings examined by Affärsvärlden, there is no direct way to resolve this limitation other than viewing the results as indicative and a basis for discussion and further research.

Assuming Affärsvärlden's classification system is continued, future research could benefit from redoing the study at a later stage. This would allow for a larger sample thus more conclusive results regarding what specific risk flags are relevant when predicting post-IPO variance. Further, it would also allow for the study to be redone with a longer timeframe for comparison with the initial return variance without losing a significant amount of datapoints due to recency in their listings. As previous literature (focusing on risk flags covered in prospectus) have indicated their value as a predictor for performance decreases over time, it would be interesting research if the explanatory value of our used variables experiences a similar pattern. Other researchers could potentially better estimate beta coefficients for companies and separate idiosyncratic from systematic variance, by benchmarking using industry specific indices and for a drastically longer period than 100-days. Looking at idiosyncratic variance solely would allow for a better prediction of how risk flags affect company-specific risks.

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Appendix

Appendix 1A

Pearson correlations for Regression I.

	(1)	(2)	(3)
FLAGS	1.00		
High Market Cap Dummy	-0.26**	1.00	
Low Market Cap Dummy	0.23**	-0.38**	1.00

Note: *p<0.05 **p<0.01

Appendix 1B

Pearson correlations for Regression II.

	(1)	(2)	(3)	(4)	(5)
MATURITY	1.00				
PROCESS	0.09	1.00			
PROSPECTUS	0.27**	0.23**	1.00		
High Market Cap Dummy	-0.19**	-0.13*	-0.21**	1.00	
Low Market Cap Dummy	0.20**	0.18**	0.05	-0.38**	1.00

Note: * p<0.05 ** p<0.01

Appendix 1C

Variance Inflation Factors Model.

Variables	Regression I	Regression II
FLAGS	1.15	N.A.
MATURITY	N.A.	1.21
PROCESS	N.A.	1.16
PROSPECTUS	N.A.	1.25
Low Market Cap Dummy	1.23	1.26
High Market Cap Dummy	1.22	1.25
Mean VIF	1.23	1.25

Appendix 2

Breush-Pagan Test for Heteroskedasticity.

Fitted values of *VAR*	Regression I	Regression II
χ^2 (1)	103.22	125.33
Prob > χ^2	0.00	0.00

H0: Constant variance.

Appendix 3

Robustness tests for Regression I & II.

	III	IV	V	VI	VII
FLAGS	0.108**	0.102**			
	(0.030)	(0.029)			
FLAGS Dummy (2-6)			0.187**		
			(0.079)		
FLAGS Dummy (<6)			0.566**		
			(0.257)		
PROCESS				0.206**	0.202**
				(0.055)	(0.053)
High Market Cap Dummy			0.435**		
			(0.063)		
Low Market Cap Dummy			0.737**		
			(0.114)		
Market Cap (LN)		0.259**			0.273**
		(0.026)			(0.024)
First North	0.074			0.053	
	(0.116)			(0.145)	
Nasdaq	0.342**			0.451**	
	(0.112)			(0.143)	
Small Exchange	0.723**			0.716**	
	(0.150)			(0.172)	
CONSTANT	0.543	2.242	0.591	0.657	2.402
	(0.125)	(0.198)	(0.121)	(0.144)	(0.180)
YEAR FIXED EFFECTS	Yes	Yes	Yes	Yes	Yes
N	328	328	329	328	328
Adj. R^2	0.291	0.323	0.309	0.302	0.339
R^2	0.308	0.334	0.326	0.319	0.351

Note: ** p<0.01, * p<0.05

Robust standard errors are reported in parentheses. Variance is winsorized at the 1st to 99th percentile. Market Cap is calculated as the natural logarithm of market cap at the time of the IPO. Small Exchange denotes market listings on NGM SME and Spotlight. Nasdaq denotes listings on Nasdaq Stockholm. First North denotes listings on Nasdaq First North.

Appendix 4

Total observations of flags included in dependent variables.

Flag	Observations
	MATURITY
Immature company	11
Large deal prior to IPO	25
CV with poor track record	46
Weak finances	10
Strange deals	11
Large owner keen on selling in speculative companies	29
Future capital needs	21
Weak incentives	83
Close personal or business ties among key personnel	27
Overly focused on trends and external environment	2
	PROCESS
Underpriced issuance prior to IPO	40
Choice of advisor (or lack of advisor)	17
High issuance fee	83
High guaranteed share in offering	21
Complex offering	27
Unclear choice of exchange	7
Long waiting time	58
Delayed listing process	32
	PROSPECTUS
Short financial history	11
Lack of information	99
Hard-selling communication	23
Total (*FLAGS)*	683