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DETERMINANTS OF DELISTING: THE CASE OF EUROPEAN STOCK EXCHANGES

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Determinants of Delisting:
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Abstract

In this paper, the authors seek to investigate the relationship between company's attributes at the time of its initial public offering and the event of its delisting from the five largest European stock exchanges: Euronext, the Deutsche Börse Group, London Stock Exchange, BME and NASDAQ OMX. By distinguishing between the financial systems of the United Kingdom and Continental Europe, the authors employ the Cox Proportional Hazards model to highlight determinants and indicate differences between the two regions for the sample of 936 listings from 2000 to 2016. Evidence suggests that the amount of proceeds raised, lockup period length, Debt-to-Assets ratio, bookrunner participation and average IPO returns at the time of listing are significant determinants of delisting for the UK, while the rest of the European delistings are related to factors such as the age of the company at the time of IPO, lockup period length and reputation of the auditors involved. The common attribute – lockup period length – affects delisting negatively in Europe and positively in the UK. Less researched analyst recommendations are proved to be insignificant determinant of delisting. The findings support that financial systems assessed in the research are different from a delisting perspective as well.

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1. Introduction

Every company reaches a point when internal financing is insufficient to cover the basic business operations. Initially, debt-financing options or direct sale of equity to third parties may be used, however, as the size of a company grows, it may wish to go public to attract new capital. Other considerations may be present as well; nevertheless, the decision to undergo initial public offering (IPO) definitely has to be closely scrutinised by the management of the company. Once a company is publicly traded, anyone can become its owner to a smaller or larger extent, therefore there is little room for previous flexibility in terms of decision making. As a public company is monitored more closely, even a small inaccuracy may lead to a negative reaction from the market that can drive the company to distress. Hence, to be successful over a longer period of time after the IPO, the entity in question and its advisors have to cerebrate whether the gains of going public outweigh the possible costs.

2015 was marked as the year when the primary equity issues hit a new high since 2007, total proceeds amounting to 57.4 billion from 364 IPOs in Europe and the average offering value equalling a peak of 248 million. (PwC, 2016). One may observe that both investors and investees expose themselves to a substantial risk during the IPO, since, certainly, not all IPOs are successful in entering the stock exchange. The first main pitfalls are usually fitting the stock exchange requirements for listing or triggering sufficient demand for the shares to be issued, which is known as a failed IPO. In terms of academic literature, much less attention is devoted to longer-term performance of companies after the initial excitement in the market has subsided. Hence, this paper focuses on a different kind of risk an IPO faces over time: delisting. Delisting or event of going private may happen voluntarily or as an outcome of a merger or an acquisition; however, throughout this paper it shall be treated as insolvency, default of a company, incompliance with the stock exchange regulations or voluntarily initiated delisting. According to Demers & Joos (2007), who researched the US market, 17 per cent of non-tech and 9 per cent of high-tech companies are liquidated or dropped from the list within five years of going public. The consequence is a severely harmed reputation that negatively influences not only future financing availability, but the current capital volume for investments as well (Bakke, Jens & Whited, 2012).

The authors of this paper aim to establish a model that addresses the issue of delisting and provides an explanation for what causes companies to be expelled from stock exchanges in Europe; an apparent gap has been identified in Europe in particular,

where the field, apart from the UK, is scarcely researched. The uniqueness of Europe lies in the fact that companies go public at a more mature state than in the US; hence the findings in the US market do not necessarily apply to this market as well (Pagano, Panetta & Zingales, 1998). The sample is built from companies traded on Euronext, the Deutsche Börse Group, London Stock Exchange, BME and NASDAQ OMX. By controlling for the dominating financial system, which is either market or bank based, the authors aspire to have a representative and objective sample for the European IPO market. Significantly, the cumulative money raised in the particular five stock exchanges exceeded 80 per cent from all proceeds in Europe in 2015 (PwC, 2016). The model, consisting of market activity measures, deal characteristics and accounting data for companies, shall provide the reader with insights into the issue of delisting. In addition to the previously found significant determinants in mostly the US market, the model will explore the impact of analyst recommendations on the survivorship rate of the IPO.

The paper contributes to the existing literature in the sense that its market coverage enables the findings to be applied across Europe, which, as a region, has not been considerably researched. Conspicuously, there are many parties concerned with the long-term survivability of IPOs: investors who take a considerable risk, companies which expose themselves to the public and stock exchanges as such that may find delisting detrimental to their reputation. The evidence discovered will allow counterparties to acknowledge crucial aspects already present at the time of an IPO that may lead to delisting, as well as compare the drivers of delisting between the financial systems of UK and Continental Europe. Additionally, as the current guidelines for a successful IPO on the Nasdaq OMX homepage provide a rather qualitative description of favourable company profiles, the results of this research may be implemented to develop a more rigorous framework of requirements (Nasdaq Baltic Market, 2017).

The authors devote the rest of this paper to an effort to answer the following research questions:

RQ_1: What are the key company attributes at the time of the IPO that may explain delisting in Europe?

RQ_2: Is there a difference between the UK and Continental Europe from the survivability perspective?

To properly address the aforementioned research questions, the impact on survivability in each financial system is investigated for these factors: accounting data, deal characteristics and the market situation. In fact, delisting throughout the following

chapters shall be treated as a result of company-related reasons, hence, mergers and acquisitions (M&As) are out of the scope of this research.

The paper is structured as follows: in Section 2 an overview of IPO process as such is given, and catalysts of listing and previously found delisting determinants are provided. In Section 3 the methodology is introduced; Section 4 is focused on adding quantitative depth by establishing the model and presenting results, while Section 5 discusses findings, contains a robustness check and describes limitations. The paper is summarised with a concise conclusion.

2. Literature review

Although many alternatives of financing exist, it is fundamentally an issue of the choice between debt and equity financing. The main difference that one should consider is that debt has a maturity and certain claims over physical assets, while equity is a non-maturing instrument that gives limited ownership and decision making rights (Rose, 1997). Initial public offering, the equity financing option reviewed in terms of this research, is widely recognised as the primary sale of equity to the public, where anyone can become a shareholder by taking on some risk that comes along with a potential of monetary gains in return (Nasdaq, 2017). As a matter of fact, an IPO is a long process during which a company is investigated and guided by several advisors, its past and future projections are estimated, prospectus and other documents are filed to the relevant stock exchange and provided to the public, and, finally, the first price of issue or offer price is determined just before the general trading starts (Barclays, 2017). To establish understanding of the drivers and considerations during an IPO, introduce the concept of delisting and its background, and point out specific drivers, a review of previous literature is compiled in the following chapters.

2.1. Reasons to go public

Different exogenous factors are present for each *ex ante* private company that affect the reasoning for listing, meaning: why would companies go public? The common understanding is that entity is short in funding; the potential commitment of proceeds is found to be strongly linked to company age – while US companies that are generally younger employ proceeds for research and development to stimulate growth, European are more likely to benefit from paying down existing debt and reducing leverage (Kim & Weisbach, 2008; Pagano et al., 1998). Bancel & Mittoo (2009) find improved reputation, investment source and financial resilience to be significant considerations for all respondents of their survey in Europe. In addition, larger firms are ought to enjoy benefits of extra monitoring as improved corporate governance, while family controlled entities look for bargaining power with their creditors. Additionally, Pagano et al. (1998) argue that other benefits as a reduced cost of debt or equity are essential matters that drive decision to go public.

Occasionally, supplementary to funding and cost benefits, hidden motivations prevail as some companies simply seek or exploit favourable market perceptions. There

are proofs of high valuation theory as when there are substantial differences between market and fundamental values, issues follow and proceeds are plainly kept in cash (Kim & Weisbach, 2008). Listing as investment exit strategy is proved to be ambiguous in Europe, since UK companies experience considerable prior shareholder exits, while Continental Europe does not (Bancel & Mittoo, 2009). Additional theories as signalling theory, optimal capital structure theory, pecking order theory or agency cost theory exist, each historically proven to be of importance under specific circumstances (Ragupathy, M. B., 2011; Leland & Pyle, 1977; Modigliani & Miller, 1958). A single, general driver for public offerings cannot be determined; it is rather a set of aspects that a company has to acknowledge individually with respect to its short and long run intentions.

2.2. Regulations and Equity Markets

In addition to sole benefit analysis, entities have to examine potential markets for the sale of their equity. All European stock exchanges have to comply with a wide variety of regulations like the Markets in Financial Instruments Directive that determine basic market processes, investor protection and indirectly affect market availability. Meanwhile, another branch of rules coexists that concerns all companies at the time of the listing on an ongoing basis, which contains guidelines and minimum requirements to qualify for each list that a stock exchange offers. Ordinarily, there is a general and an alternative list, each imposing tighter or looser regulations for companies respectively. As there are certain benefits and costs associated with each list, companies should try to identify their needs and opt for the list that fits them best (PwC, 2013).

The general standard list (or main market), which is present in all five exchanges of interest, allows to list companies that comply with the minimum EU regulatory requirements. While there is some variation between stock exchanges, usually the companies are required to have a minimum of 25 per cent of free floating shares, 3 years of audited financial statements and a market capitalization of 700 thousand pounds or 1.25 million euros, in addition to corporate governance and disclosure requirements. As a matter of fact, this list is intended for mature, domestic companies that target a local European investor audience (EY, 2013; PwC, 2013).

The premium list is considered to be the superior segment of the general list; this originates from the involvement of the Financial Supervisory Authority (FSA) in requirement enforcement. The standards of the local FSA are supplementary to the EU regulations: they include additional focus on transparency and disclosure, as well as the

advisors involved for each listing. Hence, this more expensive list introduces more safety and eliminates some uncertainty, attracting international investors as well. Deutsche Börse and the London Stock Exchange offer such a segment of the main market. (Deutsche Börse, 2016; London Stock Exchange, 2016a; EY, 2013).

The alternative lists are attractive for high growth companies that seek minimum requirements and a low fee environment. All stock exchanges offer this option to small-and-medium-sized companies (SMEs) that allow them to list with lower requirements, determined by the local FSA. Deutsche Börse, Euronext and LSE offer a low-cost market with fewer regulations than elsewhere, particularly aimed to high growth companies and sophisticated investors (Deutsche Börse, 2016; Euronext, 2016; London Stock Exchange, 2016a). For instance, there are no requirements for a minimum market capitalisation or free float of shares in the London Stock Exchange, but the financial statements of the previous three years still have to be delivered (PwC, 2013).

The survival time of companies might differ between markets, and can be accounted for by the company size, as companies are moved between the markets accordingly. Moreover, the competition to attract freely moving capital flows causes individual regulations of European stock exchanges to converge. Hence, the authors further on do not distinguish between stock exchanges themselves, as there should be no effects based on different regulations in power.

2.3. Development of financial systems

Meanwhile, development of a financial system as such might be of interest. Previous research indirectly confirms that there are differences in public company specifics between highly developed and less developed markets. Booth et al. (2006) argue that in a more developed system, where equity markets play a larger role with respect to debt markets, company R&D spending is of a much higher importance when it comes to valuations. This implies that fast growth and younger companies going public are more welcome in more progressive markets, for instance, London or the US. Additionally, Pagano et al. (1998) argue that considerations such as the need to establish a reputation in the market and a lack of liquidity for small, fast growing firms have historically caused the average age of European company listing on a stock exchange to be around 40 years, while the companies in the highly developed US market advance to stock exchanges at a much younger age.

Other attributes than age at the time of listing are found to be contrasting between the two regions as well. Becker & Sivadasan (2010) say that companies are less cash deprived as the system scores higher in development by proving that there is a higher correlation between a company's own assets and investment in the less developed European countries. Moreover, it is argued that a target capital structure is achieved faster in London than in Continental Europe by concluding that there is a significant positive effect from a higher development and a better shareholder protection (Acedo-Ramírez & Ruiz-Cabestre, 2014). Croci & Giudice (2014) observe that a firm's performance *ex ante* and *ex post* delisting differs substantially between the two regions, whereas the authors do not find shareholder structure to have an effect on delisting.

Besides company level differences, there are aggregate differences between the markets. According to Rajan & Zingales (2003), the differences between Germany, the rest of Continental Europe and the UK stem from the role of the incumbent companies and transparency issues. The authors make a clear point that the markets function differently in terms of access to financing and competitiveness due to the underdevelopment that is derived from the power of the incumbent companies, which is much higher in Continental Europe. Clearly, the Global Financial Centres Index 2016, which takes into consideration the business environment, financial sector development, infrastructure, and human capital and reputational factors, confirms the point that the markets still differ: while London leads the global ranking, Frankfurt is 19th, and others are ranked much lower (ZYen, 2016). Hence, as the matters discussed above are addressed from a different perspective in this research, the authors set the following hypothesis:

H_1: The determinants of delisting differ between the financial systems of the United Kingdom and Continental Europe.

2.4. Delisting

Delisting has been an issue that companies have faced historically and are subject to nowadays as well. In the US, around 30 per cent of all companies that went public were delisted within five years of IPO over the 1977-1990 period (Jain & Kini, 1999); Demers & Joos (2007) find the same rate to be 17 and 9 per cent for non-tech and tech companies respectively, with the sample from years 1980-2000. Hensler & Rutherford (1997) find the average survival time to be 88.54 months for firms on Nasdaq (1975-1984), with 50 per cent of delistings occurring within the first 60 months if mergers are excluded. The

main consequence of delisting of any kind is that a company is not able to raise external funding or receive other aforementioned benefits of public trading. In addition, Bakke et al. (2012) argue that delisting results in a significant decline in investment, cash savings and employment. However, one has to acknowledge that delisting does not necessarily mean that the company has gone bankrupt.

Apart from default or insolvency proceedings, there are also other reasons why a company may become delisted, for instance, voluntarily going private. According to Pour & Lasfer (2013), companies that initiate privatisation themselves do it because of the inability to raise external capital, having low growth opportunities, low or negative profitability or the wish to reduce costs associated with being listed. It can be the case that a company breaches compliance rules if it does not go private voluntarily. In case of a compliance breach, the relevant exchange evaluates the seriousness, size and nature of the breach as well as how it came to light. First, they issue a warning of breach and it needs to be resolved within a certain time period before undertaking any punitive measures. If the company does not resolve it, the stock exchange can set a fine, issue a public or private censure or cancel the right to trade its securities without the company's permission or request, which eventually results in delisting (London Stock Exchange, 2016b).

Completely different reasons to delist are mergers and acquisitions, which are typically unrelated to the specifics of the firm. From the regulatory point of view, having low free float of shares or the market capitalization being too small are the cases when a company becomes subject to acquisition delisting, followed by a mandatory tender offer to minority shareholders (New York Stock Exchange, 2016). All in all, M&A transactions (or delistings due to them) follow worldwide economic activity cycles and happen more frequently in favourable tax regime countries that have a high growth potential or familiar cultural characteristics (Xie, Reddy & Liang, 2017). This means that privatisations of this kind stem from country specific macroeconomic and regulatory factors or investor preferences and are only supported by the company's performance, and are therefore outside the scope of this research. In Europe, Thomsen & Vinten (2014) graphically show that M&As account for a higher proportion of delistings than reasons like bankruptcy or going private over time (1996-2004).

2.5. Determinants of Delisting

Literature on previous papers about IPO survivability determinants can be found in academic journals, where the issue is explored from different aspects and groundwork for factors which play a prominent role is established in further research. However, the research has been mostly focused on the United States or the United Kingdom. To familiarise with the area of interest, examination of existing findings is presented in the following section and grouped around a number of factors. The authors have overviewed papers that are widely recognised and are of the highest quality, which is indicated by their presence in the top research journals. The reader should take into consideration that there is research excluded from the summary due to the risk of a bias or results irrelevant to the scope of this paper, as the authors focus on research done either in Europe or the US.

2.5.1. Maturity and Size

Table 1. Relationship between Maturity and Size, and survivability

Independent variables	Relationship	Academic research
Age of company	+	Hensler, D. A., Rutherford, R. C., Springer, T. M. (1997).
	+	Demers, E., & Joos, P. (2007).
	+	Yang, C. Y., Sheu, H. J. (2006).
	+	Carpentier, C., Suret, J. M. (2011).
	+	Abdou, K., Varela, O. (2009).
	+	Espenlaub et al. (2012)
	+	Ahmad, W., Jelic, R. (2014).
SGA expenses	-	Demers, E., & Joos, P. (2007).
R&D expenses	+	Demers, E., & Joos, P. (2007).
VC-backed company	+	Chou, T. K., Cheng, J. C., Chien, C. C. (2013).
	+	Carpentier, C., Suret, J. M. (2011).
	-	Espenlaub et al. (2012)
	-	Ahmad, W., Jelic, R. (2014).
Sales	+	Demers, E., & Joos, P. (2007).
	+	Carpentier, C., Suret, J. M. (2011).
Proceeds	+	Hensler, D. A., Rutherford, R. C., Springer, T. M. (1997).
	+	Chou, T. K., Cheng, J. C., Chien, C. C. (2013).
Total assets	+	Carpentier, C., Suret, J. M. (2011).
	+	Abdou, K., Varela, O. (2009).
	+	Jain, B., Kini, O. (1999).
Market capitalizaton	+	Espenlaub et al. (2012)
	+	Ahmad, W., Jelic, R. (2014).

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The age of the company is a widely used variable and found to be highly significant (Hensler et al., 1997; Demers & Joos, 2007; Yang & Sheu, 2006; Carpentier & Suret, 2011). Authors unambiguously find that firms which are incorporated for a longer period before listing are more likely to survive longer (Table 1). According to Carrol (1983), there is evidence that older firms are more mature and stable, as they have

established their position in market. Additionally, older firms also have financial data available about a longer period, therefore investors are more likely to correctly evaluate their performance.

Many authors also control for size as an important characteristic for the risk of failure. However, metrics of size differ among papers. Yang & Sheu (2006), Jain & Kini (1999) and Ahmad & Jelic (2014) use size of proceeds as the control variable, but find no significant relationship, as opposed to Hensler et al. (1997) and Chou et al. (2013). On the other hand, Abdou and Varela (2009) find a significant relationship between survival time and total assets of a company at the time of the IPO. Regardless of the definition of size, all papers clearly conclude a positive association between the two variables exists, meaning, a larger size of a company implies a longer survival time (Table 1).

On the other hand, Wyatt (2014) concludes that the use of proceeds is related to the survivability of a firm. The author finds that companies which intend to use their proceeds to acquire other companies or invest in capital expenditures survive longer relative to others. Surprisingly, the author writes that, if the initial owners use proceeds to cash out of the company, the survival time goes up (Wyatt, 2014). In addition, performing research about secondary equity offerings, Silva and Bilinski (2015) find that the proceeds used for general corporate purposes and recapitalisation perform worse in comparison to other companies. Subsequently, Demers & Joos (2007) assert that the use of funds matters as well: sales, general and administrative expenses are expected to have a negative relationship, but research and developments costs to have a positive relationship with survivability.

2.5.2. Return and risk measures

To obtain a general view of a company's performance, commonly, Return on Assets (ROA) and Return on Equity (ROE) are the first to be considered. As they are relatively similar, one must wonder why most research in the field favours the use of ROA in their models. ROA has the advantage of showing the direct return generated from assets possessed, while ROE may be biased with factors such as leverage. The findings of Chou et al. (2013) prove it to be a significant explanatory variable of survival rate, while, generally, profitability has positive effects on survivability (Table 2).

Table 2. Relationship between Return and Risk, and survivability

Independent variables	Relationship	Academic research
Profitability	+	Demers, E., & Joos, P. (2007).
	+	Chou, T. K., Cheng, J. C., Chien, C. C. (2013).
	+	Carpentier, C., Suret, J. M. (2011).
	+	Jain, B., Kini, O. (1999).
Leverage	-	Demers, E., & Joos, P. (2007).
	-	Chou, T. K., Cheng, J. C., Chien, C. C. (2013).
	-	Abdou, K., Varela, O. (2009).
	-	Ahmad, W., Jelic, R. (2014).
Z-score	+	Chou, T. K., Cheng, J. C., Chien, C. C. (2013).
Aftermarket SD	-	Jain, B., Kini, O. (1999).

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To control for riskiness and its impact on survivorship, debt-to-assets ratio (D/A) is used by several authors (Demers & Joos, 2007; Ahmad & Jelic (2014); Abdou & Varela, 2009). Consistently, Chou et al. (2013) offer long term debt-to-assets ratio to be a significant determinant of survival rate. They prove that higher leverage is related to higher uncertainty, therefore lower survival time of IPOs. Alternatives to control for riskiness, such as Altman's Z-score and standard deviation of daily returns in the aftermarket, are found to have explanatory power as well (Table 2).

2.5.3. Deal Characteristics

Table 3. Relationship between Deal Characteristics and survivability

Independent variables	Relationship	Academic research
Offer price	+	Demers, E., & Joos, P. (2007).
	+	Fernando, C. S., Krishnamurthy, S., Spindt, P. A. (2004).
Underpricing	+	Hensler, D. A., Rutherford, R. C., Springer, T. M. (1997).
	+	Demers, E., & Joos, P. (2007).
	+	Chou, T. K., Cheng, J. C., Chien, C. C. (2013).
	-	Carpentier, C., Suret, J. M. (2011).
	+	Espenlaub et al. (2012)
Auditor	+	Demers, E., & Joos, P. (2007).
	+	Carpentier, C., Suret, J. M. (2011).
Underwriter ranking	+	Demers, E., & Joos, P. (2007).
	+	Chou, T. K., Cheng, J. C., Chien, C. C. (2013).
	+	Carpentier, C., Suret, J. M. (2011).
	+	Jain, B., Kini, O. (1999).
	+	Espenlaub et al. (2012)
Lockup agreements	+	Ahmad, W., Jelic, R. (2014).
Insider ownership	+	Hensler, D. A., Rutherford, R. C., Springer, T. M. (1997).
	+	Yang, C. Y., Sheu, H. J. (2006).
	+	Ahmad, W., Jelic, R. (2014).
Risk (number of risk factors in prospectus)	-	Hensler, D. A., Rutherford, R. C., Springer, T. M. (1997).

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Fernando, Krishnamurthy and Spindt (2004) examine what information can be obtained from the share price. Controlling for various factors, the authors conclude that a higher absolute share price is associated with lower mortality (Fernando et al., 2004).

Similarly, by modelling an IPO failure, Demers and Joos (2007) also find the same relationship (Table 3).

Underpricing of shares is a different way of sending a message to investors about the deal. There are numerous theoretical explanations for this, for instance, that the goal is to increase liquidity or that only healthy companies can afford to sell their shares cheaper and be subject to underpricing, letting investors earn high returns on the first day of trading (Zheng, Ogden & Jen, 2005). Additionally, this way they attract attention from analysts and investors. The relationship usually is positive, meaning, higher returns over the respective time window are associated with a higher probability to survive over time (Demers & Joos, 2006; Hensler et al., 1997; Chou et al., 2013).

As important as offer price is, the quality of the issue has equal importance. Parties involved in the process, such as auditors and underwriters, are found to significantly influence the result of an IPO (Table 3). Researchers suggest that as more reputable underwriters and auditors are involved, the higher the likelihood of survival of the IPO is (Chou et al., 2013; Carpentier & Suret, 2011; Jain & Kini, 1999; Demers & Joos, 2007; Espenlaub et al., 2012).

Besides variables used by other authors, Ahmad & Jelic (2014) explore whether lockup agreements influence the survivability of a company. According to the U.S. Securities and Exchange Commission (2016), a lockup agreement does not allow company insiders, including employees, their friends and family members, and venture capitalists to sell their shares for an agreed period of time. The authors find that for every month of lockup agreement, the survival time increases by 2 per cent, meaning that if a company sets a lockup agreement for half a year, the survival time could increase by up to 12 per cent.

2.5.4. Market Situation

Table 4. Relationship of market situation and survivability.

Independent variables	Relationship	Academic research
Stock index	+	Hensler, D. A., Rutherford, R. C., Springer, T. M. (1997).
Hot issue period	-	Espenlaub et al. (2012)
	-	Demers, E., & Joos, P. (2007).
	-	Ahmad, W., Jelic, R. (2014).
	-	Carpentier, C., Suret, J. M. (2011).

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In the literature, two factors are used to control for market situation. Hensler et al. (1997) employ Standard & Poor's 500 as a proxy for market activity. They argue that a

higher market index level is associated with lower required standards by investors, therefore, it is easier for a firm with uncertain future prospects to perform IPO (Hensler et al., 1997). Moreover, for hot issue periods when many IPOs take place Carpentier & Suret (2011) use a binary variable, while Demers & Joos (2007) and Ahmad & Jelic (2014) include the average underpricing of all IPOs ninety days prior to the date when the company went public. It is concluded in all three papers that companies which perform IPOs in hot periods tend to survive less long when compared to any other time (Table 4).

2.5.5. Industry

Table 5. Relationship between Industry of choice and survivability

Independent variables	Relationship	Academic research
Industries	+/-	Hensler, D. A., Rutherford, R. C., Springer, T. M. (1997).
	+/-	Yang, C. Y., Sheu, H. J. (2006).
	+/-	Carpentier, C., Suret, J. M. (2011).
	+/-	Jain, B., Kini, O. (1999).

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Demers and Joos (2007), by separating high-tech and non-tech companies, managed to arrive at different results for each group of companies. Similar approach to Demers and Joss (2007), is applied by Hensler et al. (1997). Instead of performing different regressions for each industry, they use binary variables for them. Significantly, the results of both papers are similar: industries with intensive rivalry on research and development have significant effects on delisting. Industry binary variables show that computer and data, wholesale, restaurant and airline companies survive for a shorter period; in turn, optical and drug companies tend to survive longer (Hensler et al., 1997).

2.5.6. Analyst Recommendations

Carter and Strader (2009) try to predict survivability five years from the time of the buy or sell recommendation. They find no evidence of correlation between these two measures. Furthermore, many authors write that analyst recommendations are an important source of information for company performance (Bradley, Clarke, Lee & Ornthanalai, 2014; Booth, Chang & Zhou, 2014; Cai & Cen, 2015). However, not much literature is devoted to examining the relationship between recommendations and survivorship over time, at least to the best knowledge of the authors.

Given the existing literature in the field and acknowledging the gaps in the literature, the authors set the following hypothesis for this research:

H_2: Companies survive a longer period of time if they:

a) have a "buy" recommendation
b) are larger in terms of assets at the time of IPO
c) are older in terms of age at the time of IPO
d) have a lower Debt-to-Assets ratio at the time of IPO
e) have larger proceeds from primary issue
f) have a higher profitability at the time of IPO
g) have a higher initial underpricing
h) have a longer lockup period
i) go public when the stock market index is not at a high a level
j) have a more active underwriter
k) have a more reputable auditor

3. Methodology

3.1. Variables used

3.1.1. Dependent variable

Survivability estimation techniques differ among papers (Table 6). Some authors use a binary variable for companies which are either delisted within a certain period of time or survive longer (Demers & Joos, 2007; Fungáčová & Hanousek, 2011; Jain & Kini, 1999). Others use time in years or months to capture more precise effects over time (Ahmad & Jelic, 2014; Yang & Sheu, 2006; Hensler et al., 1997). Alternatively, Abdou & Varela (2009) and Chou et al. (2013) conduct two kinds of regressions with different dependent variables – one, using a dummy for failed and non-failed companies, the other, using the precise time of survival. Acknowledging this, the authors of this paper intend to employ a similar approach to explore the survivability of IPOs within hazard models, setting time in months as the dependent variable and, afterwards, verifying the robustness of results by performing a logit regression. For survivorship model, the authors use precise time in months, with a variable called *survival*. In line with previous research, logit model is built with three different binary variables depending on the survival time: whether the company has survived three, four or five years is denoted by names *y3*, *y4* and *y5*, respectively.

Table 6. Dependent variables used in other research

Dependent variables	Academic research
Time	Hensler, D. A., Rutherford, R. C., Springer, T. M. (1997). Yang, C. Y., Sheu, H. J. (2006). Chou, T. K., Cheng, J. C., Chien, C. C. (2013). Carpentier, C., Suret, J. M. (2011). Abdou, K., Varela, O. (2009). Espenlaub et al. (2012) Ahmad, W., Jelic, R. (2014).
Binary variable	Demers, E., & Joos, P. (2007). Chou, T. K., Cheng, J. C., Chien, C. C. (2013). Abdou, K., Varela, O. (2009). Jain, B., Kini, O. (1999). Fungáčová, Z., Hanousek, Jan. (2011).

Note. Created by the authors using articles on EBSCOhost.

3.1.2. Independent variables

15 unique variables in total are used for the analytical part of this paper (Appendix A). In consideration of previous literature in the field, the authors aspire to control for all aspects that were scrutinised during the literature review, namely, maturity and size, return and risk, deal characteristics, market activity, industry and analyst recommendation effects. As a matter of fact, most of the previous research has been conducted in the US or the UK, hence, the determinants may not apply in the context of Europe, as previously discussed. In addition, whether the drivers of delisting differ between Continental Europe and the United Kingdom is tested. This is done by separating companies into UK and Continental Europe companies and then performing rounds of regression analyses. `

The authors control for maturity, denoted as *years0*, which indicates the number of years from the foundation date of the company to the date of its IPO. The authors expect this variable to be positively related to the survival time on account of older companies being more mature and more established players in the market (Demers & Joos, 2007; Carpentier & Suret, 2011; Hensler et al., 1997). Meanwhile, the size proxy is included in the analysis as *ln_sales,* which is the natural logarithm of sales in the IPO year. The authors also expect this variable to have a positive relationship with survival time, since companies which generate larger sales are more likely to remain and grow in the market than companies for which this is not the case (Demers & Joos, 2007; Carpentier & Suret, 2011). As concluded earlier, proceeds from issue and assets are valid proxies for size as well and hence might be determinants of survival time (Abdou & Varela, 2009; Chou et al., 2013; Jain & Kini, 1999; Ahmad & Jelic, 2014; Carpentier & Suret, 2011). Therefore, the inclusion of these variables is inevitable. Total assets and IPO proceeds are both included in the form of their natural logarithms, with captions

ln_assets and *ln_proceeds*, respectively. Since the effects in previous literature were usually positive, the authors also expect larger IPOs and larger companies to be associated with longer survival times (Appendix A).

To control for risk, Debt-to-Assets ratio or *tdta,* which shows total debt to total assets ratio in the IPO year, is examined. The authors expect a negative relationship between the ratio and survivability on the grounds of higher leverage being associated with a higher risk and vulnerability (Abdou & Varela, 2009; Chou et al., 2013; Ahmad & Jelic, 2014). Profitability is measured by return on assets and included in the regression as *nita,* calculated as net income divided by total assets, both in the year of the IPO. The expected sign for this relationship is positive, as profitable entities are more likely to survive and be stable over the medium term (Demers & Joos, 2007; Chou et al., 2013; Appendix A).

Deal characteristics themselves can deliver important messages to potential investors. Offer price and anomalies, such as spectacular initial returns, are widely researched and there is evidence for their explanatory power (Demers & Joos, 2007; Hensler et al, 1997; Espenlaub et al., 2012; Chou et al., 2013). Hence, to control for the initial offer price level, the natural logarithm is used in the regression (*ln_offer).* The expected effects are positive, considering that well-established and strong companies are more likely to sell their shares at a higher price. Additionally, to control for volatility and market perceptions of the company, one day, one week, four week, three month, and six month returns are obtained as a difference of their respective closing and offer prices divided by the offer price (*under1*, *under1w*, *under4w*, *under90* and *under180*, respectively). In general, the authors expect a negative effect, because more volatility implies growing uncertainty related to the underlying asset, in this case, the company; however, there is evidence for both positive and negative effects (Chou et al., 2013; Carpentier & Suret, 2011). Another variable of interest is *greenshoe,* which takes a value of one if the company has exercised its greenshoe option and allotted additional stock to its issue, also called overallotment. The authors expect the effect to be positive, concluding that had there been large enough demand, the market would have appraised the company's prospects as promising, but there is no theoretical proof for this relationship found in the literature (Appendix A).

The authors aim to regulate the other involved party effects by including several proved exogenous factors: binary variables for auditors and leading underwriter rankings. Auditors will be grouped based on whether they are among the most prestigious group,

namely, Deloitte, PricewaterhouseCoopers, Ernst & Young or KPMG, or one of the subsidiaries (*big4*). According to previous literature, the authors expect the relationship to be positively related to survival time (Chou et al., 2013; Carpentier & Suret, 2011; Jain & Kini, 1999; Demers & Joos, 2007; Espenlaub et al., 2012). To analyse the impact of underwriters on survival time, the authors employed Migliorati and Vismara (2014) European underwriter ranking. In particular, two attributes were considered that resulted in two separate rankings of interest: the activity ranking with reference to the number of executed IPOs and the volume ranking by the total proceeds raised from all IPOs that each underwriter took part in. Furthermore, the companies are categorised by either having a top three or a top ten underwriter by using binary variables for each rank separately, leaving less reputable underwriters in the constant term (*top3(10)* for activity, *undertop3(10)* for volume). The authors expect these variables to have a positive effect, in consideration of the premium quality services the better underwriters provide to their clientele (Demers & Joos, 2007; Chou et al., 2013; Jain & Kini, 1999; Espenlaub et al., 2012; Appendix A).

Ahmad & Jelic (2014) argue that lockup agreements contain important information about survival time and that companies which limit trading after IPO for a longer time tend to survive longer. In the paper, the authors also include lockup agreement length in months as an independent variable (*lockup*). To capture more precise effects, the lockup agreements were classified by binary variables – selling shareholder, management, or company lockup agreements. A selling shareholder lockup agreement does not allow to sell shares to those shareholders who have already sold part of their shares during the IPO (*Lselling*). Management lockup means that shares held by the members of management cannot be sold after the IPO (*Lmgmt*), while company lockup means that all the shares held by insiders, including employees and management, cannot be sold for some period after the IPO (*Lcomp*). In line with previous findings, the authors expect a positive relationship between lockup agreements and survival time, since lockup agreements were designed to increase confidence and certainty in the market (Appendix A).

Literature suggests that IPOs issued during hot issue periods in the UK market have significantly reduced survival times (Carpentier & Suret, 2011; Hensler et al., 1997; Espenlaub et al., 2012). This paper intends to control for the overall market situation and IPO market as well. Since the focus of this paper is limited to Europe, STOXX600 index level on the day of the IPO is obtained for further analysis. The specific index has an

advantage in that it compiles 600 large, medium, and small capitalisation companies from 17 developed financial markets in both Continental Europe and the UK, ensuring an accurate representation of the whole European market (STOXX, 2017). The variable is included in the analysis as *ln_stoxx600,* meaning, the natural logarithm of the index level on the day of listing is gauged. The authors expect a negative relationship between survival time and *ln_stoxx600,* whereas during high market activity, listings may be demand, not quality supply driven. Additionally, to take into account the effects coming from hot issue periods, the authors will include the initial average daily returns of all IPOs in the sample over 90 days before the issue (*avgiporet*), in a manner consistent with Hensler et al. (1997). The authors expect this to have negative effects, since in hot issue periods investors are more aggressive and willing to overpay for stocks, hence the fundamental value is ignored (Appendix A).

As part of the novelty of this paper, the authors examine the effects of *analyst recommendations* at the time of an IPO on its survivability. Analyst recommendations are included in the model as dummy variables for buy *(buy)*, sell *(sell)*, and hold *(neut)* recommendations. The expected sign for a *buy* recommendation is positive and for *sell* is negative, meaning, a *buy* recommendation is associated with a longer survival time and vice versa for a *sell* recommendation. In addition, the authors test whether it is possible to determine which companies will become delisted by using analyst recommendations after the IPO. In this case, the authors use recommendations after 6, 12, 18, 24 and 30 months. The full list of captions with recommendation variables is available in Appendix A. Using hazard models explained in the chapters to follow, one will be able to observe the role of recommendations during and after the IPO, as there is little relationship established in the literature.

3.2. Data

The geographical scope of this research is Europe. In particular, the authors examine the five largest stock exchanges in the European IPO market, namely, London Stock Exchange, Euronext, BME (Spanish Exchange), Deutsche Borse and NASDAQ OMX. The aforementioned entities account for 80 per cent of the total market in 2015 (PwC, 2016). The data the authors collected is summarised in the Appendix A, together with the sources that were used. Main sources of information are stock exchange homepages, Bureau van Dijk, Thompson Reuters Eikon, Datastream, and the Bloomberg database. In terms of this paper, an event of delisting is defined as a company either being

liquidated, going bankrupt or going private, while reasons such as mergers and acquisitions or a move to a different stock exchange are to be treated as company being neither alive nor delisted - these particular observations are excluded from the data set.

The timespan of the study is years 2000-2016. Initial extract had more than 3000 companies, but, due to unavailability of data, approximately 1600 companies were excluded. Furthermore, after filtering for M&A activity, approximately 320 additional companies were excluded, eventually reducing the number to 1085. After collecting analyst recommendations from the available sources, another wave of exclusions was applied and this exclusion process finally resulted in 936 observations that were analysed further. Therefore, the final number of representatives from each stock exchange is: London Stock Exchange (493), Euronext (212), BME (18), Deutsche Borse (133) and NASDAQ OMX (80). In the final data sample, of 936 companies analysed, 132 experienced the event of delisting during the years of this research, 75 of them within the 5 year time window. The companies included in the data set were listed for 2720 days on average, while subjects that experienced delisting were alive for 1997 days on average (Table 7).

Table 7. Summary statistics for Continental Europe and the United Kingdom.

Financial System	Number of companies	Delistings	Average time alive	Total proceeds raised, (USD thousands)
Continental Europe	443	44	3 019	103 585
The United Kingdom	493	88	2 452	94 915

Note. Created by the authors using data from Thompson Reuters.

The status of each company had to be determined manually using Thompson Reuters Eikon. Using the ISIN tickers, the authors looked up and validated the eligibility of each company for the dataset by looking at corporate events around the last day of trading. The companies with a significant M&A activity around the last day of trading or with few free floating shares were excluded from the dataset. Companies that had been suspended for more than a year and not recovered since, but had not been officially delisted as of January 1, 2017, were assumed to be delisted with the delisting date taken as the last date of trading. This assumption was made due to the fact that stock exchanges have no incentive to delist these companies, as the former earn fees while the companies are kept listed. Meanwhile, those companies may aspire to eventually recover and carry on trading publicly, while in fact they are public no more.

Another scarcely available variable of interest was analyst recommendations at the time of the IPO. The authors had access to two sources – Datastream and Bloomberg databases, but neither of them provided data for all companies of interest. Thus, the missing pieces of information were acquired by using the value from one source was the other not available. If both were available, the closest data point to the IPO date was taken when comparing the date of recommendation. As the authors had to estimate whether it is a call to buy, sell or hold, while recommendations were on a scale from 1 to 5 (where 5 is the strongest or equivalent to strong buy), an assumption was made that values below 2.5 are 'sell', those above 3.5 are 'buy' and the area in between is 'hold'.

The underpricing values for the time intervals of interest were collected from Thomson Reuters Eikon. However, they were not available for all companies in the dataset. Hence, not to lose precious observations, the authors downloaded the daily trading prices from Datastream as well as the offer prices from Eikon and manually calculated them when they were missing. In some cases, Datastream showed values in pennies, while the offer prices were in pounds – thus, the authors manually corrected for inconsistencies by closely examining extreme cases of underpricing. Underpricing for one week was taken as the price development over the following five business days, that for one month was 20 business days, three months – 60 days and six months – 120 days. Covariate related to the average IPO returns was calculated as an average of first day returns for companies that were listed over the 90 days prior to the particular IPO date. All figures are in USD or taken in thousands or millions of dollars due to database technicalities. Data from all stock exchanges is pooled, controlling for the dominant financial system.

3.3. Model

3.3.1. Survivorship model

In survivorship analysis, three types of models are widely used. Non-parametric, semi-parametric and parametric models are used in a variety of papers and for different purposes, in fields ranging from medicine to business risk analysis (Bujang et al., 2016; Ishak et al., 2013; Wakounig, Heinze, Schemper, 2015). This implies a model consisting of an infinite or finite number of parameters. The authors of this paper determined the main model to be Cox proportional hazard model, which was supplemented with the Kaplan-Meier model.

Kaplan-Meier (KM) survival estimate is a non-parametric type of maximum likelihood model, which usually only considers the development of cumulative survival probability (Clark, Bradburn, Love & Altman, 2003). As events of interest occur independently from each other over time, the probability to survive the following round is a simple product of previous round probabilities. Thus, nothing can be said about potential hazards or parameters; rather a comparison of the survivorship of two different groups over time can be made by testing the differences between the KM curves. The functional form is defined as:

$$S(t_j) = S(t_{j-t}) * (1 - \frac{d_j}{n_j}), \quad (1)$$

where $S(t_j)$, probability of survivorship at time t_j, is expressed as $S(t_{j-t})$, the probability of survivorship at time t_{j-t}, and multiplied by $(1 - \frac{d_j}{n_j})$, the rate of survival at time t_j, where d_j is the number of events and n_j is the total number of observations (Clark et al., 2003). The model is widely used to summarise conceptual differences between the treatment and control groups, due to its convenience and general applicability (Chou et al., 2013; Hensler et al., 1997; Ahmad & Jelic, 2014). In this case, the authors use Kaplan-Meier model to determine whether individual variables should be included in the final regression (UCLA, 2017). If the individual variables are close or above the significance threshold of 20 per cent, they are included and tested in the final model (UCLA, 2017).

To arrive at the final results, the authors use Cox proportional hazard model, which is built partially from characteristics of parametric and non-parametric models. Compared to a parametric model, it has a finite number of parameters, while the other part is left undefined, which allows not to assume anything about the distribution and to avoid related restrictive assumptions. It may be less precise in terms of coefficients, but permits one to estimate the direction of effect for each parameter defined, meaning, if there is an interaction between an independent and dependent variable, it allows to find whether the dependent variable increases or decreases (Gelfand et al., 2016). The survival function $\lambda(t|z)$ can be estimated from the baseline function $\lambda_0(t)$, where all the variable values for an observation equal 0 :

$$\lambda(t|z) = \lambda_0(t)e^{z_1\beta_1 + \cdots + z_k\beta_k} = \lambda_0(t)e^{z^T\beta}, \quad (2)$$

where z is a vector of covariates (indicated as T) and β is a vector of parameters (Rodriguez, 2001; Cox, 1972). The model has three main assumptions. One of them is that the hazards of the model should be proportional over time; the relevant test for

proportionality of covariates which one has to perform is Schoenfeld and scaled Schoenfeld residuals test (UCLA, 2017; Waldron, 2014; LaMorte, 2016). If disproportionality is discovered, one of the solutions is stratification, while the other option is to include a time varying covariate (UCLA, 2017). The second assumption is that variables should have a linear relationship with the natural logarithm of hazard (Waldron, 2014; LaMorte, 2016). This assumption is also tested by the same Schoenfeld and scaled Schoenfeld residuals test (UCLA, 2017). While the last assumption is less technical, it is still important to note that each survival time should be independent from that of other observations (Waldron, 2014; LaMorte, 2016). Meaning, if a company became delisted, it should not affect probability of other companies to become delisted. Despite the aforementioned assumptions, Cox proportional hazard model is one of the top choices in the academic literature for survivorship analysis due to its few constraints (Chou et al., 2013; Ahmad & Jelic, 2014; Carpentier & Suret, 2011; Hensler et al., 1997). Commonly, depending on the dataset, it is used in combination with alternatives such as Accelerated Failure Time or logit model to compare and ensure robustness of results.

The Akaike's Information Criteria (AIC) is employed as the main measure to assess variable fit, and it is supported by the respective p-values. It is important to note that AIC is used to assess fit within one model type, in this case, the Cox model, and each comparison is made keeping the same underlying dataset. Standard AIC has been proved to function well in large datasets for survival analysis and was therefore chosen over the Bayesian information criteria (BIC), as its estimation does not rely on the number of observations, but rather on the number of parameters to be estimated (Liang & Zou, 2008; Stata, 2017). To estimate whether the model type itself is appropriate, Cox-Snell residuals are used (UCLA, 2017).

3.3.2. Robustness of results

The authors employ a maximum likelihood estimation technique to additionally examine the relationship between variables and test to what extent the results from the Cox model are robust. Hence, the authors will proceed with the logit regression model, in the same manner as Chou et al. (2013) and Jain & Kini (1999). The logistic model the authors employ is defined as follows:

$$\Pr(Y_i = 1 | X_i = 1) = \phi(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \beta_k X_k) \quad (3)$$

where dependent variable Y = probability of delisting (1 for companies which delisted five years after listing or fewer, 0 for others) and X_i is a variable chosen as

explanatory. Results with p-values shall indicate the significance of variables, which is additionally examined using AIC goodness of fit measure.

4. Results

To discover the differences between the financial systems, the results are presented in the following order. First, the authors present summary statistics and characteristics of the data applied in the analysis for both systems. Second, the results and interpretations for each of the financial systems are provided, unveiling the outcome of quantitative research. Appropriate links with the literature are established in the next section.

4.1. Summary Statistics

Main summary statistics about analyst recommendations at the time of IPO and the survival function of companies are provided in Table 8 and Table 9. The statistics is presented separately for the two regions giving a broader comparison from different perspectives.

Table 8. Company-specific statistics.

Financial System	Age	Assets, (USD millions)	Proceeds, (USD millions)	Sales, (USD millions)
Continental Europe	10	3 729	234	1 120
The United Kingdom	1	818	193	664

Note. Created by the authors using data from Thomson Reuters.

As described above, the age of companies performing IPO differs between the Continental Europe and the United Kingdom, as the median age of a company going public in Europe is ten years, while in the UK it is just one year. The average assets of companies in Continental Europe are nearly USD four billion, but in the UK assets are just below USD one billion. Similarly, the total average revenue is almost twice as large in the Continental Europe as it is in the UK, reaching USD 1.1 and 0.7 billion, respectively. However, the total amount of proceeds raised is almost the same for both samples, USD 234 and 193 million in Continental Europe and the UK respectively. Consistently with the literature review, companies in Continental Europe perform IPOs at a more mature stage than in the United Kingdom.

Table 9. Analyst recommendations over time.

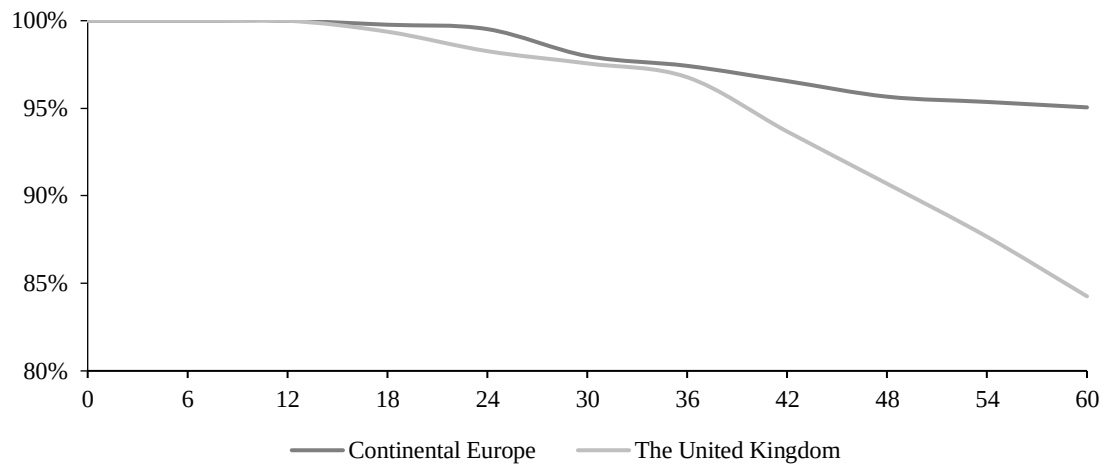
Summary of recommendations at the time of IPO (Continental Europe)																			
Recommendation	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	***Total***
Buy	22	15	5	2	0	6	31	70	71	5	1	19	16	15	16	36	39	1	***370***
Hold	7	4	1	2	0	1	3	9	4	1	1	1	2	0	2	7	4	0	***49***
Sell	5	2	0	0	0	0	4	1	3	0	0	1	2	0	1	1	4	0	***24***
Number of obs.	***34***	***21***	***6***	***4***	***0***	***7***	***38***	***80***	***78***	***6***	***2***	***21***	***20***	***15***	***19***	***44***	***47***	***1***	***443***

Summary of recommendations at the time of IPO (United Kingdom)																			
Recommendation	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	***Total***
Buy	0	2	2	5	12	47	56	59	49	12	3	12	15	11	33	69	43	7	***437***
Hold	0	1	0	4	1	8	6	9	7	1	0	4	1	0	3	3	2	1	***51***
Sell	0	0	0	0	0	2	1	0	0	0	0	1	1	0	0	0	0	0	***5***
Number of obs.	***0***	***3***	***2***	***9***	***13***	***57***	***63***	***68***	***56***	***13***	***3***	***17***	***17***	***11***	***36***	***72***	***45***	***8***	***493***

Note. Created by the authors using data from Thomson Reuters.

Analyst recommendations are similar in both systems, since the majority of companies have a 'buy' recommendation at the time of the IPO. In the authors' sample, 83.5 per cent of companies in Continental Europe had a 'buy' recommendation, while the proportion was 88.6 per cent in the United Kingdom. Larger differences are seen with 'sell' recommendations, because in the United Kingdom only 5 companies had it at the time of the IPO (1.0 per cent of total IPOs), whereas in Continental Europe 24 companies had a 'sell' recommendation (5.4 per cent of total IPOs). The remaining 11.1 and 10.3 per cent of companies had 'hold' recommendation in Continental Europe and the United Kingdom respectively. The authors believe that there are so many 'buy' recommendations because, when companies become publicly listed, their initial price does not represent the actual price. The shares are initially sold at a discount to attract investors and thus many of them are willing to become shareholders.

Figure 1. Summary survival rates.



Note. Created by the authors using data from Thomson Reuters.

As mentioned above, there are differences between companies in the United Kingdom and Continental Europe. These can be seen in Kaplan Meier survival rates, which indicate the probability to survive a specific time period (Figure 1). Within a one year time period, none of the companies became delisted in either sample, while after one year, the difference between the two functions start to increase. The most dramatic differences can be noted starting from the third year when the survival probabilities in Continental Europe and the United Kingdom are 97.4 and 96.8 per cent respectively. By the fifth year, the difference in survival functions has already reached 10.8 per cent. To highlight any underlying drivers, further investigation is conducted for the two regions.

4.2. The United Kingdom

After individual tests for variable significance, the initial pool of variables was chosen for further examination (Table 10; Table 11). The authors included at least one covariate representing each of the groups from the ones specified previously, to be precise, control for size, return and risk, deal characteristics, market activity and analysts' recommendations. However, the ultimate decision regarding the final model (1) was made after examining AIC and log-likelihood estimates. The sample for the United Kingdom consists of 493 listings, of which 88 experienced the event of delisting.

Table 10. Regression results.

The United Kingdom	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)
Ln(Proceeds)	0.852**	-	-	0.850**	0.850***	0.848***	-
	(0.011)	-	-	(0.011)	(0.010)	(0.009)	-
Avg. IPO Retruns	0.613*	0.659	-	-	-	0.635*	0.689
	(0.062)	(0.108)	-	-	-	(0.083)	(0.151)
TD/TA	1.830**	1.760*	1.698*	1.744*	1.784*	1.865**	1.779*
	(0.048)	(0.069)	(0.094)	(0.076)	(0.063)	(0.043)	(0.062)
NI/TA	0.849	0.857	0.842	0.824	0.797	0.826	0.826
	(0.447)	(0.501)	(0.449)	(0.357)	(0.284)	(0.376)	(0.402)
Lockup Period in Months	0.945*	0.940**	0.929**	0.931**	-	-	-
	(0.059)	(0.038)	(0.019)	(0.024)	-	-	-
Underwriter Top10	1.656**	1.578*	1.579*	1.652**	1.602*	1.623*	1.543*
	(0.049)	(0.076)	(0.075)	(0.049)	(0.065)	(0.059)	(0.093)
Ln(Assets)	-	0.896*	0.892*	-	-	-	0.895*
	-	(0.082)	(0.075)	-	-	-	(0.078)
Ln(Stoxx600)	-	-	2.695	3.366*	2.352	-	-
	-	-	(0.130)	(0.068)	(0.174)	-	-
Selling Sharegolder Lockup	-	-	-	-	0.264*	0.303*	0.281*
	-	-	-	-	(0.068)	(0.098)	(0.078)
No. of Obs.	493	493	493	493	493	493	493
AIC	980.4346	983.762	984.4946	981.265	982.4112	980.7131	984.4536
Log-likelihood	-484.21728	-485.88101	-486.24732	-484.6325	-485.20558	-484.35655	-486.22682

Note. Created by the authors using data from Thomson Reuters. Significance indicated as: *p < .1 **p < .05 ***p < .01. See Appendix A for variable descriptions.

As two size metrics – assets and proceeds – were eligible for inclusion in the model, both were compared in regressions (1) and (2), but were not included together due to their correlation equalling to 86 per cent (Appendix B). By comparing their corresponding AIC and log-likelihood criteria, proceeds fit the model better and are significant at almost the 1 per cent level. The estimated relationship is negative, e.g. if proceeds increase by 1 per cent, hazard to survival probability decreases by 15 per cent, which is in line with the expected sign (Table 10).

Riskiness and return are represented as D/A ratio and ROA. In the final model, D/A is found to be significant at the 5 per cent level, while ROA is not significant at all. Results suggest that if D/A increases by 1 percentage point, hazard increases by 0.83 per cent as predicted, while ROA at the time of IPO does not have any effect in this case (Table 10).

The top 10 most active underwriters and the lockup period length are estimated to be the most significant deal attributes that affect the survivability. In the final model, top 10 underwriters are significant at the five per cent level. The results suggest that if one of the underwriters was among the top 10 most active, the hazard increased by 66 per cent, indicating that most of the delistings were underwritten by the active ones. Lockup is significant at a five per cent level in regressions (2), (3) and (4), but not in the final model. However, as it is only slightly above the five per cent level, most of its 95 per cent confidence interval is below the critical value of 1 and thus indicates a positive impact on survivability. The binary for selling shareholder lockup was also considered, but the goodness of fit estimates showed the length of lockup to be of higher explanatory power in regressions (1) and (6) (Table 10).

The choice between one of two market activity proxies, in particular, average IPO returns or market index level was made in regressions (1) & (3) and (5) & (6) (Table 10). Stock index was not found to be significant and the model was worse compared to the average IPO return model, which, however, was not found to be significant at the five per cent level either.

Industries were not found to be significant in initial regressions and are hence excluded from further analysis. The analyst recommendations at different points in time and their significance are available in Appendix C. In general, the authors did not find a strong relationship, the only difference being for buy and hold recommendations 30 months after the IPO, which are significant at the 1 per cent level. If a company has a buy recommendation 30 months after listing, its chance to survive overall will decrease by 54

per cent, while if the company has a hold recommendation, 30 months after IPO, survival odds increase by 142 per cent.

4.3. Continental Europe

The Continental Europe data set consists of 443 listings, of which 44 experienced the event of delisting. The final model (1) is constructed in a similar manner as for the UK (Table 11). Nonetheless, the authors discovered disproportionality in this dataset – in particular, for the age at the time of IPO variables. Age variable was transformed into a binary variable that takes a value of 1 if the company's age is above the median value of 10 years for the purpose of stratification (UCLA, 2017). However, after this transformation, the variable did not appear to be disproportional, thus it was included in the model.

Table 11. Regression results.

Continental Europe	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)
Ln(Proceeds)	-	-	-	-	-	0.991	0.996
	-	-	-	-	-	(0.917)	(0.968)
Ln(Stoxx600)	0.289	-	0.293	0.288	-	0.293	-
	(0.228)	-	(0.233)	(0.219)	-	(0.237)	-
Age	0.367***	0.358***	0.374***	0.365***	0.353***	0.368***	0.358***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Lockup Period in Months	1.085***	1.087***	1.088***	-	-	1.086***	-
	(0.004)	(0.004)	(0.003)	-	-	(0.005)	-
Big4 Auditors	0.542**	0.576*	0.555*	0.512**	0.552*	0.549*	0.562*
	(0.046)	(0.071)	(0.055)	(0.030)	(0.051)	(0.067)	(0.071)
Underwriter Top10	-	-	0.613	-	-	-	0.602
	-	-	(0.242)	-	-	-	(0.232)
Avg. IPO Returns	-	0.832	-	-	0.827	-	0.788
	-	(0.626)	-	-	(0.607)	-	(0.542)
Selling Shareholder Lockup	-	-	-	2.711**	2.717**	-	2.842**
	-	-	-	(0.017)	(0.018)	-	(0.021)
No. of Obs.	443	443	443	443	443	443	443
AIC	473.7913	474.9411	474.2744	475.7325	476.9069	475.7805	479.2639
Log-likelihood	-232.8956	-233.4706	-232.1372	-233.8662	-234.4534	-232.8903	-233.632

Note. Created by the authors using data from Thomson Reuters. Significance indicated as: *p < .1 **p < .05 ***p < .01. See Appendix A for variable descriptions.

In the final model, age is found to be significant at the one per cent level, implying that if a company goes public at an age higher than 10 years, the survivability increases. In this case, one should focus on the positive sign rather than its numerical value due to the transformations made (Table 11).

From deal characteristics, more reputable auditors for Continental Europe companies are of high importance as well. The covariate is significant at the five per cent

level and is defined as follows: if a company has a Big 4 auditor for its financial statements, the hazard to survival curve decreases by 45.8 per cent. In addition, lockup period length is found to be significant at the one per cent level, demonstrating negative effects on survivability in general. To control for market conditions, market index level is chosen as a more appropriate variable than the average IPO returns, according to AIC, but is not found to be significant. Other variables, including analyst recommendations, are not found to be significant either and are therefore excluded from Table 11.

5. Discussion

5.1. Findings

The academic literature has already shed light on some of the relationships established in this model. Proceeds, the significant proxy for size, is the determinant of delisting with a positive effect on survivorship in the UK, while the authors find no effect on survivorship in Continental Europe. The relationship for UK companies is supported by academic literature, as findings for proceeds are in line with the previous findings for the US market by Hensler et al. (1997) and Chou et al. (2013). Meanwhile, the authors conclude that size is a determinant of low importance in Continental Europe.

The significance of lockup period length implies that a longer restriction to exit investment has a positive impact on survivability in the UK and vice versa in Continental Europe. The role of lockup period length has already been tested in London (Ahmad & Jelic, 2014). As IPO is a popular way for old shareholders to cash out their holdings in the UK, longer lockup period might limit this sort of intention. Additionally, evidence from the US suggests that lockup period length is linked with underpricing and long run liquidity. If initial liquidity is ensured by higher underpricing, more liquidity flows in as the lockup period expires, consequently increasing survivability (Bouzouita, Gajewski, & Gresse, 2015; Zheng, Ogden & Jen, 2005).

Lockup period length having an effect on survivability of companies in the Continental Europe is a novel finding, the effect being opposite to the one seen in Anglo-Saxon countries. Better prospects of survival by introducing a shorter lockup period could stem from the decreased liquidity in the already relatively low liquidity market that Europe is. As Europe is not a region with considerable shareholder exits during the IPO, while the UK is, increasing lockup might simply put unnecessary constraints on the trading activity, especially in the short term (Bancel & Mittoo, 2009).

Results suggest that there are statistically significant differences between companies which are underwritten by bookrunners that are more active in the IPO market. The involvement of more active bookrunners negatively influences survivability of the UK companies, while any effect on Continental European companies is not determined. The previous literature suggests the opposite relationship; however, their research employs Carter-Manaster ranking, which is calculated on the proceeds raised in the US market, not activity (Demers & Joos, 2007; Chou et al., 2013; Jain & Kini, 1999). This finding provides evidence that a more active underwriter does not ensure a successful longer term performance, which may imply that they initially attract investors not to the company fundamentals, but to their own reputation instead. In Continental Europe this may be less important due to the investor preferences for longer investments, hence, the fundamentals are considered much more carefully.

Meanwhile, if a European company has an auditor from the prestigious "Big 4", its survivorship increases in the medium term, while auditors do not affect the UK delistings. The former finding is in line with the conclusions of Carpentier & Suret (2011) in the Canadian market, who argue that the significant relationship with company survivorship may be linked to their ability to provide the necessary expert guidance to the companies in need. Further investigation in this direction is needed to understand why underwriters in Continental Europe and auditors in the UK would have virtually no impact on survivorship outcomes.

The findings suggest that D/A ratio has a negative relationship with the survivability in the UK. Risk proxy results are consistent with Chou et al (2013) and Abdou & Varela's (2009), who find that a higher risk or leverage introduces additional uncertainty that negatively influences the probability of survival. Chou et al (2013) investigate the US market, while Abdou & Varela (2009) research London. The aforementioned scope of results matches the authors' findings that this variable is significant in the UK. Additionally, it can be concluded that this risk factor is of much lower importance in Continental Europe, meaning that either companies are delisted due to reasons other than leverage at the time of IPO or their risk profile is different on average.

Furthermore, the company age at the time of the IPO is significant in Continental Europe only. It is argued to indicate company stability and maturity, i.e. higher age increases survivability (Hansier et al., 1997; Demers & Joos, 2007; Yang & Sheu, 2006). The detection of no relationship between age and survivability in the UK indicates that

those investors are more concerned with how risky their investment is and they might be looking for shorter term gains. In turn, European companies are a target of long run strategic investment by investors that look for more mature companies.

Analyst recommendations and their impact on survivability is found to be insignificant. However, a noteworthy trend has been discovered during the data analysis. While recommendations are usually considered to be based on thorough research and should provide the researcher with unbiased information about companies, the authors find that it is not the case in this sample. In the particular sample of 936 companies, the average recommendation value was 4.52 at the time of IPO, where 5 is the highest; 5 was given 627 times, while 1 only appeared 16 times. Clearly, nothing can be estimated with so few sell observations, but the apparent trend of overly optimistic recommendations has to be taken into consideration. Nevertheless, analysis of how analyst recommendations have developed after the IPO and their impact on survivability did not provide any reliable evidence, implying that they have no impact on delisting.

In sum, the authors distinguish differences in survivability between companies being listed in either market or bank based financial systems, which had not been tested before. The summary of hypotheses and observed significant relationships is compiled in Table 12. It is proved that the drivers of survivorship differ – Continental European investors may be more concerned about how mature and stable the companies are, while the UK IPOs are affected by different investment aspects such as riskiness, short term capital gains and the market situation. To validate the aforementioned results, a robustness check is conducted before arriving at the final conclusions.

Table 12. Summary of hypotheses and results

	Expected		**Observed**	
	UK	Europe	UK	Europe
Buy recommendation	+	+		
Higher Assets size	+	+		
Older at the time of IPO	+	+		+
Lower D/A ratio	+	+	+	
Higher Proceeds	+	+	+	
Higher ROA	+	+		
Higher underpricing	+	+		
Longer lockup period	+	+	+	-
Lower market level	+	+	+	
More active underwriter	+	+	-	
Big 4 auditor	+	+		+

Note. "+" indicates positive effect on survivability, "-" is negative. Created by the authors using regression results.

5.2. Validation of results

The authors have ensured validity of results in two ways: first, by performing Schoenfeld residuals proportionality tests to check whether any of the variables violate the proportionality assumption of Cox proportional hazard model and second, by comparing the results of Cox model with logit model (Appendix D).

As indicated above, in the Continental Europe sample there was one case where the proportionality assumption did not hold, while in the United Kingdom sample no variable had such an issue. To mitigate non-proportionality, age variable was transformed into a dummy variable with threshold of its median value, 10 years, taking a value of one, if the company had been incorporated 10 or more years before IPO. Schoenfeld residuals test was performed afterwards once more, indicating that the proportionality assumption holds.

When evaluating logit models, conducted to validate robustness of hazard analyses, one should take into account that significance of coefficients may vary across the dependent variables. The first three regressions are presented as the highest goodness-of-fit models for all three dependent variables, while the remaining ones are presented for the sake of comparison between all the coefficients which are used in Cox model (Appendix D). Ultimately, one should rather prioritise the results when 5-year delisting is examined, since it includes both previous periods and has a more representative sample.

The results of the UK logit model strongly confirm the majority of Cox proportional hazard model estimates. Variables such as logarithm of proceeds, average IPO returns, debt-to-asset ratio, lockup period in months, underwriter activity ranking and selling shareholder lockup were found to be significant with the same sign as in the Cox model. The logit model, however, could not validate findings of the Cox model about company assets, since regression (8) shows an insignificant coefficient. Return on assets was found to be insignificant by both models (Appendix D), in a manner consistent with the Cox model.

However, some contradictions were found for the Continental Europe sample. By comparing results, the authors are only able to strongly confirm findings of age, auditors, selling shareholder lockup and lockup period in months. Average IPO returns and underwriter activity top 10 were found to be insignificant by both models. On the contrary, logarithm of Stoxx600 index was found to be an important determinant in logit, but it was insignificant in Cox model, therefore the link between survival time and market situation could not be established (Appendix D). It may be the case that the logit model

does not capture the entrance and exit points in time for the companies, hence it disregards the effect of time. The authors consider results of the Cox PH model to be robust, as the majority of findings were consistently significant in logit model as well, implying that they hold regardless of the form of the model.

5.3. Limitations

There are potential biases and limitations that the authors discovered during the research. First, as elaborated in the Data section, there were data availability constraints for European stock exchanges that the authors tried to hurdle in several ways. In fact, this obstacle has to a large extent limited the number of variables that could be tested and might have introduced the omitted variable bias as well. For some variables of interest, the availability was too limited to fix the inconsistencies manually, for instance, balance sheet or cost positions as SG&A or R&D of companies in the dataset. As a result of the unavailability of cost data, the authors could not group the companies in fewer industries as the researchers Demers & Joos (2007) and Chou et al. (2013) did. Second, the sample itself might not be representative enough, having only 44 delistings in Continental Europe from 443 observations. Third, the authors excluded M&As, however, voluntarily delistings should be excluded in the further research if possible, as these sort of delistings are not driven by company or deal attributes.

Fourth, a potential limitation is the constant hazard rate over time which, in reality, may introduce a large bias in the analysis (Cox, 1972). Although proportionality was tested and disproportionality was handled with adequate techniques, it still might be a concern, especially if the analysis covers a large time period, as estimates become less accurate. Fifth, the correlation between variables was checked and controlled for by paying attention to the cases with correlation above 60 per cent. Sixth, as the period of the global financial crisis was covered in the research, a better market activity proxy than index level and IPO market returns could be introduced, given the severity of the particular crisis that may have stimulated delisting extraordinarily. Seventh, aspects such as new regulations or significant amendments to existing ones might have to be examined with more scrutiny as well.

6. Conclusions

Throughout the paper, the authors strived to identify determinants of delistings by looking at the UK and Continental Europe primary issue markets. There are two research questions set for the research that will be answered in the following paragraphs.

Regarding the first research question, the authors find evidence that probability of delisting in the UK can be explained by the amount of proceeds raised, lockup period length, Debt-to-Assets ratio, bookrunner participation and average IPO returns in the market at the time of listing. Meanwhile, European delistings are affected by company age at the time of IPO, lockup period length and reputation of auditors involved (Table 12). The common attribute – lockup period length – has negative effects in Europe, but positive in the UK. Analyst recommendations, which were expected to be a major source of information for market participants, do not appear to be a significant determinant of the long term performance of a company.

Second, the markets were proved to be different from the delisting perspective, as (1) delisting frequency is much higher in the UK and (2) determinants of delisting are different for the UK and Continental Europe. Additionally, characteristics of companies at the time of the IPO differ substantially as well. Further research to reveal specific drivers of these differences between markets has to be conducted, but there is no reason to object to the findings of Rajan & Zingales (2003) who argue that incumbents are a major force in underdeveloped markets. Although Continental Europe has seen a major development in the recent years and incumbents, such as banks, are less concentrated sources of investment, the UK and the US markets are still recognised as significantly more developed in terms of, for instance, liquidity and market activity. Most importantly, the authors conclude that the UK IPOs are rather sensitive to riskiness of investment, while European investors identify maturity as the prerequisite of success.

Companies to be listed, potential investors and stock exchanges should find the results of this research useful as well. Acknowledging the differences between IPO markets across Europe may guide a company towards being listed on a market that suits their characteristics better. Identifying the company attributes such as age at the time of IPO or D/A ratio in these regions might help investors assure themselves about their investment choices and avoid possible losses over a longer period. Meanwhile, stock exchanges might consider more carefully whether listing a particular type of company is reasonable and try to decrease potential harms to their reputation. Currently, there is little

emphasis on suitability besides the general minimum requirements, thus, paying more attention to the observed determinants might decrease the delisting rate in the future.

The academic literature benefits from new evidence for delistings in Continental Europe – with longer lockup decreasing survivability and the presence of reputable auditors and age increasing survivability. The tests of variables such as D/A, market activity, underwriter impact and size, which were previously found to be significant in highly developed markets as the UK, provide evidence that these factors are not important determinants in Continental Europe. Analyst recommendations do not affect any of the aforementioned regions. In addition, the authors identify that the two regions differ in terms of company performance *ex ante* and *ex post* going public.

The identified attributes and observations of differences between the markets might be used as a basis of further research. For this matter, there are a few areas of research besides overcoming limitations that the authors have identified as being potentially fruitful. First, separation of sample between prime, regular and alternative lists in the stock exchanges could be investigated. Second, conducting industry-specific analysis would give an insight into how uniform the determinants of delisting are. Finally, grouping companies by the reasons for delisting might yield more useful and precise results.

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8. Appendices

Appendix A. Definitions of variables

Table A.1. Variables and their descriptions.

Data	Variable	Data description	Point in time	Expected sign	Source
Independent					
Age of company					
	years0	Years since incorporation	at the time of IPO	+	Bureau Van Dijk
Total assets					
	ln_assets0	Total assets	IPO year	+	Thomson Reuters Datastream
Proceeds					
	ln_proceeds	Total proceeds raised	IPO	+	Thomson Reuters Eikon
Offer price					
	offer	Offer price of share	IPO	+	Thomson Reuters Eikon
Return on assets					
	nita	Net income/Total assets	IPO year	+	Thomson Reuters Datastream
Sales					
	ln_sales	Sales	IPO year	+	Thomson Reuters Datastream
Underwriter ranking					
	top3	Bookrunners of IPO	IPO	+	
	top10	Bookrunners of IPO	IPO	+	Thomson Reuters Eikon
	undertop3	Bookrunners of IPO	IPO	+	
	undertop10	Bookrunners of IPO	IPO	+	
Debt to assets ratio					
	tdta	Total debt/Total assets	IPO year	-	Thomson Reuters Datastream
Returns					
	under1	Closing and offer price	First day	-	
	under1w	Closing and offer price	First week	-	
	under4w	Closing and offer price	First four weeks	-	Thomson Reuters Datastream
	under90	Closing and offer price	First three months	-	
	under180	Closing and offer price	First six months	-	
Initial return of all IPOs					
	avgiporet	Closing and offer price	Last 90 day returns	-	Thomson Reuters Datastream
Index level					
	ln_stoxx600	Index value	Index level	-	Thomson Reuters Datastream
Dummy if auditor is big4					
	big4	Auditors of company	IPO	+	Thomson Reuters Datastream
Dummy for greenshoe option (exercised or not)					
	greenshoe	Data on greenshoe option	IPO	+	
Dummy for median analyst recommendations					
	buy		IPO	+	
	buy6m		6 months after IPO	+	
	buy12m		12 months after IPO	+	
	buy18m		18 months after IPO	+	
	buy24m		24 months after IPO	+	
	buy30m		30 months after IPO	+	
	neut		IPO	+/-	
	neut6m		6 months after IPO	+/-	
	neut12m		12 months after IPO	+/-	Thomson Reuters Datastream
	neut18m		18 months after IPO	+/-	
	neut24m		24 months after IPO	+/-	
	neut30m		30 months after IPO	+/-	
	sell		IPO	-	
	sell6m		6 months after IPO	-	
	sell12m		12 months after IPO	-	
	sell18m		18 months after IPO	-	
	sell24m		24 months after IPO	-	
	sell30m		30 months after IPO	-	
Dummies for lockup agreement					
	lockup	Lockup lenght (months)	IPO	+	
	lselling	Lockup type	IPO	+	
	lmgmt	Lockup type	IPO	+	
	lshareholder	Lockup type	IPO	+	
	lemployee	Lockup type	IPO	+	Thomson Reuters Eikon
	linstitut	Lockup type	IPO	+	
	lstrategic	Lockup type	IPO	+	
	lretail	Lockup type	IPO	+	
	typeslock	Lockup type	IPO	+	

Note. Created by the authors.

Appendix B. Correlation matrix

Table B.1. Correlation matrix for the United Kingdom.

The United Kingdom	Ln(Proceeds)	Ln(Sales)	Ln(Assets)	TD/TA	ROA	Lockup in months	Selling sh. Lockup	Underwriter top10	Ln(Stoxx600)
Ln(Sales)	0.6728								
Ln(Assets)	0.8577	0.7328							
TD/TA	0.1026	0.1894	0.121						
ROA	0.2762	0.3767	0.3463	-0.241					
Lockup in months	0.3261	0.2451	0.3083	0.011	0.13				
Selling sh. Lockup	0.3451	0.3694	0.3629	0.076	0.09	0.532			
Underwriter top10	0.1933	0.1428	0.1902	0.001	0.02	0.0418	0.0231		
Ln(Stoxx600)	0.3087	0.1996	0.2518	0.008	0.13	0.4158	0.2918	0.029	
Avg. IPO Returns	-0.1555	-0.0086	-0.0755	0.038	-0	-0.1062	-0.0416	0.0094	-0.3171

Note. Created by the authors using data from Thomson Reuters.

Table B.2. Correlation matrix for Continental Europe.

Continental Europe	Ln(Proceeds)	Ln(Sales)	Ln(Assets)	Lockup in Months	Selling sh. Lockup	Avg. IPO Returns	Ln(Stoxx600)	Auditors
Ln(Sales)	0.6702							
Ln(Assets)	0.7839	0.8442						
Lockup in Months	0.3461	0.1729	0.1924					
Selling sh. Lockup	0.2843	0.2577	0.2525	0.4402				
Avg. IPO Returns	0.0649	0.0712	0.056	0.0658	0.0692			
Ln(Stoxx600)	0.1048	0.0237	0.0741	0.096	0.1682	-0.0031		
Auditors	0.1907	0.1968	0.2658	-0.0252	0.0297	0.0674	-0.058	
Underwriter top10	0.2682	0.3096	0.315	0.0893	0.1149	-0.0912	0.0294	0.0321

Note. Created by the authors using data from Thomson Reuters.

Appendix C. Results for regressions with recommendations

Table C.1. Proportional Hazard model results for the United Kingdom.

The United Kingdom	Recommendations											
	At the time of IPO			After IPO								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Variable	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)	Haz. Ratio (*p*-value)
Ln(Proceeds)	0.851**	0.847***	0.851**	0.852**	0.85**	0.849***	0.854***	0.846***	0.843***	0.838***	0.821***	0.818***
	(0.012)	(0.010)	(0.012)	(0.012)	(0.011)	(0.009)	(0.010)	(0.010)	(0.008)	(0.006)	(0.003)	(0.002)
Ln(Stoxx600)	3.35*	3.585*	3.374*	3.288*	3.452*	3.427*	3.761**	3.652*	3.204*	3.44*	3.938**	4.518**
	(0.069)	(0.058)	(0.067)	(0.075)	(0.063)	(0.065)	(0.050)	(0.054)	(0.079)	(0.066)	(0.040)	(0.025)
TD/TA	1.739*	1.73*	1.73*	1.764*	1.807*	1.82*	1.934**	1.694*	1.724*	1.749*	1.867**	1.956**
	(0.078)	(0.083)	(0.081)	(0.072)	(0.062)	(0.060)	(0.040)	(0.098)	(0.083)	(0.076)	(0.050)	(0.035)
NI/TA	0.821	0.825	0.818	0.841	0.853	0.867	0.89	0.819	0.83	0.86	0.883	0.87
	(0.348)	(0.365)	(0.338)	(0.410)	(0.458)	(0.502)	(0.587)	(0.342)	(0.377)	(0.470)	(0.558)	(0.504)
Lockup Period in Months	0.931**	0.931**	0.931**	0.932**	0.930**	0.929**	0.931**	0.931**	0.935**	0.936**	0.929**	0.933**
	(0.023)	(0.024)	(0.023)	(0.026)	(0.023)	(0.020)	(0.026)	(0.023)	(0.035)	(0.036)	(0.021)	(0.031)
Underwriter Top10	1.660**	1.640*	1.666**	1.552*	1.607*	1.597*	1.577*	1.624*	1.669**	1.541*	1.657*	1.655**
	(0.048)	(0.053)	(0.046)	(0.090)	(0.064)	(0.067)	(0.074)	(0.059)	(0.044)	(0.093)	(0.047)	(0.049)
Buy	1.091	-	-	-	-	-	-	-	-	-	-	-
	(0.779)	-	-	-	-	-	-	-	-	-	-	-
Sell	-	1.916	-	-	-	-	-	-	-	-	-	-
	-	(0.371)	-	-	-	-	-	-	-	-	-	-
Hold	-	-	0.822	-	-	-	-	-	-	-	-	-
	-	-	(0.561)	-	-	-	-	-	-	-	-	-
Buy after 12M	-	-	-	0.727	-	-	-	-	-	-	-	-
	-	-	-	(0.194)	-	-	-	-	-	-	-	-
Buy after 18M	-	-	-	-	0.778	-	-	-	-	-	-	-
	-	-	-	-	(0.289)	-	-	-	-	-	-	-
Buy after 24M	-	-	-	-	-	0.671*	-	-	-	-	-	-
	-	-	-	-	-	(0.081)	-	-	-	-	-	-
Buy after 30M	-	-	-	-	-	-	0.459***	-	-	-	-	-
	-	-	-	-	-	-	(0.000)	-	-	-	-	-
Sell after 6M	-	-	-	-	-	-	-	2.2	-	-	-	-
	-	-	-	-	-	-	-	(0.188)	-	-	-	-
Sell after 12M	-	-	-	-	-	-	-	-	0	-	-	-
	-	-	-	-	-	-	-	-	(1.000)	-	-	-
Hold after 12M	-	-	-	-	-	-	-	-	-	1.727*	-	-
	-	-	-	-	-	-	-	-	-	(0.037)	-	-
Hold after 24M	-	-	-	-	-	-	-	-	-	-	1.754**	-
	-	-	-	-	-	-	-	-	-	-	(0.032)	-
Hold after 30M	-	-	-	-	-		-	-	-	-	-	2.424***
	-	-	-	-	-	-	-	-	-	-	-	(0.000)
No. of Obs.	493	493	493	493	493	493	493	493	493	493	493	493
AIC	983.1847	982.6011	982.9102	981.66	982.176	980.3515	971.3084	981.8735	978.933	979.3224	979.0663	971.0082

Note. Created by the authors using data from Thomson Reuters. Results for Continental Europe are not presented as recommendations were insignificant in all regressions. Significance indicated as: *p < .1 **p < .05 ***p < .01

Appendix D. Robustness check – logit results

Table D.1. Logit model results for the United Kingdom.

The United Kingdom	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	y3	y4	y5	y5	y5	y5
Variable	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
	(*p*-value)	(*p*-value)	(*p*-value)	(*p*-value)	(*p*-value)	(*p*-value)
Ln(Stoxx600)	1.070	-1.622	-1.601*	-1.311	-1.803**	-1.509*
	(0.538)	(0.126)	(0.060)	(0.146)	(0.033)	(0.096)
Ln(Sales)	0.072	0.083	-	-	-	-
	(0.497)	(0.236)	-	-	-	-
Ln(Proceeds)	-	-	-0.271**	-0.273**	-	-
	-	-	(0.022)	(0.024)	-	-
Ln(Offer)	0.251	0.087	0.146	0.129	0.071	0.053
	(0.438)	(0.687)	(0.404)	(0.468)	(0.679)	(0.760)
Buy	-	1.035	0.104	0.076	0.039	0.013
	-	(0.210)	(0.824)	(0.867)	(0.934)	(0.978)
Neut	0.396	-	-	-	-	-
	(0.641)	-	-	-	-	-
Big4 Auditors	-0.484	-0.594	-0.077	0.103	0.001	0.029
	(0.413)	(0.141)	(0.821)	(0.761)	(0.998)	(0.932)
Underwriter Top10	1.429**	0.954**	0.761**	0.781**	0.737*	0.745**
	(0.034)	(0.038)	(0.049)	(0.039)	(0.058)	(0.048)
Greenshoe option	-1.339	-0.548	0.044	-0.061	-0.224	-0.234
	(0.251)	(0.445)	(0.948)	(0.925)	(0.739)	(0.723)
Lockup Period in Months	-	-	-	-0.091**	-	-0.093**
	-	-	-	(0.036)	-	(0.031)
Selling Sharehol. Lockup	-	-1.862*	-1.971*	-	-2.015*	-
	-	(0.098)	(0.068)	-	(0.059)	-
Company Lockup	-1.381	-		-	-	-
	(0.174)	-		-	-	-
Age	-0.057	-0.037	-0.033	-0.033	-0.029	-0.029
	(0.462)	(0.298)	(0.196)	(0.162)	(0.253)	(0.221)
NI/TA	-0.059	0.228	-0.006	0.028	0.043	0.076
	(0.916)	(0.547)	(0.983)	(0.922)	(0.884)	(0.894)
TD/TA	0.301	0.402	0.941**	0.917**	0.909**	0.879**
	(0.757)	(0.557)	(0.035)	(0.038)	(0.042)	(0.047)
Avg. IPO Returns	-1.486**	-1.286***	-0.649*	-0.677*	-0.582	-0.609
	(0.020)	(0.004)	(0.087)	(0.078)	(0.115)	(0.102)
90D Underpricing	-1.745**	-0.667	-	-	-	-
	(0.018)	(0.135)	-	-	-	-
180D Underpricing	-	-	-0.247	-0.261	-0.211	-0.230
	-	-	(0.174)	(0.179)	(0.240)	(0.245)
Ln(Assets)	-	-	-	-	-0.155	-0.153
	-	-	-	-	(0.181)	(0.214)
Constant	-10.107	5.464	7.874	6.329	9.939**	8.346
	(0.320)	(0.357)	(0.102)	(0.213)	(0.037)	(0.103)
No. of Obs.	493	493	493	493	493	493
AIC	137.4032	245.6006	344.8025	345.9846	348.5971	349.889
Log-pseudolikelihood	-54.701608	-108.80032	-158.40123	-158.99232	-160.29853	-160.9445

Note. Created by the authors. Significance indicated as: *p < .1 **p < .05 ***p < .01

Table D.2. Logit model results for Continental Europe.

Continental Europe	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	y3	y4	y5	y5	y5	y5	y5	y5
Variables	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
	(*p*-value)	(*p*-value)	(*p*-value)	(*p*-value)	(*p*-value)	(*p*-value)	(*p*-value)	(*p*-value)
Ln(Stoxx600)	-6.306***	-6.512***	-6.295***	-6.161***	-5.527***	-5.253**	-5.149**	-5.449***
	(0.009)	(0.000)	(0.001)	(0.001)	(0.006)	(0.014)	(0.016)	(0.007)
Ln(Proceeds)	0.189	-	-	-	-0.201	-0.162	-0.190	-0.189
	(0.406)	-	-	-	(0.346)	(0.448)	(0.299)	(0.273)
Ln(Sales)	-	0.257	0.251*	0.290**	-	-	-	-
	-	(0.101)	(0.066)	(0.024)	-	-	-	-
Ln(Offer)	-0.242	-0.339	-0.244	-0.219	-0.028	0.056	-0.098	-0.254
	(0.664)	(0.472)	(0.568)	(0.608)	(0.946)	(0.890)	(0.779)	(0.461)
Buy	0.604	0.681	0.749	0.836	0.686	0.642	-0.015	-0.236
	(0.655)	(0.516)	(0.474)	(0.417)	(0.569)	(0.556)	(0.980)	(0.724)
Big4 Auditors	-0.240	-0.954	-1.328**	-1.249**	-0.970*	-0.814	-1.029*	-1.393**
	(0.791)	(0.113)	(0.023)	(0.045)	(0.079)	(0.150)	(0.072)	(0.016)
Greenshoe option	-0.085	-0.455	-0.746	-0.557	-0.533	-0.303	-0.254	-0.586
	(0.918)	(0.540)	(0.273)	(0.388)	(0.414)	(0.625)	(0.670)	(0.326)
Lockup Period in Months	-	-	-	0.037	-	0.061	0.086**	-
	-	-	-	(0.356)	-	(0.100)	(0.011)	-
Management Lockup	1.110	-	-	-	-	-	-	-
	(0.352)	-	-	-	-	-	-	-
Age	-0.118**	-0.177***	-0.178***	-0.177***	-0.184***	-0.184***	-0.193***	-0.210***
	(0.031)	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
NI/TA	3.726**	4.090	2.388	2.177	3.990	3.894	3.875	4.102*
	(0.028)	(0.328)	(0.439)	(0.464)	(0.103)	(0.126)	(0.102)	(0.083)
TD/TA	2.941*	0.454	-0.537	-0.305	0.839	1.282	1.513	1.252
	(0.081)	(0.814)	(0.783)	(0.860)	(0.594)	(0.398)	(0.325)	(0.401)
Avg. IPO Returns	-0.147	-0.635	-0.535	-0.531	-0.342	-0.345	-0.223	-0.195
	(0.736)	(0.111)	(0.177)	(0.169)	(0.406)	(0.378)	(0.497)	(0.551)
1D Underpricing	0.619**	0.777***	0.867***	0.828***	0.925***	0.861***	-	-
	(0.016)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	-	-
90D Underpricing	-	-	-	-	-	-	-	0.680***
	-	-	-	-	-	-	-	(0.004)
180D Underpricing	-	-	-	-	-	-	0.308*	-
	-	-	-	-	-	-	(0.099)	-
Selling Sharehol. Lockup	-	1.131	1.100	-	1.734**	-	-	1.604
	-	(0.181)	(0.158)	-	(0.037)	-	-	(0.033)
Constant	30.504**	32.987***	32.267***	30.869***	30.192***	28.224**	28.741**	31.405***
	(0.024)	(0.001)	(0.001)	(0.002)	(0.005)	(0.013)	(0.014)	(0.004)
No. of Obs.	441	441	441	441	441	441	441	443
AIC	88.75321	109.892	120.3828	121.7078	121.9174	124.802	128.874	127.5947
Log-pseudolikelihood	-31.376605	-41.945986	-47.191391	-47.853895	-47.958694	-49.401009	-51.436977	-50.797332

Note. Created by the authors. Significance indicated as: *p < .1 **p < .05 ***p < .01