RIDING THE WAVE

IPO UNDERPRICING ON THE LONDON STOCK EXCHANGE BETWEEN 2008 AND 2023

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Abstract:

Initial Public Offering (IPO) underpricing has been observed on the London Stock Exchange (LSE) since 1917. Between 2008 and 2023, an IPO underpricing of 13.21% was found, disrupting the previous increasing pattern between 1917 and 2007. This decrease in IPO underpricing can be attributed to enhanced regulatory frameworks, which increased trust and reduced information asymmetry. Of the previously statistically significant factors impacting IPO underpricing on the LSE, only market capitalisation remains significant. The negative estimate of this factor indicates that larger firms still experience less IPO underpricing. Moreover, no trends in IPO underpricing are identified when comparing the pre- and post-Brexit periods, signifying Brexit's limited effect on IPO underpricing.

Keywords:

Initial public offering, IPO underpricing, Brexit, Market Capitalisation, London Stock Exchange

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Introduction

Initial Public Offering (IPO) underpricing is a phenomenon where the offer price is set below the firm's market value. Previous research establishes that IPOs, on average are underpriced, affecting investors, stock liquidity, and volatility (Lowery, Officer and Schwert, 2010). In the current changing macroeconomic environment, IPOs have become a topic of discussion. During 2021, the IPO market experienced a record number of 123 IPOs on the London Stock Exchange (LSE) Main and AIM markets. However, in the following year, 2022, the number of IPOs on the LSE Main and AIM markets fell to a total of 40 IPOs (LSE, 2024). Similarly, 2023 has been a turbulent year for the IPO market, and the future is still uncertain. Nevertheless, David Ludwig, head of Global Equity Capital Markets at Goldman Sachs, is hopeful for a recovery in 2024. Since the United Kingdom (UK) left the European Union (EU) they received more regulatory control of their markets. With this newfound freedom, there are ongoing discussions of easing the regulatory requirements to list on the LSE (Szaja, Morrison and Scargill, 2024).

The first study on IPO underpricing on the LSE was written in 1967 by Merrett, Howe and Newbould who found an IPO underpricing of 17.2% between 1959 and 1963. Concurrently, the first study on the US market was conducted by Stoll and Curley (1970), who examined a sample of equity offerings during the years 1957, 1959 and 1963. Thereafter, multiple studies on IPO underpricing have followed and confirmed consistent IPO underpricing on stock markets.

Despite extensive research on IPO underpricing during the 20th century and early 21st century, a lack of research exists on the current market environment. Therefore, this study aims to address the information gap concerning IPO underpricing, and whether it still exists, between 2008 and 2023 on the LSE by leveraging the framework developed by Chambers and Dimson (2009) in their research paper “IPO Underpricing over the Very Long Run”. Further, this study seeks to investigate which factors influence IPO underpricing and if the patterns found by Chambers and Dimson (2009) continue to persist in the period 2008 to 2023. Given the existing information gap in IPO research and literature, this study is relevant to both professionals and researchers in the field.

Chambers and Dimson (2009) investigate the cause of IPO underpricing between 1917 and 2007 by dividing their period into three sub-periods. Between 1917 and 1945 they found an average IPO underpricing of 8.04%, and in the post-WWII sub-period between 1946 and 1986 an increased average underpricing of 12.09% was found. Moreover, in the sub-period between 1987 and 2007 they found that the average IPO underpricing had increased to 19.00%. Similarly, Loughran and Ritter (2004) also found that IPO underpricing on the US market increased over time, from 7% in the 1980s to 15% between 1990 and 1998.

In comparison to previous research (Chambers and Dimson, 2009), we discover an average IPO underpricing of 13.21% on the LSE, which is a decrease from 19.00% found between 1987 and 2007 by Chambers and Dimson (2009). Our finding disrupts the increasing pattern in IPO underpricing found by Chambers and Dimson (2009) on the

LSE between 1917 and 2007. Adjusting the IPO underpricing model used by Chambers and Dimson (2009) to our current period, and performing an analysis to estimate the yearly effects, we see no significant secular trends within our period with relatively low volatility in IPO underpricing when controlling for firm-specific and market environment factors.

Consistent with the approach of Loughran and Ritter (2004), our analysis focuses on the technology sector, given the notable rise in technology companies opting for public listing and LSE emerging as a leading global venue for technology firms (LSE, 2024). As our period is characterised by significant events such as the Financial Crisis, Covid Crisis and the war in Ukraine, we examine the potential impact of these events on IPO underpricing. Despite volatility in the UK stock market followed by the Financial and Covid crises, we found little to no significant effect on IPO underpricing. We only found the Financial Crisis variable to be significant on a univariate level, and this significance disappeared when firm-specific risk and market environments were controlled for in the multivariate regression.

Market Changes

During our period, 2008 to 2023, there have been several market developments and changes. To acknowledge these changes and highlight how our sample period differs from Chambers and Dimson's (2009) century-long period, we will explore the following: Book-Building, International Financial Reporting Standards (IFRS), Spinning, Regulatory Changes, Brexit, and Crises.

Book-Building

Contrary to Chambers and Dimson's (2009) period, which primarily operated under a fixed offer price regime, our period is instead characterised by the use of the book-building method. In the book-building, the underwriter controls the IPO process from determining the price to inviting investors to participate in the IPO (Ljungqvist and Wilhelm, 2003). Today, the IPO book-building process consists of the following five steps, according to the London Stock Exchange, "How to list equity" (2024): (1) Choose a market: the issuing company must decide if they should list their shares on the Main or AIM market. (2) Choose advisers: the issuing firm chooses their advisors. This step usually consists of a "beauty" parade where the advisors compete to advise the issuing company. (3) Prepare the application: the issuing company and advisors must prepare the application to list on the LSE. (4) Market to investors: involves a roadshow, where the underwriters sell and market the opportunity to invest in the issuing company to external investors. In step (5) Launch and beyond: the issuing company go through with their IPO and lists their shares on the market of their choice. After completing these five steps, the company has successfully listed its shares on the LSE.

IFRS

In 2005, many countries, including the UK, adopted the mandatory IFRS rules (EY McGrath and Gourley 2018). Hong, Hung and Lobo (2014) found evidence that the IFRS standards allowed for market comparison, thus decreasing the information asymmetry during the IPO process. They also found significant results that implementing the IFRS rules decreased IPO underpricing. Despite leaving the European Union in 2020, the UK continues to apply the IFRS rules (IFRS, 2021). Since the IFRS rules have been implemented throughout our whole sample period, we have not included a variable related to IFRS or investigated its effect on IPO underpricing further.

Spinning

The phenomenon known as spinning, where managers of the issuing firm and underwriters engage in IPO underpricing to derive personal and firm gains, has long been a subject of interest in IPO literature. Loughran and Ritter (2004) investigate spinning. They found that spinning increased the incentive for managers of the issuing firm to leave money on the table, as they would derive personal gains from the underpriced IPO. They also found that this incentive among managers increased during hot markets since analyst coverage and the hot market would help the stock price. Furthermore, Liu and Ritter (2010) identified that spinning contributed to an average increase in IPO underpricing of 23%. Spinning was later regulated in the US in 2014 by the Financial Industry Regulatory Authority (FINRA) rule 5131(FINRA, 2020) and in the UK in 2018 through the Financial Conduct Authority's, (FCA) COBS 11A.1.6 rule (FCA Handbook, 2018). Hence, spinning has most likely constituted a problem and affected IPO underpricing during both Chambers and Dimson's (2009) and our sample period. However, due to data availability, no further exploration of how spinning and the regulation of spinning have affected IPO underpricing between 2008 and 2023 is conducted. Additionally, the regulation of spinning is only one aspect of the COBS rule, making it challenging to analyse spinning separately.

Regulatory Changes

During Chambers and Dimson's (2009) century-long period, the market experienced several changes. Among the most prominent changes was the deregulation of the LSE in 1986, which made it easier to trade and enabled electronic trade. Additionally, provincial and regional exchanges existed until 1973, when they merged into the LSE. As a result, the period studied by Chambers and Dimson (2009) differs from our period (2008 to 2023). Like Chambers and Dimson's (2009) period, our period is also characterised by market changes. More recent market changes that have taken place between 2008 and 2023 are regulatory changes aimed at enabling trading and decreasing information asymmetry (Szaja et al., 2024). For example, in 2018, the FCA established changes regarding the pre-IPO analysis to address the information asymmetry in the first stage and to encourage independent analyst research. Furthermore, in 2021, the FCA reduced the free float requirement from 25% to 10% and increased the minimum initial equity market capitalisation from £700,000 to £30 million (Szaja et al., 2024). We expect that regulatory

changes aimed at reducing information asymmetry will minimise IPO underpricing, whilst the change in free float requirement is anticipated to have a minimal impact.

Brexit

The most substantial change to the UK market between 2008 and 2023 is Brexit. The day Brexit was announced (June 23rd 2016), the Pound reached a 30-year low and the global stock market lost $2 trillion in market value (Quaye, Mu, Abudu and Agyare, 2016). The UK officially left the EU, on the 31st of January 2020, a move that has brought several regulatory changes to the LSE.

Changes made close before and after Brexit were mainly due to the UK's new position as a non-EU member. Some of these changes were the Financial Services Regulations in 2020, the Official Listing of Securities Regulations in 2019 and the prospectus regulation. The prospectus regulation builds upon the EU's prospectus regulation but reflects the UK's new position as a non-EU member (Corner, 2021). For example, the prospectus regulation meant the discontinuation of the "passported" prospectus within the European Economic Area (EEA). Now instead, the UK Treasury and the Financial Conduct Authority (FCA) overseas what the European Security and Market Authority (ESMA) do in the EEA. The UK Treasury has established that a prospectus, in accordance with EEA, will now be approved by the FCA as if it were prepared under UK law (Szaja et al., 2024).

Leaving the EU, the UK is taking advantage of the newfound freedom to regulate its market. Hence, more changes are currently being discussed and pursued on the LSE, the most prominent being the prospectus regime stemming from the Lord Hill's Listing Review recommendation and the listing regime proposed by the FCA in December 2023 (LSE, 2024). The prospectus regime aims to make the prospectus regulations more agile, enhancing the quality of the information in the prospectus, increasing participation and reducing unnecessary replications. The new prospectus regime is predicted to become effective in 2025 (Browne, Corner, Graves, Summerfield, Tompkins and Ward, 2021 & Smith, Phillips, Tobin, Shah and Bateman, 2024). If the listing regime is changed as proposed by the FCA, it will be the largest re-writing of rules since 1980 (LSE, 2024). Most regulatory changes following Brexit stem from the UK's new position as a non-EU member.

What we would consider the most prominent changes, the prospectus and listings regime, has not yet become effective. Thus we have not hypothesised and tested for their impact on IPO underpricing. However, the announcement of Brexit resulted in a large market reaction (Quaye et al., 2016), and therefore may have affected companies' and investors' behavior towards issuing and investing in IPOs on the LSE. Thus, we have divided our period into two sub-periods: 2008 to 2015 and 2017 to 2023, from now on referred to as pre- and post-Brexit. The division investigates whether any significant differences in secular trends exist between the two periods. However, no significant change in secular trends between the two sub-periods is seen. Despite the concerns raised by Brexit, the LSE has maintained its status as a premier destination for companies seeking to list their shares (Szaja et al., 2024).

Crises

The UK experienced the three following events which we describe as crises: the Financial Crisis between 2008 and 2009, the Covid Crisis between 2020 and 2021, and the Ukraine war which broke out in early 2022 and is still ongoing. Despite substantial research and literature on IPO underpricing, the impact of these crises over the past two decades on IPO underpricing is relatively unexplored.

According to the UKCES (2014) report "The Labour Market Story: The UK Following Recession" the UK's economy was strongly impacted by the Financial Crisis in 2008, and a slow recovery followed. A decade later, in 2020, the Covid Crisis breakout resulted in uncertainty and volatile markets. During the Covid Crisis, the Gross Domestic Product (GDP) in the UK fell by 19.4% (Office for National Statistics, 2024) leading the government to provide loans and financial aid to stabilise the economy (Hickman, Morris and McDonald, 2022). Following the reopening of the economy, the GDP increased by 17.6%, and markets became more stable (Office for National Statistics, 2024). 2021 was characterised by a more stable macroeconomic environment (PwC, 2022). However, due to the outbreak of the Ukraine war in early 2022, markets were once again destabilised with increased inflation and volatile energy markets (Adolfsen, Kuik, Lis and Schuler, 2022). Given the substantial impacts of these crises, causing volatile markets and uncertain macroeconomic environments, we hypothesise that these three crises have significantly affected IPO underpricing. Nonetheless, it remains challenging to hypothesise whether the crises have had an increasing or decreasing effect on IPO underpricing, considering the overall volatile market environment the crises have caused.

Literature Review

When exploring the phenomenon of IPO underpricing, existing research highlights that several factors affect IPO underpricing. Here, we review the most relevant research and relate the findings to our research.

Loughran and Ritter (2004) investigated IPO underpricing on the US market between 1980 and 2000, specifically focusing on underpricing during the Internet Bubble (1999 to 2000). Loughran and Ritter (2004) found that a large amount of the change in underpricing could be attributed to the changing issuer objective function hypothesis (spinning). This phenomenon can be explained by an increased willingness to leave money on the table for personal gains and increased research coverage. Loughran and Ritter (2004) contribute a challenging view and explanation for IPO underpricing and highlight the complex relationship between underwriters, managers, and the issuing firm. Due to Loughran and Ritter's (2004) findings, this thesis investigates the relationship between underwriters, managers and the issuing firm between 2008 and 2023 by acknowledging spinning and trust between the parties in the IPO process. We find that regulatory changes during the period may have made it harder for the involved parties to exploit underpricing for their own gains.

Chambers and Dimson (2009) contribute a nearly century-long view of IPO underpricing on the LSE by exploring IPO underpricing from 1917 to 2007 and highlighting regulatory changes and patterns in underpricing over time. Through their research, they have identified a consistent increase in IPO underpricing overtime on the LSE, and their findings provide a deepened understanding of the evolution of IPO underpricing. Therefore, we build upon the foundational work of Chambers and Dimson (2009) to fill the existing information gap and to position our findings in relation to a broader historical context of IPO underpricing on the LSE.

Lowery et al. (2010) explore IPO underpricing from 1965 to 2005. Lowery et al. (2010) echo previous findings found by Loughran and Ritter (2004) and Chambers and Dimson (2009) that IPO underpricing consistently exists on the market. Considering these findings, we expect to see IPO underpricing in the modern period. However, Lowery et al. (2010) provides new insights into IPO underpricing by exploring the volatility of initial returns on IPOs. They find a positive correlation between the dispersion of IPO returns and average initial returns on a monthly basis. Moreover, they concluded that despite their expertise, underwriters experienced difficulty in valuation. They found that valuation was extra challenging for underwriters during hot markets and when the information asymmetry was more prominent. Continuing, Sherman (2005) looks into the IPO process of book-building and sale-bid auctions. Sherman (2005) finds that a more controlled process, provided by book-building, lowers risk and thus limits IPO underpricing or after-market volatility. Sherman (2005) also acknowledges the trade-off between the reduced risk of having underwriters control the process and the conflict between underwriters and issuers. Moreover, Sherman (2005) highlights that IPO underpricing compensates investors for the information asymmetry in individual IPOs.

Both Lowery et al. (2010) and Sherman (2005) highlight essential factors contributing to IPO underpricing. Lowery et al. (2010) research further demonstrates the importance of investigating a longer return period, leading us to include the 1-Month Return in our robustness check. Moreover, Sherman's (2005) findings prompt us to explore book-building, the most common IPO process in our period, and how regulatory changes in the IPO process may have affected IPO underpricing.

The previous research above has provided insights into factors affecting IPO underpricing in previous market environments. Therefore, we have chosen to investigate and build upon those factors in our study and to see whether they persist in our period. However, questions of how Brexit and other market regulations have affected IPO underpricing on the LSE remain due to the lack of relevant research on the current market environment. Our thesis touches to some extent on how Brexit has affected IPO underpricing, and we find no significant secular trends when comparing pre- and post-Brexit IPO underpricing on the LSE. Despite our research, a detailed exploration of how Brexit and regulatory changes have affected IPO underpricing on the LSE remains.

Contribution and Limitations

Chambers and Dimson (2009) investigate trends in IPO underpricing and further explore the factors impacting IPO underpricing over a century-long period. This study aims to provide an extension to Chambers and Dimson's (2009) paper by investigating a new time period on the LSE, which lacks coverage in current IPO literature.

Using the methodology of Chambers and Dimson (2009), we will investigate which factors influence IPO underpricing and if secular trends found by Chambers and Dimson (2009) persist. By building upon the foundational research of Chambers and Dimson (2009), our study also provides a novel methodological framework adopted to the present market environment. Thus, our study improves the academic understanding of IPO underpricing in the present time, as it accounts for regulatory changes and crises in the market between 2008 and 2023. Thereby, filling the information gap in IPO underpricing research. Our contribution holds significant interest for issuers, underwriters and investors as well as researchers who wish to deepen their understanding of IPO underpricing in the current setting.

Adjustments have been made to the foundational model established by Chambers and Dimson (2009) to enhance alignment with the current market environment. These adjustments, while necessary for adopting Chambers and Dimson’s (2009) model to the current financial market, constrain the comparability of factors impacting IPO underpricing. The adjustments included both integration and omission of various factors, with exclusions driven by regulatory changes and data limitations. This means that we include the following variables in the model: HOT, COLD, COUNTRY, MARKET, FINANCIAL CRISIS, and UKRAINE WAR, and exclude the following variables: LNBVP, TRACK, AUDIT, PROPSOLD, UW, PRESTIGE, RD, PLACING, and RESTRUCTURE. Additionally, due to data availability, factors relating to Brexit and regulatory changes have not been investigated. Furthermore, due to the model adjustment and restricted data availability, we cannot comprehensively answer whether all the patterns and findings in IPO underpricing found by Chambers and Dimson (2009) persist in the current market environment.

An Empirical Model of IPO Underpricing

Dependent Variable

Existing research in IPO underpricing (Chambers and Dimson, 2009) defines IPO underpricing as the discrepancy between the offer price and the closing price at the end of the first trading day. For any given firm (i), the underpricing (RETi1) is calculated by comparing the initial offer price (Pi0) with the closing price of the stock on the first trading day (Pi1).

$$RET_{i1} = \left(\frac{P_{i1}}{P_{i0}}\right) - 1$$

Model (1)

Model for IPO Underpricing

The model is based on the premise that issuers wish to maximise gross proceeds of the IPO, both in terms of gross proceeds to the firm and to existing shareholders, subject to meeting the LSE requirements. For the issuing firm, a lower IPO underpricing is better as the firm and existing owners leave less money on the table than if the underpricing is higher (Chambers and Dimson, 2009).

To ensure comparability to Chambers and Dimson (2009), we build on the linear model with RET as the dependent variable laid down by the authors. The linear model is adjusted to reflect the market environment between 2008 and 2023. The adjusted model for IPO underpricing can be seen below in Model (2), along with explanations of why certain variables are included and excluded compared to the one used by Chambers and Dimson (2009).

$$\begin{aligned} RET = {} & b_1 * LN(MCAP) + b_2 * LN(1 + AGE) + b_3 * IPO\ HOT + b_4 * IPO\ COLD \\ & + b_5 * COUNTRY + b_6 * MARKET + b_7 * COVID\ CRISIS + b_8 \\ & * FINANCIAL\ CRISIS + b_9 * UKRAINE\ WAR + b_{10} \\ & * INDUSTRY_{DUMMIES} + b_{11} * MRET + \varepsilon \end{aligned}$$

Model (2)

Independent Variables

Loughran and Ritter (2004) mention that firm-specific risk factors can partially explain IPO underpricing. Adopting Chambers and Dimson's (2009) approach, we employ firm age and market capitalisation as proxy variables for firm risk. Logarithmic transformations of the market capitalisation and age variables are applied to ensure comparability with Chambers and Dimson (2009).

Previous IPO literature, such as those by Helweg and Liang (2004) and Sherman (2005), explores IPO underpricing in hot and cold markets. Hence, hot and cold variables are included to investigate the significance of hot and cold IPO markets. Following the

methodology outlined by Helwege and Liang (2004), a three-month moving average categorises our period into hot and cold. The IPOs issued in months classified as hot had a three-month moving average between 13 and 18 IPO listings, and IPOs issued in months classified as cold had a three-month moving average of five IPO listings or less.

In line with the common practice in IPO underpricing research, demonstrated by Chambers and Dimson (2009) and Filatotchev and Bishop (2002), we incorporate an industry vector dummy utilising the Financial Times Stock Exchange (FTSE) industry classification to evaluate industry effects. Consistent with the approach of Loughran and Ritter (2004), our analysis focuses on the technology sector, given the notable rise in technology companies opting for public listings and LSE's emergence as a leading global venue for technology firms (LSE, 2024).

As observed by Quaye et al. (2016) during the announcement of Brexit, Loughran & Ritter (2004), and Chambers & Dimson (2009) during the dot-com bubble, the market tends to react strongly to unpredicted events. To explore whether unpredicted crises have affected IPO underpricing from 2008 to 2023, the variables FINANCIAL CRISIS, COVID, and UKRAINE are included in the linear model.

Chambers and Dimson (2009) include a dummy variable, USM, Unlisted Securities Market, which captures the weaker listing requirements of the USM. Following this methodology, we have adopted a dummy variable, MARKET, to capture the weaker listing requirements on the AIM compared to the LSE Main Market. Furthermore, following the approach of Chambers and Dimson (2009), we also incorporate a vector of dummy variables for each calendar year, representing the initial trading year of the issue (YEAR). The vector of year dummies is observed in the year coefficient plot figures (Model 3).

Additionally, the phenomenon of home bias, where UK investors disproportionately favour domestic stocks, allocating about 25% to UK equities despite them representing only 4% of the global index, underscores the relevance of incorporating the COUNTRY variable (Joshi, 2023). This inclusion aims to explore the impact of a firm's country of origin on its IPO underpricing on the LSE.

Control Variable

Ritter and Welch (2002) have highlighted the impact of equity market conditions on IPO underpricing. Moreover, in accordance with Chambers and Dimson (2009) and Lowery et al. (2010), a lagged market return from the previous month (MRET) before the first trading day is used as a proxy to control for market conditions.

Excluded Variables

Underwriter (UW) and prestige of the underwriter (PRESTIGE) are excluded from our analysis due to the comprehensive advisory support needed throughout the IPO process in the modern market. Firms aiming to list on the Main Market require a Sponsor (a type

of underwriter), whilst firms aiming to list on the AIM require a Nominated Advisor (Nomad), as stipulated by the LSE (2024).

AUDIT was excluded from our analysis due to the legislative evolution intensifying the auditing regulations between 2008 and 2023. The mandatory nature of auditing, established in 1900, was reinforced by the Audit Directive in 2006, with the goal of harmonising the statutory audit requirement through the Companies Act 2006 in the UK (Competition Commissions Audit Market Investigation, 2024)

Chambers and Dimson (2009) categorise IPOs into placing or public offers. This categorisation is not made in our dataset as the distinction has lost its significance, according to Chambers and Dimson (2009), following the Big Bang period (1986 to 2007). Additionally, PROPSOLD (Proportion of post-issue voting equity sold at IPO) and TRACK (Length of profit record) have been excluded from our analysis due to data availability. Similarly, LNBVP (natural logarithm of book value ratio), RD (undertaking of research and development) and RESTRUCTURE (restructuring of voting shares) are excluded due to lack of available data.

Hypothesis

We hypothesise that IPO underpricing exists within our period. However, we expect a slight decrease in IPO underpricing due to market changes fostering a more transparent IPO process. Therefore, we expect the continuous growth in IPO underpricing found by Chambers and Dimson (2009) to be disrupted. Given the regulatory changes related to Brexit and the market reaction, we expect to see a secular trend in IPO underpricing within our period.

Table I
Variable Definitions and Hypothesis

Variables defined below are used in IPO literature to explain IPO underpricing. Our hypothesis regarding each variables impact on IPO underpricing is defined with; + (Increase) ,- (Decrease) or +- (Increase or Decrease).

Variable	**Definition**	**Hypothesis** Impact on underpricing
LNMCAP	The natural logarithm of Market Capitalisation adjusted for inflation at the end of 2023 prices in pounds	-
LN(1+AGE)	The natural logarithm of one plus the firm's age	-
HOT	A dummy variable, if the IPO originated from what is classified as a hot period it is denoted by a value of one	-
COLD	A dummy variable, if the IPO originated from what is classified as a cold period it is denoted by a value of one	+
COUNTRY	A dummy variable denoted by a value of one country of origin is outside the United Kingdom	±
MARKET	A dummy variabel where the IPO is denoted by a value of one if issued on AIM	+
COVID	A dummy variable, if the IPO originated between 16 March 2020 and 19 July 2021 it is denoted by a value of one	±
FINANCIAL CRISIS	A dummy variable, if the IPO originated during 2008 or first half of 2009 it is denoted by a value of one	±
UKRAINE	A dummy variable, if the IPO originated on or after 24th of February 2022 it is denoted by a value of one	±
TECHNOLOGY	A dummy variable denoting if the issuing firm belongs to the FTSE insdustry classification Technology	+
Industry dummy	A vector dummy covering each FTSE industry. Industry membership is denoted by a value of one	±
YEAR dummy	A vector dummy covering each yearly period. Year membership is denoted by one	N/A
MRET	Equity market conditions proxied by lagged market returns over one month of the FTSE All Shares index or the FTSE AIM All Shares index prior to the first day of trading	N/A

Data

The primary data source used was the "New Issues and IPOs" data file provided by the LSE (2024), which provides all New Issues and IPOs on the LSE from 1995 to 2023. After excluding observations classified as "Not IPO" and data points prior to 2008, the dataset consisted of 1221 observations. Unlike Chambers and Dimson (2009), we excluded 'money raised' from our dataset as it was only available from June 2016 and onwards. Country of origin was specified as a country in the LSE dataset but is simplified to a dummy variable, '1', meaning that the country of origin is outside the UK. FTSE sectors were provided from the LSE database, and through an FTSE sector tree, the sectors are aggregated into industry level. Firms without an industry definition were complemented manually through the Financial Times database (2024).

S&P Capital IQ, a comprehensive database covering financial data of world markets, was used to complement the existing data gathered from LSE. In the screening tool for initial public offers, we screened for the following: LSE or AIM exchange, IPO date between 2008 and 2023 and security was type set to common stock. From the S&P Capital IQ's filtered dataset of 877 IPOs, the first day and 1-month initial return was extracted. Each IPO's age was calculated using the 'Year Founded' formula in the S&P Capital IQ Excel plug-in and then subtracting the year founded from the public offer date. In the data points where 'Year Founded' was missing, it was complemented by manually extracting the registration date of the company on the governmental website of the UK (Gov.UK, 2024). The market capitalisation at the offer price for each IPO was retrieved from the S&P Capital IQ charting tool in the local currency Pounds. Similar to Chambers and Dimson (2009), who measured market capitalisation at the offer price at the end of 2007 prices, we inflation-adjusted the market capitalisation of our data points to the end of 2023 prices using the Bank of England Inflation Calculator (2024) for the Pound.

When merging the data from the LSE and S&P Capital IQ, we were left with 645 IPOs. All IPOs that were exclusively on S&P Capital IQ were excluded. This exclusion is done as we assume that the LSE has more reliable information in regard to their own market listings than S&P Capital IQ. Like Chambers and Dimson (2009), closed-end funds, known as investment trusts in the UK, and firms with a smaller capitalisation than one million pounds have been removed. We also excluded Special Purpose Acquisition Companies (SPACs) following their emergence in recent years. Their unique structure of acquiring a business after its listing could skew the results. After the exclusions above, we were left with 604 IPOs in the dataset.

The MRET variable (1-month return pre-IPO) for the Main and AIM market (FTSE All Shares index and FTSE AIM All Shares index) was extracted from MarketWatch (2024). The definition of the financial crisis period was found in the 'Financial Crisis Timeline' report published on the parliament website (Edmonds, 2010). The Covid crisis period classification was taken from the Institute for Government Analysis (2024) of the Covid restrictions.

When categorising the IPOs into hot and cold, we use the original dataset, "New Issues and IPOs", from LSE, consisting of 1221 observations. The data distribution from the

moving averages (based on Helweg and Liang's 2004 method) was subsequently divided into quartiles denoted based on the market activity of IPO issuance. IPOs originating in periods belonging to the fourth quartile were classified as hot. Contrarily, IPOs from periods in the first quartile were classified as cold, indicating low issuance of IPOs during the corresponding periods. The remaining second and third quartiles were classified as neutral. The monthly number of IPOs and the three-month moving average across the period can be seen in Figure I.

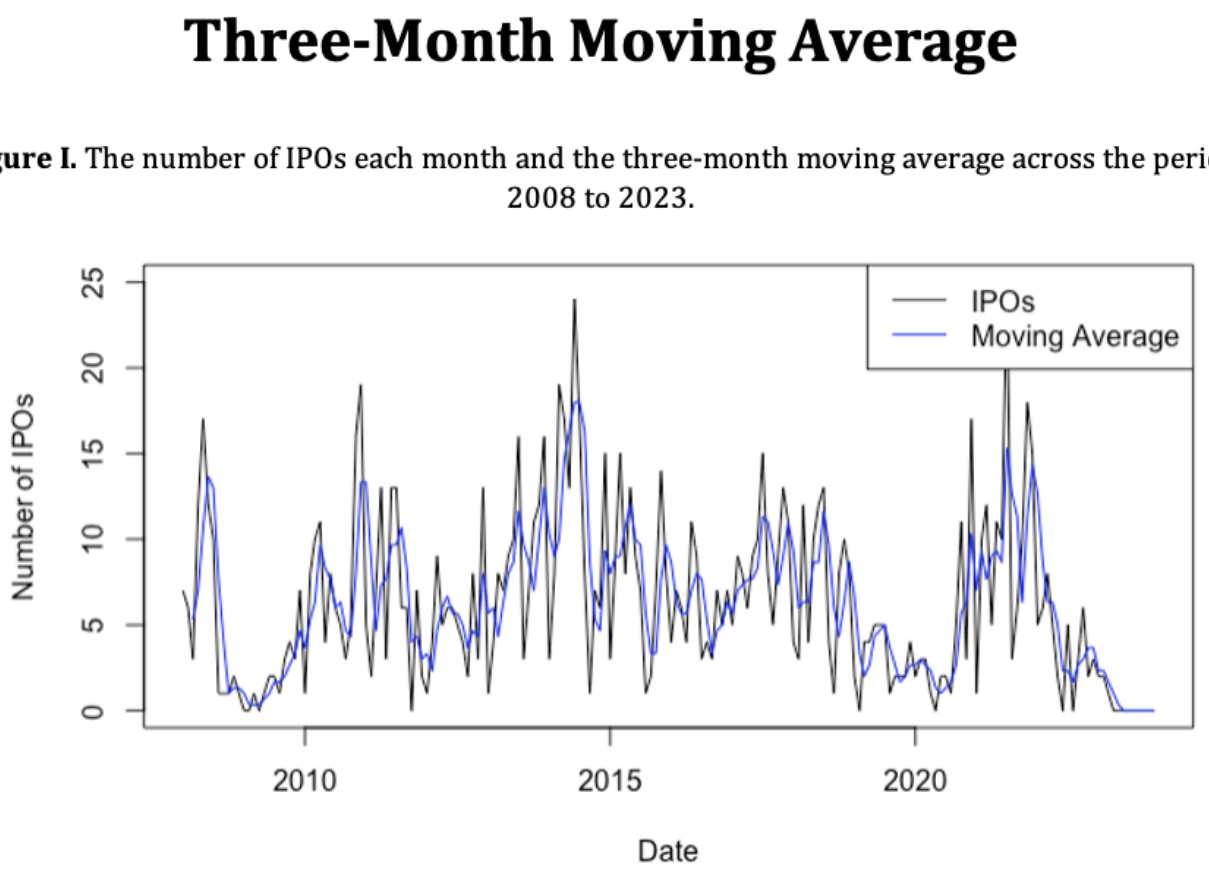


Figure I. The number of IPOs each month and the three-month moving average across the period 2008 to 2023.

Looking at the three-month moving average in Figure 1, we see large volatility in IPO issuance throughout the period. We notice that the crisis periods had reduced IPO issuance, potentially underscoring the potential effect of these crises.

Table II gives an overview of the data and potential outliers which could impact the analysis.

Table II

Descriptive Statistics from 2008 to 2023

The variables described in this table are the variables explained in the Empirical model of Underpricing. The LN prefix refers to the natural logarithm, for example, LN(1 + RET) calculates the natural logarithm of 1 plus the initial day's return (RET). Market capitalisation in millions (£) adjsuted for end of 2023 prices.

Statistic	*RET*	*LN(1+RET)*	*MCAP*	*LNMCAP*	*AGE*	*LN(1+AGE)*	*HOT*	*COLD*	*COUNTRY*	*MARKET*	*COVID*	*FINANCIAL CRISIS*	*UKRAINE*
Mean	0.13	0.10	1254.76	4.41	15.96	1.99	0.12	0.13	0.14	0.60	0.12	0.03	0.06
Median	0.075	0.07	83.3	4.42	8	2.20	0	0	0	1	0	0	0
Maximum	3.5	1.50	452863.72	13.02	259	5.56	1	1	1	1	1	1	1
Minimum	-0.89	-2.17	1.03	0.03	0	0	0	0	0	0	0	0	0
Std. Dev.	0.29	0.20	18554.15	1.97	29.78	1.33	0.33	0.34	0.35	0.49	0.32	0.16	0.23
No. Obs.	604	604	604	604	604	604	604	604	604	604	604	604	604

The dependent variable, RET has an average IPO underpricing of 13%, with a maximum IPO underpricing of 350% and a minimum of -89%. This wide variation in results indicates that the range in IPO underpricing is substantial. Similarly, the market capitalisation and firm age variables exhibit a wide range and high variability, shown by the large standard deviations. A logarithmic transformation is conducted to control for the high variability in these variables. This adjustment was made to increase the normality of the data and to facilitate the analysis process.

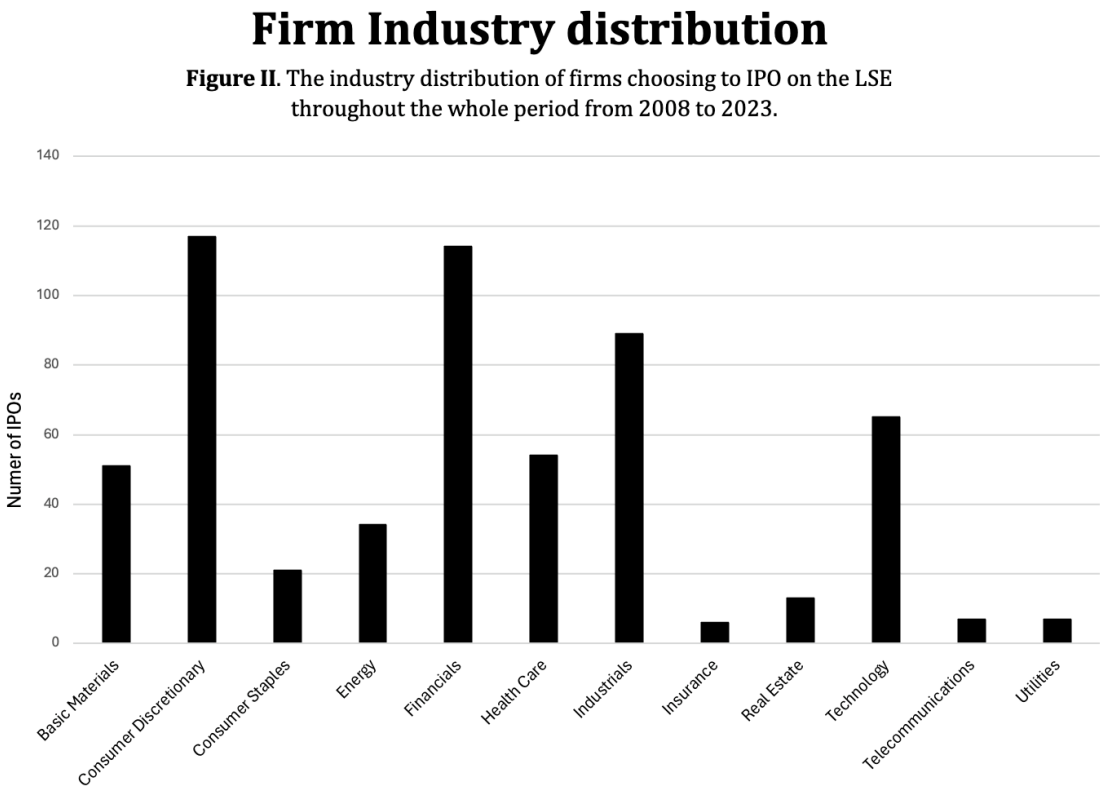
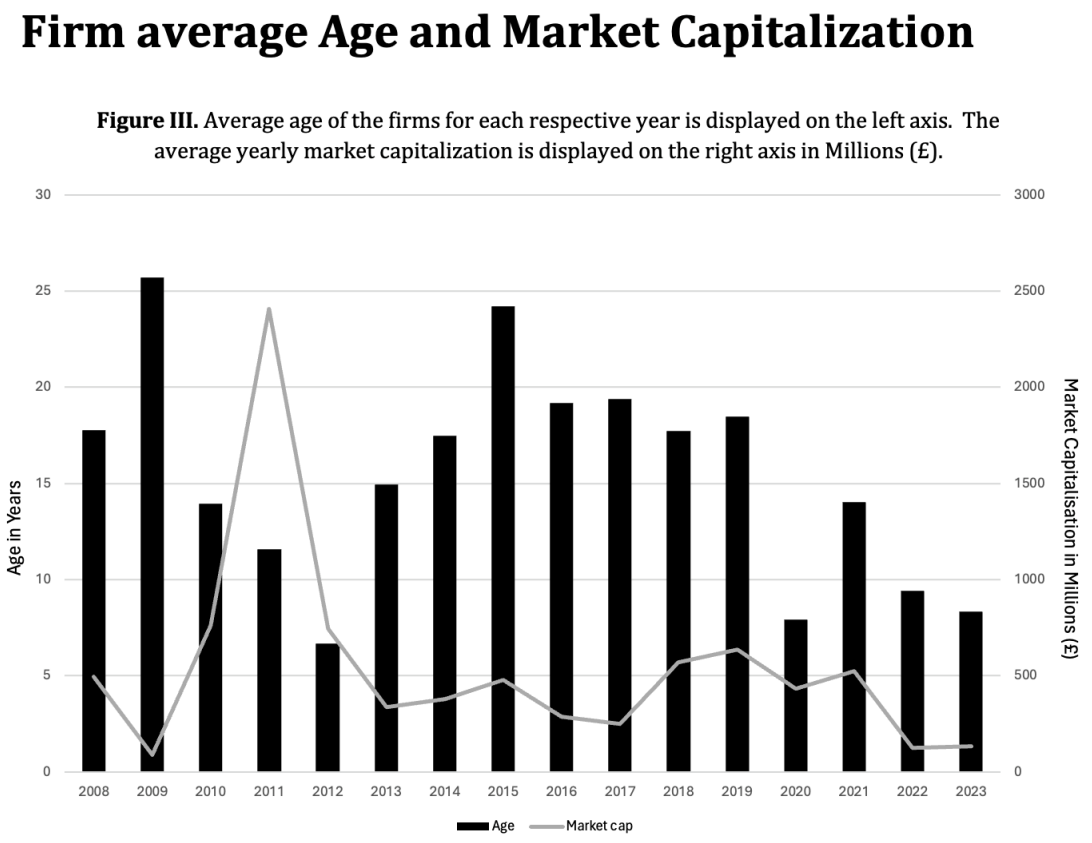


Figure II shows the industry distribution of firms choosing to list on the LSE from 2008 to 2023. There is a large discrepancy among firms from different industries deciding to partake in an IPO on the LSE. In our dataset, companies from the Financials and Consumer Discretionary industries are the most commonly listed on the LSE. In contrast, those in the Insurance and Telecommunication industries have launched fewer IPOs. The discrepancy of industries in our data set contributes to an overrepresentation of certain industry-specific characteristics, and this influence is mitigated by including an industry vector dummy.



In Figure III, we see firm characteristics regarding firm age and market capitalisation. The average firm age ranges between 6 and 26 years, and the average market capitalisation varies from 100 million to 700 million pounds. In the last two years, there has been a notable drop in average firm age and market capitalisation.

Results

Table III summarises the annual volume and first-day return of IPOs. The lowest IPO volumes in our period are observed in 2008 and 2009, the financial crisis years. Conversely, the highest IPO volume was seen in 2021 during the Covid crisis, with 94 IPOs. However, after 2021, a notable decline in IPO volume is observed, with 28 IPOs in 2022 and 15 IPOs in 2023.

Table III

Annual Volume of IPO Underpricing from 2008 to 2023

IPO underpricing is defined as in Model (1). Returns are equally weighted and capitalisation weighted. Firm capitalisation is defined as the post-IPO value of the firm at the offer price.

Year	Number of IPOs	Equally Weighted mean return (%)	Capitalisation weighted mean return (%)	Median return (%)
2008	16	7.02	-2.93	6.23
2009	7	8.42	17.44	6.00
2010	29	9.81	2.17	6.25
2011	23	12.69	0.15	5.59
2012	23	10.71	5.33	8.50
2013	44	13.34	10.62	11.35
2014	71	12.07	14.94	5.26
2015	57	9.72	9.01	7.22
2016	44	13.75	3.06	8.34
2017	56	10.53	7.00	6.07
2018	45	11.19	3.86	9.31
2019	22	26.12	4.09	9.38
2020	30	16.42	13.40	6.88
2021	94	16.76	7.72	7.75
2022	28	17.62	-3.84	9.00
2023	15	10.12	0.63	7.03
Main Market	240	15.61	5.15	7.39
AIM	364	11.62	11.07	7.5
Total	604	13.21	5.52	7.50

2008 to 2023 is characterised by an average underpricing of 13.21%, based on the equally weighted mean return of 604 IPOs. This represents a decrease in IPO underpricing compared to the 19.00% in IPO underpricing found by Chambers and Dimson (2009) between 1987 and 2007. Thus, the increasing trend seen in IPO underpricing over time does not persist in the current period. The highest IPO underpricing was observed in 2019, with a relatively low IPO volume compared to other years. Additionally, despite the announcement of Brexit, 2016 was not characterised by any extreme IPO underpricing, considering the IPO underpricing of 13.75%, which is relatively close to the period's average of 13.21%. The lowest IPO underpricing was recorded between 2008 and 2010, ranging from 7.02% to 9.81%.

The average capitalisation-weighted mean return was 5.52%, compared to the equally weighted mean return of 13.21%, hence a 7.69% difference in IPO underpricing can be seen. This difference suggests that the market capitalisation of the firm going public has a decreasing effect on IPO underpricing. This is later confirmed in our univariate and multivariate regressions in Tables IV and V.

Univariate and Multivariate regressions

An Ordinary Least Squares (OLS) regression, both on the univariate and multivariate level, is conducted using Model (2) to identify which factors affect IPO underpricing. The univariate and multivariate regression results can be seen in Table IV and Table V. In the univariate regression, each variable, including the industries, is examined in isolation in regards to the dependent variable (RET) representing the first-day return. The multivariate regression investigates the combined effect of the variables outlined in Model (2) on the dependent variable RET.

Table IV

Univariate OLS Regressions of IPO Underpricing

All variables are described in the Empiral method above, the dependent variable is RET. All univariate regressions include a 1-month lagged market return variable. Estimation is by OLS and, in accordance with Chambers and Dimson (2009), White's (1980) heteroskedasticity-consistent method is used to calculate standard errors. The statistical signifiance levels of the coefficients are the follwing: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Dependent variable: IPO Underpricing						
Market	Aggregated		Main Market		AIM	
	Estimate	*P-value*	*Estimate*	*P-value*	*Estimate*	*P-value*
LNMCAP	-0.027***	0.000	-0.039***	0.000	-0.003	0.687
LN(1+AGE)	-0.021*	0.020	-0.039*	0.023	-0.004	0.527
HOT	-0.016	0.695	0.021	0.870	-0.027	0.153
COLD	-0.043*	0.028	-0.040	0.311	-0.057***	0.000
COUNTRY	-0.024	0.451	-0.055	0.537	-0.005	0.864
MARKET	-0.037	0.188	*NA*	*NA*	*NA*	*NA*
COVID	0.043	0.460	0.091	0.483	0.006	0.839
FINANCIAL CRISIS	-0.056*	0.041	-0.152**	0.002	-0.024	0.390
UKRAINE	0.023	0.628	0.057	0.439	-0.060*	0.015
TECHNOLOGY	0.025	0.668	0.074	0.661	0.004	0.826
BASIC MATERIALS	-0.007	0.824	-0.864 .	0.099	0.033	0.398
CONSUMER DISCRETIONARY	-0.028	0.135	-0.098**	0.007	0.017	0.334
CONSUMER STAPLES	-0.068*	0.020	-0.152**	0.002	-0.029	0.386
ENERGY	-0.024	0.519	-0.095 .	0.098	0.014	0.769
FINANCIALS	0.057	0.103	0.131*	0.023	-0.063**	0.002
HEALTH CARE	0.088	0.122	0.295	0.252	0.049	0.123
INDUSTRIALS	-0.061***	0.000	-0.152***	0.000	-0.023	0.166
INSURANCE	-0.095**	0.002	-0.122*	0.015	*NA*	*NA*
REAL ESTATE	-0.070***	0.000	-0.091**	0.005	-0.055**	0.002
TELECOMMUNICATIONS	-0.062	0.260	-0.186*	0.012	0.028	0.632
UTILITIES	-0.045	0.264	-0.06	0.468	-0.033	0.275

Note: MARKET variable is only applicable to the aggregated market regression. AIM market did not have any IPOs in the insurance industry.

Table V

Multivariate OLS Regression of IPO Underpricing

All variables are described in the Empiral method above, the dependent variable is RET. The three multivariate regressions include a 1-month lagged market return variable. In the industry vector dummy, one industry has been left out to prevent the occurence of a dummy variable trap. Estimation is by OLS and, in accordance with Chambers and Dimson (2009), White's (1980) heteroskedasticity-consistent method is used to calculate standard errors. The statistical signifiance levels of the coefficients are the follwing: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Dependent variable: IPO Underpricing

Market	Aggregated		Main Market		AIM	
	Estimate	*P-value*	*Estimate*	*P-value*	*Estimate*	*P-value*
LNMCAP	-0.031**	0.005	-0.040*	0.027	-0.001	0.911
LN(1+AGE)	-0.003	0.730	0.001	0.974	-0.005	0.509
HOT	-0.020	0.656	0.071	0.618	-0.046*	0.031
COLD	-0.055*	0.025	-0.019	0.660	-0.049*	0.018
COUNTRY	-0.037	0.255	-0.075	0.288	-0.014	0.606
MARKET	-0.070 .	0.069	*NA*	*NA*	*NA*	*NA*
COVID	0.038	0.487	0.077	0.569	0.007	0.801
FINANCIAL CRISIS	-0.031	0.387	-0.155	0.272	-0.017	0.637
UKRAINE	0.014	0.793	-0.021	0.802	-0.045	0.178
TECHNOLOGY	0.046	0.508	0.162	0.422	-0.018	0.675
CONSUMER DISCRETIONARY	0.023	0.534	0.056	0.451	-0.017	0.703
CONSUMER STAPLES	-0.013	0.784	0.011	0.905	-0.0563	0.293
ENERGY	0.005	0.912	0.001	0.992	-0.018	0.769
FINANCIALS	0.005	0.497	0.131*	0.037	-0.087*	0.046
HEALTH CARE	0.113 .	0.067	0.391	0.122	0.013	0.796
INDUSTRIALS	-0.011	0.772	-0.012	0.872	-0.045	0.306
INSURANCE	-0.006	0.892	0.074	0.340	*NA*	*NA*
REAL ESTATE	-0.020	0.633	0.046	0.635	-0.077	0.088
TELECOMMUNICATIONS	0.013	0.837	0.118	0.445	-0.017	0.813
UTILITIES	-0.012	0.778	0.057	0.539	-0.052	0.256
MRET	0.402	0.113	0.745	0.191	0.285	0.215
Observations	604		240		364	
R^2	0.073		0.119		0.072	
Adj. R^2	0.039		0.039		0.020	

Note: MARKET variable is only applicable to the aggregated market regression. AIM market did not have any IPOs in the insurance industry.

Chambers and Dimson (2009) noted that more mature and larger firms experience less IPO underpricing. The univariate regression in Table IV shows that both LNMCAP and LN(1+AGE) are significant at the 0.1% and 5% levels, respectively, with negative estimates on the aggregated and Main Market. However, looking at the multivariate regression, only LNMCAP is significant at the 1% and 5% levels on the aggregated and Main Markets. Our finding that LN(1+AGE) is insignificant on a multivariate level deviates from Chambers and Dimson's (2009) results, who found that age was significant at the 10% level on the multivariate aggregated market. Therefore, our results partially align with the findings of Chambers and Dimson (2009), and we, to some extent, find support for our hypothesis that LNMCAP and LN(1+AGE) decrease IPO underpricing and that larger and more mature firms are less underpriced.

Opposite to the initial hypothesis, the Technology sector is insignificant for both the univariate and multivariate regressions. Further, previous research has been interested in hot and cold IPO markets (Helwege and Liang 2004), and contrary to our hypothesis, we find that both hot and cold markets decrease IPO underpricing. However, only cold markets significantly affect IPO underpricing across the univariate and multivariate regressions. Specifically, in the multivariate regression, cold markets are significant in both the aggregated and AIM markets. In contrast, hot markets only significantly affect IPO underpricing in the multivariate regression for the AIM market.

Contrary to our beliefs, the dummy variable COUNTRY has a negative effect on IPO underpricing. However, the impact of COUNTRY on IPO underpricing is insignificant in the univariate and multivariate regression. This demonstrates that the issuing firm's home country did not significantly affect IPO underpricing during our period. MARKET has a negative effect on IPO underpricing but is only significant at the 10% level in the multivariate regression, which indicates less underpricing on the AIM. This also holds when the average equally weighted mean return on the AIM and Main Markets are investigated, where AIM experiences a lower average equally weighted mean return of 11.62% than the Main Market, which had an average equally weighted mean return of 15.61%.

Unique to our period are the three crises, FINANCIAL CRISIS, COVID and UKRAINE. Looking at the multivariate regression, none of the crises yielded a significant result. Hence, contrary to our hypothesis, the crises have not affected IPO underpricing. However, looking at the univariate regression, both the FINANCIAL CRISIS and UKRAINE variables are significant and shown to have a negative effect on IPO underpricing.

Furthermore, results from the multivariate regression show that the industry classification of the issuing firm has no significant impact on IPO underpricing. Only FINANCIALS and HEALTHCARE are significant at the 5% and 10% level, respectively. However, looking at the univariate regression, Table IV, CONSUMER STAPLES, INDUSTRIALS, INSURANCE, and REAL ESTATE industries all statistically affect IPO underpricing. Moreover, the above industries have a negative effect on IPO underpricing, indicating that firms in those sectors are less underpriced.

Comparison of Pre- and Post-Brexit Referendum (2016)

We estimate the YEAR dummy coefficients while controlling for changing risk composition, equity market conditions and industry risk using Model (3) for the 604 IPOs to see how IPO underpricing has varied over time.

$$RET = b_1 * LN(MCAP) + b_2 * LN(1 + AGE) + b_3 * IPO\ HOT + b_4 * IPO\ COLD + b_5 * COUNTRY + b_6 * MARKET + b_7 * INDUSTRY_{DUMMIES} + b_8 * YEAR_{DUMMIES} + b_9 * MRET + \varepsilon$$

Model (3)

To help the interpretation of the Year dummy coefficients, all explanatory variables, except the year dummies, in Model (3) are demeaned. Hence, with firm characteristics that display the average characteristics of the sample, the Year dummy coefficients represent the level of IPO underpricing for each year. Below in Figure IV, these Year dummy coefficients are plotted along with average values of these coefficients for each respective period, along with a 95% confidence interval. Regressing these Year dummy coefficients on a constant with a dummy variable for IPOs that are post-Brexit, we observed no statistical difference of the +2.97% increase in the mean values of the year coefficients from the pre-Brexit period (+2.80%) and that for the post-Brexit period (+5.77%) with a p-value of 0.310.
When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 2.45%.

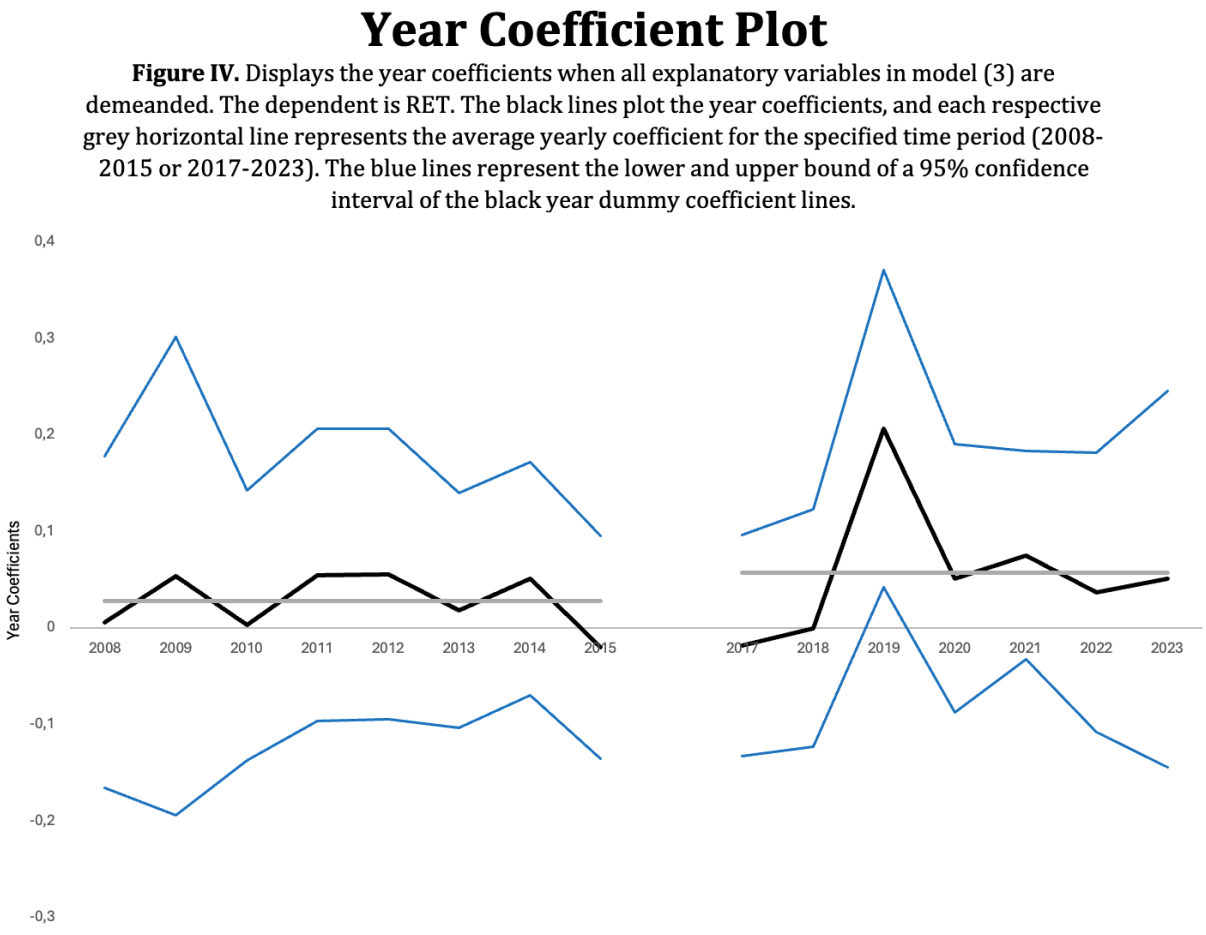


Figure IV. Displays the year coefficients when all explanatory variables in model (3) are demeanded. The dependent is RET. The black lines plot the year coefficients, and each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023). The blue lines represent the lower and upper bound of a 95% confidence interval of the black year dummy coefficient lines.

To further examine this potential increase in IPO underpricing, we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008 and 2015 and one dummy (AFTER) between 2017 and 2023. Similarly, all explanatory variables are demeaned to assist the interpretation of the period-specific dummies. The regression shows an increase of 2.41% in IPO underpricing when comparing the BEFORE (1.41%) and AFTER (3.82%) estimated effects. Like Chambers and Dimson (2009), we conduct a standard Wald test of the null hypothesis by constraining these two coefficients to equality. The results show a p-value of 0.341, meaning that the null hypothesis cannot be rejected. This indicates that IPO underpricing does not significantly differ between the pre- and post-Brexit periods.

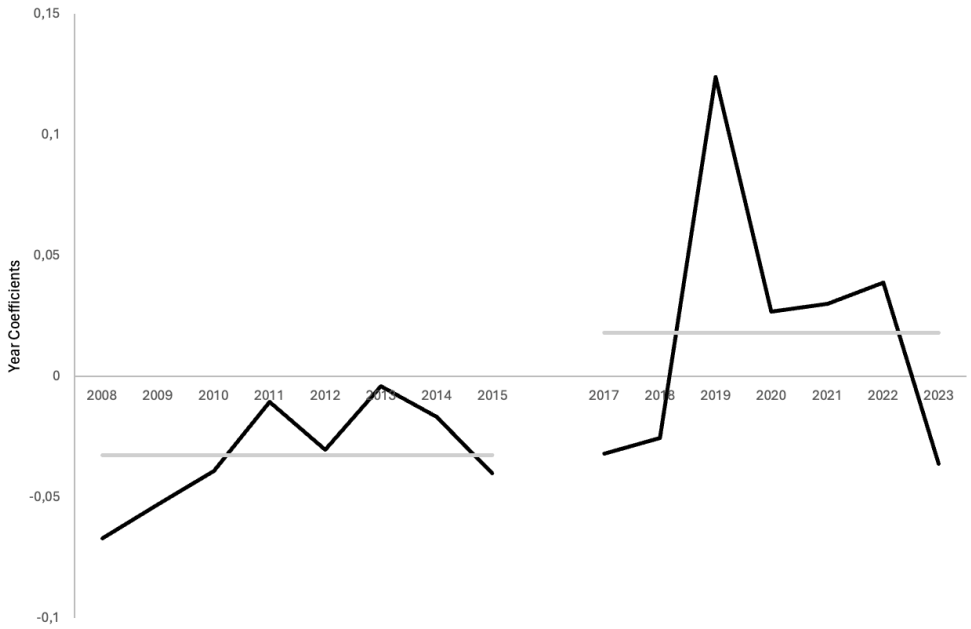
Through these two statistical tests (linear regression and standard Wald test), we find no statistical difference, meaning that no long-term trend can be identified within our period. Furthermore, IPO underpricing is relatively stable throughout the period, except for 2019, when the estimated yearly effect increased drastically to about 20%. The wide 95% confidence interval, shown by the blue lines in Figure IV, makes it challenging to determine exact trends and volatility pre- and post-Brexit periods.

Model simplification

We simplify the method above by regressing the dependent variable, RET, with only the Year dummy variables. Regressing these Year dummy coefficients on a constant plus and a dummy variable for IPOs that are post-2016, we observe a statistically significant difference of +5.07% increase in the mean values of the year coefficients from the 2008 to 2015 period (-3.28%) and that for 2017 to 2023 period (+1.79%) with a p-value of 0.035. When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 4.03%.

Year Coefficient Plot

Figure V. Displays the year coefficients when the dependent variable RET is regressed against year dummies. Each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023).



Moreover, examining this potential increase in IPO underpricing, we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008 and 2015 and one dummy (AFTER) between 2017 and 2023. The regression shows an increase of 4.03% in IPO underpricing when comparing the BEFORE (-2.67%) and AFTER (1.36%) estimated effects. Like Chambers and Dimson (2009), we conduct a standard Wald test of the null hypothesis by constraining these two coefficients to equality. The results show a p-value of 0.104, meaning that the null hypothesis cannot be rejected.

By simplifying Model (3) we find support that IPO underpricing differs between the two sub-periods. However, as this model doesn't control for changing firm composition and environmental conditions, these results need to be taken with a grain of salt. Below, we plot the yearly coefficients of a regression where the dependent variable, RET, is regressed against Yearly dummies, LNMCAP and LN(1+Age).

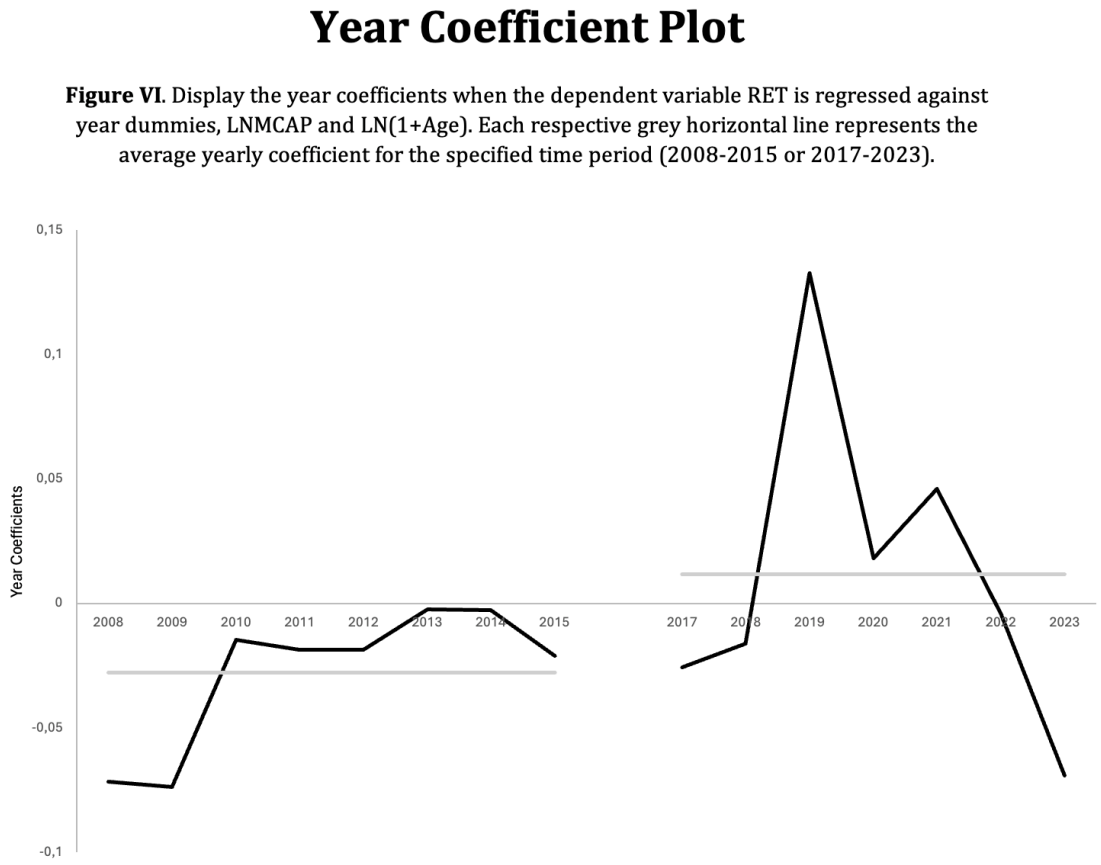


Figure VI. Display the year coefficients when the dependent variable RET is regressed against year dummies, LNMCAP and LN(1+Age). Each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023).

Further, when conducting identical tests to the ones above (including the LNMCAP and LN(1+AGE) variables in the linear OLS regression model), we see an increase in IPO underpricing between the periods. However, this increase is without statistical significance. As indicated by the regressions first done in Figure IV, secular trends are diminished as more explanatory variables are added to enhance the model, controlling for firm and environmental factors.

Robustness

To ensure the reliability of our results and regression outcomes from Model (2) and Model (3), robustness tests were conducted by altering the dependent variable RET, first-day return, to LN(1+RET), LOG(1+RET), and 1-Month return. The logarithmic transformation and extended return period aim to control for variance, achieve more normally distributed data, and ensure comparability to the results of Chambers and Dimson (2009).

Analysing the robustness tests with the dependent variables LN(1+RET) and LOG(1+RET), the factors affecting IPO underpricing are similar. The most relevant difference in relation to our hypothesis is that LN(1+AGE) loses its significance for the univariate regressions on LN(1+RET) and LOG(1+RET). Moreover, the FINANCIAL CRISIS dummy loses significance on the aggregated level in the univariate regressions on LN(1+RET) and LOG(1+RET). Except for these changes in the univariate regression, the robustness check with the dependent variables LN(1+RET) and LOG(1+RET) yielded more or less the same results as the RET univariate regression (see appendix Table VI, VII, X and XI). On the multivariate level MARKET loses significance in both robustness checks. Moreover, FINANCIAL CRISIS gains significance at the 10% level but only in the Main Market on the multivariate level. No variables other than the ones mentioned above gain or lose significance in the robustness checks, they only fluctuate between significance levels.

Investigating the robustness check with the dependent variable 1-Month return, in the univariate regression, contrary to LN(1+RET) and LOG(1+RET), the LN(1+AGE) stays significant at the 5% level for the aggregated and Main Market. Additionally, HOT gains significance at the 10% level for the aggregated and Main Markets. However, CONSUMER DISCRETIONARY, which has been significant for the dependent variable RET and the other robustness checks, loses its significance in the univariate regression on the Main Market in the 1-Month return robustness check. On the contrary, the UTILITIES industry gains significance in the aggregated and Main Markets. Through all robustness checks, LNMCAP has been significant in the aggregated market both in the univariate and multivariate regressions with negative estimates. Hence our robustness tests confirm our initial findings that LNMCAP contributes to decreased IPO underpricing on the LSE during the period.

Investigating the secular trends and the average IPO underpricing seen in the pre- and post-Brexit periods, our original results persist (IPO underpricing is higher in the post-Brexit period, 2017 to 2023, but without a statistically significant difference). However, only the robustness check of the 1-Month return yields a significant result where the underpricing in the pre-Brexit period is 6.47%. In comparison, the underpricing in the post-Brexit period is 28.71% (see appendix Figure X). This yields a difference between the both periods of 22.24%. Nonetheless, the difference between the pre- and post-Brexit periods in the other robustness checks, LN(1+RET) and LOG(1+RET) are small without signifiance. In summary, our robustness tests strengthen the initial results, indicating that no significant secular trends exist between the pre- and post-Brexit periods.

Discussion

Research by Chambers and Dimson (2009) finds a progressive increase in IPO underpricing from 1917 to 2007, culminating in a peak of 19% between 1987 and 2007. This increase in IPO underpricing was found despite benefits from regulatory changes in disclosure, which led them to conclude that market developments eroded trust between investors and issuers, causing the increase in IPO underpricing. The century-long trend of increasing IPO underpricing has been disrupted, as IPO underpricing between 2008 and 2023 decreased to 13.21%. Several market changes have occurred before and during our period compared to Chambers and Dimson's (2009), which we believe have decreased information asymmetry and increased trust between investors and underwriters. One such factor is the mandatory adoption of IFRS in 2005 (McGrath and Gourley, 2018), which Hong et al., (2014) found to negatively impact IPO underpricing due to decreased information asymmetry. Hence, the implementation of IFRS reporting may explain the decrease in IPO underpricing in our period compared to Chambers and Dimson's (2009).

Another regulatory change that can explain the decreased IPO underpricing in our period is the implementation of the COBS 11A.1.6 rule, which outlawed spinning (FCA Handbook, 2024). This regulation aimed to prohibit the unethical practices of spinning, creating a more level playing field between the issuing firm, underwriters, and investors. Despite the inability to further investigate the direct effects of the COBS 11A.1.6 rule, we believe that the prohibition of spinning has two primary effects in decreasing IPO underpricing for our period. Firstly, by fostering an IPO environment with increased trust, and secondly, Liu and Ritter (2010) found spinning to increase IPO underpricing by 23% on average. Hence, a prohibition of spinning has most likely led to decreased IPO underpricing from previous elevated levels.

The period 2008 to 2023 predominantly operated under a book-building regime in contrast to the 20th century, which mainly utilised a fixed price regime. Sherman (2005) highlighted that the book-building method lowers risk or after-market volatility. Hence, we would expect that the book-building method would decrease IPO underpricing. However, we have no evidence to support this. The fixed price regime period (1946 to 1986) analysed by Chambers and Dimson (2009) displayed an IPO underpricing of 12.09%, slightly lower than 13.21% between 2008 and 2023.

We found little to no significant results for factors (in Model 2) specifically impacting IPO underpricing. However, throughout our results and robustness checks, market capitalisation was continuously significant, and LN(1+AGE) was also significant but only in the univariate regressions. We anticipated both market capitalisation and age of firms undergoing an IPO to affect IPO underpricing, a hypothesis based on the findings of Chambers and Dimson (2009), who found significance in both variables. Hence, it was unsurprising that significance in market capitalisation was found in both the univariate and multivariate analyses. However, we were surprised that firm age did not have any statistical significance in the multivariate regression since Chambers and Dimson (2009) found firm age to be statistically significant at the 10% level. One potential reason firm age has lost its significance in the modern market compared to Chambers and Dimson's

(2009) period could be attributed to the trend of younger firms deciding to go public on the LSE, hence making firm age lose its risk proxy function previously held.

Moreover, we found no statistical significance in any of the three crises during the period, except for the financial crisis, which was significant in the univariate regression at the 5% significance level, with a negative impact on IPO underpricing. Considering the market volatility caused by these crises, we hypothesised that the crises would yield some type of statistical significance, either positively or negatively affecting IPO underpricing. Possibly, hypothesising an increasing effect of the crises on IPO underpricing would have been more natural considering the volatile IPO volumes seen from 2008 to 2023. Especially, since the crises created an unstable, unpredictable and risk-averse market environment. The average IPO volume during the entire period was 38, and looking further into the financial crisis between 2008 and 2009, only 16 respectively 7 IPOs were made. That lower IPO volumes characterise the financial crisis is not surprising considering the relatively slow macroeconomic environment in the UK during this period. Further, the lower IPO volumes continued up until 2013. This could be a reflection that the UK experienced a slower recovery from the financial crisis compared to other countries (UKCES, 2014).

The Covid crisis dummy variable has a positive but non-significant impact on IPO underpricing. As with the Financial crisis, we expected to find some significance as markets were volatile with increased uncertainty. During 2020, the IPO volume of 30 was below the period average, following the characteristic seen in the financial crisis. However, in 2021, the IPO volume peaked at 94 IPOs. Thus, the pattern seen in the latter part of the Covid crisis is the opposite of what we saw during the financial crisis, where it took the market up until 2013 to pick up (UKCES, 2014). This boom in IPO volume was relatively short-lived because, in 2022, during the outbreak of the Ukraine war, the IPO volume drastically decreased. The Ukraine war period, which is still ongoing, follows the findings seen in the financial crisis with low IPO volumes and a weaker macroeconomic environment (UKCES, 2014) and (Adolfsen et al., 2022). Despite the non-significance of the crisis variables regarding its impact on IPO underpricing, we find that the IPO volume in these crisis periods deviates substantially from the average. We also find that, through the Year Coefficients graph (Figure IV) and Table III, the volatility in IPO underpricing is relatively low, with one exception, 2019, which is not characterised by a crisis.

The LSE has become a hub for tech companies. Further, Loughran and Ritter (2004) found that tech companies had a higher one-day return than non-tech companies. Contrary to our initial hypothesis, no statistical significance exists despite TECHNOLOGY being the fourth-largest industry. TECHNOLOGY, though statistically insignificant, has a positive effect on IPO underpricing both in the univariate and multivariate regression on an aggregate and Main Market level whilst displaying a negative impact on IPO underpricing in the AIM market.

Regarding hot and cold IPO markets, we find that the COLD variable is statistically significant and decreases IPO underpricing in the univariate and multivariate regression. Similarly, we find the variable HOT to also decrease IPO underpricing and be significant in the multivariate regression. Our findings that cold markets decrease IPO underpricing

go against our initial hypothesis that cold markets would increase IPO underpricing. Our initial hypothesis is based on our belief that colder IPO periods are characterised by a worsened macroeconomic environment, where investors demand higher risk premiums to participate in IPOs. We believe that one potential explanation for this deviation is that only stable firms, usually larger firms, go public during cold markets.

During our period, the UK left the EU, a substantial change for the UK and the LSE as several regulatory changes followed (Szaja et al. 2024). The announcement of Brexit on the 23rd of June 2016 caused significant market volatility (Quaye et al., 2016). Due to this market reaction, issuing firms may hesitate to list their stock on the LSE, reducing the IPO volume. Similarly, investors may defer from investing in the LSE due to increased uncertainty regarding the aftermath of Brexit. Consequently, it may have had an impact on IPO underpricing. Therefore, we hypothesised that secular trends would be seen between the pre- and post-Brexit periods. However, we do not find any support for our hypothesis, as no secular trends exist between the two periods. Furthermore, the relatively low volatility in the Year Dummy coefficients, except for 2019, indicates that IPO underpricing has been relatively stable over time (when controlling for firm-specific and market environment factors). Examining the average IPO volume in pre- and post-Brexit periods, the first period has an average IPO volume of 34 IPOs, whilst the latter averaged 41 IPOs per year. Hence, we see no indication that companies or investors have been discouraged from listing and investing on the LSE.

Conclusion

This thesis provides an extension to Chambers and Dimson's (2009) study by examining IPO underpricing on the London Stock Exchange from 2008 to 2023. Addressing the central question and filling the existing information gap, this study examines the existence of IPO underpricing and whether the findings of Chambers and Dimson (2009) persist. Our study found a lower average IPO underpricing of 13.21%, disrupting the increasing pattern identified by Chambers and Dimson (2009). We find that the regulation of spinning through the COBS 11A.1.6 rule and the mandatory adoption of the IFRS have increased trust between underwriters, issuers, and investors in the IPO process. Firm market capitalisation is significant in determining IPO underpricing, whilst other factors investigated, such as crises and technology, show no statistical significance. Investigating Yearly coefficients reveals no significant secular trends between the pre- and post-Brexit periods, indicating Brexit's insignificant effect on IPO underpricing. With the above findings, we help deepen the understanding of IPO underpricing in the current market environment on the London Stock Exchange.

Further research

To explore IPO underpricing and the contributing factors from 2008 to 2023, we have based our research on the model that Chambers and Dimson (2009) developed and adjusted it to our period. However, several variables were excluded and not investigated due to data limitations. This limits our ability to conclude if all patterns found by Chambers and Dimson (2009) persist in the current period or if they have been replaced with new patterns. To build upon this and thoroughly explore the IPO underpricing, an indication for future research would be to examine the variables PROPSOLD, PRESTIGE, TRACK, LNBVP, RD and RESTRUCTURE which we excluded due to data availability. Furthermore, future research could look into the effect of spinning becoming regulated on the London Stock Exchange.

The ongoing regulatory discussions regarding the prospectus and listing regime on the London Stock Exchange also present a valuable research opportunity on how regulatory changes, if done, affect IPO underpricing. With the UK's exit from the EU, future research can benchmark how and if the regulatory changes have affected IPO underpricing on the LSE with EU member state exchanges. This offers a research opportunity to deepen and enhance the understanding of regulatory changes' impact on IPO underpricing.

References

Papers published in periodicals:

Chambers, D., and Dimson, E., 2009, IPO Underpricing over the Very Long Run, Journal of Finance, 64(3), 1407-1443.

Filatotchev, I., and Bishop, K.,2002, Board Composition, Share Ownership and 'Underpricing' of U.K. IPO Firms, Strategic Management Journal, 23(10), 941-955.

Helwege, J., and Liang, N., 2004, Initial Public Offerings in Hot and Cold Markets, Journal of Financial and Quantitative Analysis, 39(3), 541-569.

Hong, H. A., Hung, M., and Lobo, G. J., ., 2014, The Impact of Mandatory IFRS Adoption on IPOs in Global Capital Markets, Accounting Review, 89(4), 1365-1397.

Liu, X., and Ritter, J.,2010, The Economic Consequences of IPO Spinning, Review of Financial Studies, 23 (5), 2024-2059.

Ljungqvist, A., and Wilhelm, JR, W. R., 2003, IPO Pricing in the Dot-com Bubble, Journal of Finance, 58(2), 723-752.

Loughran, T., and Ritter, J., 2004, Why has IPO underpricing Changed over Time?, Financial Management, 33(3), 5-37.

Lowery, M., Officer, M. S., and Schwert, W. G., 2010, The Variability of IPO Initial Returns, Journal of Finance, 65(2), 425-465.

Merrett, A. J., Howe, M., and Newbould, G. D.,1967, Equity Issues and the London Capital Market (Longmans, London).

Quaye, I., Mu, Y., Abudu, B., and Agyare, R., 2016, Review of Stock Markets' Reaction to New Events: Evidence from Brexit, Journal of Financial Risk Management, 5, 281-314.

Ritter, J., and Welch, I., 2002, A Review of IPO Activity, Pricing, and Allocation, Journal of Finance, 57(4), 1795-1828.

Sherman, A. E., 2005, Global trends in IPO methods: Book building versus auctions with endogenous entry, Journal of Financial Economics, 78, 615-649.

Stoll, H. R., and Curley, A. J.,1970, Small business and the new issues market for equities, Journal of Financial and Quantitative Analysis 5(3), 309-322.

Electronic Sources:

Adolfsen, J. F., Kuik, F., Lis, E. M., and Schuler, T., 2022, The impact of the war in Ukraine on euro area energy markets, The European Central Bank (ECB), URL: https://www.ecb.europa.eu/press/economic-bulletin/focus/2022/html/ecb.ebbox202204_01~68ef3c3dc6.en.html

Bank of England, 2024, Inflation calculator, URL: https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator

Browne, P., Corner, J., Graves, P., Summerfield, P., Tompkins, A., and Ward, O., 2021, UK prospectus regime - HMT publishes its consultation paper, simmons+simmons, URL: https://www.simmons-simmons.com/en/publications/ckrvzyekw1a1q0a80c0d96g8r/uk-prospectus-regime-review-reimagining-the-uk-s-prospectus-regime

Competition Commission, 2024, Audit Market Investigation Development of the statutory financial audit, URL: https://assets.publishing.service.gov.uk/media/5329db4140f0b60a76000016/development_of_the_statutory_financial_audit.pdf

Corner, J., 2021, Prospectus regime after Brexit, simmons+simmons, URL: https://www.simmons-simmons.com/en/publications/ck3symdmpkatg0b48635yzv0b/prospectus-regime-after-brexit

Edmonds, T., 2010, Financial Crisis Timeline, House of Commons Library, 04991, URL: https://researchbriefings.files.parliament.uk/documents/SN04991/SN04991.pdf

Financial Conduct Authority (FCA) Handbook, 2018, COBS 11A.1 Underwriting and Placing, URL: https://www.handbook.fca.org.uk/handbook/COBS/11A/1.html?date=2018-10-01

Financial Industry Regulatory Authority (FINRA), 2020, 5131. New Issue Allocations and Distributions, URL: https://www.finra.org/rules-guidance/rulebooks/finra-rules/5131

Financial Times, 2024, Stock Screener, URL: https://markets.ft.com/data/equities?expandedScreener=true

GOV.UK, 2024, search the register, URL: https://find-and-update.company-information.service.gov.uk/

Hickman, J., Morris, P., and McDonald, R., 2022, COVID-19: Government support for individuals and businesses, BDO, URL: https://www.bdo.co.uk/en-gb/insights/tax/corporate-tax/covid-19-government-support-for-individuals-and-business

IFRS, 2021, United Kingdom, URL: https://www.ifrs.org/use-around-the-world/use-of-ifrs-standards-by-jurisdiction/view-jurisdiction/united-kingdom/

Institute for Government analysis, 2024, Timeline of UK government coronavirus lockdowns and measures, March 2020 to December 2021, URL: https://www.instituteforgovernment.org.uk/sites/default/files/2022-12/timeline-coronavirus-lockdown-december-2021.pdf

Joshi, A., 2023, Overcoming home bias when investing, Barclays, URL: https://privatebank.barclays.com/insights/2023/april/market-perspectives-april-2023/overcoming-home-bias-when-investing-/#ref1

MarketWatch, 2024, URL: https://www.marketwatch.com/investing/index/asx?countrycode=xx&mod=search_symbol

McGrath, E., and Gourley, L. M., 2018, The impact of Brexit on the application of IFRS in the UK, Ernest & Young, URL: https://assets.ey.com/content/dam/ey-sites/ey-com/en_uk/topics/brexit/compliance-and-regulation/ey-policy-pulse-june-2018-impact-of-brexit.pdf

Office for National Statistics, 2021, GDP and events in history: how the COVID-19 pandemic shocked the UK economy, URL: https://www.ons.gov.uk/economy/grossdomesticproductgdp/articles/gdpandeventsinhistoryhowthecovid19pandemicshockedtheukeconomy/2022-05-24

PricewaterhouseCoopers (PwC), 2021, Global IPO Watch 2021, URL: https://www.pwc.com/gx/en/audit-services/ipo-centre/assets/pwc-global-ipo-watch-2021.pdf

Saito, Y., 2023 December 27, Goldman Sachs' IPO backlog 'as high as it has ever been': IPO chief, Nikkei Asia, URL: https://asia.nikkei.com/Editor-s-Picks/Interview/Goldman-Sachs-IPO-backlog-as-high-as-it-has-ever-been-IPO-chief

S&P Capital IQ, 2024, URL: https://www.capitaliq.com/CIQDotNet/Login-okta.aspx

Smith, R., Phillips, C., Tobin, M., Shah, M., and Bateman, P., 2024, UK Prospectus Regime Reforms Approach Next Milestone, Slaughter and May, URL: https://my.slaughterandmay.com/insights/client-publications/uk-prospectus-regime-reforms-approach-next-milestone

Szaja, P. J., Morrison, M., and Scargill, M., 2024, Initial Public Offerings Laws and Regulations 2023, Global Legal Insights, URL: https://www.globallegalinsights.com/practice-areas/initial-public-offerings-laws-and-regulations/united-kingdom/

The London Stock Exchange, 2023 - A Year of Progress And Laying The Groundwork For the Future, URL: https://www.londonstockexchange.com/discover/news-and-insights/2023-market-insights

The London Stock Exchange, 2024, AIM, URL: https://www.londonstockexchange.com/raise-finance/equity/aim

The London Stock Exchange, 2024, How To List Equity, URL: https://www.londonstockexchange.com/raise-finance/equity/how-list-equity-listing-journey

The London Stock Exchange, 2024, ICB structure & definitions, URL: https://www.lseg.com/en/ftse-russell/industry-classification-benchmark-icb

The London Stock Exchange, 2024, New Issues and IPOs, URL: https://www.londonstockexchange.com/search?searchtype=all&q=New%20Issues%20and%20IPOs

The London Stock Exchange, 2024, Role Of Advisers on AIM, URL: https://www.londonstockexchange.com/raise-finance/equity/how-list-equity-listing-journey/role-of-advisers-on-aim

The London Stock Exchange, 2024, Role Of Advisers on Main Market, URL: https://www.londonstockexchange.com/raise-finance/equity/how-list-equity-listing-journey/role-of-advisers-on-main-market?accordionId=0-c3302158-ff1e-4610-86a2-9a95eb25af18

The London Stock Exchange, 2024, URL: https://www.londonstockexchange.com/

UK Commission for Employment and Skills (UKCES), 2014, The Labour Market Story: The UK Following Recession, URL: https://assets.publishing.service.gov.uk/media/5a7de9beed915d74e6222e0b/The_Labour_Market_Story-_The_UK_Following_Recession.pdf

Appendix

Robustness: LN(1+RET)

Table VI

Univariate OLS Regressions of IPO Underpricing

All variables are described in the Empiral method above, the dependent variable is LN(1+RET). All univariate regressions include a 1-month lagged market return variable. Estimation is by OLS and, in accordance with Chambers and Dimson (2009), White's (1980) heteroskedasticity-consistent method is used to calculate standard errors. The statistical signifiance levels of the coefficients are the follwing: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Dependent variable: IPO Underpricing						
Market	Aggregated		Main Market		AIM	
	Estimate	*P-value*	*Estimate*	*P-value*	*Estimate*	*P-value*
LNMCAP	-0.018***	0.000	-0.025***	0.000	-0.001	0.866
LN(1+AGE)	-0.009	0.205	-0.016	0.205	-0.002	0.743
HOT	-0.018	0.427	-0.012	0.851	-0.019	0.241
COLD	-0.022	0.145	0.001	0.977	-0.047**	0.002
COUNTRY	-0.038	0.270	-0.080	0.320	-0.010	0.661
MARKET	-0.003	0.873	*NA*	*NA*	*NA*	*NA*
COVID	-0.007	0.872	-0.020	0.838	0.003	0.914
FINANCIAL CRISIS	-0.036	0.141	-0.114***	0.000	-0.017	0.500
UKRAINE	0.021	0.513	0.064	0.184	-0.048*	0.037
TECHNOLOGY	-0.015	0.742	-0.056	0.666	0.008	0.641
BASIC MATERIALS	0.001	0.958	-0.041	0.303	0.021	0.493
CONSUMER DISCRETIONARY	-0.007	0.623	-0.048 .	0.059	0.018	0.233
CONSUMER STAPLES	-0.046 .	0.070	-0.100**	0.007	-0.023	0.433
ENERGY	-0.015	0.606	-0.052	0.253	0.005	0.893
FINANCIALS	0.037 .	0.074	0.107**	0.002	-0.057**	0.006
HEALTH CARE	0.062 .	0.053	0.165	0.187	0.038	0.126
INDUSTRIALS	-0.038**	0.008	-0.100**	0.001	-0.015	0.281
INSURANCE	-0.063*	0.014	-0.062 .	0.059	*NA*	*NA*
REAL ESTATE	-0.043**	0.004	-0.047 .	0.075	-0.042**	0.009
TELECOMMUNICATIONS	-0.041	0.406	-0.132*	0.043	0.029	0.552
UTILITIES	-0.021	0.537	-0.022	0.762	-0.022	0.393

Note: MARKET variable is only applicable to the aggregated market regression. AIM market did not have any IPOs in the insurance industry.

Table VII

Multivariate OLS Regressions of IPO Underpricing

All variables are described in the Empiral method above, the dependent variable is LN(1+RET). The three multivariate regressions include a 1-month lagged market return variable. In the industry vector dummy, one industry has been left out to prevent the occurence of a dummy variable trap. Estimation is by OLS and, in accordance with Chambers and Dimson (2009), White's (1980) heteroskedasticity-consistent method is used to calculate standard errors. The statistical signifiance levels of the coefficients are the follwing: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Dependent variable: IPO Underpricing								
Period	Aggregated			Main Market			AIM	
(46)	*Estimate*	*P-value*	*(47)*	*Estimate*	*P-value*	*(48)*	*Estimate*	*P-value*
LNMCAP	-0.020**	0.001		-0.025**	0.009		0.000	0.950
LN(1+AGE)	0.004	0.556		0.013	0.298		-0.003	0.599
HOT	-0.020	0.421		0.021	0.761		-0.035*	0.050
COLD	-0.031 .	0.071		0.008	0.795		-0.039*	0.031
COUNTRY	-0.048	0.177		-0.096	0.228		-0.016	0.466
MARKET	-0.021	0.406		*NA*	*NA*		*NA*	*NA*
COVID	-0.007	0.856		-0.007	*0.932*		0.003	0.900
FINANCIAL CRISIS	-0.024	0.358		-0.132 .	0.058		-0.009	0.777
UKRAINE	-0.003	0.936		-0.018	0.727		-0.036	0.222
TECHNOLOGY	-0.009	0.879		-0.008	0.957		-0.008	0.813
CONSUMER DISCRETIONARY	0.011	0.714		0.014	0.802		-0.009	0.808
CONSUMER STAPLES	-0.025	0.514		-0.035	0.638		-0.043	0.331
ENERGY	-0.004	0.932		-0.022	0.680		-0.018	0.702
FINANCIALS	0.021	0.485		0.084 .	0.052		-0.072 .	0.052
HEALTH CARE	0.068	0.078		0.201	0.121		0.012	0.752
INDUSTRIALS	-0.022	0.472		-0.049	0.417		-0.032	0.365
INSURANCE	-0.004	0.903		0.023	0.704		*NA*	*NA*
REAL ESTATE	-0.021	0.518		0.010	0.868		-0.057	0.111
TELECOMMUNICATIONS	-0.001	0.982		0.029	0.800		-0.004	0.945
UTILITIES	0.003	0.929		0.068	0.312		-0.036	0.328
MRET	0.288 .	0.094		0.423	0.254		0.288	0.142
Observations	604			240			364	
R^2	0.065			0.122			0.073	
Adj. R^2	0.031			0.042			0.021	

Note: MARKET variable is only applicable to the aggregated market regression. AIM market did not have any IPOs in the insurance industry.

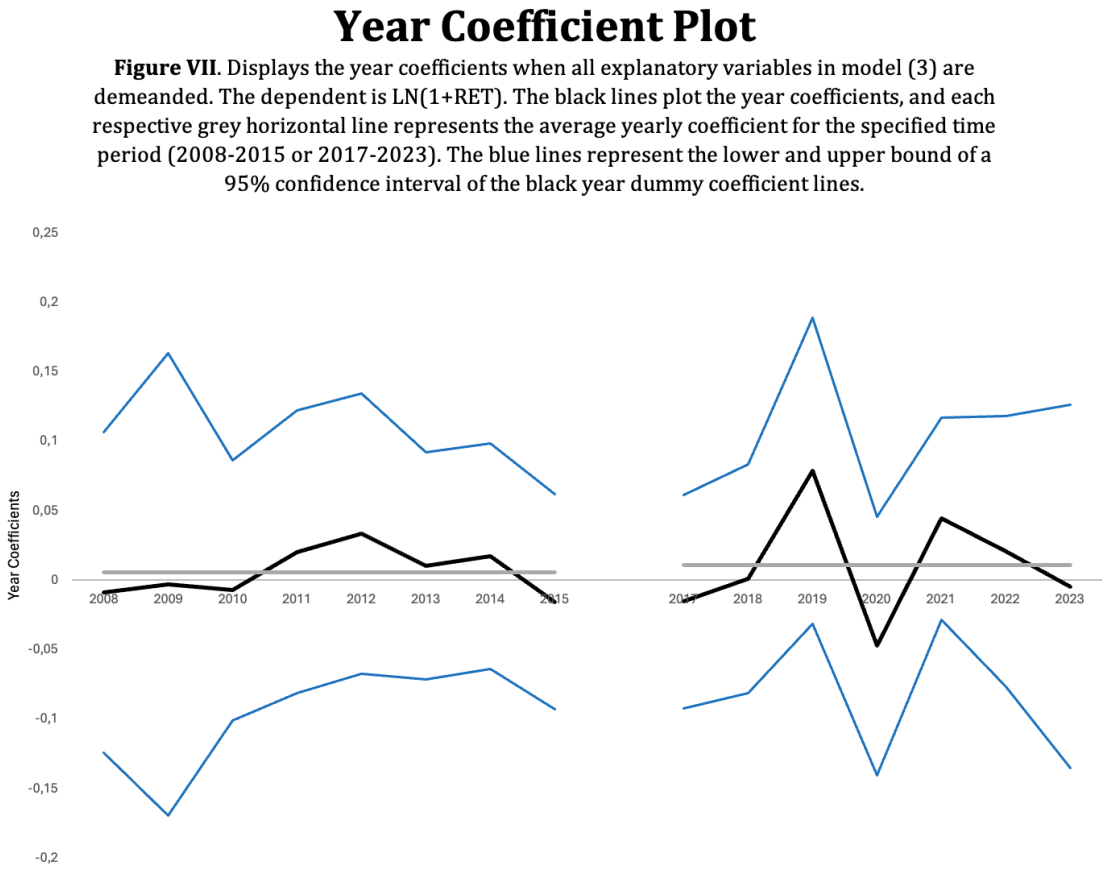


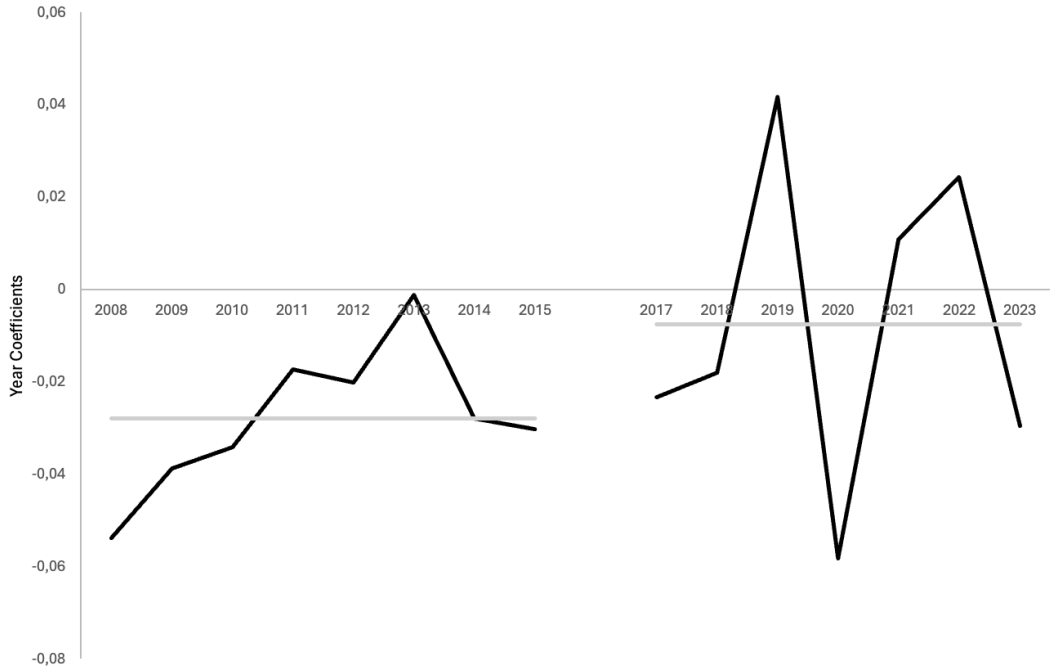
Figure VII. Displays the year coefficients when all explanatory variables in model (3) are demeanded. The dependent is LN(1+RET). The black lines plot the year coefficients, and each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023). The blue lines represent the lower and upper bound of a 95% confidence interval of the black year dummy coefficient lines.

Year dummy coefficients are plotted along with average values of these coefficients for each respective period, along with a 95% confidence interval. Regressing these Year dummy coefficients on a constant with a dummy variable for IPOs that are post-Brexit, we observed no statistical difference of the 0.58% increase in the mean values of the year coefficients from the pre-Brexit period (+0.59%) and that for post-Brexit period (+1.10%) with a p-value of 0.750 . When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 0.81%.

To further examine this potential increase in IPO underpricing we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008-2015 and one dummy (AFTER) between 2017-2023. Similarly, all explanatory variables are demeaned to assist the interpretation of the period period-specific dummies. The regression shows an increase of 0.98% in IPO underpricing when comparing the BEFORE (0.18%) and AFTER (1.16%) estimated effects. Like Chambers and Dimson (2009), we conduct out a standard Wald test of the null hypothesis, by constraining these two coefficients to equality. The results show a p-value of 0.562, meaning that the null hypothesis cannot be rejected, which shows that IPO underpricing does not significantly differ between the two pre- and post-Brexit periods.

Year Coefficient Plot

Figure VIII. Displays the year coefficients when the dependent variable LN(1+RET) is regressed against year dummies. Each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023).

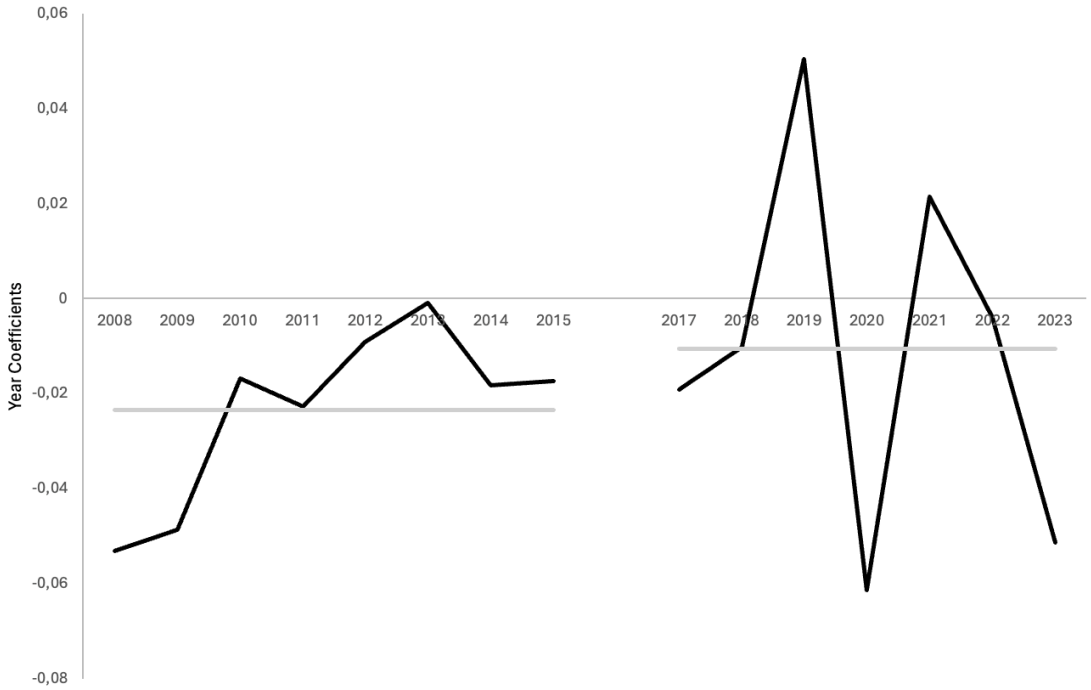


We simplify the method above by regressing the dependent variable, RET, with the Year dummy variables. We then extract these year dummy coefficients and plot these in the graph below. Regressing these Year dummy coefficients on a constant plus and a dummy variable for IPOs that are post-2016, we observe no statistical significant difference of +2.04% increase in the mean values of the year coefficients from the pre-Brexit period (-2.79%) and that for the post-Brexit period (-0.75%) with a p-value of 0.155 When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 1.91%.

Moreover, examining this potential increase in IPO underpricing we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008-2015 and one dummy (AFTER) between 2017-2023. The regression show an increase of 1.91% in IPO underpricing when comparing the BEFORE (-2.50%) and AFTER (-0.59%) estimated effects. Like Chambers and Dimson (2009), we conduct out a standard Wald test of the null hypothesis, by constraining these two coefficients to equality. The results show a p-value of 0.249, meaning that the null hypothesis cannot be rejected.

Year Coefficient Plot

Figure IX. Displays the year coefficients when the dependent variable LN(1+RET) is regressed against year dummies, LNMCAP and LN(1+Age). Each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023).



We simplify the method above by regressing the dependent variable, RET, with the Year dummy variables, LNMCAP and LN(1+Age). We then extract these year dummy coefficients and plot these in the graph below. Regressing these Year dummy coefficients on a constant plus and a dummy variable for IPOs that are post-2016, we observe no statistical significant difference of +1.27% increase in the mean values of the year coefficients from the pre-Brexitt period (-2.33%) and that for the post-Brexit period (-1.06%) with a p-value of 0.421 When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 1.36%

Moreover, examining this potential increase in IPO underpricing we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008-2015 and one dummy (AFTER) between 2017-2023. The regression show an increase of 1.40% in IPO underpricing when comparing the BEFORE (-1.79%) and AFTER (-0.39%) estimated effects. Like Chambers and Dimson (2009), we conduct out a standard Wald test of the null hypothesis, by constraining these two coefficients to equality. The results show a p-value of 0.393, meaning that the null hypothesis cannot be rejected.

Robustness: 1-Month Return

Table VIII

Univariate OLS Regressions of IPO Underpricing

All variables are described in the Empiral method above, the dependent variable is the 1- Month Return. All univariate regressions include a 1-month lagged market return variable. Estimation is by OLS and, in accordance with Chambers and Dimson (2009), White's (1980) heteroskedasticity-consistent method is used to calculate standard errors. The statistical signifiance levels of the coefficients are the follwing: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Dependent variable: IPO Underpricing						
Market	Aggregated		Main Market		AIM	
	Estimate	*P-value*	*Estimate*	*P-value*	*Estimate*	*P-value*
LNMCAP	-0.080**	0.005	-0.114**	0.008	-0.015	0.300
LN(1+AGE)	-0.057*	0.031	-0.105*	0.045	-0.011	0.442
HOT	0.081 .	0.083	-0.078	0.552	-0.074 .	0.052
COLD	-0.162*	0.002	-0.229 .	0.053	-0.133***	0.000
COUNTRY	0.080	0.664	0.283	0.529	-0.060	0.247
MARKET	-0.134	0.122	*NA*	*NA*	*NA*	*NA*
COVID	0.154	0.289	0.244	0.447	0.079	0.295
FINANCIAL CRISIS	-0.144*	0.022	-0.193	0.291	-0.093	0.176
UKRAINE	-0.062	0.441	-0.109	0.488	-0.121*	0.011
TECHNOLOGY	0.169	0.398	0.358	0.536	0.070	0.230
BASIC MATERIALS	-0.108	0.155	-0.350*	0.031	0.005	0.952
CONSUMER DISCRETIONARY	-0.069	0.296	-0.119	0.424	-0.021	0.583
CONSUMER STAPLES	-0.086	0.203	-0.333 .	0.057	0.031	0.577
ENERGY	-0.054	0.605	-0.456*	0.011	0.156	0.229
FINANCIALS	0.183	0.146	0.367	0.101	-0.103**	0.002
HEALTH CARE	-0.018	0.776	-0.009	0.942	0.024	0.684
INDUSTRIALS	-0.101*	0.041	-0.299 *	0.047	-0.017	0.633
INSURANCE	-0.246*	0.011	-0.403 .	0.061	*NA*	*NA*
REAL ESTATE	-0.141**	0.006	-0.152*	0.019	-0.123**	0.002
TELECOMMUNICATIONS	-0.181*	0.036	-0.413*	0.046	-0.042	0.422
UTILITIES	-0.201**	0.007	-0.365***	0.000	-0.051	0.439

Note: MARKET variable is only applicable to the aggregated market regression. AIM market did not have any IPOs in the insurance industry.

Table IX

Multivariate OLS Regressions of IPO Underpricing

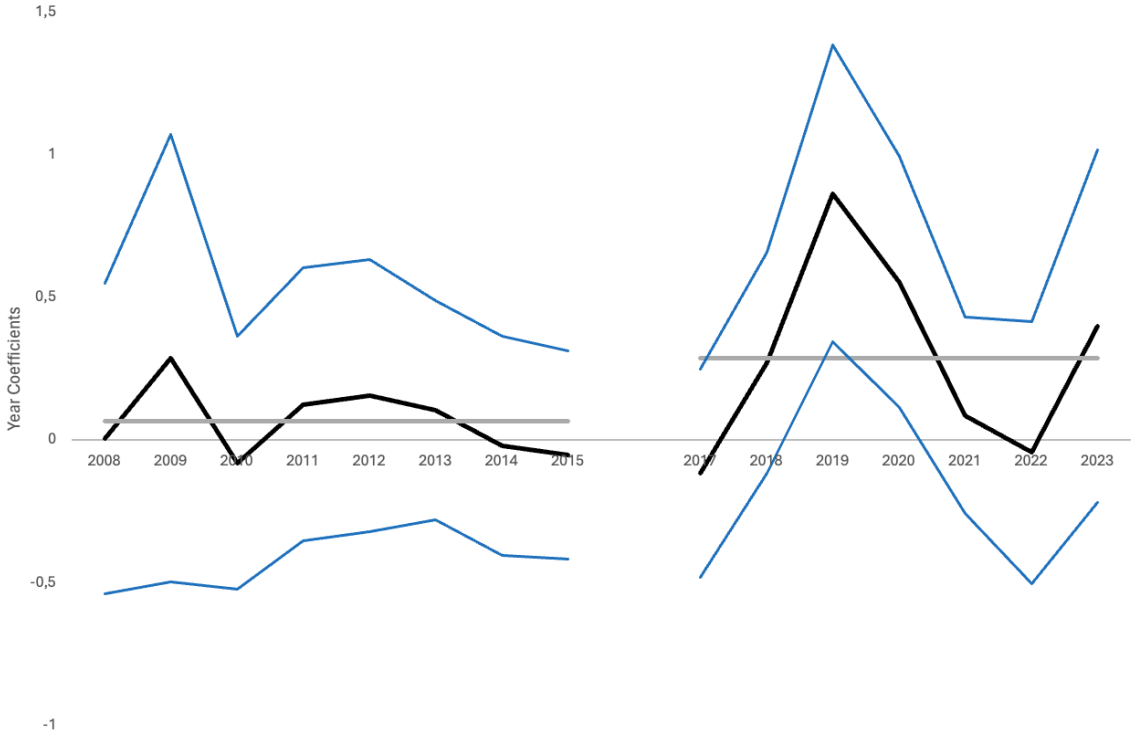
All variables are described in the Empiral method above, the dependent variable is the 1-Month Return. The three multivariate regressions include a 1-month lagged market return variable and a vector dummy. In the industry vector dummy, one industry has been left out to prevent the occurence of a dummy variable trap. Estimation is by OLS and, in accordance with Chambers and Dimson (2009), White's (1980) heteroskedasticity-consistent method is used to calculate standard errors. The statistical signifiance levels of the coefficients are the follwing: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Dependent variable: IPO Underpricing								
Period	Aggregated			Main Market			AIM	
(70)	*Estimate*	*P-value*	*(71)*	*Estimate*	*P-value*	*(72)*	*Estimate*	*P-value*
LNMCAP	-0.101**	0.009		-0.136*	0.016		-0.013	0.386
LN(1+AGE)	-0.011	0.561		0.022	0.542		-0.015	0.328
HOT	-0.088	0.137		-0.015	0.924		-0.122**	0.006
COLD	-0.164**	0.003		-0.169	0.163		-0.136***	0.000
COUNTRY	0.062	0.733		0.254	0.575		-0.080	0.127
MARKET	-0.236 .	0.067		*NA*	*NA*		*NA*	*NA*
COVID	0.147	0.306		0.157	0.686		0.091	0.230
FINANCIAL CRISIS	-0.066	0.365		0.037	0.875		-0.109	0.203
UKRAINE	-0.201	0.127		-0.320	0.166		-0.101	0.137
TECHNOLOGY	0.338	0.141		0.847	0.230		0.072	0.475
CONSUMER DISCRETIONARY	0.198	0.103		0.569 .	0.058		-0.025	0.798
CONSUMER STAPLES	0.191	0.144		0.336	0.159		0.019	0.859
ENERGY	0.127	0.319		0.099	0.700		0.152	0.313
FINANCIALS	0.188	0.188		0.562 .	0.068		-0.099	0.251
HEALTH CARE	0.179	0.103		0.572 .	0.070		0.009	0.927
INDUSTRIALS	0.146	0.174		0.389	0.132		-0.006	0.951
INSURANCE	0.113	0.404		0.415	0.127		*NA*	*NA*
REAL ESTATE	0.128	0.260		0.590 .	0.072		-0.092	0.321
TELECOMMUNICATIONS	0.146	0.316		0.678 .	0.052		-0.106	0.268
UTILITIES	-0.014	0.911		0.112	0.764		-0.017	0.856
MRET	2.146*	0.047		4.67	0.157		1.04*	0.034
Observations	602			240			362	
R^2	0.071			0.093			0.106	
Adj. R^2	0.038			0.010			0.056	

Note: MARKET variable is only applicable to the aggregated market regression. AIM market did not have any IPOs in the insurance industry.

Year Coefficient Plot

Figure X. Displays the year coefficients when all explanatory variables in model (3) are demeaned. The dependent is the 1 month Return. The black lines plot the year coefficients, and each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023). The blue lines represent the lower and upper bound of a 95% confidence interval of the black year dummy coefficient lines.

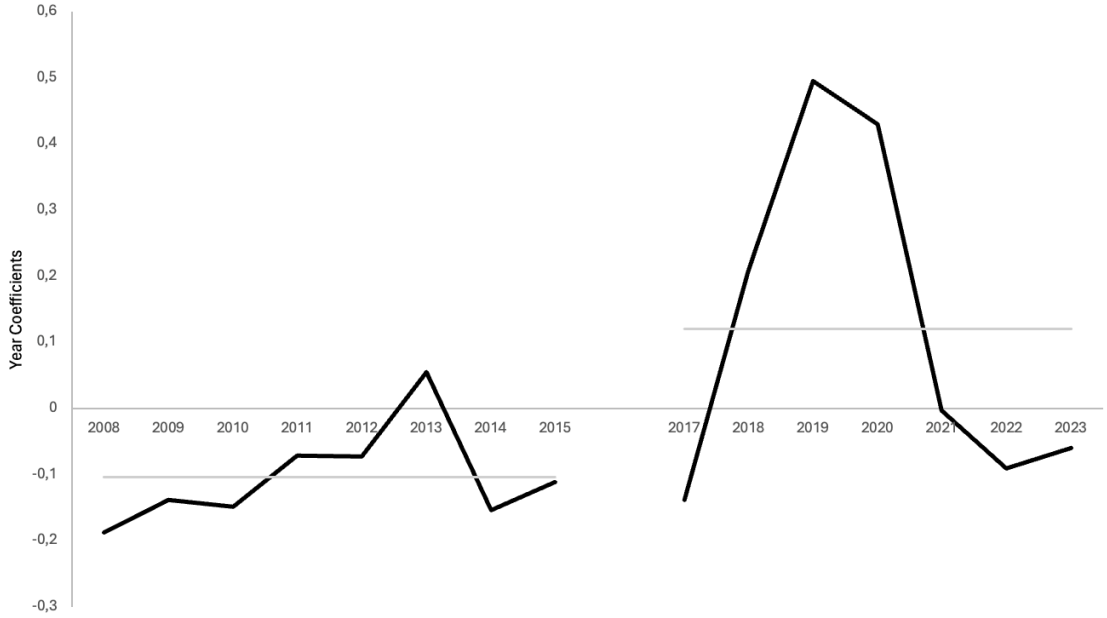


Year dummy coefficients are plotted along with average values of these coefficients for each respective period, along with a 95% confidence interval. Regressing these Year dummy coefficients on a constant with a dummy variable for IPOs that are post-Brexit, we observed no statistical difference of the 22.24% increase in the mean values of the year coefficients from the pre-Brexit period (+6.47%) and that for post-Brexit period (+28.71%) with a p-value of 0.115 . When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 16.44%.

To further examine this potential increase in IPO underpricing we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008-2015 and one dummy (AFTER) between 2017-2023. Similarly, all explanatory variables are demeaned to assist the interpretation of the period period-specific dummies. The regression shows an increase of 13.95% in IPO underpricing when comparing the BEFORE (0.58%) and AFTER (14.53%) estimated effects. Like Chambers and Dimson (2009), we conduct out a standard Wald test of the null hypothesis, by constraining these two coefficients to equality. The results show a p-value of 0.087 meaning that the null hypothesis can be rejected, which shows that IPO underpricing does somewhat significantly differ between the two pre- and post-Brexit periods.

Year Coefficient Plot

Figure XI. Displays the year coefficients when the dependent variable 1-Month Return is regressed against year dummies. Each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023).

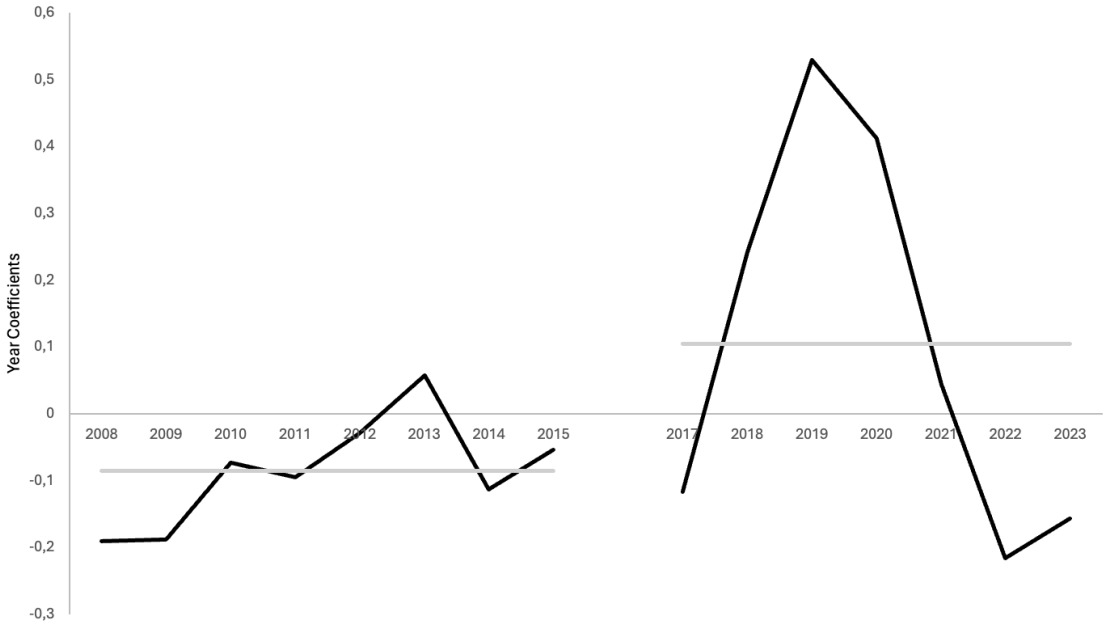


We simplify the method above by regressing the dependent variable, RET, with the Year dummy variables. We then extract these year dummy coefficients and plot these in the graph below. Regressing these Year dummy coefficients on a constant plus and a dummy variable for IPOs that are post-2016, we observe a statistical significant difference of +22.39% increase in the mean values of the year coefficients from the pre-Brexit period (-10.39%) and that for the post-Brexit period (12.00%) with a p-value of 0.036 When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 17.35%.

Moreover, examining this potential increase in IPO underpricing we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008-2015 and one dummy (AFTER) between 2017-2023. The regression show an increase of 17.35% in IPO underpricing when comparing the BEFORE (-9.81%) and AFTER (7.54%) estimated effects. Like Chambers and Dimson (2009), we conduct out a standard Wald test of the null hypothesis, by constraining these two coefficients to equality. The results show a p-value of 0.029, meaning that the null hypothesis can be rejected.

Year Coefficient Plot

Figure XII. Displays the year coefficients when the dependent variable 1-Month Return is regressed against year dummies, LNMCAP and LN(1+Age). Each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023).



We simplify the method above by regressing the dependent variable, RET, with the Year dummy variables, LNMCAP and LN(1+Age). We then extract these year dummy coefficients and plot these in the graph below. Regressing these Year dummy coefficients on a constant plus and a dummy variable for IPOs that are post-2016, we observe no statistical significant difference of 19.07% increase in the mean values of the year coefficients from the pre-Brexit period (-8.59%) and that for the post-Brexit period (10.48%) with a p-value of 0.100 When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 14.95%

Moreover, examining this potential increase in IPO underpricing we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008-2015 and one dummy (AFTER) between 2017-2023. The regression show an increase of 0.47% in IPO underpricing when comparing the BEFORE (-7.09%) and AFTER (+8.07%) estimated effects. Like Chambers and Dimson (2009), we conduct out a standard Wald test of the null hypothesis, by constraining these two coefficients to equality. The results show a p-value of 0.054, meaning that the null hypothesis can be rejected.

Robustness: LOG(1+RET)

Table X

Univariate OLS Regressions of IPO Underpricing

All variables are described in the Empiral method above, the dependent variable is LOG(1+RET). All univariate regressions include a 1-month lagged market return variable. Estimation is by OLS and, in accordance with Chambers and Dimson (2009), White's (1980) heteroskedasticity-consistent method is used to calculate standard errors. The statistical signifiance levels of the coefficients are the follwing: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Dependent variable: IPO Underpricing

Market	Aggregated		Main Market		AIM	
	Estimate	*P-value*	*Estimate*	*P-value*	*Estimate*	*P-value*
LNMCAP	-0.008***	0.000	-0.011***	0.000	-0.000	0.866
LN(1+AGE)	-0.004	0.205	-0.007	0.205	-0.001	0.743
HOT	-0.008	0.427	-0.005	0.851	-0.008	0.241
COLD	-0.010	0.145	0.000	0.977	-0.020**	0.002
COUNTRY	-0.016	0.270	-0.035	0.320	-0.004	0.661
MARKET	-0.001	0.873	*NA*	*NA*	*NA*	*NA*
COVID	-0.003	0.872	-0.009	0.838	0.001	0.914
FINANCIAL CRISIS	-0.016	0.141	-0.050***	0.000	-0.008	0.500
UKRAINE	0.009	0.513	0.028	0.184	-0.021*	0.037
TECHNOLOGY	-0.006	0.742	-0.025	0.666	0.003	0.641
BASIC MATERIALS	0.001	0.958	-0.018	0.303	0.009	0.493
CONSUMER DISCRETIONARY	-0.003	0.623	-0.021 .	0.059	0.008	0.233
CONSUMER STAPLES	-0.020 .	0.070	-0.043**	0.007	-0.010	0.433
ENERGY	-0.006	0.606	-0.023	0.253	0.002	0.893
FINANCIALS	0.016 .	0.074	0.047**	0.002	-0.025**	0.006
HEALTH CARE	0.027 .	0.053	0.072	0.187	0.017	0.126
INDUSTRIALS	-0.016**	0.008	-0.043**	0.001	-0.007	0.281
INSURANCE	-0.027*	0.014	-0.027 .	0.059	*NA*	*NA*
REAL ESTATE	-0.019**	0.004	-0.021 .	0.075	-0.018**	0.009
TELECOMMUNICATIONS	-0.018	0.406	-0.057*	0.043	0.013	0.552
UTILITIES	-0.009	0.537	-0.010	0.762	-0.010	0.393

Note: MARKET variable is only applicable to the aggregated market regression. AIM market did not have any IPOs in the insurance industry.

Table XI

Multivariate OLS Regressions of IPO Underpricing

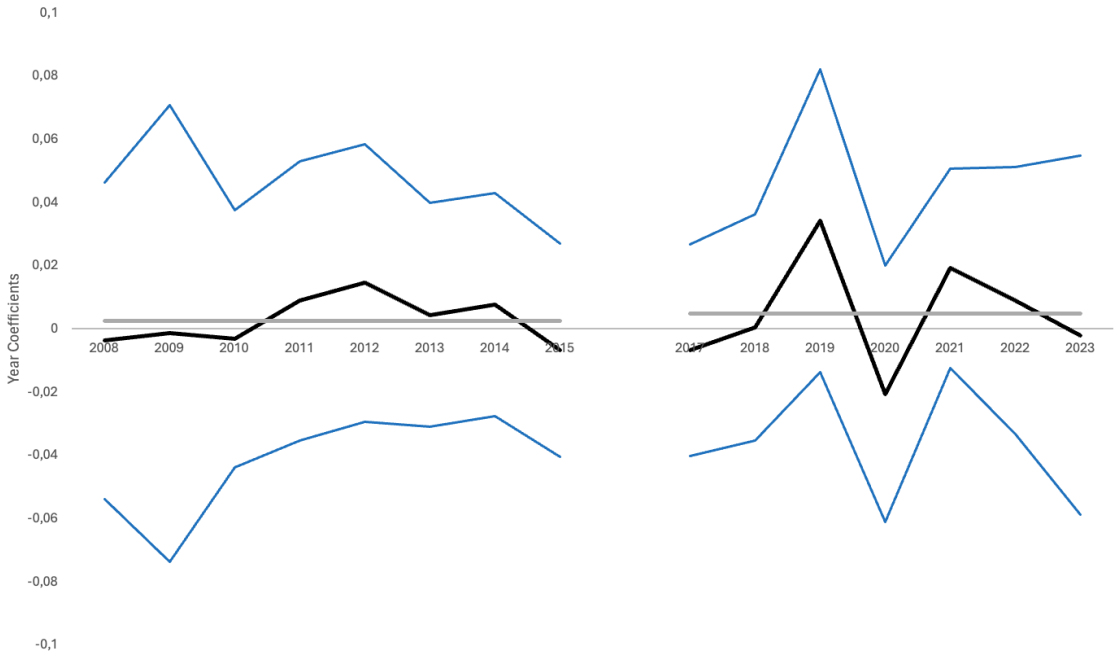
All variables are described in the Empiral method above, the dependent variable is LOG(1+RET). The three multivariate regressions include a 1-month lagged market return variable and a vector dummy. In the industry vector dummy, one industry has been left out to prevent the occurence of a dummy variable trap. Estimation is by OLS and, in accordance with Chambers and Dimson (2009), White's (1980) heteroskedasticity-consistent method is used to calculate standard errors. The statistical signifiance levels of the coefficients are the follwing: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Dependent variable: IPO Underpricing								
Period	Aggregated			Main Market			AIM	
(70)	*Estimate*	*P-value*	*(71)*	*Estimate*	*P-value*	*(72)*	*Estimate*	*P-value*
LNMCAP	-0.009**	0.001		-0.011**	0.009		0.000	0.950
LN(1+AGE)	0.002	0.556		0.005	0.298		-0.001	0.599
HOT	-0.009	0.421		0.009	0.761		-0.015*	0.049
COLD	-0.013 .	0.071		0.003	0.795		-0.017*	0.031
COUNTRY	-0.021	0.177		-0.042	0.228		-0.007	0.466
MARKET	-0.009	0.406		*NA*	*NA*		*NA*	*NA*
COVID	-0.003	0.856		-0.003	0.932		0.001	0.900
FINANCIAL CRISIS	-0.011	0.358		-0.057 .	0.058		-0.004	0.777
UKRAINE	-0.001	0.936		-0.008	0.727		-0.016	0.222
TECHNOLOGY	-0.004	0.879		-0.004	0.957		-0.003	0.813
CONSUMER DISCRETIONARY	0.005	0.714		0.006	0.802		-0.004	0.808
CONSUMER STAPLES	-0.011	0.514		-0.015	0.638		-0.019	0.331
ENERGY	-0.001	0.932		-0.010	0.680		-0.008	0.702
FINANCIALS	0.009	0.485		0.037	0.052		-0.031 .	0.052
HEALTH CARE	0.030 .	0.078		0.087	0.121		0.005	0.752
INDUSTRIALS	-0.010	0.472		-0.021	0.417		-0.014	0.365
INSURANCE	-0.002	0.903		0.010	0.704		*NA*	*NA*
REAL ESTATE	-0.009	0.518		0.005	0.868		-0.025	0.111
TELECOMMUNICATIONS	-0.001	0.982		0.013	0.800		-0.002	0.945
UTILITIES	0.001	0.929		0.030	0.312		-0.016	0.328
MRET	0.125 .	0.094		0.184	0.254		0.125	0.142
Observations	604			240			264	
R^2	0.065			0.122			0.073	
Adj. R^2	0.031			0.042			0.021	

Note: MARKET variable is only applicable to the aggregated market regression. AIM market did not have any IPOs in the insurance industry.

Year Coefficient Plot

Figure XIII. Displays the year coefficients when all explanatory variables in model (3) are demeaned. The dependent is LOG(1+RET). The black lines plot the year coefficients, and each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023). The blue lines represent the lower and upper bound of a 95% confidence interval of the black year dummy coefficient lines.



Year dummy coefficients are plotted along with average values of these coefficients for each respective period, along with a 95% confidence interval. Regressing these Year dummy coefficients on a constant with a dummy variable for IPOs that are post-Brexit, we observed no statistical difference of the +0.23% increase in the mean values of the year coefficients from the pre-Brexit period (+0.25%) and that for post-Brexit period (+0.48%) with a p-value of 0.750 . When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 0.35%.

To further examine this potential increase in IPO underpricing we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008-2015 and one dummy (AFTER) between 2017-2023. Similarly, all explanatory variables are demeaned to assist the interpretation of the period period-specific dummies. The regression shows an increase of 0.47% in IPO underpricing when comparing the BEFORE (0.07%) and AFTER (0.54%) estimated effects. Like Chambers and Dimson (2009), we conduct out a standard Wald test of the null hypothesis, by constraining these two coefficients to equality. The results show a p-value of 0.562, meaning that the null hypothesis cannot be rejected, which shows that IPO underpricing does not significantly differ between the two pre- and post-Brexit periods.

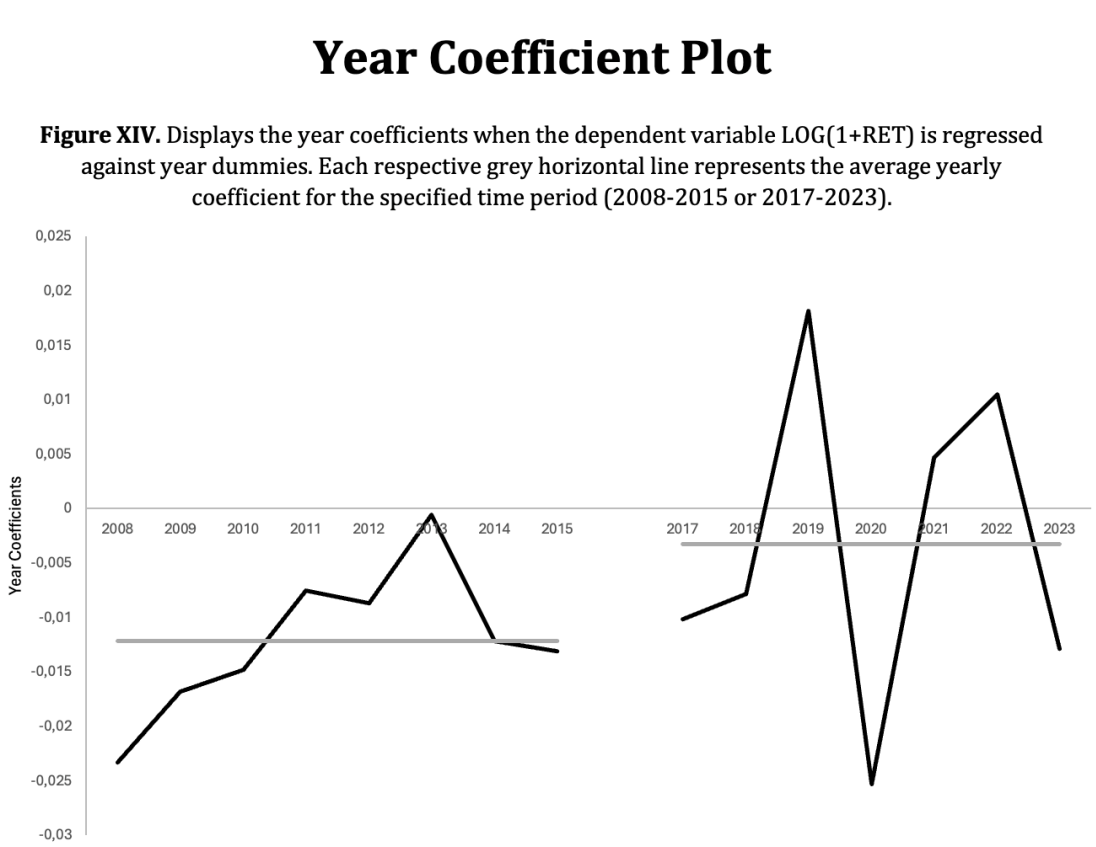


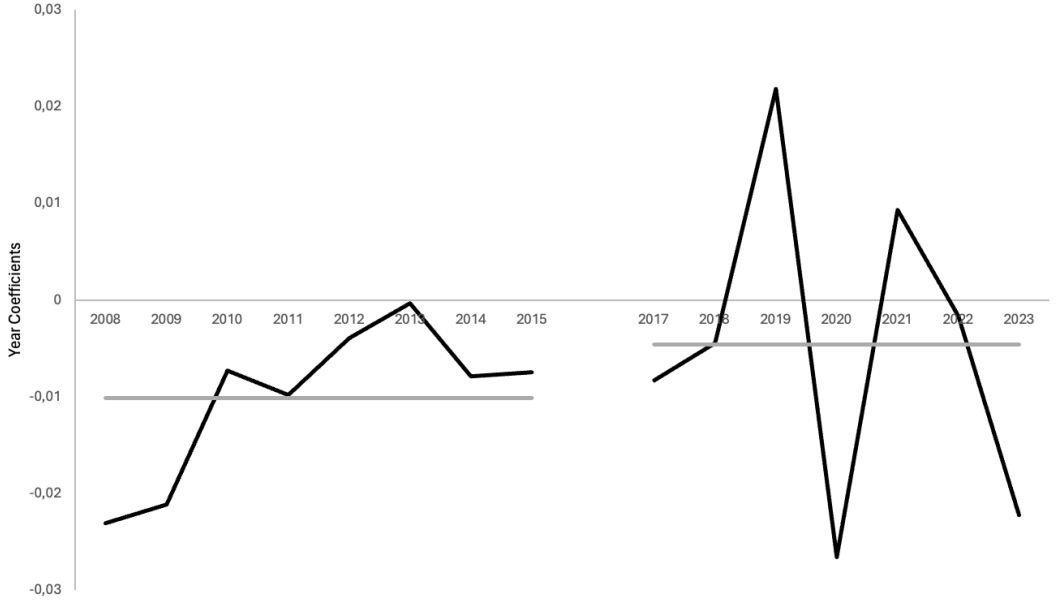
Figure XIV. Displays the year coefficients when the dependent variable LOG(1+RET) is regressed against year dummies. Each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023).

We simplify the method above by regressing the dependent variable, RET, with the Year dummy variables. We then extract these year dummy coefficients and plot these in the graph below. Regressing these Year dummy coefficients on a constant plus and a dummy variable for IPOs that are post-2016, we observe no statistical significant difference of +0.88% increase in the mean values of the year coefficients from the pre-Brexit period (-1.21%) and that for the post-Brexit period (-0.33%) with a p-value of 0.155 When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 0.83%.

Moreover, examining this potential increase in IPO underpricing we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008-2015 and one dummy (AFTER) between 2017-2023. The regression show an increase of 0.85% in IPO underpricing when comparing the BEFORE (-1.1%) and AFTER (-0.25%) estimated effects. Like Chambers and Dimson (2009), we conduct out a standard Wald test of the null hypothesis, by constraining these two coefficients to equality. The results show a p-value of 0.249, meaning that the null hypothesis cannot be rejected.

Year Coefficient Plot

Figure XV. Displays the year coefficients when the dependent variable LOG(1+RET) is regressed against year dummies, LNMCAP and LN(1+Age). Each respective grey horizontal line represents the average yearly coefficient for the specified time period (2008-2015 or 2017-2023).



We simplify the method above by regressing the dependent variable, RET, with the Year dummy variables, LNMCAP and LN(1+Age). We then extract these year dummy coefficients and plot these in the graph below. Regressing these Year dummy coefficients on a constant plus and a dummy variable for IPOs that are post-2016, we observe no statistical significant difference of +0.54% increase in the mean values of the year coefficients from the pre-Brexit period (-1.0%) and that for the post-Brexit period (-0.46%) with a p-value of 0.421 When these coefficients are weighted by the number of IPOs each year, the weighted averages for the same two intervals display an increase of 0.59%

Moreover, examining this potential increase in IPO underpricing we modified our regression by substituting the Year dummies with one period-specific dummy (BEFORE) between 2008-2015 and one dummy (AFTER) between 2017-2023. The regression show an increase of 0.61% in IPO underpricing when comparing the BEFORE (-0.78%) and AFTER (-0.17%) estimated effects. Like Chambers and Dimson (2009), we conduct out a standard Wald test of the null hypothesis, by constraining these two coefficients to equality. The results show a p-value of 0.393, meaning that the null hypothesis cannot be rejected.

AI Disclosure:
Grammarly and ChatGPT 4 has been used as an advanced grammar and spelling check to enhance the quality of the text. Additionally, ChatGPT 4 has also been used to assist with the coding process, outlining a framework for the R code.