Warrants in Underwritten IPOs

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Abstract

We examine the use of warrants as part of the brokers' compensation package in a regulatory environment that is very different from that of the US. Our results show that, though warrant-issuing UK IPO firms are riskier, they are underwritten by reputable brokers. Interestingly, warrant issuers do not minimise their total costs of going public. They incur an underpricing and a total broker compensation of 23.3% and 5.6% respectively. These costs would have been 5.4% and 3.4% had warrants not been used. The results also show that, on average, brokers enhance their underwriting fees by about 75% as a result of the warrants being part of the compensation package. These findings contradict that of Dunbar (1995), who reports that riskier companies can minimise their costs of going public through the use of warrants. Dunbar (1995) argues that the Financial Industry Regulatory Authority (formerly known as National Association of Securities Dealers) in the US should relax the regulations underlying warrants compensation as they are unnecessarily restrictive. In contrast, our findings suggest that underwriters operating in an environment with no regulatory constraints regarding the use of warrants appear to misuse their monopoly power and overcharge IPO firms for their services.

Keywords: IPOs, non-cash compensation regulations, brokers, AIM, monopsony power

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1. Introduction

The costs of going public are an important consideration for companies planning a listing on a stock exchange. In a recent survey, PricewaterhouseCoopers found that nearly half of the Chief Finance Officers of companies that have gone public in recent years had underestimated the costs of their initial public offering (IPO) (PricewaterhouseCoopers, 2012a). A large part of the costs of going public relates to the compensation for underwriting services provided by the underwriter. Dunbar (1995) finds that firms that conduct IPOs in the United States (US) minimise their costs of going public by issuing warrants as part of the compensation to underwriters. Our study examines whether this is also the case with IPO firms outside the US.

In this paper, we study the use of warrants as part of the compensation to the brokers of underwritten IPOs listed in the United Kingdom (UK). The UK setting is very different from that of the US. While, in the US, the use of warrants is constrained by regulatory requirements regarding the exercise price, the lock-in period and a minimum value for the warrant, the Alternative Investment Market (AIM) of the London Stock Exchange (LSE) carries none of these regulatory constraints. AIM, therefore, offers a perfect laboratory in which to study the unfettered use of non-cash compensation to IPO brokers. We focus only on underwritten offerings because, for these IPOs, brokers explicitly guarantee that they will subscribe/purchase shares for which they are not able to procure enough investors. Brokers play a pivotal role in the IPO process on AIM as they are responsible for advising IPO firms on the pricing of shares, assessing the level of investor interest and providing information on market and trading related issues (London Stock Exchange, 2007b).

The following example illustrates the different components of the costs that an IPO firm pays for the underwriting services that a broker provides at the time of listing. SRS Technology Group was brought to the Alternative Investment Market (AIM) on 20 August 2001. The company offered a total of 2,800,000 new shares at an offer price of £1.25 per share. The offering was underwritten by Numis Securities Limited (broker). The company paid an underwriting commission of £105,000 (3% of gross proceeds). In addition, the broker is granted warrants which can be converted into 446,079 shares at an exercise price of £1.25. The warrants can be exercised anytime within the first 2 years starting from day one of listing. Given a risk free rate of 5%, time to maturity of 2 years, first day's closing price of £1.275, total number of shares after listing of 14,869,300, and a standard deviation of the

FTSE AIM All Share Index of 0.74%, the total value of the warrants is about £ 64,215[1]. As a result, the broker enhances its fee by 61.2% (64,215/105,000) by including warrants in its compensation package. Moreover, the total broker compensation (commission plus value of warrants) is about 4.83% of the gross proceeds.

AIM was created in 1995 and today it is seen by many as one of the most successful second-tier markets in the world. AIM is Europe's largest market in terms of number of companies (London Stock Exchange, 2007b) and is also a very popular destination for international firms. During the period 1995 to 2009, nearly half of all the IPOs conducted in major stock markets in Europe took place on AIM (Vismara et al., 2012). AIM is also unique in that nearly one third of the IPOs use warrants as part of the compensation to their brokers, compared to only 4% of the IPOs listed on London's Main Market.

The contribution of our study is three-fold. First, to the best of our knowledge, this is the first study to examine the non-cash compensation of the brokers of underwritten IPOs in an environment with no regulatory constraints on the issuance of warrants. Second, our study contributes to the ongoing debate on the dissatisfaction of companies and institutional investors with equity underwriting services in the UK, especially the increase in the underwriter fee (Office of Fair Trading, 2011).[2] While the Office of Fair Trading (OFT) report focused on the underwriting fee in rights issues, we provide direct evidence on the IPO underwriting fee. Finally, our results have an important policy implication for the market regulators.

The key findings of the study are that offerings that issue warrants do not minimise their costs of going public as they incur an average underpricing of 23.3% and a total broker compensation of 5.6%. The total brokers' compensation is made up of an average underwriting commission of 3.2% and an average value of warrants worth 2.4% of the gross proceeds. This implies that brokers enhance their compensation fees by 75% (2.4%/3.2%) via the use of warrants as part of their underwriting fees. These issuers would have incurred substantially lower underpricing and broker compensation of 5.4% and 3.4% respectively had they not issued warrants. This finding is in stark contrast to that of Dunbar (1995), who finds

[1] The warrants are valued using the Cox constant elasticity variance model as described in Barry et al. (1991).
[2] An investigation by the Office of Fair Trading (UK) into the underwriting fees of rights issues in the UK found that there had been a significant increase in the fees since the onset of the current financial crisis. The average fee increased to 3% in 2009 from 2 to 2.5% over 2003-2007. IPO underwriting fees were excluded from the investigation because they were considered a significantly different type of transaction involving different types of underwriting risk.

that US IPO companies minimise their costs of going public through the use of warrants as part of the compensation package offered to the intermediaries. Our results also show that warrant-issuing IPOs are underwritten by reputable brokers. This is also in contrast to the findings of Dunbar (1995), who shows that warrant-issuing firms are underwritten by less reputable intermediaries. Our regression analysis shows that, while firms that are old, large and have larger public floats are less likely to issue warrants, the probability of the use of warrants is higher for riskier firms.

In comparison to Dunbar's inferences that the National Association of Securities Dealers (NASD) should relax the regulations underlying non-cash compensation because they are unnecessarily restrictive, our findings suggest that the UK regulator should consider the introduction of guidelines regarding the use of warrants as part of the compensation package for brokers. This may help in reducing the total costs of going public for firms that use warrants.

The remainder of this paper is organised as follows. In Section 2 we discuss the literature on the use of warrants as part of the compensation paid to intermediaries. Section 3 provides background information on the AIM, the role of the broker and the regulations underlying the issuance of warrants. In Section 4 we provide details of our data, while in Section 5 we discuss our methodology. Results are presented in Section 6. Section 7 concludes.

2. Literature review

There are three main hypotheses that have been suggested in the literature in order to explain the issuance of warrants to underwriters as part of their compensation package: the certification hypothesis (Booth and Smith, 1986), the monopsony power hypothesis (Dundar, 1995, US Securities and Exchange Commission, 1963a, 1963b, as cited in Ng and Smith, 1996) and the circumvention hypothesis (Barry et al., 1991). According to the certification hypothesis, underwriters include warrants as part of their compensation to certify that the issue is not overpriced. The monopsony power hypothesis argues that underwriters have a monopsony power over issuing firms and ask for warrant-based compensation. According to the circumvention hypothesis, underwriters use warrants as a way to avoid the maximum compensation guidelines set by the NASD. The circumvention hypothesis cannot be tested within the context of the AIM market as there are no regulatory requirements that set maximum or minimum limits on the brokers' compensation.

The empirical literature that examines the use of warrants as part of the underwriters' compensation in firm commitment offerings (FCOs) is limited to the US. Barry et al. (1991) find that warrants are mainly used in smaller, younger and riskier IPOs that are difficult and costly to market. They also find, in line with the circumvention hypothesis, that investment banks do accept warrants so as to sidestep the NASD's maximum compensation guidelines. The acceptance of warrants as part of the compensation package for underwriters in the US may, inadvertently, have been encouraged by the fact that the NASD's pricing formula undervalues warrants when compared to the Black and Scholes and Constant Elasticity Variance (CEV) models. This is mainly due to the fact that the model does not take into account the volatility of the IPO shares. This means that, whenever underwriters bring risky issues to the market, they include warrants in their compensation, instead of charging the issuers a high cash fee that would violate/exceed NASD guidelines (circumvention theory). In addition, Barry et al. (1991) provide evidence that the total costs of going public are significantly higher for the warrant-issuing IPO sample than for the no-warrant sample and these costs can be as much as 30% of the gross proceeds of the offering.

However, Dunbar (1995), who examines US FCOs during the period 1980 - 1983 and takes into account self-selection bias in his sample, finds that, for issuers who use warrants, the total costs of raising capital are lower than they would have been if warrants had not been used. Moreover, his results support the cost minimisation hypothesis, according to which issuers choose the type of contract that minimises their costs. Thus, underwriter warrants are chosen because they are considered a credible signal that the offering will not be overpriced (underwriter certification). This means that investors will require a smaller discount on the new issue, reducing the underpricing of the IPO and consequently the total costs of going public. Ng and Smith (1996) use a two-stage logit model to account for self-selection. They find evidence that issuers select contracts that maximise their net proceeds. The total underwriter costs would have been much higher had the issuers not used warrants. That is to say, net proceeds would have been lower if warrants had not been used. Ng and Smith (1996) also find evidence in support of the certification hypothesis since less well established underwriters, who lack reputational capital, certify the offer by accepting warrants as part of their compensation. In this way underwriters mitigate the information asymmetry problem that the issue might be overpriced, because their own compensation is tied to the aftermarket price performance. Moreover, consistent with previous studies, Ng and Smith (1996) show that warrants are mainly used by small and risky companies that have significant growth

opportunities. Overall, the authors suggest that certification has a much greater effect on the decision to use warrants than circumvention.

In this paper, we test the cost minimisation against the monopsony power (or segmentation) hypothesis. According to the cost minimisation hypothesis, warrants should be used when the cost of going public will be lower with their use than without. The main source of this reduction in the cost comes from the lower underpricing of the issue (Barry et al., 1991, Booth and Smith, 1986, Dunbar, 1995). If insiders can credibly send a signal to the market that they are not selling overpriced securities, then investors are likely to require a lower level of underpricing (Dunbar, 1995). One way to certify that the offer is not overpriced is to compensate the underwriters with warrants. The exercise of warrants is directly dependent on the aftermarket stock price performance. If the issue is overpriced, the stock price will drop, the value of the warrants will decrease and, consequently, the underwriter compensation will be lower. Certification through warrants should be more valuable for smaller and riskier firms, which are characterised by greater informational asymmetries because insiders may be better informed about its true value than outside investors (Dunbar, 1995).

According to the monopsony power hypothesis, the total cost of going public, when warrants are used, is greater than when they are not. This is mainly because investment banks have a monopsony power over issuing firms. If underwriters control the pricing of the IPO and are better informed than the insiders about its true value, they will ask for warrant-based compensation. They will then set the issue price below its fundamental value and, consequently, increase the value of their compensation (Dunbar, 1995). The lower the issue price, the higher the underpricing and the higher the value of the warrant. Dunbar (1995) reports that underwriters are likely to ask for security-based compensation (warrants) in riskier offerings in which information asymmetries between issuer and underwriter are expected to be much more prevalent. One of the Securities and Exchange Commission (SEC) findings was that firms that issue warrants to underwriters pay higher cash spreads and experience greater underpricing (US Securities and Exchange Commission, 1963a, 1963b, as cited in Ng and Smith, 1996). Warrants are used as a form of compensation to the underwriters for the higher costs they have to bear in bringing small and risky issues to the market. Therefore, if there is monopsony power, then the issuer cannot minimise its costs through the use of warrants.

3. The Alternative Investment Market

The AIM, which was launched in June 1995, is the LSE's junior/second-tier market and is designed mainly for smaller, growing companies that want to raise capital at a very early stage of their development. AIM is a prescribed,[3] or in other words an exchange-regulated, market as it is not supervised by the Financial Services Authority (FSA) of the UK but by the LSE (Arcot et al., 2007).

The most common method of issue on AIM is a placing in which the company shares are sold to qualified investors (informed investors) by its broker via an admission document (rather than a prospectus). The admission document is not pre-vetted by the exchange or the UK Listing Authority (UKLA) and is not approved by AIM. In the case of larger companies, if the goal is to raise a large amount of capital, a public offer is usually used. In the public offer, the securities are issued to the public through a prospectus that must comply with the European Prospectus Directive requirements. In this case, the prospectus is pre-vetted by the UKLA.

One plausible explanation for the success of the exchange-regulated markets in attracting a high volume of IPOs is their light regulatory regime. AIM has such a regulatory system, tailored to the needs of growing and smaller companies, and its rules are less onerous than those of other markets that target larger and more established companies (Arcot et al., 2007). However, AIM companies are required to have a Nominated Advisor (Nomad) and a broker at all times (ongoing advisers), whereas firms listed in other markets do not.

The success of the AIM market is evident from the fact that, during the period from 1995 to 2009, 44% of all IPOs conducted in the German, French, Italian and UK markets, and 77% of all IPOs listed on the exchange-regulated markets[4] of the aforementioned countries, took place on AIM (Vismara et al., 2012). In addition, between 1995 and 2010, 1,811 companies have been listed on AIM, raising a total of £30.7 billion. According to PricewaterhouseCoopers (2012b), London is the most international of all the capital markets around the world because more than 21% of all companies listed maintain operations outside the UK. The number of international firms joining AIM peaked in 2006, when 77 international issues took place, raising a total of £2.9 billion.

3.1. The role of the broker

[3] http://www.londonstockexchange.com/companies-and-advisors/aim/faq/faq.htm
[4] The exchange-regulated markets include the Entry Standard of Deutsche Börse in Germany, Marche Libre and Alternext in France, Mercato Alternativo dei Capitali and AIM Italia in Italy and AIM in the UK.

The broker plays an integral part not only during the flotation process but also after the admission has taken place. According to Rule 35 of the AIM rules for companies (London Stock Exchange, 2010) a firm listed on AIM should have a broker at all times and, if there is a resignation or a dismissal of the broker, then the company should notify the market immediately (Rule 17). The purpose of Rule 35 is to ensure that there will be an orderly market for the securities of a company. The roles of the broker and the Nomad are sometimes confused, especially when the same adviser is performing both roles. However, even when the Nomad and the broker are the same institution, the two roles are completely different. The Nomad is responsible for determining whether a company is suitable to be admitted to the AIM market and provides ongoing advice regarding the company's obligations and compliance with the AIM rules. On the other hand, the broker is responsible for arranging the fundraising[5], maintaining a liquid aftermarket and generally ensuring that there is sufficient interest in the company's securities[6]. When one adviser is simultaneously playing both roles (integrated house) then it should be an approved Nomad (approved by the LSE) and there should be a clear distinction between its responsibilities as a Nomad and its responsibilities as a broker (Chinese wall). The broker plays a critical role in the IPO process on AIM since it is the party standing between the investors and the company, whereas the Nomad (regulator) is the party standing between the company and the AIM market.

The existing literature on AIM has paid no attention to the role of the broker, as the focus has always been on the role of the Nomad (Gerakos et al., 2011, Mallin and Ow-Yong, 2011, Mallin and Ow-Yong, 2010, Mendoza, 2008). To the best of our knowledge, this is the first empirical study to describe and focus on the role of the broker during the flotation process.

3.2. Broker's compensation structure

The compensation the broker receives for advising a company seeking a listing on AIM consists of two main parts (London Stock Exchange, 2007b, p. 34). The first is the commission, which is calculated as a percentage of the amount of money raised in the flotation and is paid to the broker in return for procuring subscribers for the new shares and buyers for the selling/existing/secondary shares offered during the IPO. The second

[5] The broker is responsible for organising the roadshows, procuring investors for the company's shares, building the book, collecting the funds from investors and allocating the shares. The broker also acts as a market maker for the company's shares (London Stock Exchange, 2007b).

[6] The broker advises the company on how to maintain good investor relations, provides information about relevant market and trading issues, and assists the firm with other corporate finance services and fundraising activities (i.e. rights issues, mergers) (London Stock Exchange, 2007b).

component is the retainer fee, which is paid annually to retain the adviser on an ongoing basis, post-listing.[7]

In some cases warrants can be considered a third component of brokers' compensation because some companies issue warrants to their brokers in return for the services they provide. In these cases, the compensation of the brokers is directly tied up with the aftermarket performance of the stock price. If the offering is overpriced and the stock price drops in the aftermarket, then the value of the warrants decreases and the total compensation of the advisers also decreases. If the offering is underpriced and the stock price increases in the aftermarket, the value of the warrants increases and the total broker compensation (including warrants) increases.

For the AIM, there is no regulation setting a maximum or minimum for brokers' compensation (Rule 6, Table 1). The amount of commission and annual retainer fees the broker is paid depends on its initial agreement with the issuer. This applies to both underwritten offerings (UOs) and non-underwritten offerings (NUOs). In contrast to the LSE, in the US stock exchanges underwriter compensation is subject to the Financial Industry Regulatory Authority (FINRA) rules, according to which underwriting expenses are expected to be "fair and reasonable". More specifically, the maximum compensation guidelines (including warrants) are different for FCOs and best-effort offerings (BEOs) (Notice 92 – 53, FINRA Manual). The maximum amount of compensation that can be paid in the US varies directly with the risk assumed by the underwriter (FCOs or BEOs) and inversely to the gross proceeds (FINRA Rule 5110). For instance, if the money raised from the IPO is $25 million then the maximum proposed compensation for the underwriter is 7.29% or 6.68% of the gross proceeds for FCOs and BEOs respectively (Notice 92 – 53, FINRA Manual).

3.3. Non-cash and broker compensation regulations in the UK and the US

Table 1 reveals that the regulatory set-up regarding non-cash (i.e. warrants) and total underwriting compensation are very different in the LSE (both Main and AIM markets) and the US stock exchanges. While, in the LSE, there are very few rules concerning the issuance of warrants, the US stock exchanges prescribe a number of regulatory requirements relating

[7] In addition, a small number of firms (27 out of 259) pay a corporate brokering fee upon admission. This fee is typically about 1.45% of the gross proceeds.

to non-cash compensation. FINRA Rule 5110, previously known as NASD Rule 2710[8], sets out the rules on the characteristics and use of warrants as part of underwriters' compensation packages in US IPOs (Garner and Marshall, 2010).

According to Schedule One of the AIM rules for Nominated Advisers (London Stock Exchange, 2007a), neither the Nomad nor any of its partners (i.e. the broker) can be, either individually or collectively, a substantial shareholder in a company they advise. These advisers cannot hold 10% or more of the company's share capital, taking into account any warrants. However, in the US market there is no such regulation. Furthermore, the warrant exercise period can be up to five years in the US (Barry et al., 1991, Ng and Smith, 1996) but there is no such requirement in the LSE.

The underwriter in the US cannot exercise the warrants within the first 180 days after the IPO date[9]. In the AIM market there is no lock-in period and warrants can be exercised from the first day of trading.[10] In both the LSE and the US markets, there is no pre-set minimum requirement relating to the exercise price of the warrants. Since 2004, the minimum value of warrants in the US has been set at 0.2% of the gross proceeds for each amount of securities that is up to 1% of the securities being offered to the public (National Association of Securities Dealers, 2004). There is no such regulatory requirement in the UK.

However, the SEC and the NASD in the US have relaxed some of the guidelines on non-cash compensation, bringing them closer to those of the LSE. More specifically, before 1996, the exercise price for underwriter warrants was usually set at 20% above the issue price because most state security ("blue sky") laws in the US had this requirement (Barry et al., 1991, Ng and Smith, 1996). However, in 1996, the Congress amended Section 18 of the Securities Act of 1933 so that securities listed on the NYSE, the AMEX and the NASDAQ National Market[11] were exempted from state "blue sky" laws (National Securities Improvement Act of 1996). Securities listed on the NASDAQ Capital Market were also made exempt from the

[8] NASD and New York Stock Exchange (NYSE) regulations were consolidated under the FINRA in July 2007. FINRA adopted most of NASD Rule 2710 as FINRA Rule 5110 on 16 July 2008.

[9] There are some exceptions to the lock-in period reported in FINRA Rule 5110. For instance, if underwriters hold an aggregate amount of the issuer's securities less than or equal to 1% of the securities being offered, then they are not subject to the lock-in period.

[10] The only restriction in the AIM market, according to Schedule One of the AIM rules for Nominated Advisers, is that neither the Nomad nor any of its partners can conduct any transactions on the securities of the company during any close period (the close period usually refers to the two months preceding the publication of the company's annual results).

[11] The NASDAQ National Market is now called the NASDAQ Global Market, including the NASDAQ Global Select Market.

"blue sky" requirements on 24 March 2007.[12] In addition, the NASD made some amendments to Rule 2710 (the Corporate Financing Rule) that became effective from March 2004. One of these was the abolishment of the requirement that the exercise price of warrants should be at least equal to the issue price of the offering (National Association of Securities Dealers, 2004). In addition, the NASD reduced the lock-in period for exercising the warrants from one year to 180 days. Another amendment ensured that warrants issued to underwriters as compensation could exceed the limit of 10% of the gross proceeds. This is consistent with Dunbar's (1995) suggestion that the NASD should relax its guidelines as the 10% limit unnecessarily restricted underwriters' ability to certify the issue through the use of warrants.

4. Data

Our data include all non-financial IPOs listed on AIM over the period from June 1995 to December 2010. After excluding all financial industry listings, the initial sample consists of 1,262 firms.[13] 911 of these 1,262 offerings are not underwritten while 10 are partly underwritten (less than 50% of the shares sold are underwritten). When we exclude them, the remaining sample consists of 341 underwritten IPOs (about 27% of the AIM IPOs). This is in stark contrast to the US market, in which 65.5% of the IPOs are underwritten (Ritter, 1987). We exclude 13 unit IPOs, 4 IPOs due to the unavailability of admission documents, and 8 IPOs that issued warrants to other advisers (i.e. Nomad). This leaves us with a final sample of 316 underwritten IPOs.

We use a sample of 57 out of the 316 IPOs, listed over the period from June 1995[14] to December 1998, to construct the dynamic broker's reputation (based on the gross proceeds or the number of IPOs in the 3.5 years before the focal IPO occurs). Thus the remaining sample contains the 259 underwritten IPOs that took place between January 1999 and December 2010.

The stock price data are extracted from DataStream, Thomson One Banker and Bloomberg. The data regarding the broker's compensation (commission and warrant characteristics such

[12] https://listingcenter.nasdaqomx.com/Show_Doc.aspx?File=FAQsInitial.html

[13] Three underwritten IPOs that are categorised as non-financial firms in the LSE Excel spreadsheet have SIC codes in the range 6000–6999 (financial companies) and these are excluded from the initial sample as well. In addition, six underwritten offerings listed on AIM are excluded as they were either already listed on another stock exchange before being admitted to AIM or were delisted from another stock exchange and then listed on AIM. For example, Petmin Limited conducted an IPO on 20 December 2006 but had already been listed on the Johannesburg Stock Exchange in 1986. Similarly, Tricorn Group plc was previously listed on OFEX (renamed the PLUS Market).

[14] The first underwritten IPO was admitted to AIM on 27 June 1995.

as shares underlying the warrants, exercise price and time to expiration), issue price, gross proceeds, market capitalisation, date of incorporation, total assets, revenues and cash available the year prior to the IPO are collected from the admission documents.

5. Methodology

The use of warrants as part of the brokers' compensation package could be related to underpricing and the total brokers' compensation (commission + warrants) paid by the company during the flotation process. The decision to issue warrants may be a non-random one and may be influenced by variables that also have an effect on the level of underpricing and the total broker compensation. We make use of a "what-if" type of analysis to address the potential for self-selection bias. More specifically, for an IPO company that issues warrants to its broker(s), what would the underpricing and total broker compensation be, if warrants had not been used?

We use a two-stage model that is presented in Lee (1978), Dunbar (1995) and Fang (2005) to address the problem of self-selection bias. In the first stage, the model consists of a binary outcome equation that captures the issue or non-issue of warrants to the broker. In the second stage, there are two regression equations for the variable of interest. Formally, as in Fang (2005), the equations can be presented as follows:

$$I_i^* = Z_i'\gamma + \varepsilon_i \quad (1)$$

$$y_{1i} = x_i'\beta_1 + u_{1i} \quad (2)$$

$$y_{2i} = x_i'\beta_2 + u_{2i} \quad (3)$$

Equation (1) reflects the binary outcome, that is, I_i equals one if the firm issues warrants and zero otherwise:

$$I_i = 1 \text{ iff } I_i^* > 0 \text{ , and } I_i = 0 \text{ iff } I_i^* \leq 0 \quad (4)$$

Vector Z_i includes variables that might affect both the issuance of warrants, and the level of underpricing and total broker compensation.

Equation (2) is the underpricing equation for the case when warrants are issued to the broker, and equation (3) is the underpricing equation for the case when warrants are not issued. In practice, we only observe either y_{1i} or y_{2i}, for each IPO, based on the outcome of I_i:

$$y_i = y_{1i} \text{ iff } I_i = 1 \text{ , and } y_i = y_{2i} \text{ iff } I_i = 0 \quad (5)$$

x_i includes variables that affect the underpricing when warrants are or are not used. The same methodology is used to examine the relation between the use of warrants and total broker compensation by replacing the two underpricing equations with two total broker compensation equations. In this case, x_i will include variables that affect the total broker compensation when warrants are or are not used.

This self-selection regression model allows the error in equation (1) to be correlated with the errors in equations (2) and (3), so that unobserved or missing variables in the binary outcome equation (1) are allowed to also affect the underpricing or total broker compensation. Parameters β_1 and β_2 cannot be estimated directly because of potential self-selection bias. For instance, if we estimate equation (2) by ordinary least squares (OLS) using only the observations in which warrants are issued to the brokers, this will generate inconsistent estimates since the expectation of y_{1i} does not have a zero mean (u_1 and ε are correlated) (Fang, 2005).

In the first stage, we estimate equation (1) using a probit regression. The estimated value of $Z_i\hat{\gamma}$ is used to generate the inverse Mills ratio (IMR), which is defined differently for the IPOs that issue warrants and for those that do not. In the second stage, we estimate equations (2) and (3) by OLS, with one additional variable added into each regression to adjust for the potential non-zero expectation of the errors. This additional regressor is the IMR, which allows equations (2) and (3) to be estimated consistently using OLS (Lee, 1978, Fang, 2005). The IMR is defined as $\frac{\varphi(Z_i\gamma)}{1 - \Phi(Z_i\gamma)}$ for IPOs that do not issue warrants and $-\frac{\varphi(Z_i\gamma)}{\Phi(Z_i\gamma)}$ for IPOs that do issue warrants. φ is the standard normal density function and Φ is the standard normal cumulative distribution function (Dunbar, 1995).

The independent variables that are included in the probit model (equation (1), vector Z_i) are expected to have an effect on the total costs of going public (underpricing and total broker compensation). The literature suggests that riskier firms with greater ex ante uncertainty are expected to issue warrants to their underwriters (Barry et al., 1991, Dunbar, 1995, Jain and Kini, 1999, Ng and Smith, 1996). For this reason, we include two variables as proxies for ex ante uncertainty: the age of the firm, which is the difference between the date of listing and the date of incorporation, and the standard deviation of returns for the first 20 days following the official listing. We follow Dunbar's (1995) approach and make use of the public float

(shares sold in the IPO divided by the outstanding shares), the total assets one year before the flotation divided by market capitalisation and the broker's reputation. We also control for the size of the offering (natural log of gross proceeds) as larger IPOs tend to exhibit economies of scales (some parts of the underwriting costs are fixed) (Ng and Smith, 1996). Also, as shown in Notice 92 – 53, FINRA Manual, the underwriting compensation as a percentage of gross proceeds decreases when the issue size increases. An additional reason for the inclusion of gross proceeds and the public float in our analysis is that they can have an effect on underpricing as well (Habib and Ljungqvist, 2001, Loughran and Ritter, 2002).

One possible explanation for the use of warrants may be that companies do not have sufficient cash flow at their disposal to pay the broker fees. To address this, we include as a variable the cash and cash equivalents the company has the year before the IPO, divided by the gross proceeds. We also include hot market dummy variables for the years 2000 and 2005, since 42% of the underwritten IPOs took place during these two years (20.46% and 21.24% for the years 2000 and 2005 respectively).

Barry et al. (1991) and Dunbar (1995) use the Carter and Manaster (1990) ranking to capture the underwriter's reputation. However, this ranking cannot be used in the case of the LSE since there are no tombstone announcements of equity offerings. Thus, we make use of two different measures of broker reputation, the dynamic and the static reputation. The dynamic reputation, as mentioned in the previous section, is constructed based on the total gross proceeds or alternatively the number of IPOs for the 3.5 years before the flotation (June 1995 to December 1998)[15]. The 3.5 year period is rolled over throughout our whole sample period (1999-2010). There are two reasons for choosing a period of 3.5 years prior to the IPO to construct the dynamic broker reputation. First, it takes some time for underwriters to build a good reputation. Second, some reputable underwriters may choose not to underwrite any issues in a depressed market in order to avoid damaging their reputation with a poor IPO (Goergen et al., 2006).

The static reputation, which is used as an alternative to the Carter and Manaster (1990) ranking in the US (Fang, 2005, Megginson and Weiss, 1991), is based on the total gross proceeds raised or the number of IPOs brought to the market throughout the examined period. The logic for using it is that underwriters are repeated players in the market and their survival

[15] Our sample starts from the middle (June) and not the beginning of the year1995 because the first underwritten IPO took place on AIN on 27 June 1995. If, instead of 3.5 years, the dynamic broker reputation is constructed based on the 4 years prior to the IPO, then the results are qualitatively the same.

and future income depend directly on their reputation. For this reason, reputable underwriters will be very selective about the IPOs that they bring to the market throughout their life (Fang, 2005) and will avoid sponsoring overpriced IPOs.

In order to maintain the same number of observations in our probit model (equation (1)) for all different measures of broker reputation, we construct the static reputation from 1999 to 2010 and not from the end of June 1995. However, instead of using the broker reputation as a continuous measure, we discretise it into a binary classification. The dummy variable takes the value of one if the IPO is underwritten by a broker in the top 10% of brokers (in terms of reputation) and zero otherwise. The reason for doing this is because a continuous variable for broker reputation relies on two unrealistic assumptions: that it can capture this reputation with precision and can have a constant effect on the variable of interest. A binary broker reputation measure avoids both of these assumptions (Fang, 2005).

We employ Cox's CEV to value the warrants. We follow Dunbar's (1995) approach and use the first day's closing price of the underlying stock rather than its offer price. This can be justified by the fact that brokers may have inside information for the company's value when the offer price is decided (Barry et al., 1991) as they are responsible for conducting the bookbuilding, in which they contact institutional investors, obtain bids for the company's shares and consequently determine the issue price (Burton et al., 2006, Jenkinson and Jones, 2004, London Stock Exchange, 2007b).

Barry et al. (1991) calculate the average standard deviation for all the stocks that exist in the CRSP database for a time period of 126 days prior to the offer. This is equivalent to forming a CRSP equity index as they use all available stocks in the CRSP database. According to the AIM admission timetable (London Stock Exchange, 2009), the company appoints its advisers (broker and Nomad) and agrees the timetable for listing 12 to 14 weeks (approximately 120 days) before admission. This implies that the advisers, in collaboration with the management of the firm, decide when the listing will take place 12 to 14 weeks before the actual IPO date. Thus, we compute the average standard deviation of the FTSE AIM all share index across the 126 days before the offering. Barry et al. (1991) also use sector volatilities, and their results are qualitatively the same[16]. However, Barry et al.'s (1991), Dunbar's (1995), Ng and Smith's (1996) and our measure of volatility have one disadvantage. Seasoned companies are quite

[16] We cannot use AIM sector indices to calculate the volatility since some of them were introduced after the examined period of this study (i.e. automobiles and parts and food and beverage were introduced in the end of the year 2000).

different and inherently less volatile than newly listed ones (Barry et al., 1991, Boehme and Çolak, 2012, Clarkson and Thompson, 1990, Ibbotson, 1975). Thus, we use two alternative measures of volatility, based on 20 and 126 days of company-specific returns in the aftermarket. We use the Bank of England base rate in the month of the offering as a measure of the risk-free rate.

6. Results

6.1. Descriptive statistics - univariate analysis

The existing empirical papers on AIM conduct their analyses without taking into account the underwriting contract and tend to combine underwritten and non-underwritten IPOs into one sample. This is the first empirical study to distinguish between underwritten and non-underwritten offerings on AIM. In UOs, the brokers explicitly guarantee that they will subscribe/purchase the new/selling shares for which they are not able to procure enough investors, whereas in NUOs the advisers are only expected to do their best endeavours to procure investors for the IPO shares. In our sample 86 out of the 259 UOs issue warrants to their brokers and 173 do not. Thus, 33% of the underwritten IPOs on AIM grant warrants to their brokers. Barry et al. (1991) find that only 17.4% of firm commitment IPOs issue warrants to their underwriters during the period from January 1983 to May 1987, whereas Dunbar (1995) reports a figure of 37.9% in his sample of IPOs listed in the US market during the period from January 1980 to August 1983. Ng and Smith (1996) report that, during the period from 1981 to 1988, 11% of firm commitment seasoned equity offerings (SEOs) issue warrants to their investment banks.

Table 2 reports the descriptive statistics of the warrant and non-warrant subsamples and the total sample of UOs for the period from 1999 to 2010. The figures show that the IPOs that issue warrants to their brokers as part of the compensation package are more heavily underpriced than their non-warrant counterparts (23.3% vs. 14%). The figures also show that the warrant issuers are younger at the time of listing than the non-warrant issuers (1.89 vs. 4.53 years old). The difference in means is statistically significant at conventional significance levels.

Furthermore, the firms in the warrant IPO group sell fewer shares (public float of 33%) at a lower issue price (£0.83) and have a higher standard deviation of returns (3%) compared to those in the no-warrant group, which have a public float of 42%, an issue price of £1.29 and a

standard deviation of 2%. In addition, companies that issue warrants to their brokers have a lower market capitalisation (£43.8 mil. vs. £63.8 mil.) and raise less money in gross proceeds (£11.7 mil. vs. £27.2 mil.). Moreover, the companies that issue warrants to their brokers have less total assets (£5.5 mil.), revenues (£4.3 mil.) and cash (£1.01 mil.) than the no-warrant issuers (£27.1 mil., £30.7 mil. and £3.53 mil. respectively) in the year prior to the IPO. These findings are consistent with Barry et al. (1991), Dunbar (1995), Ng and Smith (1996) and Jain and Kini (1999), who report that issuers who grant warrants as compensation to the underwriters are on average smaller, have a higher aftermarket standard deviation, offer the shares at lower issue prices and, in general, are riskier and more difficult to market.

The figures reported in Table 2 also reveal that IPOs that issue warrants pay a lower commission (3.2% vs. 3.6%) to their brokers than those in the no-warrant group. The differences in both the means and the medians are statistically significant at the 10% level. These findings are not consistent with those of Barry et al. (1991) and Ng and Smith (1996), who report that underwriter cash compensation is significantly higher for the warrant group of companies (IPOs and SEOs respectively). However, our results show that the total broker compensation (commission plus value of warrants) is significantly higher for the warrants IPO group (5.6%) than the no-warrants group (3.6%). The differences in both the means and the medians are statistically significant at the 1% level. This finding is consistent with Dunbar (1995), who also reports that the mean underwriter compensation is significantly higher for the companies that issue warrants to their investment banks. This significant difference in the total broker compensation is due to the fact that the value of warrants is 2.4% of the gross proceeds or 75% of the commission. Thus, the brokers increase their fees by 75% when they include warrants in their compensation package. The firms in the warrant IPO group are more likely to be underwritten by reputable brokers than those in the no-warrants group. This is in stark contrast to Barry et al. (1991), Dunbar (1995), Bae and Jo (2007) and Jain and Kini (1999), who find that firms that issue warrants to their underwriters are underwritten by less reputable investment banks.

In order to have a better understanding of the possible relationship between the reputation of the brokers and the issuance of warrants, we provide descriptive statistics for the bottom and top 10% of brokers (Table 3). The brokers are ranked according to their market share (gross proceeds raised from the IPOs each broker has advised on as a percentage of the total gross

proceeds from all IPOs). About 64.4% of all warrants (56 out 87[17]) are issued by companies that are underwritten by the top 10% of brokers, whereas the equivalent percentage for companies advised by the bottom 10% of brokers is only about 3.5% (3 out of the 87 IPOs that issued warrants to their brokers). For instance, Collins Stewart (the most reputable broker based on market share) advised 11.97% of all IPOs (31 IPOs) and raised 17.41% of the total gross proceeds (£994.1 mil.). Out of the 31 IPOs underwritten by Collins Stewart, 17 of them (or 54.84%) issued warrants to the broker. So, in total, Collins Stewart alone underwrote 19.54% (17 out of 87) of all the IPOs that issued warrants.

A possible explanation for the very limited involvement of the less reputable brokers is that they may have neither a broad distributional network of institutional investors to whom they can sell the IPO shares, nor the capital to absorb any unsold shares from these risky IPOs. In addition, reputable brokers may include warrants in their compensation package when they underwrite risky IPOs, as they may use the warrants as a signal to the market to certify that the issue is not overpriced. The signal comes from the fact that part of their compensation is directly tied up with the aftermarket performance of the company's stock price. If the stock price increases, then the value of the warrants also increases and, consequently, the total compensation of the brokers increases. Another plausible explanation for the use of warrants may be that the brokers have a monopsony power and can demand that smaller and riskier firms (those that issue warrants) supply warrants on top of the commission paid for underwriting services.

6.2. Warrant characteristics

Table 4 reports the characteristics of the 87 warrants issued to brokers as part of their compensation. Panel A of the table shows that the average size and value of warrants (expressed as a percentage of the number of shares issued and the gross proceeds) are 6.7% and 2.4% respectively. The warrants have a maximum (minimum) size and value of 133.2% and 25.1% (0.2% and 0%) respectively. Initially, to value the warrants, we measure the volatility of the FTSE AIM all-share index over the 126 days before the offering. We also compute the value of the warrants using the volatility over 20 and 126 daily company-specific returns, and the results obtained are quantitatively and qualitatively similar. The value of the warrants of 2.4% enhances the brokers underwriting compensation package by

[17] In this table, the total number of companies that have issued warrants to their brokers is 87, and not 86 as shown in Table 2, because one IPO had 2 brokers and issued warrants to both of them.

about 75% (value of warrants as a percentage of the underwriting commission). Barry et al. (1991) report an average size and value of warrants of 7.9% and 5.29% respectively, for issues that raised $10 million or above in the IPO, using the CEV model. Ng and Smith (1996) find a warrant value of 5.67% for SEOs. Dunbar (1995) does not report a value for warrants, but provides the value of the overall amount paid to the underwriters at the time of listing, which includes warrants. The average ratio of exercise price to offer price is almost equal to 1 (1.017) and the ratio has a minimum and maximum value of 0.554 and 1.618 respectively. The warrants have an average life span of 3.9 years, with a minimum and maximum of 1 and 21 years respectively.

Panel B of the table reveals that 63 IPO companies granted warrants to brokers without any lock-in agreements. These warrants can be exercised from the first day of trading. However, this is not the case in the US as the FINRA Rule 5110 imposes a minimum lock-in period of 180 days. The figures in Panel C show that 24 IPOs issued warrants with a lock-in period, the average lock-in period among this subsample being 0.81 years, and the minimum and maximum being 0.25 and 1 year respectively (Panel A). Panel D shows that 76 IPOs offered warrants to brokers at an exercise price equal to the offer price. The finding that, on average, the exercise price of the warrants is almost equal to the offer price is in contrast to Barry et al. (1991), who find a ratio of 1.205, with 96% of the warrants in their sample having an exercise price equal to or greater than 120% of the offer price. Their findings can, to a large extent, be explained by US state "blue sky" laws on securities.

Furthermore, Panel F shows that only 8 warrants (just over 9%) have an exercise price above the offer price, the average across these 8 being an exercise price 25.9% higher than the offer price. In addition, 3 (about 3.5%) IPOs issued warrants, shown in Panel E, offered at an exercise price below the issue price (at an average of 19.9% below the issue price). Thus, the warrants of these 3 IPOs were already in the money prior to listing. This was not permitted in the US prior to 2004 (NASD Rule 2710). In Panel A the warrants have an average time to expiry of 3.9 years. This is shorter than the 4.9 years reported by Barry et al. (1991). In addition, our data show a maximum expiry period of 21 years, whereas, in the US, according to FINRA Rule 5110, the expiry period is restricted to 5 years (Barry et al., 1991, Ng and Smith, 1996). To summarize, in an environment with fewer regulatory constraints underlying the non-cash compensation, as is the case on AIM, warrants can even be issued at an exercise price lower than the issue price, with no lock in agreement and an expiry period much greater than 5 years.

6.3. Test of the cost minimisation versus monopsony power hypothesis

Table 5 reports the results of the reduced-form probit model in which the dependent variable is a dummy that takes the value of one when warrants are used and zero otherwise. Four different probit models are presented. The independent variables in these models are exactly the same, apart from the broker reputation. Models 1 and 3 include the dynamic and static reputation measures based on the gross proceeds raised in the IPO, and models 2 and 4 include the dynamic and static reputation measures based on the number of IPOs advised on by the broker, respectively. It is evident that riskier firms are more likely to issue compensation warrants to their brokers. More specifically, younger firms that have a higher aftermarket standard deviation of returns, a lower public float, lower total assets (as a percentage of market capitalisation) and raise less money (gross proceeds) from the flotation have a higher probability of issuing warrants as part of the package used to compensate brokers for their services. Dunbar (1995) also finds that riskier companies are more likely to grant warrants to their underwriters.

Furthermore, our results show that the coefficient of the public float is negative and is significantly different from zero. This implies that the probability of using warrants is inversely related to the proportion of shares offered at the time of listing. This finding is not consistent with the positive and statistically significant results reported by Dunbar (1995) for his probit model. Although, in model 2, the cash and cash equivalents (as a percentage of gross proceeds) that the companies have at their disposal in the year prior to the IPO have a negative effect on the probability of issuing warrants, in the other three models the coefficients are statistically insignificant. This implies that the suggestion that brokers include warrants in their compensation packages because companies do not have enough cash to meet the brokers' costs may not necessarily hold.

The broker reputation variable in all four models in Table 5 is positive and statistically significant at the 1% level. Thus, the probability of issuing warrants is higher for companies that are underwritten by brokers that are more reputable. This is in contrast to the finding of Dunbar (1995), who reports that the probability of issuing warrants is higher for firms that are underwritten by less reputable underwriters. One possible explanation for our result is that brokers make an explicit commitment to buy the shares of the offering if they are not able to sell them (underwritten IPOs). This implies that less reputable brokers will, on average, avoid bringing riskier IPOs to the market because they would not be able to procure enough

investors for the company's shares. On the other hand, more reputable brokers may bring riskier companies, that issue broker warrants, to the market, as well as less risky companies, because they have a wide network of institutional investors (Fang, 2005) to which they can sell the shares.

The results obtained from the first-stage (reduced-form) probit regression are used to construct the IMR. In the second-stage regression, the variables underpricing and total broker compensation are regressed on the IMR and on the independent variables, separately for the two IPO groups, those with warrants and those without. The use of the IMR adjusts for the selectivity problem that arises from the fact that we can only observe the contracts used by the issuers but cannot observe what would have happened if the alternative contract (i.e. warrants or no-warrants) had been used. In Table 6, we present the second-stage regressions based on model 1 of Table 5 (dynamic broker reputation based on the gross proceeds).

The results reported in Table 6 show that two of the IMRs are statistically significant, which suggests that there is selectivity bias, and without them OLS regressions would yield biased and inconsistent estimates. For the companies in the no-warrant group (high-quality companies), underpricing is significantly positively related to the standard deviation of returns, which implies that investors require greater underpricing for riskier firms. For the same group of companies (no-warrant group) the total broker compensation is significantly negatively related to the 2000 hot market dummy, the public float, the gross proceeds and the cash available in the year prior to listing, and significantly positively related to the 2005 hot market dummy and the standard deviation of returns. Thus, the higher the standard deviation of returns and the less cash the company has the year prior to the IPO, the higher the broker compensation will be. In addition, the more money raised and the more shares sold in the IPO (as a percentage of shares outstanding) the lower will be the fees paid to the broker (economies of scale). Booth and Smith (1986), Ng and Smith (1996) and Krigman et al. (2001) also report the existence of economies of scale in underwriting fees. As far as the 2000 and 2005 hot market dummies are concerned, we cannot make any inferences as they have contradictory effects on the total broker compensation.

For the warrant IPO group, the underpricing is significantly negatively related to the money raised from the flotation and positively related to the standard deviation of returns, which implies that, the riskier the firm, the higher is the underpricing. Moreover, the total broker compensation for the same group of companies increases if the companies have a higher

public float and more cash available in the year before the IPO. Thus, for companies that issue warrants there are no economies of scale as the more shares sold in the IPO, as a percentage of the outstanding shares, the higher is the compensation paid to the brokers. One possible explanation is that the warrant group firms are risky companies, so the brokers have to spend the same time and effort to sell one additional share to investors as they did for all the previous shares. As in the no-warrant case, we cannot draw any inference on the effect of hot market periods on brokers' compensation because the coefficient of the 2000 dummy is statistically significant but that of the 2005 is not.

The coefficients in Table 6 are used to estimate what the underpricing and total broker compensation would have been had the alternative contract (warrants vs. no warrants) been used. More specifically, the forecasts are computed as the product of the coefficient estimates from the second-stage regressions (Table 6) and the independent variables, excluding the IMR because its role is solely to adjust for self-selection bias. Then, we compare these forecasts with the actual underpricing and total broker compensation, as reported in Table 7. If the same methodology is applied using Models 2, 3 or 4 from Table 5 the results are qualitatively the same.

For the IPOs that issue warrants to their brokers the mean actual underpricing is 23.3% but it would have been 5.4% if warrants had not been used. This means that these companies would have experienced less underpricing had warrants not been used. This result is in stark contrast to the findings of Dunbar (1995), who reports a mean underpricing for companies that issue warrants of 23.3%, and a figure of 36.4% had warrants not been used.

For the same group of companies (the warrant IPO group), the total broker compensation is 5.6% but it would have been 3.4% if warrants had not been used. The results suggest that if these companies had not issued compensation warrants they would have paid lower fees to their brokers. This is consistent with Dunbar's (1995) results, who finds that the actual costs of going public (cash compensation + expenses + warrants value) are 23.9% but would have been just 14.6% if warrants had not been issued to the underwriters.

Our results show that companies that issue warrants to their brokers do not minimise their costs of going public (underpricing and total broker compensation) and would have been better off had they not issued them. Why, though, would brokers risk damaging their reputations by bringing smaller and riskier firms to the market? According to Dunbar's (1995) monopsony power hypothesis, if underwriters control the pricing of an issue and are

better informed about the true value of the company than insiders, they will demand security-based compensation because they can arbitrarily increase its value by lowering the issue price. The main implication of this is that, in riskier offerings, in which information asymmetries are more severe, brokers will require warrant-based compensation.

Burton et al. (2006) find that most of the AIM companies are too small to raise capital through the issuance of debt and thus the flotation is the only option they have. They also report that smaller companies often have great difficulty in finding a broker and, in some cases, they have no choice over the broker they use at all. Brokers appear to have bargaining power in the IPO process as companies rely on them to value their business and raise the capital needed from the flotation.

For the no-warrants group, the mean actual underpricing is 14% but it would have been negative 44.9% had they issued warrants. These firms would have been overpriced if they had used warrants. This result is different from that of Dunbar (1995), who finds that, for companies that do not issue warrants, the underpricing is unaffected by their use. As far as the total underwriter compensation is concerned, our results show that companies pay compensation of 3.6% and would have paid more than three times higher fees (11.3%) had they issued warrants. Dunbar (1995) also reports that companies that do not issue warrants minimise their other costs of going public as they would have had to pay twice as much in other costs if they had issued warrants.

An overpricing in the magnitude of 44.9% would suggest that the company is priced unrealistically high. The institutional investors participating in the offering would be likely to take a negative view about its future prospects. This would be likely to discourage other investors, unable to secure any shares in the IPO, to buy the shares in the secondary market. In addition, if a price drops below the issue price in the aftermarket, this often attracts negative publicity (Allen and Faulhaber, 1989, p. 306) since the media interprets a positive first-day return as a successful IPO (Loughran and Ritter, 2002, p. 242). This is, to some extent, consistent with the cascade effect reported by Welch (1992), according to which investors pay attention to what other investors do. Thus, if a few early investors believe that the issue is overpriced, they may share this information with other investors and cause the IPO to fail (Welch, 1992). If there is such a high level of overpricing as 44.9%, the price will probably not reflect the value of the underlying business, and the company will have very little to gain from maintaining a listing on AIM.

In addition, if the offering is overpriced then the underwriters will suffer losses, not only in their compensation (no exercise of warrants), but also in their reputational capital (Dunbar, 1995, Ng and Smith, 1996). As Fang (2005) reports, underwriters are repeated players in the IPO market, and their survival and future income depend on their reputation (James, 1992). Underwriters know that overpricing can lead to a loss of reputational capital and market value (Beatty and Ritter, 1986, Ng and Smith, 1996, Nanda and Yun, 1997, Fang, 2005) and this is why they are likely to choose the IPO contract that will not damage their reputation. Also, through underpricing, firms can raise more money later, in a SEO (Ibbotson, 1975, p. 264, Welch, 1989). Furthermore, according to the information extraction theory (Benveniste and Spindt, 1989, Hanley, 1993), large institutional investors hold information about the value of the IPO, and underpricing is a cost incurred by the issuers in order to compensate these investors for disclosing their private information. As a result, underpricing can have certain advantages for both the issuer and the underwriter, and this may explain why the firms in the no-warrant group do not issue warrants.

Overall, it is evident from our results that the companies that issue warrants to their brokers do not minimise their costs of going public, as is the case of their US counterparts. Dunbar (1995) also suggested that the NASD (renamed FINRA) should make changes in the warrant regulations, as they were unnecessarily restrictive. However, our results show that, on AIM, where there are almost no regulations on warrant compensation, smaller and riskier issuers cannot minimise their costs of going public through the use of warrants. Our findings have important policy implications, as the AIM market should consider introducing regulation relating to non-cash compensation to allow underwritten IPOs to minimise their total costs associated with going public. This should enhance the attractiveness of the AIM market as a primary avenue for listing. As Ng and Smith (1996) report, one of the conditions necessary in order to mitigate any informational asymmetries that may exist at the time of an IPO, through the use of security-based compensation, is for warrants to have a lock-in exercise period that is long enough for inside information to become public. However, as we reported earlier, the vast majority (72.4%) of warrants issued on AIM do not have a lock-in agreement as there is no such regulation in place.

7. Conclusion

This study examines the use of warrants as part of the brokers' compensation in underwritten offerings in the AIM market of the LSE. To the best of our knowledge, this is the first

empirical analysis examining the use of warrants in this way outside of the US market. It is also one of very few studies to have focused on the significant role of the broker in the flotation process on AIM. One of the main findings is that companies that issue warrants are younger and riskier and are more likely to be underwritten by reputable brokers. This contradicts Dunbar's (1995) and Barry et al.'s (1991) results who find that firms that issue compensation warrants are underwritten by less reputable investment banks. The actual underpricing and total broker compensation for companies that issue warrants are 23.3% and 5.6% respectively and would have been 5.4% and 3.4% had warrants not been issued to the brokers. The results also reveal that, on average, the brokers enhance their underwriting compensation by about 75% as a result of accepting warrants as part of the compensation package. For companies that do not issue warrants, the actual underpricing and total broker compensation are 14% and 3.6% respectively, but they would have been -44.9% and 11.3% had they issued warrants.

The results show that the underwritten offerings on AIM that issue warrants do not minimise their total costs (underpricing and total broker compensation) of going public and would have been better off had they not issued these warrants. This is in stark contrast to Dunbar (1995), who finds that companies that issue warrants minimise their costs of going public. To the best of our knowledge, this is the first study to find supportive evidence of the monopsony power hypothesis. In addition, Dunbar (1995) suggested that the NASD should relax the regulations underlying non-cash compensation as they were unnecessarily restrictive. However, our findings suggest that, in an environment in which there are almost no regulations regarding warrant compensation, issuers are not able to minimise their costs of going public through the use of warrants as their counterparts do in the US market. This implies that the AIM market should consider the introduction of regulatory requirements relating to non-cash compensation.

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Table 1
Non-cash (i.e. warrants) and total underwriting compensation regulations: London Stock Exchange vs. US Stock Exchanges

This table reports the main differences in the regulations underlying non-cash (i.e. warrant) and total underwriting compensation between the London Stock Exchange (LSE) and the US stock exchanges. Gross proceeds denotes the money raised from the IPO. NA means not applicable. NASD is the National Association of Securities Dealers. The regulations underlying the warrant characteristics and the underwriting compensation are the same on the Alternative Investment Market (AIM) and Main Market of the LSE, except for the amount of warrants that can be issued. The NASD and New York Stock Exchange (NYSE) made amendments to Rule 2710 (Corporate Financing Rule) that became effective from 22 March 2004. NASD and NYSE regulations were consolidated under the Financial Industry Regulatory Authority (FINRA) on 30 July 2007. FINRA adopted most of NASD Rule 2710 as FINRA Rule 5110 on 16 July 2008.

Rules	**London Stock Exchange** (Main and AIM markets)	**US Stock Exchanges** (before March 2004)	**US Stock Exchanges** (after March 2004)
1. Amount of warrants offered to adviser (broker or Nomad) or underwriter.	The amount of warrants issued must be less than 10% of the company's share capital on AIM (London Stock Exchange, 2007a). The amount of warrants issued cannot exceed 20% of the company's issued share capital in the Main Market (London Stock Exchange, 2010c).	The amount of securities (i.e. warrants) issued to underwriters as part of their compensation cannot exceed 10% of the shares issued to the public (NASD Rule 2710).	NA
2. Exercise period.	NA	5 years (NASD Rule 2710).	5 years (FINRA Rule 5110).
3. Lock-in period.	NA	1 year (NASD Rule 2710).	180 days (FINRA Rule 5110).
4. Min. exercise price.	NA	Equal to the offer price (NASD Rule 2710).	NA
5. Min. value of warrants.	NA	NA	0.2% of gross proceeds for 1% amount of warrants (FINRA Rule 5110)
6. Max. limit in total underwriting compensation.	NA	Varies according to gross proceeds and risk assumed (NASD Rule 2710).	Varies according to gross proceeds and risk assumed (FINRA Rule 5110).

Table 2
Comparison between warrant and no-warrant IPO groups

Underpricing is the 1st day return and is calculated as (closing price – issue price)/issue price. *Public Float* is the shares sold in the IPO divided by outstanding shares. *Standard Deviation* is the standard deviation of returns for 20 days in the aftermarket. *Age* is the number of years from incorporation to flotation on AIM. *Gross Proceeds* (million £) is the money raised from the flotation, measured as the offer price times the total number of shares offered. *Market Cap.* (million £) is the market capitalisation of the company. *Total Assets*, *Revenues* and *Cash* are extracted from the admission document and relate to figures for the year prior to the IPO. *Commission* is the money paid to the brokers for procuring subscribers and buyers for the new and selling shares respectively. The *Value of Warrants* is obtained from the CEV model and is measured as a percentage of gross proceeds. *Total Broker Comp.* is the summation of the commission and the value of warrants. *Dyn. Broker Rep* is the dynamic broker reputation and is measured based on the total gross proceeds raised and the number of IPOs brought to the market by each broker over the previous 3.5 years. *Value of Warrants/Commission (%)* is the Value of Warrants divided by the Commission and is expressed as a percentage. *Stat. Broker Rep* is the static broker reputation measure. It is based on the total gross proceeds and number of IPOs raised and brought to the market by each broker for the period from January 1999 to December 2010. *N* is the number of IPOs.

	Warrants = 1 (N = 86)		Warrants = 0 (N = 173)		Total Sample (N = 259)		Difference in Means	Difference in Medians
	Mean	Median	Mean	Median	Mean	Median	(p-value)	(p-value)
Underpricing (%)	23.3	10.0	14.0	8.0	17.0	9.0	0.06*	0.29
Issue Price (£)	0.83	0.74	1.29	1.1	1.14	1	0***	0***
Public Float (%)	33.0	33.0	42.0	37.0	39.0	35.0	0***	0***
Standard Deviation (%)	3.0	2.0	2.0	1.0	2	0.02.0	0***	0***
Age (years)	1.89	0.462	4.53	0.71	3.78	0.671	0.02**	0.13
Gross Proceeds (mil. £)	11.7	6.34	27.2	14	22.1	10.8	0***	0***
Market Cap. (mil. £)	43.8	21.1	63.8	40.4	57.1	33.6	0.07*	0***
Total Assets (mil. £)	5.5	1.5	27.1	7.9	19.9	4.8	0***	0***
Revenues (mil. £)	4.3	0.4	30.7	5.4	21.9	2.4	0***	0***
Cash (mil. £)	1.01	0.15	3.53	0.76	2.7	0.51	0.03**	0***
Commission (%)	3.2	3.2	3.6	3.5	3.5	3.5	0.06*	0.07*
Value of Warrants (%)	2.4	0.8						
Total Broker Comp.(%)	5.6	4.7	3.6	3.5	4.3	4.0	0***	0***
Value of Warrants/Commission (%)	75	25						
Dyn. Broker Rep. (gross proceeds)	0.091	0.076	0.066	0.035	0.074	0.039	0.07*	0***
Dyn. Broker Rep. (N IPOs)	0.088	0.084	0.073	0.031	0.078	0.039	0.18	0.03**
Stat. Broker Rep. (gross proceeds)	0.081	0.061	0.054	0.043	0.063	0.043	0***	0***
Stat. Broker Rep. (N IPOs)	0.086	0.116	0.059	0.042	0.068	0.054	0***	0***

***, ** and * indicate statistical significance at the 1%, 5% and 10% significance levels.

Table 3
Top and bottom 10% of brokers

Number of IPOs is the number of IPOs brought to the market by the given broker. *Gross proceeds* (£ million) is the money raised from all the IPOs each broker advised. *% of IPOs* is the number of IPOs the broker advised, expressed as a percentage of the total number of IPOs. *% gross proceeds* is the gross proceeds each broker raised, expressed as percentage of the total gross proceeds. *% of IPOs issued warrants* is the number of IPOs that granted warrants to the broker, divided by the total number of IPOs that broker advised. *% of the total number of IPOs that issued warrants* is the number of warrants the broker received divided by the total number of IPOs that issued warrants. The brokers are ranked according to the gross proceeds raised from the flotation.

Brokers	Number of IPOs	Gross proceeds (mil. £)	Number of IPOs issued warrants	% of IPOs	% gross proceeds	% of IPOs issued warrants	% of the total number of IPOs that issued warrants
Bottom 10% of brokers							
Nabarro Wells & Co.	1	0.071	0	0.39	0.001	0	0
Credo Capital	1	0.304	1	0.39	0.01	100	1.15
Hoodless Brennan & Partners	1	0.36	1	0.39	0.01	100	1.15
Astaire & Partners	1	1.081	1	0.39	0.02	100	1.15
Brown Shipley Securities	1	1.374	0	0.39	0.02	0	0
Top 10% of brokers							
Altium Capital	11	278.2	2	4.25	4.87	18.18	2.30
Seymour Pierce	39	346.9	19	15.06	6.08	48.72	21.84
Numis Securities	14	547.9	7	5.41	9.60	50.00	8.05
Evolution Securities	30	774.4	11	11.58	13.56	36.67	12.64
Collins Stewart	31	994.1	17	11.97	17.41	54.84	19.54

Table 4
Descriptive statistics for the 87 warrants issued to broker(s) in IPOs

Size of warrants is measured as (number of shares that can be purchased under the warrant)/(issue size or number of shares issued). V*alue of warrants* is obtained from the CEV model and is measured as a percentage of gross proceeds. *Exercise/offer price* is calculated as (price at which the warrant can be exercised)/(offer price). *Time to expiration (years)* is measured as the number of years between the date of listing on AIM and the expiration date of the warrant. *Lock-in (years)* is the time period during which the warrant cannot be exercised. *Min* and *Max* are the minimum and maximum values respectively. *N* is the number of warrants offered.

	Size of warrant (%)	Value of warrant (%)	Exercise/offer price	Time to expiration (years)	Lock-in (years)
Panel A: All warrants					
mean	6.7	2.4	1.017	3.902	0.813
median	3.7	0.8	1	3	1
Min	0.2	0	0.554	1	0.25
Max	133.2	25.1	1.618	21	1
N	87	87	87	87	24
Panel B: Warrants with no lock-in period (N=63)					
mean	5.5	2.3	1.012	4	0
median	3.7	0.8	1	3	0
Panel C: Warrants with lock-in period (N=24)					
mean	9.7	2.4	1.029	3.646	0.813
median	3.6	1.0	1	3.5	1
Panel D: Warrants with an exercise price equal to the offer price (N=76)					
mean	7.2	2.6	1	3.914	0.786
median	3.8	0.9	1	3	1
Panel E: Warrants with an exercise price lower than the offer price (N=3)					
mean	3.0	1.4	0.801	5.333	0
median	2.7	1.8	0.911	5	0
Panel F: Warrants with an exercise price higher than the offer price (N=8)					
mean	3.1	0.4	1.259	3.25	1
median	2.4	0.3	1.2	3	1

In Panel A, the maximum size of the warrants is 133.2% of the shares offered in the IPO because one company (Alltracel Pharmaceuticals plc, whose IPO took place on 19 July 2001) issued 825,843 shares and a warrant to subscribe for 1,100,000 Ordinary Shares (p. 40 of admission document). The maximum time to expiration of the warrants issued is 21 years because one company (CNG Travel Group plc, whose IPO took place on 07 May 2004) issued warrants that could be exercised up to 21 years post-admission (p. 89 of admission document).

Table 5
Probit regression model for the contract equation

The dependent variable is a dummy variable that takes the value of one if the firm issues compensation warrants to its broker(s) and zero otherwise. *Dummy 2000* is a dummy variable that takes the value one for the year 2000 and zero otherwise. *Dummy 2005* is a dummy variable that takes the value one for the year 2005 and zero otherwise. *Age* is the number of years from incorporation to flotation on AIM. *Standard Deviation* is the standard deviation of returns over 20 days in the aftermarket. *Public Float* is calculated by taking the total number of shares sold in the IPO divided by outstanding shares. *Gross Proceeds* are measured as the natural log of gross proceeds raised from the flotation. *Cash/Gross Proceeds* is the cash and cash equivalents available in the year prior to the IPO, divided by gross proceeds. *TA/Market Cap.* is the total assets in the year prior to the IPO, divided by the market capitalisation. *Dyn. Broker Rep.* is the dynamic broker reputation and is based on the total gross proceeds or number of IPOs raised and brought to the market by each broker over the previous 3.5 years. *Stat. Broker Rep.* is the static broker reputation measure and is based on the total gross proceeds or number of IPOs raised and brought to the market by each broker over the period from January 1999 to December 2010. All reputation measures are dummy variables that take the value one if the IPO is underwritten by one of the 10% most reputable brokers and zero otherwise. The only variable that is different in all four models is the broker reputation. *N* is the number of IPOs.

	Model 1		Model 2		Model 3		Model 4	
Variables	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Intercept	3.59**	0.02	3.82***	0.01	3.58**	0.02	3.61**	0.02
Dummy 2000	-0.17	0.48	-0.16	0.48	-0.12	0.59	-0.13	0.58
Dummy 2005	-0.04	0.87	-0.04	0.86	-0.02	0.94	-0.01	0.97
Age	-0.04**	0.04	-0.04*	0.06	-0.04**	0.05	-0.03*	0.09
Standard Deviation	11.82***	0.00	11.76***	0.00	10.59***	0.00	11.12***	0.00
Public Float	-1.32**	0.02	-1.29**	0.02	-1.39***	0.01	-1.34***	0.01
Gross Proceeds	-0.22**	0.02	-0.24***	0.01	-0.23***	0.01	-0.23***	0.01
Cash/Gross Proceeds	-0.75	0.13	-0.83*	0.07	-0.68	0.18	-0.70	0.16
TA/Market Cap.	-1.01***	0.00	-1.00***	0.00	-1.05***	0.00	-1.02***	0.00
Dyn. Broker Rep. (dummy gross proceeds)	0.62***	0.00						
Dyn. Broker Rep. (dummy N IPOs)			0.61***	0.00				
Stat. Broker Rep. (dummy gross proceeds)					0.80***	0.00		
Stat. Broker Rep. (dummy N IPOs)							0.76***	0.00
(% of correct predictions)	74%		73%		75%		75%	
Pseudo R-square	0.21		0.20		0.23		0.22	
N	259		259		259		259	

***, ** and * indicate statistical significance at the 1%, 5% and 10% significance levels.

Table 6
Second-stage regression estimates of underpricing and total broker compensation

Underpricing is the first-day return and is calculated as (closing price – issue price)/issue price. *Total Broker Compensation* is the summation (Commission + Warrant Value). *Dummy 2000* is a dummy variable that takes the value one for the year 2000 and zero otherwise. *Dummy 2005* is a dummy variable that takes the value one for the year 2005 and zero otherwise. *Age* is the number of years from incorporation to flotation on AIM. *Standard Deviation* is the standard deviation of returns over 20 days in the aftermarket. *Public Float* is the total number of the shares sold in the IPO, divided by outstanding shares. *Gross Proceeds* are measured as the natural log of gross proceeds raised from the flotation. *Cash/Gross Proceeds* is the cash plus cash equivalents available in the year prior to the IPO, divided by gross proceeds. *TA/Market Cap.* is the total assets in the year prior to the IPO, divided by the market capitalisation. *Dynamic Broker Rep.* (dummy gross proceeds) is the reputation of the broker based on the total gross proceeds raised over the 3.5 years prior to the IPO and takes the value one if the IPO is underwritten by one of the 10% most reputable brokers and zero otherwise. *IMR* is the inverse Mills ratio, which is used to adjust for selectivity bias. *N* is the number of observations.

	Dependent Variable: Underpricing				Dependent Variable: Total Broker Compensation			
	Contracts with Warrants Equation 1		Contracts without Warrants Equation 2		Contracts with Warrants Equation 1		Contracts without Warrants Equation 2	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Intercept	1.85**	0.04	0.10	0.82	0.11	0.12	0.01	0.47
Dummy 2000	0.18	0.13	0.04	0.51	0.03***	0.01	-0.01***	0.00
Dummy 2005	-0.02	0.87	0.01	0.82	0.01	0.32	0.003*	0.07
Age	-0.03	0.16	0.001	0.57	0.0006	0.73	-0.0001	0.17
Standard Deviation	6.54**	0.03	6.92***	0.00	-0.09	0.69	0.15**	0.04
Public Float	0.69	0.13	0.20	0.15	0.10**	0.02	-0.01**	0.03
Gross Proceeds	-0.16**	0.03	-0.01	0.84	-0.003	0.51	-0.002**	0.03
Cash/Gross Proceeds					0.07**	0.05	-0.01**	0.02
TA/Market Cap.	-0.24	0.57	0.05	0.40				
Dyn. Broker Rep. (dummy gross proceeds)	0.23	0.27	-0.08	0.18	-0.01	0.58	-0.0002	0.93
IMR	-0.40	0.40	0.29**	0.05	0.05*	0.08	-0.002	0.74
R-square	0.32		0.18		0.29		0.27	
N	86		173		86		173	

***, ** and * indicate statistical significance at the 1%, 5% and 10% significance levels.

Table 7
Comparison of actual costs with the estimated costs should the alternative compensation contract have been used

This table compares the average underpricing and total broker compensation costs with the estimated costs should the alternative contract have been used. *Underpricing* is the first-day return and is calculated as (closing price – issue price) / issue price. *Total Broker Compensation* is the summation (Commission + Warrant Value). N is the number of observations.

	Average cost estimates for the 86 IPOs that issued warrants to brokers			Average cost estimates for the 173 IPOs that did not issue warrants to brokers		
	Actual cost	Estimated cost if warrants had not been issued to brokers	Difference in means p-value	Actual cost	Estimated cost if warrants had been issued to brokers	Difference in means p-value
Underpricing (%)	23.3	5.4	0***	14.0	-44.9	0 ***
Total Broker Comp. (%)	5.6	3.4	0***	3.6	11.3	0 ***
N	86	86		173	173	

***, ** and * indicate statistical significance at the 1%, 5% and 10% significance levels.