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Signaling by Underpricing the Initial Public Offerings of Primary Listings in an Emerging Market

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Abstract:

The signaling hypothesis suggests that firms have incentives to underprice their initial public offerings (IPOs) to signal their quality to the outside investors and to issue seasoned equity (SEO) at more favorable terms. While the initial empirical evidence on the signaling hypothesis was weak, Francis *et al.* (2010) show that foreign firms from segmented (rather than integrated) markets strategically underprice their IPO in U.S. markets to distinguish themselves from the weaker players. Hence, the attractiveness of the signaling strategy seems to be related to the *a priori* level of information asymmetry. We examine the use of signaling in an emerging market where the information asymmetry is likely to be higher relative to an established market. Using a sample of 158 Polish IPOs from 2005 – 2009, we

show that firms that underprice their IPOs are more likely (i) to issue seasoned equity, (ii) to issue a larger portion of equity at the SEO, and (iii) to make the SEO sooner after the IPO, all of which are consistent with the signaling hypothesis. This evidence suggests that the results of Francis *et al.* (2010) are not limited to IPOs made by foreign firms in an established market, but they can be extended to primary listings by domestic firms in markets where the information asymmetry is sufficiently large for the benefit of the signal to outweigh its cost.

Keywords: initial public offering, seasoned equity offering, underpricing, signaling, emerging market, Poland

JEL: G14, G15, G30

1. Introduction

The decision to go public is one of the most important events for a firm. Typically, firms go public to raise additional equity capital to finance their investment projects. In addition, there are several indirect benefits of going public. The listing at an equity market increases stock liquidity, which is likely to reduce the cost of capital and to help the firms grow faster. Further, public firms attract more attention of financial analysts and fund managers. The broader publicity increases the company's chances to attract a wider range of investors or high caliber managers (Ljungqvist, 2004). Firms may also use an initial public offering (IPO) as a bonding mechanism as the registration with the market regulator typically imposes more stringent disclosure criteria and a more consistent enforcement that increase the firm's transparency and hence reduce the company's cost of capital (Leuz and Verrecchia, 2000, Karolyi, 2012). The more demanding requirements are thus used by the stronger players to credibly signal their quality to the outside investors.

The existing research identifies a number of empirical regularities related to the initial public offerings. First, the IPOs tend to be underpriced in that the first day closing price is on average substantially higher than the offering price (e.g. Reilly, 1973, Logue, 1973, Ibbotson, 1975). Second, the timing of IPOs seems to be clustered in time and across industries and it is possible to identify 'hot' markets when a large number of IPOs are made and 'cold' markets when the IPOs are rare (e.g. Ritter and Welch, 2002). It seems that there is a positive association between the level of underpricing and the 'hot' market, i.e. the more IPOs are made in a given year the higher the mean underpricing *ibid*. Third, on average the IPOs seem to underperform in a long run (e.g. Ritter, 1991). The precise measurement of the long-term abnormal returns following the IPOs is challenging because it is not trivial to properly adjust for risk. Nevertheless, it seems that the stock returns in three years following the IPO date are below the risk-matched peers and the underperformance is more severe for firms that were initially more underpriced (Ritter, 1991).

These empirical patterns are rather puzzling and so a substantial effort has been made to analyze potential explanations. In particular, the IPO underpricing seems to be a phenomenon that evades a conclusive explanation. The issuers seem to leave a significant amount of money on the table when they agree to issue the stocks at a price that is substantially lower than what

the stock market establishes already at the first trading day. Since the IPOs are salient events, their coverage is rather comprehensive and the first-day return has a very short time span, it is unlikely that the results are driven by data limitations or inadequate risk adjustments. Furthermore, the underpricing seems to be related to a number of the other empirical patterns, which implies that its characteristics may be the key to unraveling the nature of the economic interaction around the IPOs.

Ljungqvist (2004) classifies the alternative theories aimed at explaining the IPO underpricing into four groups: (i) asymmetric information theories, (ii) institutional theories, (iii) control theories, and (iv) behavioral theories. The asymmetric information theories view the IPO underpricing as a consequence of the existence of information asymmetries on the market (e.g. Welch, 1989, Rock, 1986, Benveniste and Spindt, 1989). There are several parties that may conceivably have an information advantage in the IPO market. The issuer may have superior knowledge of the firm value or its long-term prospects. Alternatively, the investors may have more precise understanding of the aggregate demand for the company's equity. Furthermore, the sophisticated investors may have an information advantage about the company value over the naïve investors. Finally, the underwriters may have superior insight about the company value and the market demand. If the underpricing is a reaction to the information asymmetry it may reflect the costly signal the better informed issuers send to the investors about the company's quality, the compensation to the naïve investors for the adverse selection, or the cost of soliciting the information on the investors' private demand during the book-building process.

Institutional theories explain the IPO underpricing by institutional factors such as litigation or taxes. Hughes and Thakor (1992), Hensler (1995), Lowry and Shu (2002) and Francis, Hasan and Zhou (2012) argue that intentional underpricing may act like an insurance against securities litigation that is clearly costly for defendants. Francis, Hasan and Zhou (2012) show that technology firms that plausibly face a higher litigation because their value heavily depends on the intangible assets from which the future cash flows highly uncertain use more conservative accounting techniques and they underprice their IPOs more (especially during "hot markets") than non-technology firms. Rydqvist (1997) found the evidence on Swedish data that underpricing may be advantageous due to tax reasons. Thus the existence of IPO underpricing may be a consequence of a trade-off between the tax benefits and costs related to

underpricing. Control theories portray the underpricing as a result of the separation of ownership and control, following different incentives for intervention by large outside investors (Brennan and Franks, 1997, Stoughton and Zechner, 1998). Behavioral theories explain the IPO underpricing either by investors' sentiment; i.e. the presence of 'irrational' investors who bid up the price of IPO shares beyond true value (Ljungqvist, Nanda, and Singh, 2006). Alternatively, issuers may suffer from behavioral biases causing them to put insufficient pressure on the underwriting banks to decreased underpricing (Ljungqvist and Wilhelm, 2005).

In this paper we empirically test the implications of the signaling model proposed by Welch (1989). The model assumes the issuer has an information advantage over the investors about the true value of the firm, which creates an incentive for the strong players to design a signaling mechanism that would credibly communicate their quality to the investors. If there is some probability that the true firm quality gets revealed by the nature after the IPO the strong players may decide to delay a part of the issue and to make a seasoned equity offering (SEO). In addition, the strong players have an incentive to underprice the IPO to the degree that together with the inherent imitation costs renders the mimicking strategy unattractive for the weak players. This way the strong players are able to credibly reveal their type at the expense of leaving some money on the table at the IPO. Investors who learn about the strong players' quality will subsequently be ready to buy seasoned equity at a higher price, which will off-set the lower proceeds received by the issuer at the IPO.

Despite of the intuitive appeal of the model the early empirical evidence provided limited support for its predictions. Jegadeesh, Weinstein and Welch (1993) find some evidence that the IPO underpricing is related to the subsequent SEO activity. Nevertheless they conclude that the aftermarket returns play a more important role in predicting the SEO activity, which implies that the investors are likely to be better informed about the firm's intrinsic value than the issuers. Hence, the firms decide on the SEO primarily based on the observed medium term stock market reaction that reveals the investor beliefs about the intrinsic value. Hence, the issuer's information advantage does not seem to be the primary driver of the SEO decision and the IPO underpricing is unlikely to reflect the firm's desire to signal its quality. Similarly, Michaely and Shaw (1994) who test the signaling hypothesis using the U.S. data from 1984 to 1988 conclude that it is unlikely to explain the variation in the IPO underpricing.

Recently, Francis *et al.* (2010) revisited the signaling hypothesis using a sample of foreign firms that make an IPO in a U.S. capital market. They conclude that the signaling hypothesis is a major determinant of IPO underpricing for firms from segmented markets but not for firms with the integrated markets. The authors argue that firms from the segmented markets face a higher information asymmetry and they have a greater need to access external capital markets. Hence they are more willing to incur the cost of sending the signal about their quality. Based on their findings, the authors conclude that the lack of empirical evidence in support of the signaling hypothesis may be related to difficulty in selecting firms, for which the benefit of the signal outweighs its cost. If the information asymmetry between the issuers and investors are at moderate levels the firms may not be willing to apply the lengthy and costly strategy of leaving money on the table to reduce the information asymmetry. Thus the attractiveness of the signaling strategy likely depends on the *a priori* information asymmetry in the market.

“We conjecture that the problem underlying the very weak support empirically is the inability of researchers to identify firms that actually value underpricing as a signaling device and hence are willing to apply this time-intensive strategy.”

(Francis *et al.*, 2010, p. 82)

We show that the results provided by Francis *et al.* (2010) can be extended beyond the foreign firms from segmented markets that list at a well-developed market. Bruner *et al.* (2004) and Hasan and Waisman (2010) show that the foreign firms that self-select to list in a U.S. market are rather specific firms that are superior in quality to the peers listed in their home countries. Their economic trade-offs may thus differ from the ones faced by the representative locally listed counterparts. Furthermore, the foreign firm sample includes firms that use the U.S. IPOs to cross-list rather than as their primary listing. If the proportion of the cross-listed firms differs in the sub-samples of the segmented and the integrated markets the results may be affected by the differences in the relative importance of the changes in the institutional requirements, in the expected enforcement strength and in the litigation risk resulting from the U.S. listing. In addition, the segmented markets are conceivably less efficient than the integrated markets and hence it is possible that the firms from the segmented markets underprice their U.S. IPOs more because they are more uncertain about their intrinsic value and because they have more to gain from their U.S. IPO and so they bargain less aggressively

with their underwriters about the amount of money they leave on the table. The IPO underpricing as well as the higher portion of equity capital raised at the SEO may also reflect the effort to minimize the risk of U.S. IPO under-subscription. Hence, we investigate the IPO underpricing in a uniform setting where these systematic differences are unlikely to prevail.

We consider primary listings in an emerging market, where the level of information asymmetry between the issuers and investors is likely to be higher compared to an established market (Patel, Balic and Bwakira, 2002, Claessens and Yurtoglu, 2013). If the attractiveness of the signaling strategy is related to the *a priori* information asymmetry we should be able to find signaling behavior in an emerging market. We use the data from the Polish capital market because the economic discontinuity resulting from the country's transformation from a centrally planned economy to a market economy makes a significant information asymmetry likely. Korczak and Bohl (2005) document a significant increase in valuation of Central and Eastern European companies that cross-list internationally and thereby subject themselves to a more stringent disclosure and regulatory environment. This implies that the information asymmetry may be a more pressing concern in these markets and the strong players may find it worthwhile to search for ways of credibly distinguishing themselves from the weaker players. We argue that IPO underpricing may be one way of overcoming the information asymmetry similarly to cross-listing. In addition, the Warsaw Stock Exchange (WSE) is sufficiently large and it is dominated by small and medium-sized entrepreneurial firms, which makes the market suitable for analyzing economic interactions driven by private incentives.

Our sample consists of 158 Polish IPOs from 2005 – 2009 and 25 follow-up SEOs issued within three years after the IPO date. We document a significant IPO underpricing; the mean initial return of 15.7% is statistically significant at 1% level. More importantly, we provide evidence that the firms that underprice more their IPOs are more likely: (i) to issue seasoned equity, (ii) to issue a large portion of shares at the SEO, and (iii) to issue SEO sooner after the IPO. Our findings are consistent with Francis *et al.* (2010) and they provide an additional support for the signaling theory in a setting where a larger information asymmetry is expected. At the same time we do not find any support for the market feedback hypothesis that suggests that the firms decide on the SEO based on how well the market receives the IPO. Our findings suggest that the existence of high information asymmetry is an important condition for firms to find the signaling strategy attractive.

We make several contributions to the existing literature. First, we document that in an emerging equity market domestic issuers have a significant information advantage over the investors. Given the diverse views of the asymmetric information theories on what market actors have the information advantage this finding is important. Second, we show that Francis' *et al.* (2010) results can be extended beyond the context of rather specific high-quality firms that self-select to cross-list in a well-developed market. We conclude that in an emerging market even conventional domestic issuers use the IPO underpricing to signal their quality and to subsequently issue seasoned equity at more favorable terms. Third, we provide first out-of-the-sample evidence on Francis' *et al.* (2010) proposition that the extent of the *a priori* information asymmetry matters for the issuer's incentives to use the IPO underpricing as a signaling device. In an emerging market where significant information asymmetries are likely to prevail and where alternative channels of communication may lack credibility issuers are more likely to find signaling attractive. Hence, when testing the signaling models it is important to consider the economic trade-offs underlying the issuers' decision whether or not to underprice their IPO.

The rest of paper is organized as follows. In section 2 we provide a review of the existing literature related to the IPO underpricing and we formulate our hypotheses. Section 3 describes our methodology. Section 4 outlines the institutional features of the Polish equity market and compares it with the other European stock exchanges. In section 5 we present our data sample. We present our empirical results in section 6. Section 7 concludes.

2. Literature and Hypotheses

2.1. Theory

The intuition underlying the signaling models that provide a potential explanation of the IPO underpricing is provided by Ibbotson (1975). Ibbotson suggests that the prevalent view of the IPO underpricing puzzle on the Wall Street is that issuers underprice IPO because they want to '*leave a good taste in investors' mouths so that future underwritings from the same issuer could be sold at attractive prices.*' (Ibbotson, 1975, p. 264). This intuition constitutes the basis of the signaling models that perceive the underpricing as a signal sent from more

informed issuers to less informed investors. There are several versions of the signaling models, i.e. Welch (1989), Allen and Faulhaber (1989) and Grinblatt and Hwang (1989)). As in this paper we focus on the relation between the IPO underpricing and the SEO characteristics we use the model proposed by Welch (1989).

Welch (1989) formulates a two period signaling model in which firms are rational participants with superior information in a perfectly competitive capital market. Welch distinguishes between two types of risk-neutral issuers (high and low-quality firms) whose utilities depend on the sum of the issuing proceeds from the IPO and the SEO. The investors cannot observe directly the true quality of the firm, but they know the portion of high-quality firms. The main assumptions of the Welch's signaling model is that the low-quality firms must incur imitation costs to appear to be high-quality firms and that the nature reveals with some probability the firm's true quality in the time between the IPO and the SEO, which renders the imitation cost useless. The low-quality firms thus trade off the better terms at which they can make their SEO against the cost of imitation that may sometimes be ineffective because of the revelation of the true quality by the nature.

The high-quality firms have the incentive to credibly distinguish themselves from the low-quality firms. Thus they may strategically underprice their IPOs to increase the imitation cost for the low quality firms to the level that renders the imitation unattractive. Thus, the IPO underpricing makes the low-quality firms reveal their true quality voluntarily when the real (inherent) imitation costs alone are not sufficient to deter low-quality firms from mimicking the high-quality firms. The model suggests that the high-quality firms use the IPO underpricing as a signal about their true quality. The high-quality firms are compensated for making the IPO at a low price by a higher price at the SEO when the true quality of firms is inferred by the investors. The model thus implies that the high-quality firms that underprice their IPOs are more likely to benefit from the subsequent SEO and so they are more likely to make the SEO, issue a larger portion of equity through the SEO rather than the IPO and they are likely to make the SEO sooner after the IPO.

2.2. *Empirical Evidence*

The existing empirical evidence on the signaling models is mixed. Jegadeesh, Weinstein and

Welch (1993) test the signaling model using the U.S data from the period between 1980 and 1986. They find a positive association between the degree of underpricing one side and the probability of making an SEO and the SEO size on the other. However, these results are relatively weak from the economic perspective. Because the results also indicate that the aftermarket returns play important role in predicting future SEOs the authors provide an alternative explanation of the documented relation between IPO underpricing and SEO activity, so called *market feedback hypothesis*. The hypothesis suggests that contrary to the signaling model, it is the investors who have an information advantage over the issuer, perhaps about the aggregate demand for the company stocks or the demand for the output of the investment project the IPO is intended to finance. The issuers make a small IPO and when they see that the demand for the stock is high and the price is growing they issue more stocks in an SEO. Jegadeesh, Weinstein and Welch (1993) conclude that the market feedback seems to be the dominant determinant of the SEO characteristics and therefore the evidence on the signaling hypothesis is weak.

Michaely and Shaw (1994) test the signaling hypothesis formulated by Welch (1989), Allen and Faulhaber (1989) and Grinblatt and Hwang (1989) using the U.S. data from 1984 to 1988. Contrary to the signaling models predictions they find that the firms with higher earnings and paying higher dividends are less underpriced and that more underpriced firms go to the reissue market less often and for lesser amount than less underpriced firms. Hence Michaely and Shaw (1994) do not find evidence consistent with the signaling hypothesis. Slovin *et al.* (1994) document a significantly positive effect of IPO underpricing on excess returns to first SEOs. The finding is consistent with prediction of Welch's model about IPO underpricing as a managerial signal. The authors also show that the returns are inversely related to the proportion of firm shares sold by insiders as part of the SEO. Spiess and Pettway (1997) analyzed whether firms that underpriced their IPOs more received a more favorable market response to the subsequent SEO. They find no evidence that the firms recover the cost of an underpriced IPO in either higher issue proceeds or in greater wealth for the firm's initial owners. Espenlaub and Tonks (1998) examine whether the probabilities and volumes of subsequent SEO or the insider sales are related to the proposed IPO signals and they provide results inconsistent with the signaling hypothesis.

Francis, Hasan and Li (2001) compare the IPO underpricing of foreign and domestic IPOs in

the U.S. between 1990 and 1993 and they conclude that foreign IPOs, that *ceteris paribus* face a larger information asymmetry, are significantly more underpriced, which implies that the level of underpricing is likely related to the *a priori* information asymmetry. Building on this finding Francis *et al.* (2010) revisit the signaling hypothesis using a sample of foreign IPOs in U.S. markets. They base their test on the argument that the willingness of firms to underprice their IPO in order to signal their type depends on the relative costs and benefits for a specific firm. The authors distinguish between the firms from the segmented and the integrated capital markets and they argue that on average the firms from the segmented markets should face a larger information asymmetry than the firms from the integrated capital markets. As the investors may require a substantial premium to compensate for the information risk, the high-quality firms from the segmented markets may thus be more willing to incur the cost of sending the signal to distinguish themselves from the low-quality firms. Using a sample of foreign firms that make an IPO to the U.S. market between 1985 and 2000 the authors document SEO patterns consistent with the signaling hypothesis for the firms from the segmented markets, but not for the firms from the integrated market. This suggests that the *a priori* information asymmetry is an important determinant of the signaling attractiveness.

Following Francis' *et al.* (2010) line of reasoning we investigate whether the signaling hypothesis explains the IPO underpricing at an emerging market where the *a priori* information asymmetry is likely to be high. Several existing papers examine the IPO underpricing in the emerging markets, nevertheless, none of these papers explicitly focuses on using the emerging market setting to test the implications of the signaling model. Loughran *et al.* (1994) document a positive average initial return (i.e. underpricing) for all of the 25 studied countries that including Chile, Hong Kong, Korea, Malaysia, Mexico, Singapore, Taiwan and Thailand. Mok and Hui (1997) study the newly open stock market in Shanghai, China, and they document a large IPO underpricing of 289% for A-shares and only 26% for B-shares. They argue that the extraordinary magnitude is likely to be driven by the 'Chinese characteristics' that include the high equity retention by the state, a significant time delay between the offering and listing, and the *ex ante* risk of the new issues. Su and Fleisher (1999) examine 308 privatization IPOs in China between 1987 and 1995 and they document a staggering initial underpricing of 949%. While the authors argue that their results are consistent both with the signaling models and also with the market feedback model, the

magnitude of the underpricing seems to be too high to reflect an outcome of rational economic bargaining. Rather than motivated by minimizing the cost of the obtained equity capital the sample firms seem to be driven by political considerations or the “bribery” of the bureaucrats as suggested by the authors. Indeed, in a following study Yu and Tse (2006) analyze the underpricing of Chinese IPOs between 1995 and 1998 and they conclude that the signaling hypothesis does not explain well the patterns at the Chinese IPO market and the results are consistent with the winner’s curse hypothesis. Chang *et al.* (2008) divide the IPO underpricing into the initial returns in the primary and secondary markets, they document a significantly positive initial return of Chinese A-shares and they attribute this finding to a higher IPO risk.

Chorruk and Worthington (2010) investigate 136 Thai IPOs made from 1997 to 2008 and they document a mean initial underpricing of 17.6% and observe that the underpricing has not decreased over time. Low and Yong (2011) analyze 368 IPOs made in Malaysia between 2000 and 2007 where the most common mechanism is the fixed-price method and the investors have to make an upfront payment at the time of IPO application, which limits the issuer’s knowledge of the aggregated demand for the issued stocks. They report the mean (median) initial underpricing of 30.8% (17.9%). Even though they do not explicitly study the causes of the documented underpricing they argue that issuers who lower the offer price attract higher investors’ demand, which is consistent with the stronger players using the underpricing to communicate their quality. Hearn (2011) investigates the impact of legal origin and corporate governance on the IPO underpricing using a sample of 37 IPOs from five West African countries. He documents a significant underpricing and concludes that the separation of the CEO and the chairman role and the separation between the CEO and the founder both reduce the IPO underpricing, while a higher independence of committees intended to supervise the insiders does not. Lyn and Zychowicz (2003) analyze the IPO underpricing in Hungary and Poland between 1991 and 1998 and they document a significant underpricing of 15.1% in Hungary and 54.5% in Poland. They identify the percentage change in the local market index 1 month prior to the offering day as the major determinant of the IPO underpricing. Jewartowski and Lizińska (2012) use a more recent sample of Polish IPOs covering the period from 1998 and 2008 and they report the underpricing of 14.0%, which is broadly consistent with our findings. This indicates that the underpricing is a significant phenomenon on the CEE markets. Many of the CEE studies compare the characteristics of

private issuer IPOs with privatization IPOs (PIPO) through which the state sells its previously state-owned enterprises. Dewenter and Malatesta (1997) compare underpricing of privatization and private firm IPOs in Canada, France, Hungary, Japan, Malaysia, Poland, Thailand, and the United Kingdom. They conclude that while there is a significant variation among sample countries, there is no evidence that the privatization IPOs are on average underpriced more. Using a sample of Hungarian IPOs from 1990 to 1998, Jelic and Briston (1999) show that the underpricing of PIPOs is on average larger than the one of other IPOs. They also show that the PIPOs outperform other IPOs in terms of long term returns after the listing. This indicates that the state plans to privatize a larger number of companies may use the underpricing to signal its commitment to market reforms. Aussenegg (2000) analyzes Polish IPOs from 1991 to 1999 and concludes that both private sector IPOs and PIPOs are significantly underpriced with some evidence suggesting that the PIPOs are underpriced slightly more. The author argues that the evidence is consistent with the Polish state trying to build reputation of being market-oriented by underpricing the PIPOs, by selling a high fraction at the IPOs, and by underpricing more when selling to domestic retail investors. Jelic and Briston (2003) investigate Polish PIPO between 1991 and 1999 and they find no evidence that PIPOs are underpriced more than the private sector IPOs. In addition, both domestic and international investors in PIPOs earned on average positive long-term returns after the listing, that were higher than the private sector IPOs average returns only for international investors. This implies that despite of the information disadvantage the international investors may have they choose their PIPO investment targets more successfully.

2.3. *Hypotheses*

The studies reviewed in the preceding section suggest that IPOs are on average significantly underpriced perhaps to a larger degree than in more established markets. In addition, they indicate that the information asymmetry may have been a significant determinant of the underpricing and that the governments may have used PIPO underpricing as a signal about their commitment to the market reforms. We extend these findings by analyzing whether the large information asymmetry at these markets incentivizes also the private issuers to use the IPO underpricing as a signaling device. The signaling model suggests that high-quality firms underprice IPOs in order to be able to issue SEOs at more favorable terms. Hence, to test whether signaling is used we examine if the level of IPO underpricing predicts the likelihood,

the magnitude and the timing of SEOs. Following Jegadeesh, Weinstein and Welch (1993), Yu and Tse (2006), and Francis *et al.* (2010) we formulate several hypotheses. First, the signaling benefit materializes only if a firm makes a subsequent SEO where it can benefit from investors' awareness about its quality. Hence, firms that underprice IPOs are expected to be more likely to make an SEO.

Hypothesis 1: *Firms with more underpriced IPOs are more likely to make an SEO than firms with less underpriced IPOs.*

Furthermore, the magnitude of the benefit depends on the total value of proceeds collected by the firm at the IPO and the SEO. The high-quality firm understands that when signaling it will sell its equity at the IPO at a lower price and it will sell at the SEO at a higher price than without the signal. To maximize the benefit, the high-quality firms are expected to raise a higher fraction of their equity capital at the SEO.

Hypothesis 2: *Firms with higher IPO underpricing are likely to issue larger amounts of at the SEO than firms with lower IPO underpricing.*

If firms use the IPO underpricing to signal their type we expect them that the level of underpricing is determined as a part of the strategy that already anticipates the intention of the firm to return to the market with an SEO. Assuming that it is costly to postpone the investment for which the new equity capital is raised we expect the firms that underprice their IPO more to sooner return to the market to make an SEO.

Hypothesis 3: *Firms with more underpriced IPOs are likely to make the SEO more promptly than firms with less underpriced IPOs.*

It is well established in the prior research that stock markets react on average negatively on SEO announcements (e.g. Asquith and Mullins, 1986; Masulis and Korwar, 1986; Korajczyk, Lucas, and McDonald, 1991; Choe, Masulis, and Nanda, 1993; Gao and Ritter, 2010). There are several possible reasons for the negative stock market reaction. From the trade-off perspective, issuing equity *ceteris paribus* reduces financial leverage and hence it attenuates the disciplining role of debt (Asquith and Mullins, 1986). From the pecking order perspective

the management may have preference over the sources of capital and they access the equity markets only if the retained earnings and the available debt financing are insufficient to cover the existing investment needs. Hence the SEO announcement sends a negative signal about the company's (in)ability to obtain capital from the preferred sources. Alternatively, from the market timing perspective, which currently seems to be the prominent theoretical explanation (DeAngelo, DeAngelo and Stulz, 2010), the stock market may react negatively on the SEO announcements if better-informed managers issue equity only if they observe that it is currently overvalued (e.g., Myers and Majluf, 1984; Baker and Wurgler, 2000). In all the above cases, the negative stock market reaction reflects the downward revision of the investors' intrinsic value estimates based on the news revealed in the SEO announcement.

If the issuers use the IPO underpricing strategically to signal their quality there must be a shared understanding between the issuer and the investors about the meaning of the signal. In such a case the high quality firms are expected to return to the stock market fairly soon after the IPO to issue more equity in order to benefit from the more favorable terms they can obtain after credibly revealing their quality. Hence the signaling model suggests that the 'follow up' SEO are expected from the high quality firms that significantly underprice their IPOs rather than being bad news and hence the stock market reaction should be attenuated, i.e. less negative.

Hypothesis 4: *The market reacts less unfavorably to the announcements of an SEO by firms with more underpriced IPOs than by firms with less underpriced IPOs.*

The hypotheses formulated above are also consistent with alternative explanation suggested by *market-feedback (pooling) hypothesis* (Jegadeesh, Weinstein and Welch, 1993). Similar to the signaling hypothesis the market-feedback hypothesis is based on the assumption of the information asymmetry between the issuer and the investors. However, rather than assuming that the issuer has an information advantage (perhaps over the quality of the firm), the market-feedback hypothesis assumes that the investors have an information advantage over the issuer (perhaps about the demand for the company stocks). The less informed issuers make an IPO and observe how well it is received by the market. If the stock price rises after the IPO the issuer infers that the investors collectively have a favorable view on the future prospect of the firm. Having observed the favorable market reaction following the IPO the issuer updates

their own estimate of the company value and they may decide to obtain additional equity capital through an SEO to increase the scale of the project. Thus both the signaling model and the market-feedback model view the IPO mispricing as a manifestation of uncertainty resolution, nevertheless, they suggest the opposite direction of the flow of information.

In order to distinguish between the two alternative explanations we measure the excess market return in the first months following the IPO (henceforth ‘aftermarket returns’) and formulate four complementary hypotheses (below). Similar to Jegadeesh, Weinstein and Welch (1993) we argue that if the IPO underpricing reflects the revelation of information possessed by the investors, the price discovery process is likely to be a longer term than if the issuers use the underpricing to reflect the signal sent by the better informed issuers to the investors. Hence, if we observe that the SEO characteristics are more related to the aftermarket returns rather than to the IPO-day return (i.e. IPO underpricing) we conclude that the association is likely to be driven by the market feedback, i.e. by the information flow from the investors to the issuer. On the contrary, if we observe that the SEO characteristics are unrelated to the aftermarket returns we conclude that the signaling by the issuer to the investor is the likely explanation.

Hypothesis 1A: *The aftermarket return is a better predictor of the SEO likelihood than the IPO-date return.*

Hypothesis 2A: *The aftermarket return is a better predictor of the SEO size than the IPO-date return.*

Hypothesis 3A: *The aftermarket return is a better predictor of the time between IPO and SEO than the IPO-date return.*

Hypothesis 4A: *The aftermarket return is a better predictor of the stock market reaction on the SEO announcement than the IPO-date return.*

3. Methodology

Consistent with prior literature we test the signaling hypothesis by relating the SEO characteristics (SEO probability, SEO magnitude, SEO timing and the stock market reaction

on SEO announcement) to the level of IPO underpricing (*UP*) (e.g. Michaely and Shaw, 1994, Francis *et al.*, 2010, Jegadeesh, Weinstein and Welch, 1993). To distinguish the signaling hypothesis from the alternative explanation based on the market feedback hypothesis we include in all regressions measures of the aftermarket returns (*AbRet1*, *AbRet2*). If the market feedback is the dominant explanation for the IPO underpricing we expect *AbRet1*, *AbRet2* to load; otherwise the two measures should be insignificant. To mitigate the effect of outliers we Winsorize all variables at 1 % level. As a robustness check we also report results based on the original non-Winsorized sample.

3.1. SEO Probability

We test Hypotheses 1 and 1A on the SEO probability using a logit model:

$$\text{Prob}(\text{SEO})_i = \frac{e^{\alpha + \beta_1 \cdot \text{UP} + \beta_2 \cdot \text{AbRet1} + \beta_3 \cdot \text{AbRet2} + \beta_4 \cdot \text{LnIPO} + \beta_5 \cdot \text{PDA} + \gamma \cdot \text{year fixed effect} + u_i}}{1 + e^{\alpha + \beta_1 \cdot \text{UP} + \beta_2 \cdot \text{AbRet1} + \beta_3 \cdot \text{AbRet2} + \beta_4 \cdot \text{LnIPO} + \beta_5 \cdot \text{PDA} + \gamma \cdot \text{year fixed effect} + u_i}} \quad (1)$$

where $\text{Prob}(\text{SEO})_i$ is the probability that the *i*-th firm issues seasoned equity within three years after the IPO date. *UP* is the IPO underpricing defined as the difference between the first trading day closing price and the issuing price. *AbRet1* (*AbRet2*) are the abnormal aftermarket returns measured over the period between 1 and 20 (21 to 40) trading days after the IPO date. We verify that the minimum time lag between the IPO and the SEO in our sample is 122 calendar days, which implies that the abnormal aftermarket returns are not affected by a concurrent SEO. Consistent with prior research the aftermarket returns are estimated using the market model based on daily stock returns in the estimation window between 41 to 140 trading days following the IPO date. Note that the market model cannot be estimated using the pre-IPO data because no stock price exists before the actual IPO. We use the Warsaw Stock Exchange index (WIG) as a proxy for the market return.

We include several control variables. *LnIPO* captures the IPO size and it is defined as a natural logarithm of IPO value, i.e. the number of shares sold times the issue price. *PDA* a dummy variable that is equal to 1 if a firm issues allotment certificates ('prawo do akcji') and zero otherwise. We include this variable to control for the possibility that the underpricing has different characteristics in firms that decide to issue allotment certificates before actually

listing their stock in the market. We include year fixed effects that control for the variation driven by economic conditions and other effects concentrated in time.

In this regression the IPO underpricing (UP) and the abnormal aftermarket returns ($AbRet1$ and $AbRet2$) are the primary variables of interest. If the underpricing reflects the signal sent by the issuer about their type as suggested by Hypothesis 1 we expect the coefficient β_1 of UP to be positive. Alternatively, if the likelihood of the SEO is driven by the market feedback following the IPO we expect the coefficients β_2 and β_3 of $AbRet1$ and $AbRet2$ to be positive.

3.2. *SEO Size*

We use a Tobit regression to test Hypotheses 2 and 2A on the determinants of the relative SEO size. The use of the Tobit regression accounts for the fact that the recorded sizes of the seasoned offerings are bounded below by zero, i.e. an explicit assumption that the data are left-censored.

$$(SEO / IPO)_i = \begin{cases} \alpha + \beta_1 \cdot UP + \beta_2 \cdot AbRet1 + \beta_3 \cdot AbRet2 + \beta_4 \cdot LnIPO + \beta_5 \cdot PDA + \gamma \cdot year \ fixed \ effect + u_i & \text{if RHS} > 0, \\ 0 & \text{otherwise,} \end{cases} \quad (2)$$

where the size of the seasoned equity offering (SEO/IPO) is measured as the SEO value expressed as a percentage of the IPO value. In line with Jegadeesh, Weinstein and Welch (1993) and Francis *et al.* (2010) we set the dependent variable equal to 0 if a firm does not issue seasoned equity within 3 years after the IPO, i.e. the SEO value is 0% of IPO value. We use the same set of explanatory variables as in the previous regression, namely the IPO underpricing (UP), the after-market abnormal returns ($AbRet1$, $Abret2$), the IPO size ($LnIPO$), the existence of allotment certificates (PDA) and the year fixed effect.

If firms use the IPO underpricing as a signaling device, Hypothesis 2 suggests that the β_1 coefficient at UP should be positive as firms that underprice more are expected to raise a larger fraction of the new equity at the SEO to benefit from the more favorable terms they can obtain after credibly revealing their quality. On the other hand, if the SEO size is determined only after the issuer observes the aftermarket returns as suggested in Hypothesis 2A we

expect the β_2 and β_3 coefficients of variables $AbRet1$, $Abret2$ to be positive.

3.3. *SEO Timing*

We use a Tobit regression to test the Hypotheses 3 and 3A on the determinants of the time lag between IPO and SEO issue.

$$(LnDays)_i = \begin{cases} \alpha + \beta_1 \cdot UP + \beta_2 \cdot AbRet1 + \beta_3 \cdot AbRet2 + \beta_4 \cdot LnIPO + \beta_5 \cdot PDA + \gamma \cdot year \text{ fixed effect} + u_i & \text{if } LHS < Ln(1095) \\ Ln(1095) & , \text{otherwise} \end{cases} \quad (3)$$

where the dependent variable is the natural logarithm of the number of calendar days between the IPO and the SEO ($LnDays$). In line with Francis *et al.* (2010) we only consider SEOs that take place within 3 years after the IPO and we set the dependent variable equal to the natural logarithm of the maximum value, i.e. 1095 days, if a firm does not issue seasoned equity during those three years. We use the Tobit specification that explicitly assumes that data are right-censored. We include the same set of independent variables, the IPO underpricing (UP), the abnormal aftermarket returns ($AbRet1$, $AbRet2$), the IPO size ($LnIPO$), the existence of allotment certificates (PDA) and the year fixed effect.

In case firms use the IPO underpricing as a signaling device, Hypothesis 3 suggests that the β_1 coefficient at UP should be negative because firms that underprice to signal their type are likely to return to the stock market sooner to benefit from the more favorable terms they can obtain after credibly revealing their quality. Alternatively, if the SEO timing is determined only after the issuer observes the aftermarket returns as suggested in Hypothesis 3A we expect the β_2 and β_3 coefficients of variables $AbRet1$, $Abret2$ to be negative. As minimum time between IPO and SEO ($LnDays$) in our sample is equal to 122 calendar days, and so the abnormal after-market returns ($AbRet1$, $AbRet2$) are not influenced by the SEO activity.

3.4. *Market Reaction on SEO Announcement*

We use a standard ordinary least square regression (OLS) to test the Hypotheses 4 and 4A that suggest the determinants of the stock market reaction on the announcement of the SEO issue.

$$\begin{aligned} \text{AnnRea} = & \alpha + \beta_1 \cdot \text{UP} + \beta_2 \cdot \text{AbRet1} + \beta_3 \cdot \text{AbRet2} + \beta_4 \cdot \text{LnIPO} + \beta_5 \cdot \text{PDA} + \gamma \cdot \text{year fixed effect} + \\ & + \gamma_1 \text{LnDays} + \gamma_2 \text{LnSEO} + \gamma_3 (\text{SEO} / \text{IPO}) + u_i \end{aligned} \quad (4)$$

where the stock market reaction on the SEO announcement (*AnnRea*) is measured as the abnormal three-day day return over -1 day to $+1$ day surrounding the SEO announcement. As before to estimate abnormal returns we use the standard market model with the Warsaw Stock Exchange index (WIG) as a proxy for the market return. The market model is estimated on daily returns from the period between -266 days to -11 days prior to SEO announcement and we require the stock returns to be available for at least 100 days for estimation (this condition does not eliminate any observations).

As before the independent variables include the IPO underpricing (*UP*), the abnormal aftermarket returns (*AbRet1*, *AbRet2*), the IPO size (*LnIPO*), the existence of allotment certificates (*PDA*) and the year fixed effect. In addition, consistent with prior literature we include the natural logarithm of the number of calendar days between IPO and the SEO (*LnDays*), the natural logarithm of the size of the SEO (*LnSEO*), the size of the SEO in the relation to the size of the IPO (*SEO/IPO*) as additional control variables. Jegadeesh, Weinstein and Welch (1993) argue that the inclusion of these additional control variables is important to account for the possible differences in the extent to which the market is surprised by the SEO announcements that are unrelated to the stock returns around the time of their IPOs.

If high-quality firms use the IPO underpricing as a signaling device, the market should understand the implications of the signal and rationally anticipate that the high-quality firm that underpriced their IPOs will soon return to the market to make an SEO at more favorable terms. Hence, we expect a weaker (negative) price reaction on the SEO announcement if it follows an IPO underpricing signal. Thus Hypothesis 4 predicts the β_1 coefficient at *UP* to be positive reflecting the less negative stock market reaction on the SEO announcement for firms that signal their quality by IPO underpricing. On the other hand, if the decision to make an SEO is determined based on the observed aftermarket returns as suggested in Hypothesis 4A we expect the β_2 and β_3 coefficients of variables *AbRet1*, *Abret2* to be positive

4. Institutional Setting

When choosing an emerging market suitable for our analysis we have considered the market size, the market composition and the degree of *a priori* information asymmetry in the market. First, the market size is vital to be able to collect a sufficiently large sample. Poland belongs to the top 20 largest economies measured in terms the purchasing power parity adjusted gross domestic product (Kearney, 2012). The Warsaw Stock Exchange (WSE) has grown rapidly after its initiation in 1991 and hence we are able to collect a fairly large sample of IPOs and subsequent SEOs. In the recent years WSE has experienced an intensive IPO activity and it is one of five most active European capital markets in terms of IPOs (see Tables 1 – 3 for the details).

Second, WSE is dominated by small and medium-sized entrepreneurial firms rather than by relatively large, highly regulated firms, which makes the market suitable for analyzing economic interactions driven by private incentives. The prominent position of WSE and its suitability for research purposes has been recognized in prior studies, for example by Lischewski and Voronkova (2012).

“Its market capitalization, trading volume, the number and variety of traded securities make the Polish market the leading stock exchange in the region, satisfying all necessary conditions for reasonable empirical research. ... Additionally, the institutional characteristics of this market, such as presence of a large number of small firms as opposed to a large number of medium-size and large firms on developed markets provide an interesting backdrop for testing what has become an established model.”

(Lischewski and Voronkova, 2012, p. 9)

Third and most importantly, our research design hinges on the existence of significant information asymmetries between the issuer and the investors. Patel, Balic and Bwakira (2002) examine corporate transparency and disclosure quality in emerging countries. They conclude that Poland has the second lowest transparency & disclosure score (36 out of 98 possible) out of the 6 largest emerging economies they consider (second only to Brazil). Claessens and Yurtoglu (2013) analyze the quality of corporate governance in emerging countries and they show that Poland features relatively weak creditor rights and minority shareholder protection. Furthermore, Wisniewski and Bohl (2005) show that corporate

insiders in Poland earn substantially higher insider trading profits than the estimates reported for mature markets and that insider trades conveying the most valuable information tend to be reported with a delay, both of which imply a significant informational asymmetry between the firm managers and the outside investors. Mun and Brooks (2012) document a fairly low press coverage of financial crisis topics in the Polish business press (third lowest score out of 17 investigated countries), which may indicate limited media role in closing the information gap. Dobija and Klimczak (2010) report that the market efficiency and the value relevance of earnings have not significantly improved over time despite of the implementation of financial reporting reforms. Hence, the Polish market seems to be suitable for our analysis as it is both sufficiently large and active in terms of IPOs and SEOs and at the same time it represents a setting with an information asymmetry sufficiently large to render the signaling strategy attractive.

The Warsaw Stock Exchange (WSE) started the trading on April 16, 1991. The number of companies listed on main market has grown from 9 in 1991 to 438 in 2012. Table 1 shows the development of WSE main market over this time period. The IPOs are clustered in time with the first ‘hot market’ in 1997 and 1998 when more than 50 companies per year were introduced to trading and the second ‘hot market’ in 2008 when 81 companies were listed. Conversely, in 2002 and 2003 the number of listed companies actually declined as more companies were delisted from then introduced to the market. The average company size has been increasing fairly steadily over time since 1994 with the exception of years 2001 and 2008 when the financial crisis depressed the market capitalization. The growth in the average company size has increased in the years after 2003 when the first foreign company got listed in main market as the foreign companies are on average almost 10-times the size of the domestic companies. In 2012 43 foreign companies were listed as compared to 395 domestic companies, but they constituted nearly a third of the total market capitalization. A half of the foreign companies (22) are dual listed companies. Another increase in the average company size in 2009 and 2010 was caused by the introduction of several large privatized IPOs, e.g. ENEA, PGE, Tauron (energy), and PZU (insurance).

INSERT TABLE 1 HERE

Table 2 shows the market capitalization of CEE and SEE stock exchanges over last eight years. During that time WSE became the largest stock market in the post-communist countries in terms of total market capitalization. With the aggregate market capitalization of EUR 134 billion at the end of 2012 WSE is almost five times the size of the Prague Stock Exchange, almost nine times the size of the Budapest Stock Exchange and almost thirty three times the size of the Bratislava Stock Exchange. In addition, WSE has recently experienced an intensive IPO activity and it is one of five most active European capital markets in terms of IPOs, which resulted in the WSE outgrowing also the Vienna Stock Exchange and the Athens Stock Exchange.

INSERT TABLE 2 HERE

Table 3 provides a comparison of the issue activity and the offering values between the WSE with the main European IPO markets. In the eight tabulated years the WSE has listed the second largest number of companies (268) with only the London Stock Exchange listing more (399). Nevertheless, the size of the firms listed at the WSE is smaller than in the other exchanges, which implies that the WSE ranks only five in the total offering value. WSE was less affected by the crisis years 2008 – 2010 during which time it was the second most active stock exchange both in terms of the number of listed firms and the total offering value. As noted before, the primary reason the intensive issuing activity in the crisis years is the privatization of several large Polish companies, e.g. ENEA, PGE, Tauron, and PZU. All these companies were among the ten largest IPOs in a given year.

INSERT TABLE 3 HERE

5. Data Sample

We obtain our sample using two main sources: (i) the WSE websites and publications², and (ii) the Thomson Reuters One database. The sample consists of companies that make their IPO between 2005 and 2009 (inclusive). We start our sample period in 2005 because before 2005 the data about the size of IPO are incomplete (only newly issued shares are available) and the data about SEO issue (i.e. SEO date, SEO price and SEO volume) are highly inconsistent. We end the sample period in 2009 because we require three years of post-IPO data to be able to analyze of the company made an SEO in these three subsequent years. Our initial sample includes 200 domestic and foreign IPOs. We exclude 12 privatization IPOs (PIPOs) of state-owned enterprises because the information asymmetry between the issuer and the investors is likely to differ in these firms relative to the private sector IPOs. In addition, since the state is an owner that makes multiple IPOs the nature of its signaling strategy may differ. The signaling benefits may not only be realized through the SEO, but also through PIPOs made later on in time after the state has already built up some reputation through the pricing of early PIPOs. We exclude 13 companies that were listed elsewhere before they made their IPO at the WSE due to possibly different level of the information asymmetry resulting from higher disclosure requirements for listed companies in the countries where they are already listed. Similar to cross-listing, we also exclude 2 firms that entered the main market by transferring from the less regulated market (NewConnect). Finally, we exclude 15 companies due to the lack of available data on the IPO volume. The sample selection procedure is summarized in Table 4. Our final sample consists of 158 IPOs. Consistent with Jegadeesh, Weinstein and Welch (1993) and Francis *et al.* (2010) we consider SEOs that take place within 3 years after an IPO. In our sample 25 out of 158 companies make an SEO in the following three years.

INSERT TABLE 4 HERE

² There are used the original website www.gpw.pl as well as information website www.gpwinfostrefa.pl. News from main markets about issuing equity offerings is available since 2005.

Table 5 shows the descriptive statistics for our final sample. Panel A shows the statistics for the entire sample, Panel B for the subsample of companies that made an SEO within the 3 years after the IPO, and Panel C for the subsample of companies that did not make an SEO during that time. Only 15.8 % of IPOs issued SEO within 3 years after IPO. More than 60 % of IPOs used allotment certificates when they issued IPOs. The mean (median) value of IPO underpricing for full sample is positive and equal to 15.7 % (6.6 %). The IPOs that are followed by an SEO are underpriced more both when it comes to the mean (28.2 % relative to 13.4 %) and median underpricing (10.8 % relative to 6.1 %). This provides some preliminary evidence consistent with the signaling hypothesis. The mean of first 20 days abnormal return following the IPOs (*AbRet1*) is equal to 0 for firms that did not issue SEO within upcoming 3 years and it is slightly negative (-0.04) for firms with an SEO. On the other hand, the mean of second 20 days abnormal return after IPOs (*AbRet2*) is positive for both groups. Median values of abnormal aftermarket returns (*AbRet1*, *AbRet2*) are negative for all groups. The mean value of the IPO size (*LnIPO*) for full sample is equal to 17.383 and there is almost no difference between IPOs with and without a following SEO (17.472 vs. 17.336). Firms with an SEO on average issued SEO that has higher value that IPO (higher about 34.7 %).

INSERT TABLE 5 HERE

Table 6 presents more detailed statistics about IPOs in individual years. The mean first day return (i.e. the IPO underpricing) for the whole sample period is 15.7%. The aggregate proceeds for the full sample are 13.36 billion PLN and the total amount of money left on the table by the issuers is 1.73 billion PLN. For a better comparison of the mean first day return (*UP*), we also compute the weighted average of *UP* where the weights are determined by the IPO value. The proceeds-weighted mean of first day return is equal to 12.95 % that is lower than equally-weighted mean but still significantly non-negative. The mean of equal-weighted IPO underpricing for corresponding years are positive except the year 2008.

INSERT TABLE 6 HERE

Table 7 shows the correlation matrix for the variables we use in our regressions. We are

primarily interested in the correlation between variables related to the SEOs (*SEO*, *LnDays*, *SEO/IPO*, *AnnRea*) and the variables capturing signaling or market feedback (*UP*, *AbRet1*, *AbRet2*). The table provides evidence about the expected correlation between the IPO underpricing (*UP*) with probability of SEO issue (*SEO*), the relative size of SEO as a fraction of IPO (*SEO/IPO*), the time between the IPO and the SEO (*LnDays*) and market reaction to the SEO announcement (*AnnRea*). Except for the market reaction to the SEO announcement (*AnnRea*), all these correlations are significant at 5 % level. On the other hand, none of the correlations between the abnormal market returns (*AbRet1* and *AbRet2*) and the SEO characteristics is significant. If anything the correlations with *SEO* and *SEO/IPO* are negative (insignificant), contrary to the market feedback hypothesis. The correlation matrix thus provides some early indication about the data may be consistent with the signaling hypothesis, but not with the market feedback hypothesis.

INSERT TABLE 7 HERE

6. Empirical Results

6.1. Signaling Model

Our results, presented in Table 8, are consistent with the prediction of the signaling model. We show that firms with more underpriced IPOs are more likely (i) to issue SEOs; (ii) to issue larger SEOs and (iii) to issue SEOs more promptly after the IPO. In line with Hypothesis 1 the results of the logit regression show a positive and statistically significant relationship (*z*-stat 2.63) between the level of underpricing (*UP*) and the probability of SEO ($\text{Prob}(\text{SEO})$). We also find support for Hypotheses 2 that expects firms with more underpriced IPOs to issue a larger portion of new equity at the following SEO. The slope coefficient of the IPO underpricing (*UP*) is positive and statistically significant (*t*-stat 2.68). Furthermore, our results are consistent with Hypothesis 3 that suggests that firms with more underpriced IPOs make their SEO sooner. In a regression where the dependent variable is the log of the number of days between the IPO and the SEO (*LnDays*) the slope coefficient of the IPO underpricing (*UP*) is negative and statistically significant (*t*-stat -2.52). Note that despite of the relatively low number of observations (158 IPOs and 25 SEOs) the first two results are statistically

significant even at 1% level (p -values 0.0094 and 0.0081 respectively) and the third result approaches the significance at 1% level (p -value 0.0127) (p -values not tabulated).

On the contrary, our results are not consistent with prediction in Hypothesis 4 that the market reacts less unfavorably to the announcement of an SEO by firms with more underpriced IPOs. The effect of IPO underpricing (UP) on announcement reaction is not statistically different from zero (t -stat 0.20). We believe that the insignificant result can be caused by different implications of the SEO announcement in an emerging market relative to the established market. As argued above, the existing evidence suggests that in the established markets the investors typically view the SEO announcement as bad news either because it suggests that the managers had to resort to the least preferred source of financing (pecking order) or because it reveals managers' belief that the stock may be overvalued (market timing). However, the degree to which the investors perceive the SEO announcement as a negative signal may depend on the economic circumstances. Choe, Masulis, and Nanda (1993) show that the price reaction on SEO announcement is less negative in the times of economic expansion (rather than contraction) when the adverse selection problem is less severe as firms have more promising investment opportunities and there is less uncertainty about the value of their assets.

In an emerging market populated mostly by growing companies SEOs may be simply motivated by additional capital needs rather than by managerial preferences over capital sources or their considerations about the appropriateness of the current stock price. To assess the plausibility of this idea we compute the mean stock market reaction on the SEO announcement. We find that the mean three-day stock market reaction on the SEO announcement is 0.3% (not tabulated), which is a positive number not statistically different from zero (t -stat 0.29). This implies that in an emerging market the investors do not view the SEO announcement as a bad news and therefore there is little reason to expect the stock market reaction to be affected by IPO underpricing. This result is consistent with Gajewski and Ginglinger (2002) who report that in contrast to the U.S. results, several studies on European and Australian data find a non-negative or even positive stock price reaction on the SEO announcement.

INSERT TABLE 8 HERE

As a complement to the regression results we provide a quintile analysis in Table 9 in order to evaluate the consistency of the reported results across the different sections of the distribution and to see what parts of the distribution drive the results. Panel A presents the actual and predicted percentages of firms making SEOs within three years after the IPO for each quintile based on IPO underpricing. Both the extreme quintiles 1 and 5 differ from the rest of the distribution. Only about 6.3% of the firms in the lowest *UP* quintile issue SEOs compared to nearly 22.6% of the firms in the highest *UP* quintile. There is one exception (*UP* quintile 2) to the monotonic increase on the SEO likelihood across the *UP* quintiles.

Panel B of Table 9 reports the actual and predicted mean of relative SEO size (*SEO/IPO*). There is a clear tendency of the relative SEO size to increase across the *UP* quintiles. The mean relative SEO size is 10.0% for the lowest quintile and 51.3% for the highest quintile. Only quintile 3 does not conform to the increasing pattern over the *UP* quintiles. The table also shows that the results on the SEO relative size are primarily driven by the quintile 5, i.e. by firms with the highest level of underpricing. This is consistent with the prediction of the signaling theory that it is the firms that are particularly aggressive in pricing their IPOs that have most to gain from distinguishing themselves from the rest of the population and that eventually raise large amounts of equity through their subsequent SEO.

Panel C of Table 9 shows the average number of days between the IPO and the SEO for the individual *UP* quintiles. For the lowest IPO underpricing quintile the mean number of days between IPO and SEO is 1067 compared to 946 for the highest quintile, consistent with the tendency of firms that underprice their IPOs more to issue seasoned equity sooner. The pattern is fairly homogeneous across the individual quintiles with the exception of quintile two shows the shortest lag (884 days). The decisions about the SEO timing may have been affected by the financial crisis that may have changed the anticipation of the issuers and make them postpone the SEOs.

INSERT TABLE 9 HERE

6.2. *Market Feedback Model*

The results presented in the previous section provide fairly coherent evidence on the relevance of IPO underpricing for predicting the SEO characteristics, which is consistent with the signaling model. Nevertheless, a common concern regarding these results is that they are also consistent with an alternative explanation based on the market feedback. The change in price in the first day of trading (*UP*) may represent the market-wide perception about the issuer's value. Contrary to the signaling model that assumes that the issuer has an information advantage over the investors, it is conceivable that the issuers do not know the precise value of the company part of which they sell. They issue a smaller portion of equity at the IPO and wait how the market reacts, which reveals the aggregate market valuation of the company. If the market perception is favorable the firm decides to issue more equity through an SEO. The market feedback model thus makes similar predictions about the relationship between the IPO underpricing and the following SEO characteristics, but it is based on a starkly different points of departure. While the signaling model assumes the information advantage of the issuer, the market feedback assumes the information advantage of the investors.

Fortunately, there is a way to distinguish between the two competing explanations. If the market feedback is the dominant explanation then one could expect that the price discovery process will continue for some time and therefore not just the first-trading-day return (*UP*) but also the return in the following days (*AbRet1* and *AbRet2*) should be in a similar way related to the IPO characteristics. In contrast, if the issuers underprice IPOs to signal their quality there is no reason to expect a relationship between the aftermarket returns (*AbRet1* and *AbRet2*) and the SEO characteristics. In fact, Jegadeesh, Weinstein and Welch (1993) report some evidence that the SEO characteristics are related to the IPO underpricing (*UP*) but at the same time they find an even stronger association between the SEO characteristics and the aftermarket returns (*AbRet1* and *AbRet2*). They conclude that this result fails to provide a robust support for the signaling model because the *UP* may be just the first phase of the price discovery process and hence the former association may be driven by the market feedback.

In contrast to Jegadeesh, Weinstein and Welch (1993) our results presented in Tables 8 and 9 provide an unambiguous support for the signaling model. More specifically, we find no evidence of an association between aftermarket returns (*AbRet1* and *AbRet2*) and subsequent SEO activity. The regression results reported in Table 8 show that neither *AbRet1* nor *AbRet2*

are statistically significant in any of the four regression specifications. The z -statistics/ t -statistics on *AbRet2* range between -0.17 and 0.35 , which clearly indicates the lack of association. The z -statistics/ t -statistics on *AbRet1* are larger in magnitude and they range between -1.18 and 0.63 , but the two largest z -statistics/ t -statistics (in absolute value) in Model 1 (-1.18) and Model 2 (-1.15) are actually negative, which is contrary to the prediction of the market feedback theory. In line with the regression results the quintile analysis reported in Table 9 does not show any consistent pattern between *AbRet1* and *AbRet2* and the SEO characteristics. Hence we find no evidence consistent with Hypotheses 1A – 4A and so we may ascribe the result documented in the previous section to the signaling theory. Our results are thus consistent with Francis *et al.* (2010).

6.3. Robustness Check

To mitigate the effect of potential outliers we Winsorize all the regression variables at 1% level. As a robustness check in Table 10 we also report the regression results based on the non-Winsorized data. Comparing Table 8 and Table 10 one can conclude that in all regression specifications the results for *UP*, *AbRet1* and *AbRet2* are unchanged even when it comes to the statistical significance of the individual results (considering the significance at the conventional 5% level). Hence, clearly our results reported above are not driven by the elimination of the most extreme observations by Winsorizing.

INSERT TABLE 10 HERE

7. Conclusion

The existence of the IPO underpricing has attracted a lot of research interest ever since it was first rigorously documented by Logue (1973), Reilly (1973) and Ibbotson (1975). Several explanations have been proposed including the signaling model that suggests that the underpricing reflects the issuers' strategic decision to sell at a price lower than the intrinsic value to signal their quality to the investors and to subsequently issue seasoned equity at more favorable terms (Welch, 1989). The initial empirical evidence on the signaling model was weak and researchers concluded that the market feedback rather than the issuer's signal

seemed to be the primary driver of the SEO activity (Jegadeesh, Weinstein and Welch, 1993). Recently, however, Francis *et al.* (2010) have revisited the signaling theory using a sample of foreign IPOs on U.S. capital market. They argue that the lack of empirical support for the IPO signaling hypothesis stems from the difficulty in identifying the group of firms that face a sufficiently large information asymmetry to be willing to use the costly signaling strategy to credibly communicate their quality. They conclude that firms from segmented but not from integrated markets underprice their IPOs to signal their type when listing at a U.S. equity market.

Following this line of reasoning we test the signaling theory in an emerging market where the information asymmetry is likely to be high and where the benefits of the signal may plausibly outweigh its costs. Using a sample of 158 Polish IPOs from 2005 to 2009 we document a significant underpricing of 15.7% on average. More importantly, we show that firms the underprice their IPOs more (i) are more likely to make an SEO in the three years after the IPO, (ii) make larger SEOs relative to the preceding IPO value, and (iii) make their SEO faster. Despite of the limited number of observations these results are highly statistically significant. In addition, we find no association between the three SEO characteristics and the aftermarket return following the IPO. Taken together these results are inconsistent with the alternative market feedback explanation and thus they provide an unambiguous support for the signaling theory.

We conclude that the signaling model provides plausible predictions of the issuers' behavior in an emerging IPO market. The initial lack of empirical support may have been driven by the quality of the U.S. institutional setting that reduces the *a priori* information asymmetry to the extent that renders signaling by IPO underpricing unattractive for the issuers. In a setting where large information asymmetries are likely we find a consistent empirical support for the signaling model.

Future research may further explore the relationship between the propensity to use the IPO underpricing for signaling purposes and the *a priori* information asymmetry in the market. First, it may be interesting to see if the companies that underprice their IPOs attract a different kind of investors. The level of information asymmetry may be different for the domestic and foreign investors, for the private and institutional investors. Future research may investigate if

the IPO underpricing affects the demand of these investor groups differently. Second, as the emerging markets mature, the market actors accumulate experience and reputation and the institutional requirements and their enforcement converge to the established standards the information asymmetry may get reduced and the alternative channels of communication may become more effective, which both may render signaling by IPO underpricing too costly relative to the alternatives. Future research may investigate if this prediction materializes. Third, there may be one-time shocks to the tendency of the information asymmetry to decrease. Prior research shows that the integration of the Central and Eastern European countries into the European Union affects the investors' risk (e.g. Dvořák and Podpiera, 2006). Hence, it is conceivable that for example the adoption of the euro as the country currency will be interpreted as a sign of the country's and the EU's commitment for a deeper integration, which should decrease the investors' risk and thereby reduce the issuers' incentives to use the IPO underpricing as a signaling device.

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References

- Allen, F., Faulhaber, G.R., 1989. Signaling by underpricing in the IPO market. *Journal of Financial Economics*, 23, 303-324.
- Asquith, P., Mullins, D.W., 1986. Equity issues and offering dilution. *Journal of Financial Economics*, 15, 61-89.
- Aussenegg, W., 2000. Privatization Versus Private Sector Initial Public Offerings in Poland. *Multinational Finance Journal*, 4, 69-99.
- Baker, M., Wurgler, J., 2000. The Equity Share in New Issues and Aggregate Stock Returns. *The Journal of Finance*, 55, 2219-2257.
- Benveniste, L.M. Spindt, P. A., 1989. How investment bankers determine the Offer price and allocation of initial public offerings. *Journal of Financial Economics*, 24, 343-362.
- Brennan, M.J., Franks, J., 1997. Underpricing, Ownership and Control in Initial Public Offerings of Equity Securities in the U.K.. *Journal of Financial Economics*, 45, 391-413.
- Chang, E., Chen, C., Chi J., Young, M., 2008. IPO underpricing in China: New evidence from the primary and secondary markets. *Emerging Markets Review*, 9, 1-16.
- Choe, H., Masulis, R.W., Nanda, V., 1993. Common stock offerings across the business cycle: Theory and evidence. *Journal of Empirical Finance*, 1, 3-31.
- Chorruk, J., Worthington, A.C., 2010. New evidence on the pricing and performance of initial public offerings in Thailand, 1997-2008. *Emerging Markets Review*, 11, 285-299.
- Claessens, S., Yurtoglu, B.B., 2013. Corporate governance in emerging markets: A survey. *Emerging Markets Review*, 15, 1-33.
- DeAngelo, H., DeAngelo, L., Stulz, R.M., 2010. Seasoned equity offerings, market timing, and the corporate lifecycle. *Journal of Financial Economics*, 95, 275-295.

Dewenter, K.L., Malatesta, P.H., 1997. Public Offerings of State-Owned And Privately-Owned Enterprises: An International Comparison. *The Journal of Finance*, 52, 1659-1679.

Dobija, D., Klimczak, K.M., 2010. Development of accounting in Poland: Market efficiency and the value relevance of reported earnings. *The International Journal of Accounting*, 45, 356-374.

Espenlaub, S., Tonks, I., 1998. Post-IPO Directors' Sales and Reissuing Activity: An Empirical Test of IPO Signalling Models. *Journal of Business Finance and Accounting*, 25, 1037-1079.

Francis, B., Hasan, I., Li, F., 2001. Underpricing of Foreign and Domestic IPOs in the U.S. Market: Empirical Evidence. *Financial Markets, Institutions and Instruments*, 10, 1-18.

Francis, B.B., Hasan, I., Lothian, J.R., Sun, X., 2010. The signaling hypothesis revisited: Evidence from foreign IPOs. *Journal of Financial and Quantitative Analysis*, 45, 81-106.

Francis, B.B., Hasan, I., Zhou, M., 2012. Strategic Conservative Earnings Management of Technology Firms: Evidence from the IPO Market. *Financial Markets, Institutions and Instruments*, 21, 261-293.

Gajewski, J.F. and Ginglinger, E., 2002. Seasoned Equity Issues in a Closely Held Market: Evidence from France. *European Finance Review*, 6, 291-319.

Gao, X., Ritter, J.R., 2010. The marketing of seasoned equity offerings. *Journal of Financial Economics*, 97, 33-52.

Grinblatt, M., Hwang, C.Y., 1989. Signaling and pricing of new issues. *Journal of Finance*, 44, 393-420.

Hasan, I., Waisman, M., 2010. Going Public: An Empirical Investigation of U.S. Bound Israeli IPOs. *Financial Markets, Instruments, and Institutions*, 19, 215-244.

Hensler, D.A., 1995. Litigation Costs and the Underpricing of Initial Public Offerings.

Managerial and Decision Economics, 16, 111-128.

Hughes, P.J., Thakor, A.V., 1992. Litigation risk, intermediation, and the underpricing of initial public offerings. *Review of Financial Studies*, 5, 709-742.

Ibbotson, R.G., 1975. Price performance of common stock new issues. *Journal of Financial Economics*, 2, 235-275.

Jegadeesh, N., Weinstein, M., Welch, I., 1993. An empirical investigation of IPO returns and subsequent equity offerings. *Journal of Financial Economics*, 34, 153-175.

Jelic, R., Briston, R., 1999. Hungarian privatization strategy and financial performance of privatized companies. *Journal of Business Finance and Accounting*, 26, 1319-1357.

Jelic, R., Briston, R., 2003. Privatisation Initial Public Offerings: the Polish Experience. *European Financial Management*, 9, 457 - 484.

Jewartowski, T., Lizińska, J., 2012. Short- and Long-Term Performance of Polish IPOs. *Emerging Markets Finance and Trade*, 48, 59-75.

Karolyi, G.A., 2012. Corporate governance, agency problems and international cross-listings: A defense of the bonding hypothesis. *Emerging Markets Review*, 13, 516-547.

Kearney, C., 2012. Emerging markets research: Trends, issues and future directions. *Emerging Markets Review*, 13, 159-183.

Korajczyk, R.A., Lucas, D.J., McDonald, R.L., 1991. The effect of information releases on the pricing and timing of equity issues. *Review of Financial Studies*, 4, 685-708.

Korczak, P. and Bohl, M.T., 2005. Empirical evidence on cross-listed stocks of Central and Eastern European companies. *Emerging Markets Review*, 6, 121-137.

Leuz, C. and Verrecchia, R., 2000. The Economic Consequences of Increased Disclosure. *Journal of Accounting Research*, 38, 91-124.

Lischewski, J., Voronkova, S., 2012. Size, value and liquidity. Do They Really Matter on an Emerging Stock Market? *Emerging Markets Review*, 13, 8-25.

Ljungqvist, A., 2004. IPO Underpricing, in: Eckbo, B.E., (Ed.) *Handbook of Corporate Finance: Empirical Corporate Finance*, Elsevier.

Ljungqvist, A., Wilhelm, W.J., 2005. Does Prospect Theory Explain IPO Market Behavior? . *Journal of Finance*, 60, 1759-1790.

Ljungqvist, A., Nanda, V., Singh, R., 2006. Hot Markets, Investor Sentiment, and IPO Pricing. *Journal of Business*, 79, 1667-1702.

Logue, D.E., 1973. On the pricing of unseasoned equity issues: 1965-1969. *Journal of Financial and Quantitative Analysis*, 8, 91-103.

Loughran, T., Ritter, J.R., Rydqvist, K., 1994. Initial public offerings: International insights. *Pacific-Basin Finance Journal*, 2, 165-199.

Lowry, M., Shu, S., 2002. Litigation risk and IPO underpricing. *Journal of Financial Economics*, 65, 309-335.

Lyn, E., Zychowicz, E., 2003. The performance of new equity offerings in Hungary and Poland. *Global Finance Journal*, 14, 181-195.

Masulis, R.W., Korwar, A.N., 1986. Seasoned equity offerings: An empirical investigation. *Journal of Financial Economics*, 15, 91-118.

Michaely, R., Shaw, W.H., 1994. The pricing of Initial Public Offerings: Test of Adverse Selection and Signaling theories. *Review of Financial Studies*, 7, 279-319.

Mok, H.M.K., Hui, Y.V., 1998. Underpricing and aftermarket performance of IPOs in Shanghai, China. *Pacific-Basin Finance Journal*, 6, 453-474.

Mun, M., Brooks, R., 2012. The roles of news and volatility in stock market correlations

during the global financial crisis. *Emerging Markets Review*, 13, 1-7.

Myers, S.C., Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13, 187-221.

Patel, S.A., Balic, A., Bwakira, L., 2002. Measuring transparency and disclosure at firm-level in emerging markets. *Emerging Markets Review*, 3, 325-337.

Reilly, F.K., 1973. Further evidence on short-run results for new issues investors. *Journal of Financial and Quantitative Analysis*, 8, 83-90.

Ritter, J., 1991. The Long-Run Performance of Initial Public Offerings. *Journal of Finance*, 46, 3-27.

Ritter, J.R., Welch, I., 2002. A Review of IPO Activity, Pricing, and Allocations. *Journal of Finance*, 57, 795-828.

Rock, K., 1986. Why new issues are underpriced. *Journal of Financial Economics*, 15, 187-212.

Rydqvist, K., 1997. IPO Underpricing as Tax-Efficient Compensation. *Journal of Banking and Finance*, 21, 295-313.

Slovin, M.B., Sushka, M., E., Bendeck, Y., M., 1994. Seasoned common stock issuance following an IPO. *Journal of Banking and Finance*, 18, 207-226.

Spiess, K.D., Pettway, R.H., 1997. The IPO and First Seasoned Equity Sale: Issue Proceeds, Owner/Manager Wealth, and the Underpricing Signal. *Journal of Banking and Finance*, 21, 967-988.

Stoughton, N.M., Zechner, J., 1998. IPO Mechanisms, Monitoring and Ownership Structure. *Journal of Financial Economics*, 49, 45-78.

Su D.W., Fleisher B.M., 1999. An empirical investigation of underpricing in Chinese IPOs.

Pacific-Basin Finance Journal, 7, 173-202.

Warner, J.B., Watts, R.L., Wruck, K.H., 1988. Stock prices and top management changes. *Journal of Financial Economics*, 20, 461-492.

Welch, I., 1989. Seasoned offerings, imitation costs and the underpricing of initial public offerings. *Journal of Finance*, 44, 421-450.

Wisniewski, T.P., Bohl, M.T., 2005. The Information Content of Registered Insider Trading Under Lax Law Enforcement. *International Review of Law and Economics*, 25, 169-185.

Yu, T., Tse, Y.K., 2006. An Empirical Examination of IPO underpricing in the Chinese A-share market. *China Economic Review*, 17, 363-382.

Table 1 – Warsaw Stock Exchange

Year	List	Delist	Firms			Market Capitalization		
			<i>Domestic</i>	<i>Foreign</i>	<i>Total</i>	<i>Domestic</i>	<i>Foreign</i>	<i>Total</i>
1991	9	0	9	0	9	161	---	161
1992	7	0	16	0	16	351	---	351
1993	6	0	22	0	22	5 845	---	5 845
1994	22	0	44	0	44	7 450	---	7 450
1995	21	0	65	0	65	11 271	---	11 271
1996	18	0	83	0	83	24 000	---	24 000
1997	62	2	143	0	143	43 766	---	43 766
1998	57	2	198	0	198	72 442	---	72 442
1999	28	5	221	0	221	123 411	---	123 411
2000	13	9	225	0	225	130 085	---	130 085
2001	9	4	230	0	230	103 370	---	103 370
2002	6	19	217	0	217	110 565	---	110 565
2003	5	19	202	1	203	140 001	27 715	167 716
2004	36	9	225	5	230	214 313	77 385	291 698
2005	35	10	248	7	255	308 418	116 482	424 900
2006	38	9	272	12	284	437 719	198 190	635 909
2007	81	14	328	23	351	509 887	570 370	1 080 257
2008	33	10	349	25	374	267 359	197 756	465 115
2009	13	8	354	25	379	421 178	294 643	715 821
2010	34	13	373	27	400	542 646	253 836	796 482
2011	38	12	387	39	426	446 151	196 712	642 863
2012	19	7	395	43	438	523 390	210 657	734 047

Note: List represents the number of newly listed firms on the main market. Delist is the number of firms delisted from main market. Market Capitalization shows the aggregate value of all traded shares in million Polish zloty (PLN). Source: WSE.

Table 2 – CEE and SEE Stock Exchanges Market Capitalization (bil. euro)

Exchange	Year							
	2005	2006	2007	2008	2009	2010	2011	2012
Warsaw (POL)	79.35	112.83	144.32	65.18	105.16	142.27	107.48	134.76
Vienna (AUT)	107.04	151.01	161.73	54.75	79.51	93.94	65.68	80.43
Athens (GRE)	123.03	152.21	181.23	64.74	78.5	50.38	26.02	34.04
Prague (CZE)	31.06	34.69	47.99	29.62	31.27	31.92	29.20	28.19
Budapest (HUN)	27.59	31.69	31.53	13.33	20.89	20.62	14.63	15.74
Bucharest (ROM)	13.54	18.86	21.52	6.47	8.4	9.78	10.82	12.09
Sofia (BGR)	4.31	7.83	14.82	6.37	6.03	5.5	6.36	5.03
Ljubljana (SVN)	6.7	11.51	19.74	8.47	8.46	6.99	4.87	4.91
Bratislava (SVK)	3.73	4.21	4.55	3.91	3.61	3.38	4.18	4.09

Note: The market capitalization is computed for all market (main and alternative) in billions of euro (EUR). The market capitalization includes shares of domestic companies and shares of foreign companies which are exclusively listed on an exchange (i.e. the foreign company is not listed on any other exchange). Source: FESE.

Table 3 – IPO Markets in Europe

Stock Exchange	2005		2006		2007		2008		2009		2010		2011		2012		Total	
	<i>N</i>	<i>Value</i>	<i>N</i>	<i>Value</i>	<i>N</i>	<i>Value</i>	<i>N</i>	<i>Value</i>	<i>N</i>	<i>Value</i>	<i>N</i>	<i>Value</i>	<i>N</i>	<i>Value</i>	<i>N</i>	<i>Value</i>	<i>N</i>	<i>Value</i>
London Stock exchange	41	12.52	97	27.68	99	27.64	38	7.14	9	0.62	52	9.03	39	13.37	24	4.35	399	102.36
NYSE Euronext	25	16.17	49	20.81	40	7.56	16	2.47	6	1.91	11	0.34	8	0.04	11	1.02	166	50.31
Frankfurt Stock Exchange	19	3.52	38	6.28	28	6.73	2	0.32	1	0.05	10	2.30	13	1.45	10	2.11	121	22.75
Spanish Stock Exchange	1	0.16	10	2.97	12	10.08	1	0.29	1	-	2	1.51	4	6.07	-	-	31	21.09
Warsaw Stock Exchange	35	1.74	38	1.05	80	1.98	30	2.46	12	1.58	26	3.77	31	2.07	16	0.70	268	15.33
Italian Stock Exchange	15	2.40	21	4.33	29	3.94	6	0.13	1	0.11	2	2.10	3	0.49	1	0.16	78	13.66
NASDAQ OMX	27	2.15	45	2.50	35	2.30	10	0.15	6	0.07	15	2.01	13	0.29	8	0.04	159	9.50
Oslo Stock Exchange	30	1.39	15	1.46	18	1.26	4	0.00	-	-	9	2.36	4	0.55	3	0.29	83	7.32
Swiss Stock Exchange	10	2.14	9	1.02	10	1.98	6	0.17	4	-	4	0.16	2	-	4	0.80	49	6.27
Vienna Stock Exchange	7	1.16	7	1.72	6	1.43	-	-	-	-	-	-	2	0.37	-	-	22	4.67
Irish Stock Exchange	-	-	1	0.50	1	1.50	1	-	-	-	-	-	-	-	-	-	3	2.00
Luxemburg Stock Exchange	18	1.46	-	-	-	-	4	0.02	-	-	-	-	-	-	1	-	23	1.48
Athens Stock Exchange	2	0.03	2	0.61	3	0.48	-	-	1	0.01	-	-	-	-	-	-	8	1.13

Note: The number and value of IPOs in individual European stock exchanges (main market only) excluding dual listings. Value stated in billions euro. Source: PWC IPO WATCH.

Table 4 - Sample Construction

Initial sample	200
Cross-listings	-13
Privatization IPOs	-12
Transferred from NewConnect	-2
Missing information about IPO volume	-15
Final sample	158

Note: The initial sample includes all IPOs made in WSE main market over the period between 2005 and 2009. Cross-listings refer to companies that were listed elsewhere before they made their IPO at the WSE. Privatization IPOs refer to state-owned enterprises that for which the IPO was used as a privatization strategy as stated in the Factbook of the WSE. Transferred firms entered the main market after being listed on the alternative market (NewConnect). Source: WSE.

Table 5 – Descriptive Statistics

	N	Mean	StdDev	Med	Min	Max
<i>Panel A – All IPOs</i>						
<i>UP</i>	158	0.157	0.291	0.066	-0.191	1.599
<i>AbRet1</i>	158	-0.006	0.153	-0.020	-0.291	0.553
<i>AbRet2</i>	158	0.014	0.144	-0.007	-0.356	0.508
<i>LnIPO</i>	158	17.383	1.317	17.309	13.503	20.547
<i>PDA</i>	158	0.620	0.487	1.000	0.000	1.000
<i>SEO</i>	158	0.158	0.366	0.000	0.000	1.000
<i>SEO/IPO</i>	158	0.288	0.836	0.000	0.000	4.457
<i>LnDays</i>	158	6.867	0.400	6.999	4.804	6.999
<i>AnnRea</i>	158	0.001	0.022	0.000	-0.077	0.158
<i>LnSEO</i>	158	4.124	7.188	0.000	0.000	19.085
<i>Panel B – IPOs with an SEO</i>						
<i>UP</i>	25	0.282	0.468	0.108	-0.167	1.599
<i>AbRet1</i>	25	-0.040	0.176	-0.051	-0.291	0.418
<i>AbRet2</i>	25	0.013	0.180	-0.004	-0.356	0.445
<i>LnIPO</i>	25	17.472	1.511	17.207	15.425	20.547
<i>PDA</i>	25	0.520	0.510	1.000	0.000	1.000
<i>SEO</i>	25	1.000	0.000	1.000	1.000	1.000
<i>SEO/IPO</i>	25	1.347	1.423	0.855	0.001	4.457
<i>LnDays</i>	25	6.169	0.665	6.330	4.804	6.932
<i>AnnRea</i>	25	0.003	0.057	-0.006	-0.077	0.158
<i>LnSEO</i>	25	16.762	2.140	17.034	9.010	19.085
<i>Panel C – IPOs without an SEO</i>						
<i>UP</i>	133	0.134	0.239	0.061	-0.191	1.313
<i>AbRet1</i>	133	0.000	0.148	-0.018	-0.270	0.553

<i>AbRet2</i>	133	0.014	0.137	-0.008	-0.319	0.508
<i>LnIPO</i>	133	17.366	1.283	17.371	13.503	20.547
<i>PDA</i>	133	0.639	0.482	1.000	0.000	1.000
<i>SEO</i>	133	0.000	0.000	0.000	0.000	0.000
<i>SEO/IPO</i>	133	0.089	0.459	0.000	0.000	3.663
<i>LnDays</i>	133	6.999	0.000	6.999	6.999	6.999

Note: The table reports the number of observations (*N*), mean (Mean), standard deviation (*StdDev*), median (*Med*), minimum (*Min*) and maximum (Max) for the primary variables for the full sample of all IPOs (Panel A), for the IPOs that were followed by an SEO in three subsequent years (Panel B), and for the IPOs that were not followed by an SEO in three subsequent years (Panel C). *UP* is the IPO underpricing defined as the difference between the first trading day closing price and the issuing price. *AbRet1* (*AbRet2*) are the abnormal aftermarket returns measured over the period between 1 and 20 (21 to 40) trading days after the IPO date. *LnIPO* is the IPO size defined as a natural logarithm of IPO value (the number of shares sold times the issue price). *PDA* a dummy variable that is equal to 1 if a firm issues allotment certificates ('prawo do akcji') and zero otherwise. *SEO* is the dummy variable equal to 1 if a firms issues seasoned equity in the three years following the IPO and zero otherwise. *SEO/IPO* is the relative SEO size defined as a ration of the SEO value to the IPO value; the variable is set to 0 if no SEO exists. *LnDays* is the natural logarithm of the number of calendar days between the IPO and the SEO; the variable is set to $\ln(1095)$ if no SEO was made in the three years following the IPO. *AnnRea* is the stock market reaction on the SEO announcement measured as the abnormal three-day day return over -1 day to +1 day surrounding the SEO announcement. *LnSEO* is the natural logarithm of the SEO value. All variables are Winsorized at 1% level to control for outliers.

Table 6 – IPO Underpricing

Year	N	UP		UP value	IPO value
		<i>Equal-weighted</i>	<i>Proceeds-weighted</i>		
<i>Panel A: Winsorized Data at 1 % Level</i>					
2005	28	8.87%	5.19%	0.11 billions	2.08 billions
2006	34	28.60%	19.61%	0.62 billions	3.17 billions
2007	64	17.23%	15.22%	0.93 billions	6.11 billions
2008	22	1.07%	-0.23%	0.00 billions	1.50 billions
2009	10	14.13%	14.11%	0.07 billions	0.49 billions
Total	158	15.74%	12.95%	1.73 billions	13.36 billions
<i>Panel B: Non-Winsorized Data</i>					
2005	28	8.87%	5.19%	0.11 billions	2.08 billions
2006	34	38.05%	20.16%	0.64 billions	3.17 billions
2007	64	17.23%	14.45%	0.91 billions	6.33 billions
2008	22	-1.42%	6.34%	0.09 billions	1.50 billions
2009	10	14.13%	14.11%	0.07 billions	0.49 billions
Total	158	17.43%	13.48%	1.83 billions	13.58 billions

Note: Equal-weighted and Proceeds-weighted IPO underpricing (*UP*). Proceeds-weighted is weighted by value of IPO. UP value represents the aggregate amount money left on the table computed as *UP* times IPO value. IPO value represents the aggregate proceeds, i.e. the value of IPO issued in individual year. In Panel A is based on the data Winsorized at 1% level, Panel B is based on non-Winsorized results.

Table 7 – Correlation Matrix

	<i>UP</i>	<i>AbRet1</i>	<i>AbRet2</i>	<i>LnIPO</i>	<i>PDA</i>	<i>SEO</i>	<i>SEO/IPO</i>	<i>LnDays</i>	<i>AnnRea</i>
<i>UP</i>	1								
<i>AbRet1</i>	0.108 (0.18)	1							
<i>AbRet2</i>	-0.077 (0.34)	-0.008 (0.92)	1						
<i>LnIPO</i>	-0.038 (0.63)	0.079 (0.33)	-0.060 (0.45)	1					
<i>PDA</i>	-0.064 (0.42)	-0.048 (0.55)	-0.040 (0.62)	-0.369 (0.00)	1				
<i>SEO</i>	0.187 (0.02)	-0.097 (0.23)	-0.002 (0.98)	0.029 (0.71)	-0.090 (0.26)	1			
<i>SEO/IPO</i>	0.207 (0.01)	-0.108 (0.18)	-0.088 (0.27)	-0.135 (0.09)	-0.053 (0.51)	0.663 (0.00)	1		
<i>LnDays</i>	-0.126 (0.11)	0.001 (0.99)	0.062 (0.44)	-0.142 (0.08)	0.160 (0.04)	-0.760 (0.00)	-0.396 (0.00)	1	
<i>AnnRea</i>	0.060 (0.45)	-0.041 (0.61)	0.030 (0.71)	-0.040 (0.61)	-0.060 (0.46)	0.055 (0.49)	0.030 (0.71)	0.009 (0.91)	1

Note: The correlation matrix presents pairwise correlation coefficients and the corresponding *p*-values (in parentheses) based on the full sample of 158 observations. Correlations significant at better than 5% level are highlighted in bold. *UP* is the IPO underpricing defined as the difference between the first trading day closing price and the issuing price. *AbRet1* (*AbRet2*) are the abnormal aftermarket returns measured over the period between 1 and 20 (21 to 40) trading days after the IPO date. *LnIPO* is the IPO size defined as a natural logarithm of IPO value (the number of shares sold times the issue price). *PDA* a dummy variable that is equal to 1 if a firm issues allotment certificates ('prawo do akcji') and zero otherwise. *SEO* is the dummy variable equal to 1 if a firm issues seasoned equity in the three years following the IPO and zero otherwise. *SEO/IPO* is the relative SEO size defined as a ratio of the SEO value to the IPO value; the variable is set to 0 if no SEO exists. *LnDays* is the natural logarithm of the number of calendar days between the IPO and the SEO; the variable is set to $\ln(1095)$ if no SEO exists. *AnnRea* is the stock market reaction on the SEO announcement measured as the abnormal three-day day return over -1 day to +1 day surrounding the SEO announcement. All variables are Winsorized at 1% level.

Table 8 – Regression Results

	Model 1	Model 2	Model 3	Model 4
	<i>SEO</i>	<i>SEO/IPO</i>	<i>LnDays</i>	<i>AnnRea</i>
constant	-2.10 (-0.61)	0.25 (0.06)	8.78*** (3.58)	-0.17 (-0.35)
<i>UP</i>	2.06*** (2.63)	2.65*** (2.68)	-1.33** (-2.52)	0.02 (0.20)
<i>AbRet1</i>	-1.83 (-1.18)	-2.20 (-1.15)	0.64 (0.63)	-0.04 (0.27)
<i>AbRet2</i>	0.57 (0.35)	-0.35 (-0.17)	0.14 (0.13)	0.00 (0.02)
<i>LnIPO</i>	0.10 (0.51)	-0.10 (-0.40)	-0.10 (-0.76)	0.00 (0.10)
<i>PDA</i>	-0.66 (-1.23)	-1.06 (-1.47)	0.62 (1.59)	0.04 (0.54)
<i>LnDays</i>	-	-	-	-0.00 (-0.11)
<i>LnSEO</i>	-	-	-	0.01 (0.92)
<i>SEO/IPO</i>	-	-	-	0.00 (0.18)
year fixed effect	yes	yes	yes	yes
N	158	158	158	25
Pseudo R ²	0.11	0.07	0.10	-

Note: The table presents the results from the regressions. Model 1 - logit regression estimates of the relation between stock returns at the time of the IPO and the probability of a seasoned equity offering (*SEO*). Model 2 - Tobit regression analysis of the relation between stock returns at the time of the IPO and the size of SEO as a fraction of IPO (*SEO/IPO*). Model 3 - Tobit regression analysis of the relation between stock returns at the time of the IPO and the time between the IPO and SEO (*LnDays*) and Model 4 – OLS regression with the dependent variable is the abnormal SEO three-day announcement price reaction (*AnnRea*). The independent variables are *UP* (IPO underpricing, first-day return, measured as $(P1-P0)/P0$), *AbRet1* and *AbRet2* is the abnormal after market returns in the two 20-day periods after the IPO. *LnIPO* is the natural logarithm of the IPO size, *PDA* is a dummy variable and equal to 1 when shares are traded as right to shares after IPO date and 0 otherwise. *LnDays* is the natural logarithm of the time between SEO and IPO. *LnSEO* is the natural logarithm of SEO issue size. *SEO/IPO* is a proportion of the SEO issue size to the IPO size. All data are winsorized at 1 % level to control for outliers effect. Z-stats (Model 1) and t-stats (Model 2, 3, 4) are reported in parentheses and the symbols *, **, *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

Table 9 – Quintile Analysis

Panel A – SEO Probability

Quintile	Prob(SEO)			Prob(SEO)			Prob(SEO)		
	<i>UP</i>	Actual	Predict	<i>AbRet1</i>	Actual	Predict	<i>AbRet2</i>	Actual	Predict
1	-7.86%	6.25%	10.46%	-18.93%	25.00%	23.95%	-15.16%	12.50%	17.41%
2	1.16%	21.88%	10.33%	-7.70%	12.50%	12.93%	-4.90%	9.38%	13.99%
3	7.44%	12.90%	15.27%	-2.23%	22.58%	17.26%	-0.84%	29.03%	17.04%
4	17.79%	15.63%	16.12%	3.92%	3.13%	12.65%	5.43%	12.50%	13.69%
5	61.37%	22.58%	27.28%	22.52%	16.13%	12.26%	23.05%	16.13%	17.06%

Panel B – SEO Size

Quintile	SEO/IPO			SEO/IPO			SEO/IPO		
	<i>UP</i>	Actual	Predict	<i>AbRet1</i>	Actual	Predict	<i>AbRet2</i>	Actual	Predict
1	-7.86%	10.04%	14.06%	-18.93%	41.45%	37.65%	-15.16%	23.53%	28.99%
2	1.16%	17.61%	12.92%	-7.70%	11.95%	17.05%	-4.90%	8.73%	20.27%
3	7.44%	2.88%	20.07%	-2.23%	20.33%	22.67%	-0.84%	42.52%	24.00%
4	17.79%	25.12%	20.49%	3.92%	13.93%	17.48%	5.43%	10.08%	18.12%
5	61.37%	51.30%	43.71%	22.52%	18.82%	15.62%	23.05%	22.42%	19.24%

Panel C – SEO Timing

Quintile	<i>Days</i>			<i>Days</i>			<i>Days</i>		
	<i>UP</i>	Actual	Predict	<i>AbRet1</i>	Actual	Predict	<i>AbRet2</i>	Actual	Predict
1	-7.86%	1067	1021	-18.93%	921	909	-15.16%	967	937
2	1.16%	884	1008	-7.70%	1052	1003	-4.90%	1061	979
3	7.44%	957	964	-2.23%	833	941	-0.84%	787	941
4	17.79%	956	954	3.92%	1064	990	5.43%	1029	989
5	61.37%	946	872	22.52%	945	974	23.05%	977	969

Note: The table shows conditional means (Actual) and predicted values based on the corresponding regression (Predict) for the entire sample of 158 IPOs sorted into quintiles based on the variable listed in the first column of each block, i.e. *UP*, *AbRet1*, or *AbRet2*. Panel A – SEO Probability (*Prob(SEO)*) contains the actual and predicted percentage of firms issuing SEOs within 3 years after an IPO. Panel B – SEO Size (*SEO/IPO*) contains the actual and predicted SEO size as a ration of the SEO value to the IPO value; the variable is set to 0 if no SEO exists. Panel C – SEO Timing (*Days*) contains the actual and predicted the number of calendar days between the IPO and the SEO; the variable is set to 1095 if no SEO was made in the three years following the IPO. Actual refers to the actual values of the variables. Predicted refers to the mean fitted values from the logit and tobit models. *UP* is the IPO underpricing defined as the difference between the first trading day closing price and the issuing price. *AbRet1* (*AbRet2*) are the abnormal aftermarket returns measured over the period between 1 and 20 (21 to 40) trading days after the IPO date. All variables are Winsorized at 1% level to control for outliers.

Table 10 – Non-Winsorized Regression Results

	Model 1	Model 2	Model 3	Model 4
	<i>SEO</i>	<i>SEO/IPO</i>	<i>LnDays</i>	<i>AnnRea</i>
constant	-1.74 (-0.50)	0.72 (0.14)	8.58*** (3.48)	0.56 (0.63)
<i>UP</i>	1.61** (2.17)	1.86*** (2.82)	-0.80*** (-2.66)	-0.00 (-0.05)
<i>AbRet1</i>	-1.68 (-1.11)	-2.44 (-1.22)	0.68 (0.76)	0.03 (0.20)
<i>AbRet2</i>	-0.35 (-0.22)	-1.61 (-0.71)	0.68 (0.66)	0.09 (0.59)
<i>LnIPO</i>	0.09 (0.45)	-0.12 (-0.40)	-0.10 (-0.74)	-0.02 (-0.48)
<i>PDA</i>	-0.80 (-1.44)	-1.53 (-1.75)	0.71* (1.76)	-0.02 (-0.16)
<i>LnDays</i>	-	-	-	0.02 (0.59)
<i>LnSEO</i>	-	-	-	0.01 (0.77)
<i>SEO/IPO</i>	-	-	-	-0.01 (-0.42)
year fixed effects	yes	yes	yes	yes
N	158	158	158	25
Pseudo R2	0.13	0.08	0.11	-

Note: The table presents the results from the regressions. Model 1 - logit regression estimates of the relation between stock returns at the time of the IPO and the probability of a seasoned equity offering (*SEO*). Model 2 - Tobit regression analysis of the relation between stock returns at the time of the IPO and the size of SEO as a fraction of IPO (*SEO/IPO*). Model 3 - Tobit regression analysis of the relation between stock returns at the time of the IPO and the time between the IPO and SEO (*LnDays*) and Model 4 – OLS regression with the dependent variable is the abnormal SEO three-day announcement price reaction (*AnnRea*). The independent variables are *UP* (IPO underpricing, first-day return, measured as $(P1-P0)/P0$), *AbRet1* and *AbRet2* is the abnormal after market returns in the two 20-day periods after the IPO. *LnIPO* is the natural logarithm of the IPO size, *PDA* is a dummy variable and equal to 1 when shares are traded as right to shares after IPO date and 0 otherwise. *LnDays* is the natural logarithm of the time between SEO and IPO. *LnSEO* is the natural logarithm of SEO issue size. *SEO/IPO* is a proportion of the SEO issue size to the IPO size. Z-stats (Model 1) and t-stats (Model 2, 3, 4) are reported in parentheses and the symbols *, **, *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

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