



# Do institutional investors drive the IPO valuation?

Chui Zi Ong\*, Rasidah Mohd-Rashid, Kamarun Nisham Taufil-Mohd

*School of Economics, Finance & Banking, Universiti Utara Malaysia, 06010, Sintok, Kedah, Malaysia*

Received 21 January 2020; revised 7 April 2020; accepted 11 May 2020

Available online ■ ■ ■

## Abstract

This study aimed to investigate the effect of institutional ownership on initial public offering (IPO) valuation and also to examine the indirect role played by the pricing mechanism on the relationship. Cross-sectional multiple regression was used to analyse the relationship between institutional ownership and IPO valuation based on the sample of 450 IPOs listed on Bursa Malaysia between January 2000 and December 2018. The results show that institutional ownership had a positive association with IPO valuation. The signalling role of institutional investors attempted to convey information on firms' qualities which in turn had approximately fair IPO valuations. Further, this study found that book-built IPOs with higher institutional ownership were priced more closely to the firms' intrinsic values. The results have implications for underwriters and issuers in signalling firms' qualities through incorporating book-building in IPOs and allocating a higher number of shares to institutional investors.

Copyright © 2020, Borsa İstanbul Anonim Şirketi. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

*JEL classification:* G12; G23; G32

*Keywords:* Book-building; Fixed-price; Institutional ownership; Initial public offerings; Price-multiples; Valuation

## 1. Introduction

During an initial public offering (IPO), issuers face a challenge in determining the offer price for their shares. In most cases, the issuer hires an underwriter to determine the IPO value and underwrite it (Baron, 1982). According to Purnanandam and Swaminathan (2004), IPO valuation is the initial step in IPO pricing, where underwriters specify the value of firms that are going public in determining the firms' intrinsic values. These values are then utilised as a guide in setting firms' offer prices. Theoretically, IPOs are fairly priced if their offer prices are equal to their initial price on the first day. However, one of the key issues in IPO valuation is IPO mispricing, such as underpricing and overpricing anomalies (Chen, Firth, & Kim, 2004).

IPO mispricing could be due to the relationship between issuers and investors in terms of asymmetrical information, leading to adverse selection problems. Therefore, underwriters perform a price stabilisation mechanism by purchasing shares in the aftermarket. This mechanism aids in preventing the IPO price from declining to below its offer price, besides reducing price fluctuation in the IPO aftermarket. To illustrate, Aggarwal and Rivoli (1990) stated that IPO overvaluation in the United States (U.S.) usually occurred in the early aftermarket trading due to investors' optimism. As a result, over- or under-reactions to the IPO value would occur during the first month of trading. However, Bommel, Dahya, and Shi (2010) found that it took almost one week for IPO prices to stabilise in the U.S. market and for firms' intrinsic values to be reflected, indicating that they apply immediate information aggregation to the book-building mechanism.

In the context of the Malaysian market, the fixed-price mechanism is implemented by most firms when issuing IPOs (Tajuddin, Mohd-Rashid, Abdullah, & Abdul-Rahim, 2015). Underwriters work with issuers to set the offer price without

\* Corresponding author.

*E-mail address:* [cztracy.1012@gmail.com](mailto:cztracy.1012@gmail.com) (C.Z. Ong).

Peer review under responsibility of Borsa İstanbul Anonim Şirketi.

<https://doi.org/10.1016/j.bir.2020.05.003>

2214-8450/Copyright © 2020, Borsa İstanbul Anonim Şirketi. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Please cite this article as: Ong, C. Z et al., Do institutional investors drive the IPO valuation?, *Borsa İstanbul Review*, <https://doi.org/10.1016/j.bir.2020.05.003>

enquiring investors' demand. As a result, potential investors face difficulties in determining firms' intrinsic values. Information regarding IPOs' intrinsic values is not completely reflected in the offer prices, resulting in the assumption that the IPO price establishment would require over one week. Meanwhile, [Yong \(2013\)](#) found that the prices of Malaysian fixed-price IPOs stabilised on the fifth trading day of the IPOs. However, the study covered the samples from the year 2004–2011. In other words, the price stabilisation period of fixed-price IPOs in Malaysia might be longer. Therefore, due to the diverse findings on price stabilisation, this study attempted to investigate the accuracy of IPO valuations based on four different prices, namely offer price, first-day market price, average first-week market price, and the average first-month market price.

This study suggests that firms ought to achieve accurate valuation by using the appropriate valuation method to measure their intrinsic values. Numerous prior studies had examined the effectiveness of the relative method known as “price-multiple method”, which was used in valuing IPO firms ([Cassia, Paleari, & Vismara, 2004](#); [Chang & Tang, 2007](#); [How, Lam, & Yeo, 2007](#); [Kim & Ritter, 1999](#); [Purnanandam & Swaminathan, 2004](#)). This method involves the capitalisation of comparable firms' multiples and the accounting values of new firms. Moreover, only two prior studies, namely [Cogliati, Paleari, and Vismara \(2011\)](#) and [Deloof, Maeseneire, and Inghelbrecht \(2009\)](#) implemented an absolute method known as the “discounted cash flow method” to ascertain IPO firms' intrinsic values. This method integrates the present value of future payoffs for IPO valuation. Since the majority of firms that perform IPO are young and growing companies, the limited operating history in IPO prospectuses consistently leads to challenges in forecasting the firms' future payoff ([How et al., 2007](#); [Kim & Ritter, 1999](#)). Therefore, price-multiple methods (price-to-earnings,  $P/E$ ; price-to-book value,  $P/B$ ; and price-to-sales,  $P/S$ ) were applied in this study for firm valuation in the context of the Malaysian IPO market. Subsequently, the most superior valuation model was determined, where the estimated intrinsic value was set to be the closest to the offer price and intermediate aftermarket prices. The ideal valuation model was then used to compute the IPO valuation ratio,  $P/V$  ([Purnanandam & Swaminathan, 2004](#)). Due to the importance of IPO valuation, this article focuses on the factors influencing IPO valuation among the sample of firms in Malaysia.

In this paper, it is argued that the proportion of shares allocated to institutional investors would influence the IPO valuation. In developing successful IPOs, firms often use the strategy of offering a higher number of new shares to institutional investors to improve the IPO valuation and pricing ([Aggarwal, Prahala, & Puri, 2002](#); [Stoughton & Zechner, 1998](#)). In determining an attractive offer price for investors, underwriters incorporate institutional investors' opinions about the firms' prospects. Nevertheless, institutional investors' willingness to subscribe for shares is based on a rational evaluation of the firms' prospects. This is possibly due to the unavailability of relevant information regarding the issues

before the IPO listing ([Yung & Zender, 2010](#)). For firms which do not have a prospect, it is less likely that institutional investors will subscribe to their new issues due to the awareness that the share price might decrease in the future. Overall, issuers could not provide sufficient information on firms' qualities to prospective investors.

This study investigated the influence of institutional ownership on IPO valuation in an emerging market, specifically the Malaysian market, due to three reasons. The first reason is the pricing mechanism. As the majority of Malaysian IPOs are priced using the fixed-price mechanism, these IPOs are always subject to severe information asymmetries ([Eldomiaty, 2008](#)) and low levels of information efficiency ([Chan, Menkveld, & Yang, 2008](#)). The views of institutional investors are not taken into account when pricing the IPOs. Hence, underwriters take a more extended period to obtain information from the market so that it could be reflected fully in the IPO offer price which could cause the role of institutional investors in emerging markets to be different from in developed markets, specifically in the U.S. market. In this regard, the existence of high information asymmetries for Malaysian IPOs prompted this study to investigate the role of institutional investors in IPO valuation.

Secondly, the major institutional investors with more substantial shareholdings are mostly government-linked companies, namely, Employees Provision Fund (*Kumpulan Wang Simpanan Pekerja, KWSP*), Social Security Organisation (*Pertubuhan Keselamatan Sosial, PERKESO*), and Hajj Funds Institution (*Lembaga Tabung Haji, LTH*). These organisations participate actively in the Malaysian market. They often subscribe to new issues of firms with higher growth potential. Therefore, the participation of institutional investors could be a signalling mechanism in IPO valuation. The third reason refers to the unique features of the Malaysian market in the aspect of allocation of offerings. Firms are required to sell 25 per cent of the shares offered to the public, while 12.5 per cent is to be allocated to indigenous (*Bumiputera*) investors. The reasons mentioned above led this study to investigate the effects of institutional ownership on IPO valuation in Malaysia.

This study specifically aimed to investigate the role of institutional investors in IPO valuation. Insights from this study are expected to contribute to the existing IPO literature. First, this study used signalling theory and the concept of asymmetric information to explain the role of institutional investors in IPO valuation. Most of the previous studies investigated the role of institutional investors in initial returns ([Che-Yahya, Abdul-Rahim, & Mohd-Rashid, 2017](#); [Mohd-Rashid, Abdul-Rahim, & Yong, 2014](#); [Yong, 2011](#)) and flipping activities ([Che-Yahya, Abdul-Rahim, & Yong, 2014](#)). Despite the importance of institutional investors in signalling firms' quality and in lessening the ex-ante uncertainties around the IPOs through underpricing and flipping activities, the influence of institutional ownership on the valuation of IPOs at the offering date and in the immediate market remains unexplored.

The present study extends the works of [Mohd-Rashid, Masih, Abdul-Rahim, and Che-Yahya \(2018\)](#) by examining

the role of underwriters in the valuation of Malaysian IPOs with a higher share allocation to institutional investors instead of focusing on the IPO pricing. Also, the present study extends the works of [Che-Yahya et al. \(2014\)](#), [Mohd-Rashid et al. \(2014\)](#), and [Yong \(2011\)](#) by narrowing down on the role of institutional investors in IPO valuation in the immediate aftermarket. This is because institutional investors, which are regarded as informationally opaque, have the ability to send a credible signal to firms about firms' qualities, and henceforth, they retain their shares for a long term so that they could earn steady incomes.

This paper develops the idea that the proportion of share allocation to institutional investors is a key signalling factor which affects the extent to which the offer price and market prices of firms that issue IPOs are determined based on firms' intrinsic values. This is because institutional investors are effective in conveying superior information and stabilising the market prices of new shares in the aftermarket. The signalling role of institutional investors could reduce the ex-ante uncertainties surrounding new issues. While prior studies on the signalling role of institutional investors primarily revolved around underpricing and flipping activity phenomena, no direct evidence is available on the relationship between institutional ownership and IPO valuation. Thus, the current study fills the gap by examining the role of institutional investors in IPO valuation.

Second, to suggest the efficiency of institutional ownership in valuing and pricing IPOs before and after listing, a complete argument would not be formed without considering the effects on IPO samples which are priced using the book-building mechanism. This study also aimed to examine the interaction effect of book-building mechanism on the relationship between institutional ownership and IPO valuation. Book-built IPOs possess fewer ex-uncertainties given investors' valuations and demands are officially obtained during roadshows ([Kutsana & Smith, 2004](#)). Issuers supply a sufficient number of new shares to meet the level of institutional investors' demands for shares. Thus, the book-building mechanism could lower the likelihood of IPOs being issued with excess demands at which the market prices are expected to be stabilised in the aftermarket. In Malaysia, a small number of firms was priced using the book-building mechanism, which was introduced in 2002. These IPOs are mostly large and mature firms. In this study, the ability of institutional investors to capture the signals of firms' qualities may be diverse among the fixed-price and book-built IPOs. Overall, it is suggested in this study that although IPO valuation could be affected by institutional ownership, the effect could be moderated by using the book-building mechanism. However, these issues are not discussed.

The remaining parts of this article are separated into several sections. Section 2 demonstrates the previous literature works on IPO valuation and institutional ownership. Section 3 describes this study's data and methodology. It is followed by

Section 4, which interprets the findings from this study's empirical analysis. The last section outlines the conclusion of this study.

## 2. Literature review

### 2.1. IPO valuation

Underwriters often use price-multiple valuation models to obtain an accurate valuation of firms. High valuation accuracy is indicated by IPOs with negative and small valuation errors. For instance, the highly popular study by [Kim and Ritter \(1999\)](#) reported that the use of forecasted earnings in the *P/E* of comparable firms with identical industry and revenue characteristics resulted in a higher valuation accuracy. This is mainly because earnings forecasts incorporate the information of IPO proceeds that are proposed for financing business growth activities, whereas historical earnings do not incorporate this information ([Firth, Kwok, Liao-Tan, & Yeo, 1995](#)). In New Zealand, [Berkman, Bradbury, and Ferguson \(2000\)](#) found that when compared with the market price, the use of *P/E* of market-based comparable firms dominated the *P/E* of industry-based comparable firms in terms of IPO valuation accuracy. In the Europe market, [Cassia et al. \(2004\)](#) found that *P/B* led to a high valuation accuracy when the IPO price on the first trading day was compared with the intrinsic value based on the respective industry. Following that, [How et al. \(2007\)](#) reported that *P/E* led to negative and lower prediction errors when comparable firms were matched with identical industries and firm's size in Australia IPO market. Moreover, compared to offer prices, the intrinsic values generated by the *P/E* were closer to the IPO prices on the first trading day. In the context of emerging markets, [Chang and Tang \(2007\)](#) selected *P/E* as the ideal valuation model in Taiwan IPO market.

Overall, the negative and low valuation errors reported by prior studies were caused by deliberate underpricing by underwriters, where they set lower offer prices compared to the firms' intrinsic values. These findings were in agreement with those by [Houston, James, and Karceski \(2006\)](#), who reported that IPO offer prices were undervalued based on the recommendations by financial analysts regarding comparable firms during the internet-bubble period from 1999 to 2000 in the IPO market in the U.S. Underwriters attempted to undervalue IPOs to induce investors' sentiment to participate in the IPO market. In contrast, [Purnanandam and Swaminathan \(2004\)](#) found that IPO offer prices were overvalued by 14–50 per cent when compared with their operating characteristics. The same authors found that overvalued IPOs experienced higher underpricing, implying that IPO prices on the first trading day do not indicate firms' intrinsic values due to the effects of market sentiment and investors' optimism. According to [Miller's \(1977\)](#) theory, a higher involvement of optimistic

investors increased the prices on the first trading day of IPOs, resulting in a higher valuation of the IPOs. This pattern indicated the degree of valuation on offer price by underwriters with significant information. Concerning the valuation by investors who are subjected to information asymmetry on the prices in the intermediate aftermarket, it is possibly influenced by several factors. In this study, institutional ownership was employed to investigate the IPO valuation.

## 2.2. Institutional ownership

According to [Aggarwal et al. \(2002\)](#), institutional investors are a group of investors who are more informed about firms and the market. Hence, institutional investors are a knowledgeable group who have the ability to identify high- and low-quality firms. In the IPO literature, it has been well established that a high involvement of institutional investors in the IPO market contributed a significant influence on the IPO performance. [Chemmanur \(1993\)](#) specified that underpricing is a way to encourage institutional and retail investors to provide information regarding firms that go public. This information is then reflected in market prices on the first IPO trading day due to post-IPO trading by institutional investors, which are often similar to firms' intrinsic values. However, [Purnanandam and Swaminathan \(2004\)](#) argued that overvalued IPOs obtain higher underpricing on the first day of IPO trading listing due to the presence of investors' sentiments. Therefore, institutional investors' views regarding IPO firms' values are varied. Specifically, the offer prices and market prices might be higher or lower than the firms' intrinsic values. Thus, this article presents prior empirical studies on the link between institutional ownership and IPO anomalies to explain the role of institutional investors in IPO valuation.

The present study proposes that signalling and information asymmetry theory be used to test the influence of institutional ownership on IPO valuation. Underwriters favour institutional investors because they are more capable of conveying information on the IPOs ([Benveniste & Spindt, 1989](#); [Cornelli & Goldreich, 2001](#)). Generally, the present study argues that IPOs with higher institutional ownership could improve the IPO valuation during the period of offer price setting and in the immediate aftermarket. However, none of the previous studies examined the effect of institutional ownership on the valuation of IPOs. Throughout the supportive evidence, prior empirical studies by [Fernando, Krishnamurthy, and Spindt \(2004\)](#) and [Neupane and Poshakwale \(2012\)](#) noted that underwriters set high offer prices for firms with the highest allocation of shares to institutional investors. Issuers are confident with their firms' higher qualities and make their offerings attractive to institutional investors. [Fernando, Gatchev, and Spindt \(2014\)](#) stated that institutional investors prefer to invest in higher-priced IPOs compared to penny-stock IPOs, and these higher-priced IPOs obtain a higher valuation as well. In other words, underwriters allocate a higher number of shares to institutional investors to signal high-quality IPOs.

In contrast, in the case of the Malaysian market, [Mohd-Rashid et al. \(2018\)](#) argued that underwriters set low offer prices for firms with higher institutional ownership. Given that Malaysian IPOs are considered risky due to the practice of fixed-price pricing mechanism ([Tajuddin et al., 2015](#)), underwriters determine offer prices without soliciting institutional investors' opinions. [Rock \(1986\)](#) stated that institutional investors prefer IPOs if there is a likelihood of the IPO being underpriced. The reason is that institutional investors choose firms that are transparent since they are informed investors. Such a condition indicates that institutions that invest in bulk will benefit from the allocation even though they earn low returns in the immediate aftermarket ([Mohd-Rashid et al., 2014](#); [Yong, 2011](#)). Thus, this study predicted that underwriters determine the offer prices closer to firms' intrinsic values.

[Che-Yahya et al. \(2014\)](#) stated that after an IPO listing, the signalling role of institutional investors' participation in conveying signals of the firm's qualities reduces the flipping activity of investors. [Aggarwal \(2003\)](#) and [Gounopoulos \(2006\)](#) claimed that institutional investors are considered as a "strong hand" as they are inclined to be loyal to firms. [Bayley, Lee, and Walter \(2006\)](#) stated that institutional investors hold their shares of underpriced IPOs rather than overpriced IPOs. [Sapian, Abdul-Rahim, and Yong \(2013\)](#) contended that institutional investors in the Malaysian IPO market are likely to obtain long-term steady returns as compared to quick capital gains. They invest only in firms with growth potential and ultimately, the higher institutional ownership is regarded as a signal of high-quality firms which could improve the long-run returns ([Boehmer, Boehmer, & Fishe, 2006](#)). Given the long-term commitment of institutional investors in IPOs, the market prices of IPOs are expected to stabilise in the intermediate aftermarket. Thus, aftermarket prices are predicted to be driven closer to firms' intrinsic values.

Furthermore, this study argues on the essential role of institutional investors in the valuation of the small portion of book-built IPOs in Malaysia. The private information provided by institutional investors reflects superior information and hence, it is incorporated into the IPO pricing, leading to IPO offer prices reflecting the true values of firms ([Benveniste & Spindt, 1989](#); [Ritter & Welch, 2002](#)). It could be said from these arguments that underwriters may increase the value of book-built IPOs by setting the offer prices closer to firms' intrinsic values, as they are computed at the beginning of the IPO pricing. In contrast to setting a high offer price due to the signalling role of institutional investors, underpricing is still adequately provided as a reward to institutional investors for revealing their information about the IPOs ([Aggarwal et al., 2002](#)). In other words, the approximately fair valuation of book-built IPOs is expected to be strengthened.

Based on the Malaysian IPO market, specifically in the sample of book-built IPOs, this study highlights that to influence the IPO valuation, issuers could signal their qualities through the participation of institutional investors. In contrast to fixed-price IPOs which exhibit greater uncertainties ([Yong,](#)

2013), Malaysia's book-built IPOs are characterised as large and developed firms with fewer uncertainties. Neupane, Marshall, Paudyal, and Thapa (2017) argued that investors tend to retain their shares of book-built IPOs. With that being said, greater institutional ownership tends to convey good signals about book-built IPOs' qualities and promote price stabilisation. Thereby, this study predicted that aftermarket prices of book-built IPOs are driven closer to firms' intrinsic values until a month of listing.

### 3. Data and methodology

#### 3.1. Data

The data in this study consisted of 576 IPOs listed on Bursa Malaysia from January 2000 to December 2018. January 2000 was chosen as the starting period of this study to exclude the effects of the Asian financial crisis (AFC), which occurred between 1997 and 1998, on the Malaysian stock market. The data were collected from the firms' prospectuses on Bursa Malaysia, DataStream, and Bloomberg. For the analysis of IPO valuation accuracy, the data were obtained from Bloomberg including trailing twelve-month historical earnings per share (*EPS*), historical book values per share (*BPS*) after adjusting for net proceeds from IPOs, and trailing twelve-month historical revenues per share (*RPS*) to be utilised for calculating *P/E*, *P/B*, and *P/S* of comparable firms, respectively.

Before conducting the valuation analysis, the criteria for data collection were formulated first, as highlighted in this article. Specifically, as *P/E* or *P/B* could not be a negative value, the IPOs or comparable firms with negative *EPS* or book values of equity must be omitted from the samples. Furthermore, IPOs with special types of offers, such as a restricted offer for sale to eligible employees and indigenous investors, tender offers, and special issues were excluded from the sample (Mohd-Rashid et al., 2014). The same omission was done for IPOs from selected industry sectors, such as Finance, Real Estate Investment Trusts (REITs), Exchange Traded Funds (ETF), and Special Purpose Acquisition Companies (SPAC) due to the different presentation formats of the financial statements. In finalising the sample, IPOs with incomplete data were excluded. The exclusion of data and extreme outliers IPOs via data cleansing process resulted in an IPO sample of 450 firms in total. Table 1 presents the distribution of the IPO samples.

#### 3.2. IPO valuation

As mentioned previously, price-multiple methods are usually used for IPO firm valuation (How et al., 2007; Kim & Ritter, 1999). In approximating the intrinsic values of IPOs, selecting comparable firms from a similar industry was considered to be a practical approach due to their similar revenue characteristics. Kim and Ritter (1999) selected five IPO firms with similar Standard Industrial Classification (SIC) codes within 12 months before the offer date of the target

IPOs. This selection was made using an algorithm method as IPO prospectuses do not offer any information on the comparable firms used by the underwriters in determining the IPO prices. This study modified the methodology by Kim and Ritter (1999) by selecting five comparable firms in terms of revenues from identical industries. The industry classification was determined through Bloomberg. The price-multiples of the selected five comparable firms were further used to compute the median value. The median was selected to estimate the intrinsic values as it could mitigate the outlier problem, which was due to extreme multiples and the production of unbiased estimation (How et al., 2007).

The IPO valuation accuracy was first tested to identify the price-multiple method with a high valuation accuracy. The methodology by Kim and Ritter (1999) was adopted by employing three types of multiples, namely *P/E*, *P/B*, and *P/S*. These multiples were used to determine the ideal valuation model for the issuance of Malaysian IPOs. The standard measure of IPOs' valuation accuracy was based on the calculation of IPOs' valuation error. Accordingly, the formula of IPOs' valuation error by How et al. (2007) and Roosenboom (2012) was adopted to compare the degree of estimation performed on the firms' intrinsic values based on comparable firms. Following is the formula for computing the valuation error:

$$\text{Valuation Error} = \frac{(P - V)}{V} \quad (1)$$

where *P* denotes either the offer price, first-day market price, average first-week market price, or average first-month market price of IPO trading. Meanwhile, *V* represents the firm's intrinsic value, which was computed by multiplying the IPO firm's value drivers (e.g. *EPS*, *BPS*, or *RPS*) with the median value of the price-multiples of five comparable firms. The trailing twelve-month historical earnings per share, the historical post-issue of the pro-forma book value per share, and the trailing twelve-month historical revenues were used to compute the *P/E*, *P/B*, and *P/S* of comparable firms, respectively. Therefore, the best valuation model was determined through the presence of negative and small valuation errors in the results. The selected valuation model from the valuation accuracy analysis was then used to calculate the IPO valuation ratio at four different prices. The calculation of relative IPO

Table 1

The selection process of IPO sample from January 2000 to December 2018.

Description	Number of IPOs
Number of IPOs before exclusion	576
(-) Total number of IPOs with negative EPS and/or BPS	5
(-) Total number of IPOs issue through special types of offers	33
(-) Total number of IPOs from finance, REIT, SPAC and ETF sectors	36
(-) Total number of IPOs with incomplete data	11
(-) Total number of outliers	32
<b>Total number of final IPO samples</b>	<b>450</b>

valuation ratio ( $P/V$ ) was based on the methodology by Purnanandam and Swaminathan (2004), which compared the IPOs' prices with the median market prices of their comparable firms. In this study, the price-multiples for the IPOs and comparable firms were calculated as follows:

$$(P/V)_{op} = \frac{(Price - multiple)_{IPO,op}}{(Price - multiple)_{comp,op}} \quad (2)$$

$$(P/V)_{cp} = \frac{(Price - multiple)_{IPO,cp}}{(Price - multiple)_{comp,cp}} \quad (3)$$

$$(P/V)_{week} = \frac{(Price - multiple)_{IPO,week}}{(Price - multiple)_{comp,week}} \quad (4)$$

$$(P/V)_{month} = \frac{(Price - multiple)_{IPO,month}}{(Price - multiple)_{comp,month}} \quad (5)$$

### 3.3. Model specification

To analyse the influence of institutional investors' ownership on the IPO valuation ratio in the Malaysian market, this study employed the Ordinary Least Square (OLS) regression model. The regression model developed in this study is as follows:

$$(P/V)_{op,i} = \beta_0 + \beta_1 PRIV_i + \beta_2 DBOOK_i + \beta_3 OSR_i + \beta_4 LNNTA_i + \beta_5 PUBLIC_i + \beta_6 OFFER_i + \beta_7 MKTCON_i + \beta_8 DCRISIS_i + \varepsilon \quad (6)$$

$$(P/V)_{cp,i} = \beta_0 + \beta_1 PRIV_i + \beta_2 DBOOK_i + \beta_3 OSR_i + \beta_4 LNNTA_i + \beta_5 PUBLIC_i + \beta_6 OFFER_i + \beta_7 MKTCON_i + \beta_8 DCRISIS_i + \varepsilon \quad (7)$$

$$(P/V)_{week,i} = \beta_0 + \beta_1 PRIV_i + \beta_2 DBOOK_i + \beta_3 OSR_i + \beta_4 LNNTA_i + \beta_5 PUBLIC_i + \beta_6 OFFER_i + \beta_7 MKTCON_i + \beta_8 DCRISIS_i + \varepsilon \quad (8)$$

$$(P/V)_{month,i} = \beta_0 + \beta_1 PRIV_i + \beta_2 DBOOK_i + \beta_3 OSR_i + \beta_4 LNNTA_i + \beta_5 PUBLIC_i + \beta_6 OFFER_i + \beta_7 MKTCON_i + \beta_8 DCRISIS_i + \varepsilon \quad (9)$$

Accordingly,  $P/V$  represents an IPO's valuation ratio. This ratio was measured as the price-multiple of the IPO calculated using four different prices (offer price, first-day market price, average first-week market price, and average first-month market price) and the price-multiple of comparable firms. Following Che-Yahya et al. (2014) and Yong (2011),  $PRIV$  was calculated as the number of new shares allocated to institutional investors as a percentage of the total number of shares issued. Meanwhile,  $DBOOK$  refers to the dummy for the book-building mechanism, which carried a value of 1 for

the IPOs that were priced using the book-building mechanism and 0 value for IPOs that were priced using the fixed-price mechanism. According to Kutsana and Smith (2004), book-built IPOs are characterised as firms with low uncertainties as investors' views are obtained during the roadshow. Due to the informative investors' views, the offer prices of book-built IPOs should be set closer to the firms' intrinsic values. As the proxy of investor demands, the oversubscription ratio ( $OSR$ ) was measured as the total number of IPOs subscribed over the number of shares offered to the public (Tajuddin, Abdullah, & Taufil-Mohd, 2018). It was then alternatively obtained from resources including The StarBiz newspaper. Firms with higher growth potential provide a credible signal to investors, encouraging their demands for the IPO subscription (Aggarwal, Bhagat, & Rangan, 2009). High demands for shares often influence IPO values.

$LNNTA$  represents the natural log of the net tangible asset, functioning as the proxy for the firm's size (Wan-Hussin, 2005). Specifically, a firm with a higher net tangible asset value indicates a large firm with a lower level of uncertainty, resulting in a lower IPO valuation. Moreover, public ownership ( $PUBLIC$ ) was measured as the number of shares issued to retail investors as a percentage of the total number of IPO shares offered. According to the winner's curse hypothesis (Rock, 1986), a higher number of shares allocated to retail investors would transform into a "lemon" issue to uninformed investors. This issue is caused by the loss generated by the shares due to IPO overpricing. Thus, the IPOs would be undervalued since investors might be less likely to subscribe to the IPOs that have higher share allocations to retail investors.  $OFFER$  represents the total number of shares issued via offer-for-sale (Mohd-Rashid et al., 2018). Specifically, a higher proportion of shares offered by a firm's shareholders indicates the firm's poor quality to the market, leading to IPO undervaluation. Furthermore, stock market condition ( $MKTCON$ ) represents the sentiment of stock market investors during the decision making for the IPO subscription. It was measured through the percentage of the difference between the price index upon listing and the price index on the offer date over the price index on the offer date in terms of FTSE Bursa Malaysia EMAS (Mohd-Rashid et al., 2014). It was hypothesised that the IPOs listed during a bullish market were highly valued. Finally,  $DCRISIS$  refers to the dummy for the sub-prime financial crisis, which carried a value of 1 for the IPOs listed during the sub-prime financial crisis period and 0 otherwise. The firms listed during the crisis period possibly posed higher risks to the market, which consequently impacted the IPOs' valuation.

The moderating model was employed to investigate the sub-sample for the pricing mechanism hypothesis. As the pricing of a portion of the Malaysian IPOs was based on the book-building mechanism, a significant interaction between institutional ownership and IPO valuation ratio in terms of the pricing mechanism was found. Following is the moderating regression model developed in this study:

$$\begin{aligned} (P/V)_{op,i} = & \beta_0 + \beta_1 PRIV_i + \beta_2 DBOOK_i \\ & + \beta_3 (PRIV * DBOOK)_i + \beta_4 OSR_i \\ & + \beta_5 LNNTA_i + \beta_6 PUBLIC_i + \beta_7 OFFER_i \\ & + \beta_8 MKTCON_i + \beta_9 DCRISIS_i + \varepsilon \end{aligned} \quad (10)$$

$$\begin{aligned} (P/V)_{cp,i} = & \beta_0 + \beta_1 PRIV_i + \beta_2 DBOOK_i \\ & + \beta_3 (PRIV * DBOOK)_i + \beta_4 OSR_i \\ & + \beta_5 LNNTA_i + \beta_6 PUBLIC_i + \beta_7 OFFER_i \\ & + \beta_8 MKTCON_i + \beta_9 DCRISIS_i + \varepsilon \end{aligned} \quad (11)$$

$$\begin{aligned} (P/V)_{week,i} = & \beta_0 + \beta_1 PRIV_i + \beta_2 DBOOK_i \\ & + \beta_3 (PRIV * DBOOK)_i + \beta_4 OSR_i \\ & + \beta_5 LNNTA_i + \beta_6 PUBLIC_i + \beta_7 OFFER_i \\ & + \beta_8 MKTCON_i + \beta_9 DCRISIS_i + \varepsilon \end{aligned} \quad (12)$$

$$\begin{aligned} (P/V)_{month,i} = & \beta_0 + \beta_1 PRIV_i + \beta_2 DBOOK_i \\ & + \beta_3 (PRIV * DBOOK)_i + \beta_4 OSR_i \\ & + \beta_5 LNNTA_i + \beta_6 PUBLIC_i + \beta_7 OFFER_i \\ & + \beta_8 MKTCON_i + \beta_9 DCRISIS_i + \varepsilon \end{aligned} \quad (13)$$

#### 4. Empirical findings and discussion

Table 2 presents the results of the descriptive statistics of firms' characteristics from the sample of 450 IPOs, which were listed from January 2000 to December 2018. Based on the table, the average value of the offer price was RM1.02, whereas the average first-day market price was RM1.25. Furthermore, the average first-week market price and the average first-month market price had mean values of RM1.24 and RM1.23, respectively. The reported average percentage of

institutional ownership was 44.35 per cent of the total number of shares issued by the firms. Furthermore, Che-Yahya et al. (2014) reported that the institutional ownership from 2000 to 2012 was slightly higher than 42.46 per cent. However, this percentage was slightly lower than the 45.31 per cent from 2000 to 2014, which was found by Mohd-Rashid et al. (2018) in the Malaysian IPO market. In the case where the institutional investors received the allocation of new shares through private placement issue, the average values ranged from a minimum of 0 per cent to a maximum of 100 per cent. The absence of institutional investors' participation in new issues was expected to occur in the year 2000 as private placement was only introduced in the Malaysian IPO market in the year 2001 (Yong, 2010). Therefore, the absence of institutional investors in any IPO listed in 2000 was justified.

Concerning the control variables, the average pricing mechanism dummy of 0.073 was obtained in Table 2, demonstrating that 7.3 per cent of the total IPOs were priced using the book-building mechanism. The average percentage of share allocation to retail investors was found to be 20.97 per cent. This value indicates that the public spread of IPOs did not fulfil the Listing Requirement of Bursa Malaysia. Bursa Malaysia's Listing Requirement states that at least 25 per cent of new issues are to be allocated to the public. Concerning offer-for-sales, an average of 20.86 million units of the existing issued shareholders' shares was offered to investors for the IPO subscription. Regarding investor demand (*OSR*), an average value of 28.06 times was obtained. The market condition, reflected by the EMAS index during the IPO listing, had an average value of 0.50 per cent, including the highest return of 11.60 per cent and the lowest return of -14.72 per cent. As for the crisis dummy, the average of 0.11 indicates that 11 per cent of the total IPOs were offered during the global financial crisis period.

Table 3 displays the descriptive statistics of IPO valuation accuracy. Concerning the price-multiples, the IPO samples obtained an average *P/E (P/S)* of 13.995–17.881 (2.238–2.751), scaled at four different prices. These multiples were lower compared to the mean *P/E (P/S)* of comparable firms which ranged from 50.252 to 51.747 (from 4.099 to 4.128), scaled at four different prices. Compared to the *P/E* of IPOs scaled at four different prices, the high *P/E* of comparable firms were due to the precision of earnings, which had been reported in the prospectus. This argument is in agreement with Kim and Ritter (1999), where noisy estimates were predicted from the earnings due to the error in the true economic earnings. Despite the remarkable use of accounting numbers, their accuracy is questionable. Therefore, it is argued in this study that underpriced offer prices are prevalent as firms want to attract investors to subscribe to their IPOs. However, the IPO samples recorded average *P/B* values of 1.770–2.168 based on the four different prices, which are higher than the average *P/B* values of comparable firms of 1.251–1.265 scaled at four different prices. It implies that the high *P/B* values of the IPOs based on four different prices might be influenced by the arbitrariness of book values (Damodaran, 2006). The IPOs with high *P/B* values indicate that the firms

Table 2  
Descriptive statistics of IPO firms' characteristics.

	Mean	Max.	Min.	s.d.
Offer price (RM)	1.017	4.800	0.120	0.716
First-day market price (RM)	1.251	7.500	0.170	0.976
Average first-week price (RM)	1.244	6.900	0.170	0.991
Average first-month price (RM)	1.229	6.899	0.148	1.000
Earnings per share (RM)	0.101	1.270	0.004	0.098
Book value per share (RM)	0.699	9.630	0.078	0.664
Revenue per share (RM)	0.900	10.069	0.004	1.111
Institutional ownership (%)	44.354	100.000	0	30.012
Book-building (Dummy)	0.073	1.000	0	0.261
Oversubscription Rate (Times)	28.060	229.200	-0.891	36.760
Public ownership (%)	20.967	100.000	0	17.601
Offer-for-sales (million unit)	20.859	522.000	0	53.130
Net tangibles asset (RM million unit)	146.000	3190.000	4.402	332.000
Market condition (%)	0.502	11.602	-14.724	4.141
Crisis (Dummy)	0.113	1.000	0	0.317

Notes: IPO sample size (N) = 450, beginning from January 2000 to December 2018. Min = minimum; Max = maximum; s.d. = standard deviation; Earnings per share = trailing twelve-month historical earnings per share; Book value per share = book values per share after adjusted for net proceeds; Revenue per share = trailing twelve-month of historical revenues per share.

Table 3  
Descriptive statistics of price-multiples.

	IPO Firms				Comparable Firms' Medians			
	Mean	Max.	Min.	s.d.	Mean	Max.	Min.	s.d.
$P/E_{op}$	13.995	101.537	1.220	10.579	50.252	154.348	6.577	23.939
$P/E_{cp}$	17.881	144.632	1.464	16.649	51.747	155.200	6.612	24.754
$P/E_{week}$	17.740	158.463	1.398	16.951	51.577	155.429	6.683	24.403
$P/E_{month}$	17.481	148.153	1.411	16.813	51.458	153.307	7.181	23.909
$P/B_{op}$	1.770	6.190	0.039	0.801	1.265	3.826	0.336	0.648
$P/B_{cp}$	2.208	6.769	0.046	1.197	1.251	3.613	0.275	0.629
$P/B_{week}$	2.190	7.114	0.046	1.215	1.258	3.628	0.326	0.640
$P/B_{month}$	2.168	8.311	0.045	1.256	1.258	3.566	0.313	0.648
$P/S_{op}$	2.238	16.419	0.150	2.149	4.128	20.920	0.259	3.054
$P/S_{cp}$	2.751	16.372	0.150	2.616	4.113	19.598	0.248	3.000
$P/S_{week}$	2.731	15.503	0.144	2.634	4.126	19.631	0.246	3.051
$P/S_{month}$	2.704	14.515	0.134	2.626	4.099	19.444	0.249	3.047

Notes: IPO sample size (N) = 450, beginning from January 2000 to December 2018. The present study uses trailing twelve-month historical earnings per share, book values per share after adjusted for net proceeds and trailing twelve-month of historical revenues per share to calculate price-to-earnings, price-to-book and price-to-sales, respectively. The price-multiples of selected five comparable firms (based on similar industry and closest revenue) were used to compute in a median of comparable firm price-multiples. Offer price-to-earnings ( $P/E_{op}$ ), offer price-to-book ( $P/B_{op}$ ) and offer price-to-sales ( $P/S_{op}$ ) were calculated using the offer price for the IPO firms, and the market prices on the day before issuing for the comparable firms. First-day price-to-earnings ( $P/E_{cp}$ ), first-day price-to-book ( $P/B_{cp}$ ) and first-day price-to-sales ( $P/S_{cp}$ ) were calculated using the first-day market price for the IPO firm, and the market prices on the listing date for the comparable firms. Average first-week price-to-earnings ( $P/E_{week}$ ), average first-week price-to-book ( $P/B_{week}$ ) and average first-week price-to-sales ( $P/S_{week}$ ) were calculated using the average first-week price for the IPO firm, and the market prices on the average first-week days after listing for the comparable firms. Average first-month price-to-earnings ( $P/E_{month}$ ), average first-month price-to-book ( $P/B_{month}$ ) and average first-month price-to-sales ( $P/S_{month}$ ) were calculated using the average first-month price for the IPO firm and the average month of market prices on the average first-month days after listing for the comparable firms.

Table 4  
Mean differences between prices and intrinsic values.

	Mean		Median		Mean Difference		Median Difference	
	P	V	P	V	Difference	T-statistics	Z-statistics	
<b>Panel A: Offer price</b>								
$P/E$	1.017	4.944	0.800	3.169	-3.927	-17.029***	-18.238***	
$P/B$	1.017	0.847	0.800	0.538	0.170	4.854***	9.633***	
$P/S$	1.017	2.939	0.800	1.760	-1.922	-11.424***	-15.412***	
<b>Panel B: 1st day market price</b>								
$P/E$	1.251	5.096	0.935	3.433	-3.845	-17.092***	-18.122***	
$P/B$	1.251	0.841	0.935	0.532	0.410	11.419***	14.463***	
$P/S$	1.251	2.918	0.935	1.721	-1.667	-10.667***	-13.084***	
<b>Panel C: Average 1st day market price</b>								
$P/E$	1.244	5.060	0.921	3.399	3.816	-17.272***	-18.134***	
$P/B$	1.244	0.843	0.921	0.541	0.401	10.998***	14.168***	
$P/S$	1.244	2.912	0.921	1.702	-1.668	-10.743***	-13.174***	
<b>Panel D: Average 1st month market price</b>								
$P/E$	1.229	5.035	0.915	3.431	-3.806	-17.279***	-18.161***	
$P/B$	1.229	0.844	0.915	0.540	0.385	10.177***	13.652***	
$P/S$	1.229	2.872	0.915	1.703	-1.643	-10.688***	-13.300***	

Notes: \*\*\* denote statistical significance at the 1% level, which is based on Paired T-Test and Wilcoxon Signed Ranks test for the difference from zero.  $P$  denoted as offer price and first-day price in Panel A and Panel B, respectively.  $V$  is the intrinsic value estimated by either  $P/E$ ,  $P/B$  or  $P/S$  multiples based on the median of five comparable firms scaled at the offer price and first-day market price, respectively.

incorporated the proceeds for growth activities as proposed in the prospectus, which increased the book value of the firms. This could cause the investors to have high expectations of the IPOs and further subscribe to the IPO investment.

To statistically quantify the relationship between IPOs' prices and their intrinsic values, the study identified the mean differences between the four different prices of IPOs and their

intrinsic values using Paired  $T$ -Test and Wilcoxon Signed-Rank Test. As shown in Table 4, significant differences were found between all the four prices across the intrinsic values. Based on Panel A of Table 4, for the intrinsic values estimated using  $P/E$  and  $P/S$ , the IPOs' offer prices were set lower than the firms' intrinsic values. Therefore, it indicates that underwriters often underpriced the IPOs relative to firms' intrinsic values. Concerning the fixed-price mechanism, as investors' demands were not incorporated in the IPO pricing, the low offer prices were deliberately set by the underwriters to promote the IPOs' new shares subscription to investors.

Similarly, referring to the results in Panels B, C, and D of Table 4, the aftermarket prices were remarkably lower than the firms' intrinsic values, indicating that IPO underpricing was present even after price stabilisation. The firms' aftermarket prices required over one month to reflect their intrinsic values. These findings are contradictory to Yong (2013), who stated that the intrinsic values of fixed-price Malaysian IPOs were reflected in the average first-week market prices. To enhance the understanding of the relationship between firms' prices and intrinsic values, valuation accuracy was tested based on the calculation of valuation errors, as shown in Table 5.

As indicated in Table 5, the use of  $P/S$  in the valuation of IPO firms generated the least valuation errors, followed by  $P/E$  and  $P/B$ . Panel A of Table 5 shows that mean valuation errors of -28.80 and -68.30 per cent were obtained with the use of  $P/S$  and  $P/E$ , respectively. It indicates that the use of median  $P/S$  ( $P/E$ ) of five comparable firms resulted in 28.8 per cent (68.3 per cent) of the mean offer price, which was lower than firms' intrinsic values.  $P/S$  was properly used to estimate firms' values, as earnings inconsistencies might occur in many firms in several consecutive years before their public appearance.



Table 5  
Valuation error of the three price-multiples based on 450 Malaysian IPOs.

	Mean	Median	Max.	Min.	s.d.
<b>Panel A – valuation errors calculated using offer price</b>					
<i>P/E</i>	−0.672***	−0.742	1.683	−0.962	0.272
<i>P/B</i>	0.683***	0.400	7.520	−0.963	1.053
<i>P/S</i>	−0.288***	−0.514	7.670	−0.953	0.818
<b>Panel B – valuation errors calculated using 1st day market price</b>					
<i>P/E</i>	−0.614***	−0.700	2.034	−0.958	0.329
<i>P/B</i>	1.047***	0.688	7.173	−0.950	1.276
<i>P/S</i>	−0.125**	−0.425	9.583	−0.954	1.091
<b>Panel C – valuation errors calculated using average 1st week market price</b>					
<i>P/E</i>	−0.619***	−0.708	2.012	−0.961	0.321
<i>P/B</i>	1.012***	0.670	7.955	−0.950	1.268
<i>P/S</i>	−0.138***	−0.438	9.501	−0.956	1.068
<b>Panel D – valuation errors calculated using average 1st month market price</b>					
<i>P/E</i>	−0.628***	−0.717	1.696	−0.961	0.302
<i>P/B</i>	0.991***	0.608	7.162	−0.952	1.291
<i>P/S</i>	−0.136***	−0.434	8.631	−0.959	1.085

Notes: Valuation error is  $(P-V)/V$ , where  $P$  is the offer price in Panel A, the first day of the market price in Panel B, the average first-week of the market price in Panel C, and the average first-month of the market price in Panel D;  $V$  is the intrinsic value estimated by either *P/E*, *P/B* or *P/S* multiple based on the median of five comparable firms with similar industry and closest revenue. The highlighted adjusted value with the symbol: \*\*\* and \*\* represent significance level at 1% and 5%, which is based on the  $t$ -test for the difference from zero.

Moreover, in terms of the expansion of valuation errors through three different aftermarket prices shown in Panels B, C, and D of Table 5, it was found that *P/S* provided the most accurate IPO valuation. *P/S* produced valuation errors ranging from −13.80 to −12.50 per cent compared to the offer price. Therefore, it suggested that the mean intrinsic value estimated using *P/S* gradually transitioned to the market price on the first trading day compared to the offer price. This observation was unpredictable (How et al., 2007). It was due to the use of the algorithm method by underwriters to estimate the intrinsic value, which was closer to the IPO price on the first trading day. For this reason, this study's results are justified by the deliberate underpricing by underwriters. Therefore, *P/S* was

Table 6  
IPO valuation based on price-to-sales (*P/S*).

	Mean	25th Quartile	50th Quartile	75th Quartile	Wilcoxon Z-statistics
<i>P/V</i> / <i>P/S</i> <sub>op</sub>	0.712	0.293	0.486	0.844	−13.344***
<i>P/V</i> / <i>P/S</i> <sub>cp</sub>	0.874	0.346	0.575	0.991	−10.411***
<i>P/V</i> / <i>P/S</i> <sub>week</sub>	0.862	0.346	0.562	1.014	−10.536***
<i>P/V</i> / <i>P/S</i> <sub>month</sub>	0.864	0.337	0.566	0.969	−10.662***

Notes: This table displays the distribution of IPO valuation based on price-to-sales (*P/S*). *P/V* ratios are computed as the ratio of the *P/S* of IPOs divided by the corresponding market price *P/S* of the comparable firm. *P/V*/*P/S*<sub>op</sub> = Offer price-to-value based on price-to-sales; *P/V*/*P/S*<sub>cp</sub> = first-day price-to-value based on price-to-sales; *P/V*/*P/S*<sub>week</sub> = average first-week price-to-value based on price-to-sales; *P/V*/*P/S*<sub>month</sub> = average first-month price-to-value based on price-to-sales. The z-statistics is based on Wilcoxon Signed-Rank Test on the hypothesis that the IPO price-multiples follow the same distribution as those of the comparable firms. \*\*\* denotes statistical significance at the 1% level respectively.

chosen as an appropriate valuation method which was further applied into the IPO valuation ratio, *P/V* (Purnanamdam & Swaminathan, 2004). The *P/V* based on *P/S* was then to be estimated using the main and control variables and its results are displayed in Table 9.

Table 6 presents the distribution of IPO valuation ratios based on *P/S*. The Wilcoxon Signed-Rank Test was performed to test the null hypothesis that the median *P/S* amounted to 1. Accordingly, the median *P/S* was scaled at four different prices for the IPO samples, which generated values ranging from 0.486 to 0.566. The median *P/S* values scaled at four different prices were significantly lower than 1. This study's key findings revealed that the IPOs were undervalued at the offer price, first-day market price, average first-week market price, and the average first-month market price. These results contradict Purnanandam and Swaminathan (2004), who stated that IPO overvaluation had been present from 1980 to 1997. Moreover, the low median *P/S* based on the offer price was due to the practice of fixed-price mechanism among Malaysian IPOs. Underwriters set offer prices without enquiring institutional investors' demands. In contrast, Zheng (2007) found that the median *P/S* amounted to 0.87, which was closer to 1 due to the book-building mechanism practice in the U.S. IPO market. In addition, the median *P/S* values scaled at aftermarket prices were slightly higher compared to the *P/S* value scaled at the offer price. Although the IPOs were not overpriced based on intrinsic values, this phenomenon indicates that firms' intrinsic values might be reflected in IPO prices for over a month.

Table 7 presents the findings of the Pearson correlation analysis between the variables and IPO valuation based on *P/S*. It could be seen that none of the correlations exceeded the 0.70 cut-off point, indicating the absence of multicollinearity issue in the correlations.

Table 8 displays the comparison between high and low institutional ownership IPOs in terms of the mean difference. The levels of IPO valuation ratios displayed substantial variances between the high and low institutional ownership groups, scaled at four different prices. Specifically, the mean IPO valuation ratios ranged from 0.900 to 1.073 for the high institutional ownership group, while these ratios ranged from 0.569 to 0.710 for the low institutional ownership group. These ratios indicate the higher involvement of institutional investors in the IPOs with the decrease in valuation error and stabilised price. Furthermore, the levels of private placement were diverse across high and low institutional ownership groups. The findings shown in Table 8 prove that the higher investor demand and large firms' size were significantly associated with high institutional ownership in IPOs. A higher number of shares was allocated to institutional investors by firms that issued a small proportion of shares to public investors and by firms with fewer offer-for-sales. Moreover, IPOs listed in the period of global financial crisis issued a higher number of shares to institutional investors. The mean differences for all variables (except *DBOOK* and *MKTCON*) were significant at the level of 10 per cent or lower.

Table 7  
Pearson correlation analysis.

	P/V_P/S <sub>op</sub>	P/V_P/S <sub>cp</sub>	PV_P/S <sub>week</sub>	P/V_P/S <sub>month</sub>	1.	2.	3.	4.	5.	6.	7.
1. <i>PRIV</i>	0.190***	0.177***	0.177***	0.149***							
2. <i>DBOOK</i>	0.064	0.035	0.044	0.042	0.058						
3. <i>OSR</i>	0.060	0.216***	0.207***	0.192***	0.221***	-0.089*					
4. <i>LNNTA</i>	-0.056	-0.092*	-0.076	-0.061	-0.249***	0.583***	-0.301***				
5. <i>PUBLIC</i>	-0.162***	-0.148***	-0.148***	-0.086*	-0.503***	-0.165***	-0.192***	0.032			
6. <i>OFFER</i>	0.027	0.007	0.011	0.006	-0.122**	0.510***	-0.146***	0.521***	-0.155***		
7. <i>MKTCON</i>	-0.025	0.016	0.011	-0.017	0.085*	0.053	-0.012	-0.019	-0.117**	0.017	
8. <i>DCRISIS</i>	0.012	-0.075	-0.079*	-0.087*	0.111**	0.034	-0.167***	0.076	-0.090*	0.052	-0.051

Notes: \*\*\*, \*\* and \* denote statistical significance at 1%, 5% and 10% respectively (2-tailed). *PRIV*= Institutional Ownership; *DBOOK* = Dummy variable of book-building method issue; *OSR*= Investor demand; *LNNTA* = Natural logarithm of net tangible assets; *PUBLIC*: Public Ownership; *OFFER*= Offer-to-sales; *MKTCON* = market condition; *DCRISIS* = Dummy variable of IPOs issued at the period of global financial crisis within 2007–2009; the numbers in column headings correspond with the number of variables in a row.

Table 8  
Mean differences between high and low institutional ownership IPOs.

Variable	Institutional Ownership		Mean Differences	T-test	Mann-Whitney Test
	High	Low		t-statistics	z-statistics
<i>P/V_P/S<sub>op</sub></i>	0.900	0.569	0.331	3.870***	-4.523***
<i>P/V_P/S<sub>cp</sub></i>	1.073	0.702	0.371	3.834***	-4.347***
<i>P/V_P/S<sub>week</sub></i>	1.044	0.684	0.360	3.854***	-4.613***
<i>P/V_P/S<sub>month</sub></i>	1.008	0.710	0.298	3.144***	-4.262***
<i>PRIV</i> (per cent)	79.422	6.717	72.705	73.359***	-14.314***
<i>DBOOK</i>	0.059	0.022	0.037	1.540	-1.536
<i>OSR</i> (times)	39.008	20.558	18.450	3.966***	-2.750***
<i>NTA</i> (RM mil)	121.444	125.740	-4.296	-0.122	-6.680***
<i>PUBLIC</i> (per cent)	11.335	32.256	-20.921	-9.885***	-8.952***
<i>OFFER</i> (num. of mil. shares)	9.018	24.106	-15.088	-2.466**	-6.157***
<i>MKTCON</i> (per cent)	0.616	0.001	0.615	1.101	-0.647
<i>DCRISIS</i>	0.141	0.067	0.074	2.004**	-1.992**

Notes: \*\*\* and \*\* denote statistical significance at the 1% and 5% levels respectively. According to Fama and French's (1993), this study segregated the high and low institutional investor ownership by taking IPOs with the lowest institutional ownership quartile (30 per cent lowest from the sample) and represented them as low-private placement portfolio. In contrast, IPOs in the highest institutional ownership quartile (30 per cent highest from the sample) to be represented as high-private placement portfolio.

Table 9 presents the results of cross-sectional multiple regression, specifically, the estimation of IPO valuation scaled at four different prices by institutional ownership. No autocorrelation issue was found after the correction using the Newey-West method as the Durbin-Watson's range was shown to be from 1.631 to 1.830. Meanwhile, the adjusted  $R^2$  values were lower than 10 per cent for the four regression models. These figures indicate that all the variables tested in this study could justify less than 10 per cent of the variations in the IPO valuation ratios. Since significant  $F$ -statistics values for four regression models were found, the goodness-of-fit of the models ( $p < 0.01$ ) were confirmed. The Variance Inflation Factor (VIF) of the IPO valuation models ranged from 1.031 to 1.963, demonstrating the absence of multicollinearity issues. Finally, this study performed the Ramsey RESET test to check the linearity of the regression models, and ultimately, all the models were correctly specified.

Similar to the findings from the Pearson Correlation test in Table 9, institutional ownership (*PRIV*) was positively related to IPO valuation based on the offer price and aftermarket prices (first-day market price, average first-week market price, and average first-month market price). Based on Model 1 results in Table 9, the significant positive results indicate that underwriters determined the IPOs' offer prices closer to firms' intrinsic values when *PRIV* was higher. This result is in agreement with this study's prediction, indicating that *PRIV* functioned as a signalling mechanism of good prospects and quality of the issuers (Aggarwal et al., 2002; Che-Yahya et al., 2017). Institutional investors have favourable information about firms' prospects such that the participation of institutional investors could convey the qualities of firms. According to Aggarwal (2003) and Gounopoulos (2006), the involvement of institutional investors in any IPOs is primarily due to their optimism of the prospects of the firms. In other words, they will only invest in firms that are transparent and have better prospects because they are informed investors. Consequently, institutional investors will only invest if they are aware of the high quality of firms (Che-Yahya et al., 2014; Neupane, Neupane, Paudyal, & Thapa, 2016).

The positive result of *PRIV* on  $P/V_P/S_{op}$  provides support for Mohd-Rashid et al. (2014) and Yong (2011), who stated that institutional investors that are being allocated a large portion of new shares obtain low initial returns. In other words, institutional investors are likely to subscribe to underpriced IPOs instead of overpriced IPOs. Thus, institutions that invest in bulk will benefit from the allocation, although they earn low returns in the intermediate aftermarket. Furthermore, Sopian et al. (2013) contended that institutional investors in the Malaysian IPO market are likely to obtain long-term steady returns as compared to quick capital gains. It means that they invest only in firms with future better prospects, and eventually, the participation of institutional investors conveys signals of high-quality firms. Their participation could add credibility to the pricing of IPOs. Thus, to exhibit that firms have high qualities when listing, underwriters should set the IPO offer prices closer to the firms' intrinsic values if a higher number of new shares is being allocated to institutional investors.

Table 9  
Multiple regression results of institutional ownership and IPO valuation.

Variables	Model 1: $P/V\_P/S_{op}$	Model 2: $P/V\_P/S_{cp}$	Model 3: $P/V\_P/S_{week}$	Model 4: $P/V\_P/S_{month}$
<i>PRIV</i>	0.376*** (0.117)	0.406** (0.171)	0.415** (0.162)	0.458*** (0.165)
<i>DBOOK</i>	0.232* (0.139)	0.207 (0.171)	0.209 (0.177)	0.210 (0.179)
<i>OSR</i>	-0.001 (0.002)	0.005* (0.003)	0.005 (0.003)	0.005* (0.003)
<i>LNNTA</i>	-0.062 (0.042)	-0.063 (0.059)	-0.044 (0.058)	-0.029 (0.062)
<i>PUBLIC</i>	-0.385** (0.183)	-0.303* (0.166)	-0.305* (0.166)	0.076 (0.383)
<i>OFFER</i>	5.80E-10 (7.14E-10)	9.84E-10 (1.02E-09)	8.25E-10 (1.01E-09)	8.18E-10 (9.67E-10)
<i>MKTCON</i>	-0.011 (0.009)	-0.001 (0.010)	-0.003 (0.010)	-0.009 (0.009)
<i>DCRISIS</i>	-0.094 (0.107)	-0.222** (0.113)	-0.240** (0.107)	-0.266** (0.105)
<i>C</i>	1.736** (0.799)	1.738 (1.087)	1.536 (1.128)	1.177 (1.174)
<b>Observation</b>	450	450	450	450
<b>Adjusted R<sup>2</sup></b>	0.034	0.058	0.056	0.042
<b>F-statistics</b>	2.987***	4.467***	4.300***	3.448***
<b>Durbin-Watson</b>	1.631	1.817	1.830	1.818
<b>VIF Range</b>	1.246–1.963	1.267–1.705	1.239–1.684	1.031–1.736
<b>Ramsey RESET test</b>	1.837	0.493	0.710	0.216

Notes: Autocorrelation and heteroskedasticity problems are determined by conducting the Durbin-Watson test and White test, respectively followed with the correction by Newey-West Covariance Estimator. The highlighted adjusted values with the symbols: \*, \*\* and \*\*\* represent significance at the 10%, 5% and 1% levels respectively.

Based on Models 2, 3, and 4 in Table 9, positive relationships were found between *PRIV* and IPO valuation ( $P/V\_P/S_{cp}$ ,  $P/V\_P/S_{week}$ , and  $P/V\_P/S_{month}$ ). Specifically, the aftermarket prices of the IPOs after the first month of trading were driven closer to the intrinsic values of the IPOs with greater *PRIV*. The reason being, institutional investors had preferences for firms with long-term growth prospects which allured retail investors to subscribe to the IPOs. The result supports Bayley et al. (2006), who stated that institutional investors are not going to flip their underpriced shares since they are informed about the future growth of firms. Similarly, Che-Yahya et al. (2014, 2017) asserted that institutional investors decide to retain their shares in high-quality IPOs for a more extended period so that they could earn long-term steady incomes from the future appreciation of the share prices. In other words, large institutional investors' participation in high-quality IPOs

tends to stabilise the aftermarket prices of the IPOs relative to the firms' intrinsic values until a month of listing.

For the control variable, the results of *DBOOK* in Model 1 indicate that IPOs priced using the book-building mechanism significantly set the offer prices closer to the firms' intrinsic values. These findings are in agreement with Kutsana and Smith (2004), who proposed that book-built IPOs possess fewer uncertainties. Further, it could be seen from Models 2 and 4 in Table 9 that *OSR* was positively related to  $P/V\_P/S_{cp}$  and  $P/V\_P/S_{month}$  at the significant level of 10 per cent as it fulfilled the investors' demands. Concerning the undervaluation of IPO results in Table 6, investors would eventually demand to subscribe for shares with low offer prices. However, excessive demands would force the aftermarket prices to increase compared to firms' intrinsic values. These findings are similar to the findings by How et al. (2007).

Table 10  
Multiple regression results of institutional ownership and IPO valuation with moderating effect (pricing mechanism).

Variables	Model 1: $P/V\_P/S_{op}$	Model 2: $P/V\_P/S_{cp}$	Model 3: $P/V\_P/S_{week}$	Model 4: $P/V\_P/S_{month}$
<i>PRIV</i>	0.336*** (0.119)	0.364** (0.176)	0.370** (0.166)	0.418** (0.169)
<i>DBOOK</i>	-0.224 (0.234)	-0.269 (0.261)	-0.292 (0.267)	-0.249 (0.271)
<i>PRIV*DBOOK</i>	0.869** (0.385)	0.908* (0.467)	0.955** (0.481)	0.875* (0.484)
<i>OSR</i>	-0.001 (0.002)	0.005* (0.003)	0.005 (0.003)	0.005* (0.003)
<i>LNNTA</i>	-0.071* (0.041)	-0.072 (0.058)	-0.054 (0.057)	-0.038 (0.061)
<i>PUBLIC</i>	-0.404** (0.182)	-0.323* (0.165)	-0.326** (0.165)	-0.057 (0.385)
<i>OFFER</i>	9.69E-10 (6.88E-10)	1.39E-09 (1.03E-09)	1.25E-09 (1.00E-09)	1.21E-09 (9.55E-10)
<i>MKTCON</i>	-0.011 (0.009)	-0.002 (0.010)	-0.003 (0.010)	-0.009 (0.009)
<i>DCRISIS</i>	-0.103 (0.104)	-0.232** (0.110)	-0.250** (0.105)	-0.275*** (0.103)
<i>C</i>	1.915** (0.783)	1.926* (1.067)	1.536 (1.128)	1.212 (1.168)
<b>Observation</b>	450	450	450	450
<b>Adjusted R<sup>2</sup></b>	0.036	0.058	0.056	0.042
<b>F-statistics</b>	2.844***	4.087***	3.958***	3.172***
<b>Durbin-Watson</b>	1.626	1.816	1.829	1.817
<b>VIF Range</b>	1.267–4.480	1.332–3.497	1.264–3.483	1.034–3.603
<b>Ramsey RESET test</b>	0.856	0.177	0.236	0.020

Notes: Autocorrelation and heteroskedasticity problems are determined by conducting the Durbin-Watson test and White test, respectively followed with the correction by Newey-West Covariance Estimator. The highlighted adjusted values with the symbols: \*, \*\* and \*\*\* represent significance at the 10%, 5% and 1% levels respectively.

Nonetheless, the present study found that three control variables, namely *LNNTA*, *OFFER*, and *MKTCON*, had an insignificant association with IPO valuation in all the regression models. These results indicate that underwriters and investors did not emphasise the firm's size, proportion of offer-for-sale, and the recent stock market condition when the IPOs were valued. In respect of *PUBLIC*, it was found that the share allocation to public investors significantly influenced  $P/V_{P/S_{op}}$ . This phenomenon could be viewed from the perspective of the winner's curse theory (Rock, 1986). Similar to the findings by Tajuddin et al. (2018), retail investors received higher share allocations from the poorest qualities of IPOs as these shares would generate losses after the firms' listing. For this reason, the IPOs were undervalued by the underwriters.

The last control variable is *DCRISIS*, which observed the undervaluation of firms listed during the global financial crisis, as seen from Models 2 to 4 in Table 9. These findings are supported by Tajuddin et al. (2018), who indicated that IPOs listed during the global financial crisis period were exposed to higher risks. Thus, investors would be pessimistic of the IPOs, which subsequently created downward pressure on the market prices in the aftermarket.

Some Malaysian IPOs were book-built. Specifically, these IPOs were known to possess less information asymmetry. *PRIV* was predicted to significantly affect the IPO valuation in the sample of book-built IPOs. To gain an improved understanding of *PRIV* in the pricing mechanisms, this study incorporated an interaction effect between institutional ownership and pricing mechanism (*PRIV\*DBOOK*) as an additional explanatory variable and the results are shown in Table 10. The significant effect of the moderating variable (*PRIV\*DBOOK*) on IPO valuation ratios were stronger than that of the single variable *PRIV*. Specifically, the *t*-statistics of *PRIV\*DBOOK* (0.869) was higher than that of the single variable *PRIV* (0.336) in Model 1 of Table 10.

Further, this study found that *PRIV\*DBOOK* was positively related to IPO valuation ratios in all the regression models. The findings in Model 1 of Table 10 imply that the book-built IPOs with greater institutional investors' participation were approximately fairly priced by the underwriters. This implication could be related to the explanation of information gathering theory (Benveniste & Spindt, 1989) and signalling theory. In book-building, underwriters have a preference for institutional investors due to their capability to signal information on IPOs (Aggarwal et al., 2002). Underwriters who have discretionary powers tend to allocate shares preferentially to institutional investors which are considered as long-term shareholders (Cornelli & Goldreich, 2001; Jenkinson & Jones, 2009).

In Malaysia, given the book-built IPOs are characterised by large and developed firms, institutional investors often subscribe to the shares due to less uncertainties from the issuers. In other words, the allocation of a large portion of new shares to institutional investors could signal the firms' quality and reduce the uncertainties, which in turn would improve the valuation and strengthen the pricing efficiency of book-built

IPOs. In these cases, book-built IPOs experience less underpricing by the underwriters. This argument is justified by Aggarwal et al. (2002) and Chemmanur, Hu, and Huang (2010), where institutional investors who invest in bulk benefit from share allocations although they ought to earn lower initial returns from book-built IPOs. Thus, to improve the pricing efficiency, greater share allocation to institutional investors provides an approximately fair valuation of book-built IPOs.

From Models 2 to 4 of Table 10, the positive signs on *PRIV\*DBOOK* indicate that book-built IPOs with higher *PRIV* are driven approximately by the firms' intrinsic values after the first month of IPO listing. The results seem to suggest that the preferential share allocation of book-built IPOs have a tendency to stabilise the aftermarket prices after a month of the IPO listing. This explanation is justified by Neupane et al. (2017), where institutional investors who are perceived as long-term investors are not likely to flip their shares of book-built IPOs as they believe that these IPOs are characterised by firms with better prospects. In this case, consistent with the view that book-building enables underwriters to establish long-term relationships with investors, the aftermarket prices increase steadily until reflecting firms' intrinsic values (Benveniste, Erdal, & Wilhelm, 1998). Similar to Boehmer et al. (2006), institutional investors who invest in bulk benefit from share allocation and price stabilisation, thus gaining long-run returns. Therefore, due to fewer uncertainties in book-built IPOs, institutional investors have higher confidence in their investment in the firms and retain their shares for the long term. Thus, the presence of greater institutional ownership could stabilise the aftermarket prices of book-built IPOs relative to firms' intrinsic values.

To justify the signalling explanation of institutional ownership for multiple regression, this study conducted the robustness check of the regression results by replacing the dependent variables of the IPO valuation ratios with initial returns of the IPOs. Initial return (underpricing) merely reflects the upsurge in market prices of firms from the offer price to the market price in the immediate IPO market (Rock, 1986). In the same vein, the initial return of an IPO reflects how much investors earn from the IPO investment during the initial days. The present study carried out the test on the signalling role of institutional investors at different stages of initial returns, namely first trading day ( $IR_{cp}$ ), the average of first week trading days ( $IR_{week}$ ), and the average of first month trading days ( $IR_{month}$ ), which are presented in Table 11.

As a result, the reported adjusted  $R^2$  values from Models 1 to 6 of Table 11 ranged between 13.30 and 16.70 per cent. This study found that the positive coefficient of *PRIV* was weakly significant in all the regression models. Interestingly, the *t*-statistics of *PRIV* in all the models in Table 11 were lower than those of public ownership (*PUBLIC*), demonstrating that the institutional investors which received higher share allocations from issuers ought to earn little initial returns compared to retail investors during the first trading day of the IPOs. These results are in line with Abdul Rahim, Sapain, Yong, and Auzairy (2013), Mohd-Rashid et al. (2014), and Yong

Table 11  
Robustness check by estimating initial return models.

Variables	Model 1: $IR_{cp}$	Model 2: $IR_{cp}$	Model 3: $IR_{week}$	Model 4: $IR_{week}$	Model 5: $IR_{month}$	Model 6: $IR_{month}$
<i>PRIV</i>	8.756** (8.278)	9.368* (8.527)	13.883* (8.290)	14.685* (8.524)	15.930* (8.544)	16.889* (8.758)
<i>DBOOK</i>	-5.684* (6.518)	1.240 (9.570)	-4.975 (7.192)	4.104 (9.497)	-5.443 (8.462)	5.394 (11.184)
<i>PRIV*DBOOK</i>		-13.194 (14.344)		-17.301 (14.405)		-20.653 (16.970)
<i>OSR</i>	0.448*** (0.081)	0.448*** (0.081)	0.427*** (0.093)	0.427*** (0.093)	0.419*** (0.089)	0.418*** (0.089)
<i>LNNTA</i>	-1.684 (2.627)	-1.546 (2.645)	-0.777 (2.858)	-0.596 (2.886)	0.908 (3.160)	1.124 (3.198)
<i>PUBLIC</i>	37.618*** (12.546)	37.910*** (12.551)	47.785*** (17.436)	48.168*** (17.442)	53.323*** (19.653)	53.780*** (19.669)
<i>OFFER</i>	-7.50E-09 (2.03E-08)	-1.34E-08 (2.27E-08)	-1.23E-08 (2.13E-08)	-2.00E-08 (2.39E-08)	-1.86E-08 (2.53E-08)	-2.97E-08 (2.81E-08)
<i>MKTCON</i>	2.063*** (0.407)	2.071*** (0.410)	1.944*** (0.477)	1.954*** (0.480)	1.759*** (0.511)	1.771*** (0.514)
<i>DCRISIS</i>	-15.396*** (4.731)	-15.256*** (4.691)	-18.400*** (5.166)	-18.216*** (5.103)	-21.597*** (5.267)	-21.378*** (5.188)
<i>C</i>	34.354 (48.550)	31.633 (48.924)	13.685 (52.743)	31.633 (48.924)	-19.661 (58.051)	-23.919 (58.807)
<b>Observation</b>	450	450	450	450	450	450
<b>Adjusted R<sup>2</sup></b>	0.167	0.165	0.143	0.141	0.133	0.132
<b>F-statistics</b>	12.226***	10.859***	10.334***	9.189***	9.644***	8.586***
<b>Durbin-Watson</b>	1.814	1.811	1.857	1.854	1.832	1.829
<b>VIF Range</b>	1.134–3.291	1.136–4.776	1.121–3.694	1.139–4.853	1.156–3.964	1.167–4.383
<b>Ramsey</b>	4.442	4.195	3.168	2.988	1.161	1.035
<b>RESET test</b>						

Notes:  $IR_{cp}$ ,  $IR_{week}$  and  $IR_{month}$  are denoted as the difference between the first-day market price, average first-week market price or average first-month market price, to the offer price respectively. Autocorrelation and heteroskedasticity problems are determined by conducting the Durbin-Watson test and White test, respectively followed with the correction by Newey-West Covariance Estimator. The highlighted adjusted values with the symbols: \*, \*\* and \*\*\* represent significance at the 10%, 5% and 1% levels respectively.

(2011), who reported a negative relationship between institutional ownership and initial return of IPO. Institutional investors favour high-quality firms that could generate long-run returns in the future (Boehmer et al., 2006). However, insignificant negative results were observed for *PRIV\*DBOOK* in Models 2, 4, and 6 of Table 11. The negative results seem to support the information revelation theory (Benveniste & Spindt, 1989; Chemmanur et al., 2010), where underpricing serves as a compensation for institutional investors for disclosing superior information to underwriters. Greater institutional ownership is expected to stabilise the prices of book-built IPOs in the immediate aftermarket. In addition, certain control variables, namely *OSR*, *PUBLIC*, *MKTCON*, and *DCRISIS* were significantly related to  $IR_{cp}$ ,  $IR_{week}$ , and  $IR_{month}$  in all the regression models. Finally, the present study acknowledges that the role of institutional investors and the effects of the pricing mechanism are both essential in IPO valuation in the Malaysian market, which consists of IPOs with severe uncertainties.

## 5. Conclusions and implications for future research

This study aimed to investigate the relationship between institutional ownership and IPO valuation. The data in this study consisted of 450 IPOs listed on Bursa Malaysia from January 2000 to December 2018. Before conducting the investigation, the valuation accuracy analysis was performed to determine the particular price-multiple which contributed to small and negative valuation errors from *P/E*, *P/B*, and *P/S*. *P/S* was chosen as the appropriate method for valuing firms. The selected price-multiple was applied to the IPO valuation ratio. It was then used to investigate the influence of institutional ownership on IPO valuation based on offer price and aftermarket prices, namely the market price on the first trading day

of the IPOs, the average price for the first week of the IPO trading days, and the average price for the first month of the IPO trading days. Cross-sectional multiple regressions were implemented to determine the relationship between institutional ownership and IPO valuation.

The results showed that institutional ownership had a significant positive effect on IPO valuation. Underwriters set the offer prices of IPOs with higher institutional ownership closer to the firms' intrinsic values. Institutional investors serve as a signal of firms' qualities, and they only invest in firms that are transparent and have better prospects. This could help to increase firms' transparency after listing if the firms are approximately fairly valued. Furthermore, institutional investors in the aftermarket displayed more positive behaviour towards the IPO value. To illustrate, with higher participation of institutional investors which possess superior information on IPOs, institutional investors tend to retain their shares in IPOs as they know that firms with growth potential could generate long-run returns.

Moreover, the study found that the valuation of book-built IPOs with higher institutional ownership performed better and was more accurate than the overall sample of IPOs in Malaysia. This influence is due to the incorporation of institutional investors' demands in IPO pricing, and hence, the IPOs were approximately fairly valued. Also, the aftermarket prices of book-built IPOs were stabilised compared to the intrinsic values if issuers allocated a large portion of new shares to institutional investors. Institutional investors prefer to invest in book-built IPOs as these IPOs are established as large and developed firms with long-term growth prospects.

Several important implications have been established for underwriters, issuers, and investors through this study's findings. Specifically, underwriters play a leading role in

determining the IPO value by exploring the importance of institutional investors which act as a signalling device for firms' qualities. Essentially, with the enhancement in firms' valuation by underwriters, it is suggested that they allocate larger shares to institutional investors to establish their reputation. Moreover, it is recommended that underwriters and issuers issue IPOs through a book-booking mechanism in Malaysia and allocate a higher portion of shares to institutional investors to improve transparency when firms go public. The findings will be advantageous for issuers in managing the listing process of IPOs effectively. Besides, the findings on IPO valuation models suggest that potential investors should invest in IPOs in which institutional investors invest in bulk which serve as a signal of high-quality firms and hold their shares for the longer term. Investors are shown to be interested in the capital gain from high-quality firms as they believe in the firms' prospect to generate long-run returns.

Overall, Malaysian IPOs are undervalued at firms' intrinsic values, indicating that the price stabilisation is not complete in the first month following the IPO listing. Due to this undervaluation, this study acknowledges that the explanation on the models which estimates IPO valuation is inadequate. Therefore, it is recommended that the existing valuation models are further developed by including other pre-IPO information from IPO prospectuses. Finally, future studies should conduct further investigation into other factors influencing IPO valuation, such as firms' growth opportunity.

### Declaration of Competing Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article

### Acknowledgements

The authors also would like to acknowledge their gratitude for funding from the Fundamental Research Grant Scheme (FRGS/1/2018/SS01/UUM/02/7) (S/O Code: 14203) provided by the Ministry of Higher Education, Malaysia. The authors are appreciative to the anonymous reviewers of the journal for the constructive comments to improve the quality of this article.

### References

- Abdul Rahim, R., Sapain, R. Z. Z., Yong, O., & Auzairy, N. A. (2013). Flipping activity and subsequent aftermarket trading in Malaysian IPOs. *Asian Academy of Management Journal of Accounting and Finance*, 9(1), 113–128.
- Aggarwal, R. (2003). Allocation of initial public offerings and flipping activity. *Journal of Financial Economics*, 68(1), 111–135. [https://doi.org/10.1016/S0304-405X\(02\)00250-7](https://doi.org/10.1016/S0304-405X(02)00250-7).
- Aggarwal, R., Bhagat, S., & Rangan, S. (2009). The impact of fundamentals on IPO valuation. *Financial Management*, 38(2), 253–284. <https://doi.org/10.1111/j.1755-053X.2009.0103.5.x>.
- Aggarwal, R., Prahala, N., & Puri, M. (2002). Institutional allocation in initial public offerings: Empirical Evidence. *The Journal of Finance*, 57(3), 1421–1442. <https://doi.org/10.1111/1540-6261.00465>.
- Aggarwal, R., & Rivoli, P. (1990). Fads in the initial public offering market? *Financial Management*, 19(4), 45–57. <https://doi.org/10.2307/3665609>.
- Baron, D. (1982). A model of the demand for investment banking advising and distribution services for new issues. *The Journal of Finance*, 37, 955–976. <https://doi.org/10.1111/j.1540-6261.1982.tb03591.x>.
- Bayley, L., Lee, P., & Walter, T. (2006). IPO flipping in Australia: Cross-sectional explanations. *Pacific-Basin Finance Journal*, 14, 327–348. <https://doi.org/10.1016/j.pacfin.2006.01.00.2>.
- Benveniste, L. M., Erdal, S. M., & Wilhelm, W. J., Jr. (1998). Who benefits from secondary market stabilization of IPOs? *Journal of Banking & Finance*, 22, 741–767. [https://doi.org/10.1016/S0378-4266\(98\)00014-4](https://doi.org/10.1016/S0378-4266(98)00014-4).
- Benveniste, L. M., & Spindt, P. (1989). How investment bankers determine the offer price and allocation of new issues. *Journal of Financial Economics*, 15, 213–232. [https://doi.org/10.1016/0304-405X\(89\)90051-2](https://doi.org/10.1016/0304-405X(89)90051-2).
- Berkman, H., Bradbury, M. E., & Ferguson, J. (2000). The accuracy of price-earnings and discounted cash flow methods of IPO equity valuation. *Journal of International Financial Management & Accounting*, 11(2), 71–83. <https://doi.org/10.1111/1467-646X.00056>.
- Boehmer, B., Boehmer, E., & Fishe, R. (2006). Do institutions receive favorable allocations in IPOs with better long-run returns? *Journal of Financial and Quantitative Analysis*, 41(4), 809–828. <https://doi.org/10.1017/S002210900002659>.
- Bommel, J. V., Dahya, J., & Shi, Z. (2010). An empirical investigation of the speed of information aggregation: A study of IPOs. *International Journal of Banking, Accounting and Finance*, 2(1), 47–79. <https://doi.org/10.1504/IJBAAF.2010.031575>.
- Cassia, L., Paleari, S., & Vismara, S. (2004). The valuation of firms listed on the nuovo mercato: The peer comparables approach. *Advances in Financial Economics*, 10(4), 113–129. [https://doi.org/10.1016/S1569-3732\(04\)10005-4](https://doi.org/10.1016/S1569-3732(04)10005-4).
- Chang, K., & Tang, Y. (2007). Pricing Taiwan's initial public offerings. *Asia-Pacific Journal of Accounting & Economics*, 14, 69–84. <https://doi.org/10.1080/16081625.2007.9720788>.
- Chan, K., Menkveld, A. J., & Yang, Z. (2008). Information asymmetry and asset prices: Evidence from the China foreign share discount. *The Journal of Finance*, 63, 159–196. <https://doi.org/10.1111/j.1540-6261.2008.01313.x>.
- Che-Yahya, N., Abdul-Rahim, R., & Mohd-Rashid, R. (2017). The moderating effect of information asymmetry on the signalling role of institutional investors in the Malaysian IPOs. *Asian Journal of Business and Accounting*, 10(1), 127–165.
- Che-Yahya, N., Abdul-Rahim, R., & Yong, O. (2014). Influence of institutional investors' participation on flipping activity of Malaysian IPOs. *Economic Systems*, 38(4), 470–486. <https://doi.org/10.1016/j.ecosys.2014.03.002>.
- Chemmanur, T. (1993). The pricing of initial public offerings: A dynamic model with information production. *The Journal of Finance*, 48(1), 285–304. <https://doi.org/10.1111/j.1540-6261.1993.tb04710.x>.
- Chemmanur, T., Hu, G., & Huang, J. (2010). The role of institutional investors in initial public offerings. *Review of Financial Studies*, 23(12), 4496–4540. <https://doi.org/10.1093/rfs/hhq109>.
- Chen, G., Firth, M., & Kim, J. (2004). IPO underpricing in China's new stock markets. *Journal of Multinational Financial Management*, 14(3), 283–302. <https://doi.org/10.1016/j.mulfin.2003.07.007>.
- Cogliati, G., Paleari, S., & Vismara, S. (2011). IPO pricing: Growth rates implied in offer prices. *Annals of Finance*, 7, 53–82. <https://doi.org/10.1007/s10436-010-0170-6>.
- Cornelli, F., & Goldreich, D. (2001). Bookbuilding and strategic allocation. *The Journal of Finance*, 56(6), 2337–2369. <https://doi.org/10.1111/0022-1082.00407>.
- Damodaran, A. (2006). *Damodaran on valuation*. New York: John Wiley and Sons.
- Deloof, M., Maeseneire, W., & Inghelbrecht, K. (2009). How do investment banks value initial public offerings (IPOs). *Journal of Business Finance &*

- Accounting*, 36(1&2), 130–160. <https://doi.org/10.1111/j.1468-5957.2008.02117.x>.
- Eldomiaty, T. I. (2008). Determinants of corporate capital structure: Evidence from an emerging economy. *International Journal of Commerce and Management*, 17(1), 25–43. <https://doi.org/10.1108/10569210710774730>.
- Fama, E. F., & French, K. R. (1993). The cross-section of expected stock returns. *The Journal of Finance*, 47(2), 427–465. <https://doi.org/10.1111/j.1540-6261.1992.tb04398.x>.
- Fernando, C., Gatchev, V., & Spindt, P. (2014). IPO offer price selection, institutional subscription, and the value of the firm: Theory and evidence. In M. Levis, & S. Vismara (Eds.), *Handbook of Research on IPOs* (pp. 101–123). United Kingdom: Edward Elgar Publishing.
- Fernando, C., Krishnamurthy, S., & Spindt, P. (2004). Are share price levels informative? Evidence from the ownership, pricing, turnover and performance of IPO firm. *Journal of Financial Markets*, 7(4), 377–403. <https://doi.org/10.1016/j.finmar.2004.01.001>.
- Firth, M., Kwok, B., Liao-Tan, C. K., & Yeo, G. (1995). Accuracy of profit forecasts contained in IPO prospectuses. *Accounting and Business Review*, 2, 55–83.
- Gounopoulos, D. (2006). Activity in fixed offer price mechanism allocated IPOs. In G. N. Gregoriou (Ed.), *Initial public offerings: An international perspective* (pp. 187–209). New York: Elsevier.
- Houston, J., James, C., & Karceski, J. (2006). What a difference a month makes: Stock analyst valuations following initial public offerings. *Journal of Financial and Quantitative Analysis*, 41(1), 111–137. <https://doi.org/10.1017/S0022109000002441>.
- How, J., Lam, J., & Yeo, J. (2007). The use of comparable firm approach in valuing Australian IPOs. *International Review of Financial Analysis*, 16, 99–115. <https://doi.org/10.1016/j.irfa.2006.09.003>.
- Jenkinson, T., & Jones, H. (2009). IPO pricing and allocation: A survey of the views of institutional investors. *Review of Financial Studies*, 22(4), 1477–1504. <https://doi.org/10.1093/rfs/hhn079>.
- Kim, M., & Ritter, J. (1999). Valuing IPOs. *Journal of Financial Economics*, 53(3), 409–437. <https://doi.org/10.1111/1540-6261.00478>.
- Kutsana, K., & Smith, R. (2004). Why does book building drive out auction methods of IPO issuance? Evidence from Japan. *Review of Financial Studies*, 17(4), 1129–1166. <https://doi.org/10.1093/rfs/hhg049>.
- Miller, E. (1977). Risk, uncertainty, and divergence of opinion. *The Journal of Finance*, 32(4), 1151–1168. <https://doi.org/10.1111/j.1540-6261.1977.tb03317.x>.
- Mohd-Rashid, R., Abdul-Rahim, R., & Yong, O. (2014). The influence of lock-up provisions on IPO initial returns: Evidence from an emerging market. *Economic Systems*, 38(4), 487–501. <https://doi.org/10.1016/j.ecosys.2014.03.003>.
- Mohd-Rashid, R., Masih, M., Abdul-Rahim, R., & Che-Yahya, N. (2018). Does prospectus information matter in IPO pricing. *Journal of Islamic Accounting and Business Research*, 9(4), 514–530. <https://doi.org/10.1108/JIABR-10-2017-0146>.
- Neupane, S., Marshall, A., Paudyal, K., & Thapa, C. (2017). Do investors flip less in bookbuilding than in auction IPOs? *Journal of Corporate Finance*, 47, 253–268. <https://doi.org/10.1016/j.jcorpfin.2017.09.015>.
- Neupane, S., Neupane, B., Paudyal, K., & Thapa, C. (2016). Domestic and foreign institutional investors' investment in IPOs. *Pacific-Basin Finance Journal*, 39, 197–210. <https://doi.org/10.1016/j.pacfin.2016.06.011>.
- Neupane, S., & Poshakwale, S. (2012). Transparency in IPO mechanism: Retail investors' participation, IPO pricing and returns. *Journal of Banking & Finance*, 36(7), 2064–2076. <https://doi.org/10.1016/j.jbankfin.2012.03.010>.
- Purnanandam, K., & Swaminathan, B. (2004). Are IPOs really underpriced? *Review of Financial Studies*, 17(3), 811–848. <https://doi.org/10.1093/rfs/hhg055>.
- Ritter, J., & Welch, I. (2002). A review of IPO activity, pricing, and allocations. *The Journal of Finance*, 57(4), 1795–1828. <https://doi.org/10.1111/1540-6261.00478>.
- Rock, K. (1986). Why new issues are underpriced. *Journal of Financial Economics*, 15(1), 187–212. [https://doi.org/10.1016/0304-405X\(86\)90054-1](https://doi.org/10.1016/0304-405X(86)90054-1).
- Roosenboom, P. (2012). Valuing and pricing IPOs. *Journal of Banking & Finance*, 36, 1653–1664. <https://doi.org/10.1016/j.jbankfin.2012.01.009>.
- Sapian, R. Z. Z., Abdul-Rahim, R., & Yong, O. (2013). IPO underpricing and aftermarket liquidity: Evidence from Malaysia. *International Journal of Business and Society*, 14(2), 299–318.
- Stoughton, N. M., & Zechner, J. (1998). IPO mechanism, monitoring and ownership structure. *Journal of Financial Economics*, 49(1), 45–77. [https://doi.org/10.1016/S0304-405X\(98\)00017-8](https://doi.org/10.1016/S0304-405X(98)00017-8).
- Tajuddin, A. H., Abdullah, N. A. H., & Taufil-Mohd, K. N. (2018). Shariah-compliant status and IPO oversubscriptions. *Journal of Islamic Accounting and Business Research*, 9(4), 531–548. <https://doi.org/10.1108/JIABR-10-2017-0147>.
- Tajuddin, A. H., Mohd-Rashid, R., Abdullah, N. A. H., & Abdul-Rahim, R. (2015). An empirical examination of over-subscription in the Malaysian IPO market. *International Journal of Economics and Management*, 9(S), 81–102.
- Wan-Hussin, W. N. (2005). The effects of owners' participation and lockup on IPO underpricing in Malaysia. *Asian Academy of Management Journal*, 10(1), 19–36.
- Yong, O. (2010). Initial premium flipping activity and opening-day price spread of Malaysian IPOs. *Capital Markets Reviews*, 18(1), 45–61.
- Yong, O. (2011). Winner's curse and bandwagon effect in Malaysian IPOs: Evidence from 2001–2009. *Jurnal Pengurusan*, 32, 21–26.
- Yong, O. (2013). When do after-market IPO prices stabilize? Evidence from Malaysian fixed-price IPOs. *International Review of Business Research Papers*, 9(4), 77–90.
- Yung, C., & Zender, F. J. (2010). Moral hazard, information asymmetry and IPO lockups. *Journal of Corporate Finance*, 16, 320–332. <https://doi.org/10.1016/j.jcorpfin.2009.12.004>.
- Zheng, S. (2007). Are IPOs really overpriced? *Journal of Empirical Finance*, 14, 287–309. <https://doi.org/10.1016/j.jempfin.2006.06.001>.