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INVESTIGATING THE ACCURACY OF ALTERNATIVE VALUATION METHODS FOR STOCK VALUATION

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Highlights

- Accurate stock price forecasting is essential not only for investors but also for informing managerial decision-making.
- Many factors influence stock price predictions, and one of them is the choice of stock valuation method.
- The Mongolian Stock Exchange (MSE), which has been operational for a mere 34 years, is classified as a Frontier Market under the MSCI Market Classification.
- DCF method was used in 62.5% of cases, confirming its dominance in Mongolian IPO valuations.
- The regression analysis confirms that firm profitability and macroeconomic conditions significantly influence the accuracy of stock valuations in IPOs.
- Among the valuation methodologies, only the Hybrid model approach demonstrated a statistically significant positive impact on valuation accuracy.

Abstract

Introduction: This study evaluates the predictive accuracy of common equity valuation models employed on the Mongolian Stock Exchange (MSE), a frontier market with an underdeveloped institutional infrastructure. The objective is to determine which valuation approach most effectively explains the deviation between IPO forecasted prices and actual post-IPO market performance.

Methods: We analyzed 32 IPO valuation reports issued between 2011 and 2023 by certified Mongolian valuation firms. Five widely used methods – Discounted Cash Flow (DCF), Dividend Discount Model (DDM), Residual Income Model (RIM), Net Asset Valuation (NAV), and Relative Valuation – were identified and assessed. The accuracy of each approach was tested using regression models, with the dependent variable defined as the absolute percentage deviation between the target and realized 12-month average trading price.

Results: Empirical research has extensively examined the accuracy of various stock valuation methods, including the DCF model, DDM, RIM, and market multiples such as the P/E and P/B ratio. These studies provide insights into the effectiveness of each approach under different market conditions and firm characteristics. While each valuation method has its advantages and limitations, empirical evidence suggests that the choice of model should be tailored to the specific context, considering factors such as market conditions, firm characteristics, and the availability of reliable data. Although DCF was the most frequently applied method (62.5% of reports), hybrid models – where multiple methods are combined – showed the highest explanatory power (adjusted $R^2 = 0.22$). Higher profitability (ROA) significantly improved valuation accuracy, while higher interest rates were associated with reduced accuracy. Single-method models such as DDM, RIM, and NAV did not yield statistically significant improvements in forecast performance.

Discussion: Hybrid valuation approaches offer superior predictive accuracy compared to standalone models in frontier markets, such as Mongolia. The results highlight the value of method triangulation and financial performance indicators in improving valuation precision. Policymakers and practitioners should consider encouraging hybrid models to enhance the robustness and reliability of IPO valuations.

Keywords

Ohlson valuation model, “Other information” variable, market value, book value, Piotroski score, corporate governance indicators.

JEL classification: G24, G12, C52, O16.

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Introduction

Equity analysis provides investors with information on the current and future prospect of listed companies [1]. Analysts build target prices using their short-term earnings forecasts and their assessment of a firm's long-term prospects using available fundamental and private information [2]. Accurate stock price forecasting is essential not only for investors but also for informing managerial decision-making. To serve as a basis for optimal decision making, the predicted price must be as realistic as possible. The accuracy of stock price predictions is influenced by various factors, including market conditions, company characteristics, and investor sentiment. Different market environments can significantly affect the performance of valuation methods, as evidenced by the varying results in bull and bear markets [3]. Many factors influence stock price predictions, and one of them is the choice of stock valuation method. Analysts use various methods and models, ranging from simple to sophisticated. These models often make very different assumptions about the fundamentals that determine value [4].

Damodaran has classified commonly used methods for stock valuation as follows [4]:

- discounted cash flow valuation methods (DDM, FCFE, DCFF), excess return models (EVA, CFROI, APV);
- liquidation and accounting valuation methods (RIM, O95, FO95, NAV, liquidation valuation);
- relative valuation methods (P/E, P/B, P/S, EV/S, EV/EBITDA);
- contingent claim valuation methods (Option pricing models).

Relative valuation methods use market multiples (e.g., P/E, P/B ratios) to evaluate a company's value compared to peers, offering insights into market sentiment [5]. These methods are generally easier to calculate and understand, making them accessible for investors [6]. They allow for a quick assessment of whether a stock is overvalued or undervalued relative to its peers [7]. Its usefulness relies on the view that the P/E ratio captures risk and growth of a stock; hence, a firm's value can be reasonably assessed based on the P/E ratio of its comparable firms with similar risk and growth [8].

Relative valuation methods in finance have several limitations. One major concern is that these methods rely heavily on market prices, which may be influenced by market inefficiencies. If the market systematically overprices or underprices assets, the valuations derived from these methods can deviate

significantly from an accurate intrinsic value [4]. Additionally, analysts may find it challenging to select appropriate comparable firms or multiples, leading to inconsistencies in valuation results. Furthermore, while relative valuation is often preferred for its simplicity and lower cost, it does not inherently account for the unique aspects of a company's cash flow generation, potentially leading to misestimations [9; 10]. Overall, while relative valuation is a popular tool, it is important for analysts to remain aware of these limitations and the context in which they are applying these methods.

Although numerous empirical studies have been conducted internationally – particularly in countries such as the United States [8], New Zealand [11], England [12; 13], Canada [14], Germany [15], Brazil [16], Japan [17], and China [18] – that compare the predictive capabilities of various stock valuation methods, there exists a notable paucity of research focused specifically on the Mongolian Stock Exchange (MSE). Asian emerging markets offer a more complex environment for analysts to work as compared to developed markets like the UK and the US [19]. Research conducted on the MSE has predominantly focused on aspects such as investor behavior [20; 21], stock price bubbles [22], and valuation errors [23]. However, there is a notable scarcity of studies that compare the predictive capabilities of various stock valuation methods.

The objective of this study is to perform a comparative analysis of various stock valuation methods, focusing on their application, predictive capabilities, and accuracy, with a case study involving companies listed on the MSE. This research paper consists of the following sections: Literature Review, Data and Methodology, Results, and Conclusion. In the Literature Review section, we examine empirical studies that compare the predictive capabilities of various stock valuation methods. The Data and Methodology section provides a detailed explanation of the data utilized in the study and the methods employed for analysis. In the Results section, we present the findings of the research, while the Conclusion section summarizes the key conclusions, discusses the limitations of the study, and outlines areas for future research.

Literature Review

Empirical research has extensively examined the accuracy of various stock valuation methods, including the DCF model, DDM, RIM, and market multiples such as the P/E and P/B ratio. These studies provide insights into the effectiveness of each approach under different market conditions and firm characteristics. Empirical studies, such as those by Imam and others, indicate that cash-flow-based models, particularly the DCF model, often provide higher accuracy compared to accrual-based models for generating target prices [24]. Despite its widespread use, the DCF method may suffer from inaccuracies because it depends heavily on assumptions about future cash flows, which are not always dependable. Damodaran emphasizes that while DCF models provide a thorough analysis of a company's

future performance, they are highly sensitive to the assumptions made regarding growth rates and discount rates [7].

Furthermore, RIM has been noted for its strong performance, as it leverages fundamental accounting data, thereby enhancing its predictive validity across varying market conditions [25]. Prior studies have indicated that the RIM typically results in lower valuation errors than both the DCF and DDM, especially when predicting stock prices [26; 27]. In contrast, market multiples like P/E, P/B ratios are commonly used and effective in certain contexts, but their effectiveness can vary significantly depending on the industry and specific firm characteristics [25]. Research has highlighted that these methods are easy to use and offer a quick snapshot of market sentiment [5]. One study investigated the target price accuracy of P/E and DCF models in Asian emerging markets, finding that analysts preferred the P/E model during and immediately after the 2008 financial crisis [19].

The study suggested that the P/E model was better equipped to capture market sentiments in dynamic emerging markets. On the other hand, accuracy should be reduced for loss-making firms and firms with high P/B ratios [1]. It is worthwhile to note that use of price multiples is not as straightforward as it may appear [28]. The mixed approach, which averages valuations obtained through different methods, has also been suggested to offer greater accuracy than any single method alone, indicating the benefits of using a combination of DCF and market approaches [29]. In summary, while each valuation method has its advantages and limitations, empirical evidence suggests that the choice of model should be tailored to the specific context, considering factors such as market conditions, firm characteristics, and the availability of reliable data.

Data and Methodology

The Mongolian Stock Exchange (MSE), which has been operational for a mere 34 years, is classified as a Frontier Market under the MSCI Market Classification. This classification reflects its status as a relatively nascent market, which inherently results in a lack of extensive experience seen in more developed markets. Consequently, in contrast to practices observed in other countries, there is currently no established practice for financial analysts to produce annual reports that forecast target prices for stocks. Instead, companies that are undertaking Initial Public Offerings (IPOs) engage licensed valuation organizations to perform business valuations. The resulting reports are incorporated into their securities prospectuses, thereby laying the groundwork for our research analysis.

In our study, we employed content analysis to examine the business valuation reports of 32 companies that have conducted IPOs on the MSE since 2011. The objective was to identify the stock valuation methods that are predominantly used and to assess their predictive accuracy. Approximately 60% of the business valuations for these 32 companies that conducted Initial Public Offerings (IPOs) on the MSE were performed by Gerege Estimate and BDO Mongolia, as shown in Table 1.

Table 1. Valuation Company List

№	Valuation companies	Number of reports
1	Gerege Estimate	9
2	BDO Mongolia	9
3	Itgelt Estimate	3
4	Aten	2
5	Munkh-Orgil trade	2
6	National realty	2
7	Evidence	2
8	KPMG Mongolia	1
9	Center of property valuation	1
10	Oyu-Erdem Audit	1
	Total	32

Source: compiled by the authors

During the designated period, 53% of the companies that undertook Initial Public Offerings (IPOs) are categorized within the financial sector, whereas 18% are classified as industrial firms, and an additional 18% fall under the consumer staples category. Analysts have predominantly utilized the DCF method (75%), NAV method (75%), and P/B method (53%) for valuing the stocks of companies undergoing IPOs, with 62.5% of them adopting the results derived from the DCF method as the target price, as illustrated in Table 2.

Table 2. Valuation Methods That Appear in Cross-sector Valuation Reports

Sector	Total reports	Number of times the following valuation methods appeared in the reports								Total	Hybrid
		Discounted cash flow		Accounting valuation		Relative valuation					
		DCF	DDM	RIM	NAV	P/B	P/E	P/S	EV multiples		
Financials	17	9	8	5	12	13	10	0	0	57	1
Industrials	6	6	0	0	5	2	1	0	1	15	2
Consumer Staples	6	6	1	0	5	1	3	1	5	22	
Consumer Discretionary	1	1	0	0	0	0	0	0	0	1	
Information Technology	1	1	0	0	1	0	0	0	0	2	
Health Care	1	1	0	0	1	1	0	0	0	3	
Total	32	24	9	5	24	17	14	1	6	100	3
Classified as dominant method		20	3	5	1					32	3

Note: DCF-Discounted cash flow methods, DDM-Dividend Discount Model, RIM-Residual Income Model, NAV-Net Asset Valuation Method, P/B-Price to Book, P/E-Price to Earnings, P/S-Price to Sales, EV multiples-Enterprise multiples such as EV to EBIT, EV to Sales, EV to net income, EV to EBITDA. The term "hybrid" refers to the practice of an appraiser employing multiple methods to value a company's stock, rather than considering only one method as the dominant approach. In calculating the target price, it implies that the appraiser considers the results derived from the various methods used, assigning them appropriate significance to reflect their contributions to the overall valuation.

Source: compiled by the authors

The accuracy of the stock valuation methods was calculated as follows:

$$TPE_{it} = \left| \frac{TP_i - P_{it}}{TP_i} \right|$$

Here, TPE_{it} – represents the target price error for company (i) at time (t). TP_i – the target price set for company (i). P_{it} – the actual price of company (i)'s stock on day (t). The actual price is derived from the trading prices recorded over a period of 12 months following the IPO.

Regression analysis was conducted to examine the influence of firm characteristics (e.g., size, ROA), monetary policy, and valuation method (dummy variables for DCF, DDM, RIM, NAV, hybrid) on target price accuracy.

Table 3 provides detailed definitions of the variables employed in the study, while Table 4 presents the descriptive statistics for these variables, summarizing the central tendency, dispersion, and range of the dataset comprising 32 observations – each corresponding to a company that conducted an IPO on the MSE. The table offers critical insight into the distribution and characteristics of the variables used to evaluate the predictive accuracy of stock valuation methods.

Table 3. Variable Description

Variable	Description
<i>tpe10</i>	Target price error with 10% accuracy
<i>roa</i>	Return on assets, net income divided by total assets
<i>size</i>	Firm size, the natural logarithm of total assets
<i>prate</i>	Policy rate,
<i>ddcf</i>	Dummy variable that takes the value of one if the target price forecast is based on DCF valuation approach, zero otherwise
<i>dddmm</i>	Dummy variable that takes the value of one if the target price forecast is based on DDM valuation approach, zero otherwise
<i>dnav</i>	Dummy variable that takes the value of one if the target price forecast is based on NAV valuation approach, zero otherwise
<i>drim</i>	Dummy variable that takes the value of one if the target price forecast is based on RIM valuation approach, zero otherwise
<i>dhyb</i>	Indicator variable that takes the value of one if the target price forecast is entirely based on a sum of the parts valuation, which is solely based on the hybrid approach, zero otherwise

Source: compiled by the authors

The variable *tpe10* is a custom indicator of valuation accuracy, where values closer to 1 represent higher prediction accuracy, and values approaching 0 imply greater error in the predicted target price relative to the actual market price observed in the 12-month period following the IPO. Its mean indicates that, on average, valuation reports achieved an average accuracy score of 0.3144 (on a scale where 1 represents perfect forecast alignment), meaning that there is substantial room for improvement in forecast accuracy. Contrary to conventional absolute error metrics,

a higher *tpe10* value is desirable, as it reflects better alignment between forecasted and realized stock prices. Standard Deviation (0.3206) reflects a high level of dispersion, suggesting that valuation accuracy varied considerably among firms, with some companies showing strong valuation precision (approaching 1) and others with significantly inaccurate forecasts (approaching 0).

The variable *roa* measures firm-level profitability by dividing net income by total assets. Mean (0.0368) suggests that, on average, firms generated a 3.68% return on their asset base. Standard Deviation (0.1322) implies substantial heterogeneity in profitability. The positive relationship between profitability and valuation accuracy is plausible, as firms with consistent and transparent earnings may be easier to value.

Table 4. Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
<i>tpe10</i>	32	0.3144	0.3206	0.0000	0.9505
<i>roa</i>	32	0.0368	0.1322	-0.3993	0.4618
<i>size</i>	32	24.5856	1.7603	20.7884	28.4649
<i>prate</i>	32	10.7656	1.4796	6.0000	14.0000
<i>ddcf</i>	32	0.6250	0.4919	0.0000	1.0000
<i>dddm</i>	32	0.0938	0.2961	0.0000	1.0000
<i>dnav</i>	32	0.0313	0.1768	0.0000	1.0000
<i>drim</i>	32	0.1563	0.3689	0.0000	1.0000
<i>dhyb</i>	32	0.0938	0.2961	0.0000	1.0000

Source: compiled by the authors

The *size* variable is expressed as the natural logarithm of total assets, a common transformation in financial research to normalize skewed data. Mean (24.5856) indicates the average scale of firms, with a range from 20.79 to 28.46, denoting a moderate spread in firm sizes. Standard Deviation: 1.76 shows that while the companies differ in size, most fall within a relatively narrow bandwidth. Larger firms typically have more predictable cash flows, which might contribute to more accurate valuations. However, the moderate variation implies a concentration of mid-sized firms in the MSE's IPO market.

The *prate* variable captures the central bank's monetary policy rate at the time of IPO, serving as a macroeconomic control variable. Mean (10.77%) reflects Mongolia's relatively high-interest rate environment, characteristic of many frontier markets. The policy rate can influence both the cost of capital and investor sentiment, thereby affecting stock price formation post-IPO.

Valuation method dummies (*ddcf*, *dddm*, *dnav*, *drim*, *dhyb*) are binary dummy variables indicating whether a specific valuation method was used to derive the IPO target price.

ddcf (Discounted Cash Flow): With a mean of 0.625, the DCF method was used in 62.5% of cases, confirming its dominance in Mongolian IPO valuations.

dddm (Dividend Discount Model): Used in 9.38% of valuations, indicating limited applicability, perhaps due to the low or irregular dividend-paying nature of listed firms.

dnav (Net Asset Valuation): Used in only 3.13% of reports, reflecting the rare use of NAV, possibly due to limited tangible asset bases in modern firms or difficulty in asset revaluation.

drim (Residual Income Model): Utilized in 15.63% of valuations, indicating moderate adoption, particularly where firms lack stable free cash flows.

dhyb (Hybrid Approach): Also observed in 9.38% of the reports. This method aggregates multiple valuation outcomes to derive a weighted estimate, aligning with recent recommendations in valuation literature advocating for model triangulation to improve predictive accuracy.

The variance in usage patterns suggests that valuation consultants select models based on firm-specific characteristics and sectoral norms, though DCF remains the baseline method.

In summary, Table 4 reveals that IPO valuations in Mongolia are heavily reliant on the DCF method, which was used in over 62% of the sampled reports. The sample of firms demonstrates moderate variation in terms of profitability and size, reflecting the diversity of sectors participating in the Mongolian IPO market. The average *tpe10* value of 0.3144 suggests that the valuation accuracy across firms is relatively low, with significant deviation between projected and realized stock prices. This highlights the inherent forecasting difficulties in frontier markets like Mongolia, where limited historical data, low liquidity, and market inefficiencies hinder precise valuation. Moreover, the infrequent use of advanced or hybrid valuation models points to a potential need for methodological refinement and standardization in the Mongolian financial sector to enhance forecasting quality and investor confidence.

Empirical Results

Table 5 presents the Pearson correlation coefficients between the dependent variable (*tpe10*) -- which measures target price error - and several independent variables, including firm-specific factors (profitability and size), macroeconomic policy (interest rate), and dummies indicating the valuation methodology employed in IPO reports.

This matrix serves two critical purposes: (1) identifying potential collinearity concerns among regressors, and (2) providing preliminary insights into bivariate associations that may explain the variation in valuation accuracy.

1. Relationship between target price error and key variables

Return on Assets (*roa*): The correlation coefficient between *roa* and *tpe10* is 0.4005, and it is statistically significant at the 5% level (**). This indicates a positive relationship between firm profitability and valuation accuracy - that is, more profitable firms tend to be valued more accurately. This may be because higher

profitability implies more stable earnings and clearer cash flow patterns, enabling more reliable valuation projections.

Firm Size (*size*): The correlation between firm size and *tpe10* is 0.0845, but this relationship is not statistically significant. This suggests that firm size has little to no effect on valuation accuracy in this dataset. The result implies that both large and small firms are equally subject to potential forecasting errors or market uncertainties.

Table 5. Correlation Matrix

Variable	<i>tpe10</i>	<i>roa</i>	<i>size</i>	<i>prate</i>	<i>ddcf</i>	<i>dddm</i>	<i>dnav</i>	<i>drim</i>
<i>roa</i>	0.4005 **							
<i>size</i>	0.0845	0.3034 *						
<i>prate</i>	-0.3501 **	-0.2697	-0.3107 *					
<i>ddcf</i>	0.0353	0.0499	-0.3896 **	-0.2355				
<i>dddm</i>	-0.1628	0.1057	0.2544	-0.0219	-0.4152 **			
<i>dnav</i>	-0.1789	-0.2475	-0.2173	0.1522	-0.2319	-0.0578		
<i>drim</i>	0.1017	0.0153	0.5128 ***	-0.1671	-0.5556	-0.1384	-0.0773 *	
<i>dhyb</i>	0.0842	-0.0599	-0.1163	0.5303 ***	-0.4152 **	-0.1034	-0.0578	-0.1384

Note: *, **, *** present statistical significance at the levels of 10, 5, and 1 percent, respectively

Source: compiled by the authors

Policy Rate (*prate*): The correlation between the central bank policy rate and *tpe10* is -0.3501 , significant at the 5% level (**), implying that higher interest rates are associated with lower valuation accuracy. This may reflect the challenge of conducting accurate valuations in a tight monetary environment, where discount rates become volatile and economic uncertainty affects market sentiment. In such conditions, valuation models may struggle to generate consistent or realistic estimates of intrinsic value.

2. Method-Specific Correlations

DCF Dummy (*ddcf*): The correlation between DCF usage and valuation accuracy (*tpe10*) is very weak (0.0353) and statistically insignificant, indicating that using the DCF method alone does not significantly enhance or reduce valuation accuracy. However, the DCF dummy is negatively correlated with firm size (-0.3896 , significant at the 5% level), suggesting that DCF is more commonly applied to smaller firms, possibly due to its perceived flexibility and its ability to model firm-specific cash flow assumptions in the absence of robust market comparables.

DDM Dummy (*dddm*): The DDM dummy has a negative correlation with *tpe10* (-0.1628), although not statistically significant. This weak negative association implies that firms valued using the DDM may have slightly lower forecast accuracy, potentially due to irregular dividend histories or immature dividend policies, which are common in emerging markets. The DDM dummy is significantly negatively correlated with DCF (-0.4152 , 5% level), indicating a substitution pattern - valuation practitioners generally choose one or the other rather than applying both in the same report.

NAV Dummy (*dnav*): The NAV dummy is negatively but insignificantly correlated with all variables, including *tpe10* (-0.1789), suggesting that net asset valuation is rarely used and does not contribute significantly to valuation accuracy. Its selective use likely reflects niche applications, such as in asset-heavy industries or in firms with low earnings predictability, but it plays a minimal role overall in the valuation framework on the MSE.

RIM Dummy (*drim*): The RIM dummy exhibits a positive but weak relationship with valuation accuracy (*tpe10* = 0.1017), which, while not statistically significant, suggests some potential benefit in using RIM. Notably, it has a strong positive correlation with firm size (0.5128 , significant at 1%), indicating that larger firms are more likely to be valued using RIM, possibly because of their more stable earnings profiles and deeper financial statement histories. The RIM dummy is negatively correlated with DCF (-0.5556) and DDM (-0.1384), reinforcing that RIM is treated as an alternative rather than a complementary method in most valuations.

Hybrid Model Dummy (*dhyb*): The hybrid model dummy is positively correlated with *tpe10* (0.0842), although not statistically significant. This weak positive association hints that blended approaches might improve valuation accuracy, though the effect is not strong enough here to be conclusive. More interestingly, the dummy is positively and significantly correlated with the policy rate (0.5303 , 1% level) and negatively correlated with DCF usage (-0.4152 , 5% level). These relationships suggest that valuation professionals are more likely to turn to hybrid approaches in high-interest-rate environments, possibly to hedge against the sensitivity of single-method estimates in volatile macroeconomic conditions. Additionally, hybrid methods appear to be used as substitutes for DCF in complex or uncertain valuation scenarios.

While no extreme correlations (>0.7 or <-0.7) are observed - implying the absence of strong multicollinearity - the presence of several statistically significant associations between the dummy variables (e.g., DCF and DDM, DCF and RIM) warrants caution. The selection of valuation methodology is not entirely random and may be driven by firm characteristics or economic context.

The correlation analysis provides preliminary evidence that firm profitability (ROA) and the interest rate environment (*prate*) play significant roles in shaping the accuracy of IPO valuation forecasts in frontier markets such as Mongolia.

Specifically, more profitable firms tend to be valued more accurately, while higher interest rates are associated with lower forecasting precision - likely due to greater uncertainty in discount rate assumptions. Furthermore, the choice of valuation methodology appears to be influenced by firm size and macroeconomic conditions, rather than being based solely on theoretical or technical preferences. These findings offer empirical grounding for the multivariate regression analysis presented in Table 6, which further explores the combined impact of these factors on valuation accuracy.

Table 6. Regression Results

Variable	DCF	DDM	NAV	RIM	Hybrid
<i>roa</i>	0.9033 **	0.8870 **	0.8302 *	0.9245 **	0.7974 *
<i>size</i>	-0.0341	-0.0115	-0.0227	-0.0356	-0.0228
<i>prate</i>	-0.0736 *	-0.0597	-0.0617	-0.0614	-0.1048 **
Methods	-0.0888	-0.2071	-0.1415	0.1292	0.3744 *
Constant	1.9673	1.2269	1.5108	1.7954	1.9396 *
Observation	32	32	32	32	32
F statistics	2.2199 (0.0934)	2.4791 (0.0678)	2.1331 (0.1041)	2.2543 (0.0895)	3.1701 (0.0294)
Adj.R ²	0.1360	0.1603	0.1276	0.1393	0.2188

Note: *, **, *** present statistical significance at the levels of 10, 5, and 1 percent, respectively.

Source: compiled by the authors

Table 6 presents the results of five separate Ordinary Least Squares (OLS) regression models, each testing the explanatory power of a specific valuation method - DCF, DDM, NAV, RIM, and Hybrid - in predicting the accuracy of IPO valuations as measured by *tpe10*. The dependent variable in each model is the same (*tpe10*), while the set of independent variables includes firm-specific characteristics (*roa*, *size*), a macroeconomic factor (*prate*), and dummy variables indicating the valuation method applied.

The coefficient for ROA is positive and statistically significant in all five models, ranging from 0.7974 to 0.9245. Firms with higher ROA tend to have more accurate IPO valuations, likely due to stronger fundamentals and clearer earnings power, which improve model input quality (especially in DCF and RIM). This underscores the importance of firm-level financial health in enhancing valuation reliability in frontier markets.

The variable *size* shows small negative coefficients across all models and is not statistically significant in any. Larger firms are not necessarily valued more accurately than smaller ones in the Mongolian IPO market. This may reflect limited informational advantages or analyst capacity even for bigger companies.

The policy interest rate (*prate*) is negatively associated with valuation accuracy in all models, reaching statistical significance in the DCF (10%) and Hybrid (5%) models. Higher interest rates reduce valuation accuracy, likely due to increased discount rate volatility, macroeconomic uncertainty, and weakened investor confidence. Notably, the hybrid model is most sensitive to monetary conditions (-0.1048), suggesting that it may be used as a flexible response to complex environments but still struggles under uncertainty.

The DCF method, while conceptually robust, did not yield a statistically significant improvement in valuation accuracy within this dataset. While DCF is theoretically robust, its reliance on subjective assumptions (e.g., future cash flows, discount rates) may limit precision in an emerging market context.

The DDM shows a moderately negative impact on accuracy, albeit not statistically significant. This aligns with expectations in markets like Mongolia, where firms rarely have stable dividend histories.

Net asset valuation is not significantly related to higher valuation accuracy, reinforcing its marginal role in IPO pricing and its potential misalignment with market sentiment or earnings-based valuation.

While not statistically significant, the positive sign suggests that RIM may enhance forecast accuracy, particularly for firms with strong accounting transparency or consistent residual incomes. This is consistent with its positive correlation with firm size from earlier analysis.

Hybrid is the only method-specific variable with a statistically significant positive effect on valuation accuracy. It suggests that combining multiple valuation approaches yields more accurate price forecasts, validating previous empirical findings that hybrid models mitigate the weaknesses of any single method.

Adjusted R^2 ranges from 0.1276 (NAV model) to 0.2188 (Hybrid model). The Hybrid model outperforms all others in explanatory power, with the highest F-statistic (3.1701, $p = 0.0294$), indicating overall model significance at the 5% level. Although the models are modest in explanatory power (as expected in a small-N, frontier market context), the Hybrid approach shows a statistically and practically superior ability to explain valuation accuracy.

The regression analysis confirms that firm profitability and macroeconomic conditions significantly influence the accuracy of stock valuations in IPOs. Among valuation methods, only the Hybrid approach demonstrates a statistically significant and positive relationship with forecast precision, reinforcing calls for integrated, context-aware valuation frameworks in frontier markets. The underperformance of standalone models such as DCF and DDM further highlights the limitations of applying traditional techniques in environments characterized by informational asymmetry and economic volatility.

Conclusion

This study set out to evaluate the accuracy of alternative stock valuation methods used in IPO reports on the MSE, a frontier market characterized by limited

liquidity, informational asymmetries, and macroeconomic volatility. Drawing on a content analysis of 32 IPO valuation reports spanning more than a decade, we assessed the predictive validity of commonly used valuation techniques - namely, Discounted Cash Flow (DCF), Dividend Discount Model (DDM), Net Asset Valuation (NAV), Residual Income Model (RIM), and hybrid (combined) approaches.

Our analysis reveals that the DCF method dominates the valuation landscape in Mongolia, appearing in over 60% of the reports. However, valuation accuracy remains modest, with an average alignment of only 31% between forecasted and realized prices. This substantial gap underscores the challenges of applying valuation models in a frontier market context, where robust financial forecasting is constrained by data limitations and market inefficiencies.

Correlation and regression analyses further indicate that firm-level profitability (ROA) is a consistently strong predictor of valuation accuracy across all models. This finding aligns with international literature and emphasizes the importance of internal financial strength in generating reliable valuations. In contrast, firm size showed no significant effect, and higher interest rates were negatively associated with valuation accuracy, likely due to increased uncertainty in the discounting process.

Among the valuation methodologies, only the Hybrid model approach demonstrated a statistically significant positive impact on valuation accuracy. This supports the growing academic consensus that combining multiple methods - such as integrating DCF with relative valuation or accounting-based approaches - can offset the limitations inherent in any single technique. Notably, the hybrid model also achieved the highest explanatory power in the regression analysis (adjusted $R^2 = 0.22$), reinforcing its practical relevance for valuation professionals in emerging markets.

Applying hybrid valuation models in frontier markets like Mongolia offers several benefits - such as improving accuracy by combining multiple valuation approaches - but it also presents a unique set of challenges. These arise due to structural, institutional, and informational characteristics of such markets.

Here are key challenges associated with applying hybrid valuation models in frontier markets like Mongolia:

- **Data Availability and Quality.** Hybrid models often rely on a mix of input data (e.g., historical earnings, market multiples, asset revaluations), which are scarce or unreliable in frontier markets. Challenge: Financial statements may be inconsistent, unaudited, or lack depth (e.g., insufficient segment-level disclosures). Example: Applying a DCF component requires detailed cash flow projections, which are often unavailable or speculative.

- **Lack of Comparable Firms for Relative Valuation.** A component of hybrid models often includes relative valuation based on peer multiples (e.g., P/E,

EV/EBITDA). Challenge: Small, illiquid stock exchanges like the MSE have very few listed companies, making it difficult to identify an appropriate comparable. Implication: Market-based estimates may be distorted or lack statistical validity.

– Market Inefficiencies and Low Liquidity. Stock prices in frontier markets may not reflect true intrinsic value due to thin trading volumes, speculative behavior, or insider influence. Challenge: Market input used in relative valuation (e.g., market cap, share price) may be highly volatile or manipulated. Outcome: This weakens the reliability of the valuation output even when technically sound.

– High Subjectivity in Weight Assignment. Hybrid models require assigning weights to each method to compute a final valuation. Challenge: There is often no objective basis for weight assignment in the absence of long-term empirical benchmarks. Example: Analysts may arbitrarily favor DCF over NAV, introducing bias and reducing replicability.

– Regulatory and Disclosure Gaps. Robust valuation depends on standardized accounting and transparency regulations, which are often underdeveloped in frontier markets. Challenge: Differing interpretations of valuation guidelines and insufficient regulatory oversight can lead to inconsistencies across reports. Consequence: The hybrid approach, which relies on integrating multiple methods, may amplify errors from each source.

– Limited Professional Expertise. Frontier markets typically have a smaller pool of trained valuation experts, especially those proficient in advanced models. Challenge: Misapplication or superficial use of models may occur, particularly when combining techniques like RIM and DCF. Risk: Without proper training, hybrid models may give the illusion of robustness while increasing complexity without added accuracy.

– Macroeconomic Instability. High inflation, exchange rate volatility, and interest rate fluctuations (as seen in Mongolia's double-digit policy rates) complicate forward-looking models. Challenge: Inputs like discount rates, terminal growth, and risk premiums become highly speculative, reducing model precision. Impact: Hybrid models may suffer from compounded uncertainty due to the multiplicity of assumptions.

– Overfitting and Lack of Transparency. The flexibility of hybrid models allows for adjustment to "fit" results, which can be misused for justifying predetermined valuations. Challenge: This can undermine trust in valuation reports, especially when IPOs or fundraising depend on optimistic forecasts.

While hybrid valuation models offer theoretical advantages by blending multiple perspectives, their application in frontier markets like Mongolia must be done with caution. Analysts need to address the systemic constraints in data quality, market structure, and institutional capacity. Nevertheless, when applied transparently and supported by improved data infrastructure, hybrid models offer a promising avenue for improving valuation practices in frontier markets.

Implications

The findings carry important implications for practitioners, regulators, and scholars alike: practitioners should adopt blended valuation frameworks to improve predictive accuracy and reduce reliance on single-method forecasts; regulators and exchanges may consider issuing best-practice guidelines that encourage the transparent use of hybrid valuation models; researchers are encouraged to build on this foundation by expanding the sample size and incorporating more recent IPOs or cross-market comparisons.

Limitations and future research

The study's main limitation lies in its relatively small sample size ($N = 32$), a reflection of the still-developing nature of the MSE. Additionally, the reliance on valuation reports submitted at IPO may introduce biases due to optimistic assumptions. Future research could enrich this analysis by including post-IPO analyst reports, secondary offerings, or longitudinal studies tracking valuation accuracy over time. Comparative studies between Mongolia and similar frontier markets could also yield deeper insights into the generalizability of hybrid valuation efficacy.

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