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IMPROVING ANALYST TARGET PRICE PERFORMANCE THROUGH ENHANCED VALUATION TECHNIQUES

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ABSTRACT

This study focuses on the target price issue, it aims to improve the reliability of target price through the enhanced valuation techniques. Firstly, this study improves the target price reliability by enhancing the discount rate estimation method. Secondly, the concept of industry-specific combined valuation approach has been introduced by this study, this new concept not only takes advantage of the benefit from the combination of absolute and relative model, but also consistent with the distinguishing features of different industries. Thirdly, this study presents an enhanced target price setting method to improve the target price reliability, this method provides effective solutions to the common but unsolved question about how to combine a range of value estimates. Finally, a reliability testing method has been introduced by this study to measure the performance of value estimate and target price.

JEL: G12, G14, C10

KEYWORDS: Target Price Performance, Enhanced Valuation Methods

INTRODUCTION

The target price, together with the recommendation and earnings forecast are three most important quantitative outputs of the analysts' equity reports. Brav and Lehavy (2003) point out the target prices are analysts' most informative statement on firms' value, and the market tend to react significantly and immediately to their initial and revision announcements. Dong (2008) states that target prices reflect analysts' expectation for the highest price level that a company's stock is likely to reach within a certain time horizon, usually one year from the target price announcement day. Ideally, the target prices are supposed to help investors judge the best point to exit their existing positions for realizing the maximum profit potential. However, the target prices do not always produce the right signals, and most of them tend to be over-bullish. Recently, the reliability of target prices estimated by analysts has raised great attention of investors. There are increasingly doubts on target prices, as their low reliability has been found frequently, especially assigned targets for technology stocks are often too high to achieve. This study concentrates on the recent popular topic of target price issue. It attempts to improve the reliability of target prices by enhancing the valuation methodology from three aspects: the discount rate estimation method, valuation model and target price setting technique. In addition, this study introduces a reliability testing method to measure the performance of both value estimate and target price. The rest of the study is organized as follows: the literature review section discusses the low reliability of target prices, and the factors which have indirect and direct influences on the target prices. The enhanced discount rate estimation method section presents the expand CAPM model and the target price-based GGM model. The enhanced valuation model section introduces a concept of industry-specific combined model. The enhanced target price setting technique section designs a three steps approach to set target price. The reliability testing methods for value estimate and target price section presents a reliability testing method to measure the performance of value estimate and target price, followed by the concluding comments in the last section.

LITERATURE REVIEW

The low reliability of listed companies' target prices is becoming a wide spread issue. There are increasing researches investigating the target prices, and show that the target prices often significantly deviate from the market prices. Brav and Lehavy (2003) and Asquith et al. (2005) showed that, for the period 1997 to 1999, the average return implied by target prices was 32.9%. Bradshaw et al. (2013) found the target prices between the years 2000 and 2009 implied a return of 24.0%. In fact, there was only an actual market return of 8.1% from the years 1997 to 2009 (Bradshaw et al., 2014). Bonini et al. (2010) discovered that the target price reliability is very limited, their prediction errors are consistent, auto-correlated, non-mean reverting and large. In fact, the low reliability of target prices is a wide spread issue worldwide. Asquith et al. (2005) found that about 54.3% of target prices in the US reach their targets within 12 months. Kerl (2011) revealed that approximately 56.5% of target prices are achieved in Germany, Bonini et al. (2010) found that only 33.1% of target prices are achieved in Italy. The target price issue also attracts attention of financial media, for example "Price Targets are Hazardous to Investors' Wealth" (Morgenson, 2001) and "Moving Targets: Forget Analysts' Price Targets. They're Really Just for Show" (Maiello, 2000) are two famous articles express stock investors' attitudes towards target prices.

In reality, many factors that can indirectly influence the performance of target price. Bradshaw et al. (2013) found evidence that the target price accuracy is largely related to the overall market condition, where the target price forecasts are more accurate in the up rather than the down market. This is usually true as the financial analysts tend to issue "bullish" target prices, which are easier to achieve in a bull market. Asquith et al. (2005) suggested that the high target prices actually are the products of the financial analyst's optimism. Bradshaw et al. (2013) discovered that the target prices issued by the financial analysts employed by pure brokers are more optimistic due to the incentives to generate trading. Bonini and Kerl (2012) found that financial analysts' access to privately available information affected their ability to produce reliable valuation implications. The authors also revealed that the increased accuracy can be attributed to the additional information that financial analysts use to adjust the target prices.

Kerl (2011) highlighted that the size, reputation and research intensity of the investment bank had a positive influence on the target price accuracy. Bradshaw et al. (2013) discovered that the target price performance is worse when the target company's stock price volatility is high, and the target price is more likely to be achieved during the company-specific positive price momentum. Bradshaw et al. (2013) and Bilinski et al. (2013) concluded that country-specialized financial analysts with better past target price forecast records, higher forecasting experience, and employed by a large broker often issued more accurate target prices. Bilinski et al. (2013) emphasized that country-specific institutional and regulatory factors such as accounting disclosure quality, cultural traits and financial reporting standards explained the difference in target price reliability across borders. Ali and Hwang (2000), Ball et al. (2000) and Imam et al. (2013) also discovered that the value-relevance of accounting numbers varied significantly between countries due to the different legal systems, and the level of alignment of financial and tax accounting.

In addition to the above factors which have indirect influences on the listed company's target price reliability, the target price is directly affected by the quality of the value estimate. Financial analysts determine the target price on the basis of estimated future intrinsic value, where the future intrinsic value is often predicted based on the value estimate. Recent studies have shown that the quality of historical accounting data, the accuracy of company performance forecast data, the discount rate estimation method and the valuation model has significant effects on the quality of value estimates. Gleason et al. (2013) found evidence that the accuracy of a value estimate is strongly associated with the accuracy of the earnings forecast. Cassia and Vismara (2009) suggested that the equity reports that adopt the steady state earnings growth rate to determine the terminal value always produce more reliable value estimates. Gleason et al. (2013) underscored the importance of both forecasting ability and the valuation model. The authors further revealed that the potential benefits of superior earnings forecasts can be lost if those forecasts are used as

input in a flawed valuation model. Demirakos et al. (2010) showed that the valuation model affects value estimate accuracy. In the valuation of small, unstable and high-risk companies with volatile earnings and a limited number of comparable companies, the discount cash flow models often outperform the price multiples. For companies with negative future cash flows, Pinto et al. (2009) emphasized that the residual income model is the most appropriate valuation model. Liu et al. (2002) found that the forward price to earnings multiples tends to produce the most accurate value estimates for high growth or profitable companies. The market condition also influences the valuation model choice. Demirakos et al. (2010) suggested that the value estimate quality is more likely to improve when the financial analyst applies the price to earnings model in a bull market and the discount cash flow model in a bear market.

Enhanced Discount Rate Estimation Method

The discount rate has been widely used in the company valuation to estimate the intrinsic value of an enterprise. In the valuation practice, the cost of capital of a company has often been used as a discount rate that equates expected economic income with present value (Pratt, 2002). Normally, the cost of capital may refer to the required return on a company's equity capital or debt capital, or both (WACC). The estimation of an accurate discount rate is the first step to produce reliable value estimate and target price. Since the cost of equity is the most important component of WACC, this study focuses on the improvement of the cost of equity estimation method.

Expanded Capital Asset Pricing Model

This study presents the expanded CAPM which is originally introduced by Pratt (2002) and Pinto et al. (2009) to better estimate the cost of equity. The general expression is given in equation (1) below.

$$\text{Cost of Equity} = \text{Risk free rate} + \text{Shrunk beta} * \text{Market premium} + \text{SP} + \text{EP} \quad (1)$$

Where:

Shrunk beta = (1 – weight) * peer group beta + weight * company beta, weight = (cross-sectional standard error)^2/[(cross-sectional standard error)^2 + (time series beta standard error)^2]. SP = Beta-adjusted average size premium. FP = Firm-specific risk premium The expanded CAPM is based on the fact that unsystematic risk cannot be fully diversified away especially for median and small cap firms, where total realized returns on smaller companies have been substantially greater than the CAPM would have predicted (Pratt, 2002). The beta-adjusted size premium is added to CAPM to reflect the average level of incremental unsystematic risk that smaller firms over larger firms. The Morningstar Ibbotson calculates the beta-adjusted size premium by dividing NYSE listed firms into 11 size groups (from 1-largest to 10b-smallest) according to their market capitalization, and each group has its own average beta. The realized return in excess of what traditional CAPM estimates is the beta-adjusted average size premium. In addition, the firm-specific risk premium is also included to capture the unsystematic risk that is unable to be measured by both beta-adjusted average size premium and Shrunk beta. The estimation of firm-specific risk premium is depends on the subjective judgment of the firm, and it is usually ranges from -2% to +2%. In addition, the shrunk beta is recommended by Morningstar Ibbotson to replace the simple OLS raw beta. Rather than adjust the beta toward mean value of one over the long run by Marshall Blume method, the shrunk beta method adopts the Vasicek Shrinkage technique to estimate a reasonable beta toward industry or peer mean value. In particular, firms with high beta or high standard error in their beta are subject to more adjustment toward industry average (Pratt, 2002).

Target Price-Based Multistage Gordon Growth Model

The target price-based multistage Gordon growth model (TPGGM) is based on Pratt (2002) and Fitzgerald et al. (2011) to estimate the cost of equity. The general expression is given in equation (2) below:

$$\mathrm{TP} = \sum_{n=1}^{5} \frac{[\,CF_0\,(1+\mathrm{g}_1)^n]}{(1+r)^n} + \sum_{n=6}^{10} \frac{[\,CF_5\,(1+\mathrm{g}_2)^{n-5}]}{(1+r)^n} + \frac{\frac{CF_{10}(1+\mathrm{g}_3)}{r-\mathrm{g}_3}}{(1+r)^{10}} \quad (2)$$

Where:

TP is analyst' consensus target price for the firm in the next 12 months. CF_0 is the cash flow in the preceding year (growth stage) = Net income + Noncash charge - Capital expenditure - Addition to net working capital + Changes in long term debt. CF_5 is the expected cash flow in the fifth year (transition stage) = Net income + Noncash charge - Capital expenditure - Addition to net working capital + Changes in long-term debt. CF_{10} is the expected cash flow in the tenth year (mature stage) and it is equal to the dividend or Earnings * (1- Long term Real GDP grow rate / Long term ROE). g_1, g_2 and g_3 are the expected cash flow growth rates in three stages (g_1 equals to the firm-specific growth rate, g_2 equals to the peer group or industry average growth rate and g_3 equals to the expected long-term GDP growth rate). r is the constant discount rate (cost of equity) for all three stages The TPGGM is a multi-stage model that incorporates different growth rates for different life stages of a firm, and this is more reasonable for rapid growing firm. The multi-stage model divides the lifetime of a firm into three stages: growth, transition and mature, and then estimates a cost of equity that equates the sum of the present values of the expected cash flows of the three stages to the target price. The TPGGM chooses the consensus target price as a proxy of the intrinsic value per share to consistent with the assumption of basic GGM. Fitzgerald et al. (2011) show that target price based estimate of cost of equity normally outperforms the market price based, the correlation between estimated and realized cost of equity is consistently positive and statistically significant when derived from target price. Following the studies of Pratt (2002) and Koller et al. (2010), the TPGGM defines the dividend or cash flow broadly and differently across the three stages. The declining growth rates recommended by Morningstar Ibbotson are also consistent with the change of a firm over its lifetime.

Enhanced Valuation Model

The valuation model selected has to be consistent with the characteristics of the companies being valued in order to produce reliable target prices. For a group of companies classified as either an industry or a sector, they share many similar features and these companies can be valued by certain type of models. Demirakos et al. (2004) carried out a content analysis reports across different industries. The authors find that the single period comparatives are frequently used in valuations of stable and traditional industries such as beverages, where accrual accounting can better reflect the value of the companies. The authors also indicate that the discounted cash flow models are more suitable for companies in fast growing pharmaceutical and technology industry with higher risk. Iman et al. (2008) conducted a semi-structured interview with investment analysts and a content analysis on equity research reports. The authors ranked the free cash flow model as the first choice to value high growing technology and media industry companies. They also ranked relative models of price to book as the primary model for financial/insurance firms, since these firms mainly consist of highly liquid or marketable assets. For cyclical retail or fashion industry which is heavily subject to business cycle effect, the authors considered the multiples of enterprise value to earnings before interest, tax, depreciation and amortization (EBITDA) as the most appropriate model to deal with the volatile earnings and produce reliable valuation results.

Although the industry-specific absolute or relative models are consistent with the industry or firm features, their intrinsic problems still limit their ability to produce reliable value estimates and target prices. In recent

valuation practice, the multi-period absolute models such as discounted cash flows become the analysts' dominant models. However, the absolute models still face great uncertainty of specific forecast such as future cash flows, and difficulties in the estimation of required return on capital. Pinto et al. (2009) suggest that absolute models are also over-sensitive to the changes in estimated inputs, since the absolute models is over reliance on estimated terminal values. Gode and Ohlson (2005) state that the terminal value can account for as much as 80-90% of the estimated value for high growth companies. On the other hand, the relative model such as the single period price or enterprise value multiples are easy to use and offer convenience to communicate, but their biggest problem is whether the chosen benchmark itself is fairly priced (Pinto et al., 2009). In reality, the average value of a series of comparable firms with similar features to the subject firm is a more common choice of benchmark. Alford (1992) suggests the combination of risk (beta) and earnings growth rate as effective criterion for selecting comparable firms. Bhojraj and Lee (2002) found that relative valuation based on peer group median value can produce more reliable target price than industry and market benchmarks. Although the 'best' benchmark is closely similar, it is not exactly the same as the company being valued. The value estimate or target price would be misleading when the comparable peers are difficult to identify, as its reliability depends on the definition of the peers.

Neither the absolute nor relative model deems 'perfect', and this study proposes the concept of industry-specific combined model. This concept considers several different industry-specific techniques together to arrive at "fair valuation" for the corresponding industry. The recent trend in company valuation practice emphasizes the importance of combined model, the analyst choose on average nine valuation models in the valuation of firms according to the Institutional Factor Survey conducted by Merrill Lynch in 2006. In addition, Jenkins (2006) suggests that the combined models are superior in valuation accuracy to single models, since the combination of absolute and relative models is able to focus both on multi-period and short-term forecasts. Vardavaki and Mylonakis (2007) conclude that the combined model is more informative by providing better and more accurate estimation of equity market values. They also suggest the effectiveness of combining models is derived from their ability to simultaneously capture multiple dimensions of valuation information contained. Imam et al. (2013) indicate the use of accrual based relative multiple model alongside a cash flow based absolute model reduces valuation error, as accruals add value relevant information to cash flows. In addition, it is also important to consider the industry unique feature in the valuation of firms from different industries. The industry-specific combined model proposed by this study not only takes advantage of the benefit from the combination of absolute and relative model, but also consistent with the unique features of different industries.

Enhanced Target Price Setting Technique

As one of the most important steps in valuation, analysts need to set a reasonable target price on the basis of valuation result. However, there is no standard or surefire way to determine the target price for listed firms. Imam et al. (2008) conducted a semi-structured interview with 42 UK sell-side investment analysts, the authors conclude three major processes of target price formation. The most commonly used approach is to set a target price on the basis of a combination of valuation models after adjusting for the analysts' subjective judgments. The second method is a relative based approach used to arrive at a price, and then a reversal of absolute model is applied to determine what implied growth rate that the target price would be delivered. The third method is the use of a subjectively determined percentage of premium or discount on the current price, and then the application of a valuation model(s) to produce a number close to target price. Based on the previous studies, this study introduces an enhanced target price setting approach. This approach starts with the valuation of company on the basis of combined model. The second step is to apply the regression-based method or Bayesian method to combine a range of value estimates from the combined model. The last step involves the reasonable adjustments of the combined value estimate produced by step two according to a series of non-financial factors. The approach introduced in this study does not attempt to combine various value estimates into one by using case-by-case adjustments immediately, it applies the objective regression technique or Bayesian techniques to combine value estimate before the manual

adjustments. Therefore, this approach is expected to outperform the traditional target price setting methods, the following sections investigate how to combine various value estimates (step two).

Partial Least Square Regression Approach

This study introduces the Partial Least Square regression (PLSRA) to combine various value estimates. The PLSRA is based on the methods suggested by Hoogerheide et al. (2010), Thordarson (2007), Yee (2004) and Yoo (2006). The general expression of the PLSRA is given in equation (3) below. The PLSRA is more logical and easy to use, automatically generates time-varying weights and allows the users to customize it by adding or removing any model to satisfy specific valuation needs.

$$\mathrm{MPt,s} = Vt,s + Ut = At + \sum_{i=1}^{n} Wt,i * VEt,i + Ut \qquad t = 1,2,\ldots.,T. \tag{3}$$

Where:

t = Valuation date. MPt,s = The market price for company s at valuation date t, assume MPt,s = Vt,s (Vt,s is the intrinsic value). Vt,s = The combined value estimate of company s produced by a combination of valuation models. At = Constant term at valuation date t. Wt,i = The weight of individual model i at valuation date t. VEt,i = The value estimate of company at valuation date t implied by individual model i. Ut = The estimation error is the remaining part of the intrinsic value that is not captured by the combined model or PLSRA, which is the difference between the intrinsic value at valuation date t and estimated intrinsic value (combined value estimate) at date t.

The rationale for the PLSRA is straightforward: every individual value estimate from different model is an incremental piece of information, relying on only one estimate may ignores some information, so the intrinsic value of company is the aggregate estimate that equal to the sum of individual estimates (Yee, 2004). The key assumptions of this approach is that the market prices reflect all available information and prices are efficient at all valuation dates, so MPt,s is used as proxy of the intrinsic values Vt,s. In addition, unlike the prior weighted average methods with restrictions that no constant term is added, and all weights must be non-negative and sum to one (Hoogerheide et al. 2010). The PLSRA includes the constant to avoid biases, where the methods with constant term are often more accurate than using the restricted least squares weighting scheme. Besides, the PLSRA further removes the restriction that the weight of different models have to sum up to unity. Similar to Yee (2004), the PLSRA generates different weights at different valuation dates by using historical time series data of value estimates (back testing). However, the Durbin-Watson test is required to eliminate the effect of autocorrelation between time series variables in case they are correlated in some way. The sample period is also limited to recent 12 months to avoid the possible non-stationarity of time series.

Bayesian Triangulation Approach

Similar to the PLSRA, the Bayesian approaches can be used to combine various value estimates. According to Yee (2008), this study presents an improved Bayesian triangulation approach (BTA) to produce the time-varying weights. The general expression of BTA is given in equation (4) below:

$$\mathrm{MPt,s} = \mathrm{Vt,s} + \mathrm{Ut} = (1 - \mathrm{Wt,2} - \mathrm{Wt,3}) * \mathrm{VEt,1} + \mathrm{Wt,2} * \mathrm{VEt,2} + \mathrm{Wt,3} * \mathrm{VEt,3} + \mathrm{Ut} \tag{4}$$

$$\text{Wt},2 = \frac{\sigma_1^2\sigma_3^2}{\sigma_1^2\sigma_2^2 + \sigma_1^2\sigma_3^2 + \sigma_2^2\sigma_3^2} \tag{5}$$

$$\text{Wt},3 = \frac{\sigma_1^2\sigma_2^2}{\sigma_1^2\sigma_2^2 + \sigma_1^2\sigma_3^2 + \sigma_2^2\sigma_3^2} \tag{6}$$

$$\text{Wt},1 = (1 - \text{Wt},2 - \text{Wt},3) = \frac{\sigma_2^2\sigma_3^2}{\sigma_1^2\sigma_2^2 + \sigma_1^2\sigma_3^2 + \sigma_2^2\sigma_3^2} \tag{7}$$

Where:

t = Valuation date (t = 1, 2, …., T.). MPt,s = The market price for company s at valuation date t, assume MPt,s = Vt,s. Vt,s = The combined value estimate of company s produced by a combined model. VEt,(1,2 or 3) = The value estimate of company s implied by individual model 1, 2 or 3 at valuation date t. Ut = The estimation error is the remaining part of the intrinsic value that is not captured by the combined model. Wt,(1,2 or 3) = The weight of individual model 1, 2 or 3 at valuation date t. σ1The standard error of value estimate VEt,1, which is a noisy measure of fundamental value Vt,s. Specifically, VEt,1 = Vt,s + e1 where e1 ~ N(0, σ1). σ2 = The standard error of value estimate VEt,2, also a noisy measure of Vt,s. Assume VEt,2 = Vt,s + e2 where e2~ N(0, σ2) is uncorrelated with e1. σ3 = The standard error of value estimate VEt,3, also a noisy measure of Vt,s. In particular, VE3 = Vt,s + e3 where e3 ~ N(0, σ3) is uncorrelated with e2 and e1so that corr(e1,e2) = corr(e1,e3) = corr(e2,e3) = 0.

The BTA generates different weight at different valuation dates by using the company's time series data (back testing). In addition, the sample period is limited to the recent 12 months to avoid the possible non-stationarity or over-fluctuation of time series. The key assumption of this approach is that the market prices reflect all available information, and the prices are efficient at the valuation dates. Unlike the PLSRA, the BTA sum of weights is equal to unity. According to the weighting scheme of BTA, if a value estimate is exact, it deserves full weight and its counterparts deserve zero weight. On the other hand, if a value estimate is infinitely imprecise, it deserves no weight and the two remaining estimates have non-zero weight (Yee, 2008). However, similar to other Bayesian probability theory-based methods, the BTA is difficult to extend when more than three valuation models are used at the same time. Therefore, the PLSRA outperforms the BTA in general.

Reliability Testing Methods for Value Estimate and Target Price

This study presents a reliability testing method to measure the performance of both value estimate and target price. This reliability testing method can also be used to measure the analyst performance, and assists investors to better understand the information contained in equity reports. Since the target price is actually the combined value estimate after qualitative adjustments, this section presents methods to verify the combined value estimate at first, and then offers detailed techniques to test the reliability of target price.

Reliability Testing Method for (Combined) Value Estimates

Based on the approaches suggested by Kaplan and Ruback (1994), Francis et al. (2000), Cheng and McNamara (2000) and Liu et al. (2007), this study presents a reliability test for (combined) value estimate which consists of the measurement of accuracy and explanatory power. Kaplan and Ruback (1994) indicates that it is possible one value estimate could successfully estimate the intrinsic value on average (accuracy), yet perform poorly in explaining the variation in fundamentals (explanatory power) and the converse is also possible. The first step of the reliability test is to contrast combined value estimates with market prices at

valuation dates, and then classify them into different groups (above, below or equal to market prices). The second step is to test their accuracy by applying the following metrics: Signed (Absolute) Valuation Error [a]is the (absolute) deviation between combined value estimate and market price per share of company at valuation date [b]. Signed (Absolute) Valuation Error Scaled by (1) market price per share of company at valuation date, (2) combined value estimate of company at valuation date, (3) the sum of market price and signed (absolute) valuation error [c] or (4) the sum of combined value estimate and signed (absolute) valuation error [c]. Statistics Distribution of Signed (Absolute) Valuation Error or Signed (Absolute) Valuation Error Scaled by (1), (2), (3) or (4), include mean, median, central tendency [d], square root [e], standard deviation or inter-quartile range.

Where:

a.) Alternatively, the valuation error also can be calculated as the natural logarithm of the ratio of the combined value estimate to the market price. Note log(combined value estimate/market price) = log(combined value estimate) - log(market price). b.)Compare combined value estimate with market price at valuation date (or around valuation date) under the assumption that market price reflect all available information and is efficient. However, if the market is not at reasonable level of efficiency, then contrast the combined value estimate with market price three to five days after the target price issued. c.)The signed (absolute) valuation error scaled by the sum of market price and signed (absolute) valuation error or the sum of combined value estimate and signed (absolute) valuation error are used to reduce the adverse effect of extreme large outliers and regulate the error value to between 0 and 1, and create convenience for comparison. d.)The central tendency is the percentage of combined value estimates (scaled) with valuation error within certain percentage (e.g. ±15%). Alternatively, the percentage of combined value estimates within certain percentage of the market price at valuation date. e.)Although the signed (absolute) valuation error scaled by (3) and (4) can reduce the outlier effect, it is right-skewed and their square roots are required to solve the skewness issue. The third step of the reliability test is to investigate how well the combined value estimates can explain the variations of companies' intrinsic values over time. This study uses an OLS univariate regression-based approach given in equation (8) below. The explanatory power can be judged by whether the intercepts and coefficients are significantly different from 0 and 1 respectively (based on t-statistic), the degree of Pearson and Spearman correlation between the market prices and combined value estimates, and the adjusted R^2.

$$MPt,s = At + Bt,s * VEt,s + Ut \qquad t = 1,2,\ldots.,T. \tag{8}$$

Where:

MP t,s = The natural logarithm of market price of company s at valuation date t. At = The intercept term is expected to become zero if the combined value estimate is the unbiased estimator of the market price or intrinsic value. Bt,s = The coefficient should equal to one if the combined value estimate is the unbiased estimator of market price. VEt,s = The natural logarithm of combined value estimate for company s. Ut = Valuation error. The ordinary least square method minimizes the sum of squared vertical distances between the market prices and estimated intrinsic values.

Reliability Testing Method for Target Price

The following performance testing method on target price does not consider the effect of target price revisions, and is under the assumption that the mispricing does exist and the market reacts to target price announcements immediately. In order to avoid the influence of announcements on the market prices, the first step of the reliability test is to contrast the target prices (TP) with the market prices three trading days prior to the announcement dates (MPTTD), and then classify them into five explicit recommendation groups as below. Although the target prices are often issued with recommendations, a unified classification

standard makes the test results comparable. Based on the study of Bonini et al. (2010), this study recommends the below classification method: Strong Sell: The TPs are set equal to -25% or less of the MPTTDs. Sell: The TPs are set within -10% to – 25% of the MPTTDs. Hold: The TPs are set equal to ± 10% or within ± 10% of the MPTTDs. Buy: The TPs are set within +10% to +25% of the MPTTDs. Strong Buy: The TPs are set equal to +25% or more of the MPTTDs The second step involves the judgment of whether different groups of target prices have been achieved according to the metrics recommended by Imam et al. (2013), and then label target prices as "Realized" or "Unrealized". For target prices with buy or strong buy recommendations, the target prices are realized if the maximum prices of the companies' shares during the 12-month forecast horizon are greater than or equal to the target prices. For companies with sell or strong sell recommendation, the target prices are met if the minimum prices during the 12-month forecast horizon are less than or equal to the target price. Similarly, for hold recommendations, the target prices are achieved if the maximum and minimum market prices during the forecast horizon are within approximately ±15% of the target prices.

The third step measures the degree of reliability for these target prices in different recommendation groups labeled as "Realized". The first metric (%REALIZED) is the percentage of all realized target prices in each group. Most of the studies examine the percentage of targets meet in and meet at the end of forecast horizon. This study introduces a more logical metric (%DISTRIBUTION) that analyzes the distribution of target price achievement within the different time frames (e.g. quarters) of a year. The third metric (%FREQUENCY) is the frequency or percentage of closing prices which are equal or above the target prices in the next 12 months for buy and strong buy groups. The frequency of closing prices which are equal or smaller than the target prices in the one year forecast horizon for sell and strong sell group. For target prices in the hold group, their degrees of reliability are measured by the standard deviation of closing prices within next 12 months. The last step examines these "Unrealized" target prices in the five recommendation groups. The first metric (%UNREALIZED) is the percentage of total unrealized target prices in each group. The second metric (%FORECAST_ERROR) can reflect the different level of target price forecast error. Specifically, for buy and strong buy groups, it is the absolute difference between the maximum price of the company' share during the 12-month and target price. For sell and strong sell, the absolute difference between the minimum price and target price. For hold group, the absolute difference between maximum (minimum) closing price and +15% (-15%) of target price.

CONCLUDING COMMENTS

This study concentrates on the recent popular topic of the target price performance, it investigates the underlying reasons for the target price underperformance, and then proposes to improve the reliability via the enhanced valuation methods. Firstly, this study attempts to improve the performance of the target price through enhancing the discount rate estimation method. An expanded CAPM model which contains the shrunk beta, beta-adjusted size premium and firm-specific risk premium has been suggested to estimate the cost of equity. In addition, this study recommends a target price-based multistage Gordon growth model as another cost of equity estimation method. This method adapts the consensus target price as a proxy of the intrinsic value per share to better consistent with the assumption of basic Gordon growth model. Secondly, this study proposes the concept of industry-specific combined valuation model. This concept not only takes advantage of the benefit from the combination of absolute and relative model, but also consistent with the unique features of different industries. Thirdly, this study presents a new target price setting method and provides effective solutions to the common but unsolved question, which is how to combine a range of value estimates. Finally, a reliability testing technique has been introduced by this study. This technique measures the performance of the value estimates based on their accuracy and explanatory power, and tests the quality of the target prices by classifying them into five explicit recommendation groups and then measure their reliability respectively.

This study emphasizes the importance of valuation methodology in the deterimation of target price reliablity. However, a range of other factors such as market condition, analyst's optimism, price momentum and country-specific factors also have strong indirect impact on the target price. Thus, further research on those indirect factors is highly recommended. In addition, this study mainly adopts the qualitative research method and focuses on the improvement of valuation methodology. It is recommended that future research tests the enhanced valuation techniques presented in this study by using real financial data, and fully applies these techniques into valuation and target price setting practice.

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