The dual use of residual income and discounted cash flow valuation methods by U.S. sell-side equity analysts

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Abstract

We explore the use of residual income (RI) valuation by U.S. sell-side equity analysts by comparing the characteristics and performance of RI valuations with those of discounted cash flow (DCF) when both methods are used by the same analysts for the same firm in the same report. We find that analysts are equally likely to adopt RI valuations built around forecasting net operating income (RNOA-RI) as around net income (ROE-RI). However, the economic properties of RNOA-RI and ROE-RI valuations are quite different. RNOA-RI valuations are optimistic relative to future prices and contain forecasted RNOAs that increase toward a terminal year median of 28%, whereas ROE-RI valuations are unbiased relative to future stock prices and contain ROEs that decline toward a terminal year median of 17%. Supporting our conclusion that ROE-RI valuations tend in practice to be superior to DCF and RNOA-RI valuations, we observe that analysts' ROE-RI valuations are stronger determinants of analysts' target prices than are their DCF or RNOA-RI counterparts.

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1. Introduction and overview

Beginning with the seminal papers of Ohlson (1995) and Feltham and Ohlson (1995), residual income (RI) valuation has gained prominence in academic accounting. Notable examples of its use include the value-relevance literature (Barth, Beaver and Landsman, 2001), identifying mispriced stocks (Lee, Myers and Swaminathan, 1999), estimating firms' costs of capital (Li and Mohanram, 2014), and understanding risk and growth (Penman 2011; Penman and Reggiani, 2013). RI is also widely taught alongside DCF methods in MBA valuation classes (Easton, McAnally, Sommers and Zhang, 2014; Lundholm and Sloan, 2013; Penman, 2012) and in the CFA curriculum (Pinto, Henry, Robinson and Stowe, 2010; CFA 2014 Level II Program curriculum).

In this study we contribute to the RI valuation literature by providing the first academic evidence on the use of RI in practice by sell-side equity analysts. Given the predominance of DCF in analysts' formal valuation modeling and the need to control for multiple determinants of DCF and RI valuations when undertaken by different analysts for different firms on different dates, we study analysts' RI methods using the subset of analyst reports issued by U.S. brokers that contain dual equity valuations—one from a DCF model and one from an RI model. We identify 422 such reports from Investext that span 103 firms over the period May 1998 - Oct. 2011.

Using this dataset, we conduct a series of empirical descriptions and tests. First, we observe that half of analysts' RI valuations are built around forecasting operating income and/or the return on net operating assets (the RNOA-RI method), and half are built on forecasting net income and/or the return on equity (the ROE-RI method). We then note that although in their DCF valuations analysts rarely report any measures of the economic rates of return implied by their forecasts of free cash flows, in their RNOA-RI (ROE-RI) valuations analysts almost always show such metrics in the form of RNOA and residual RNOA (ROE and residual ROE). The visibility of these long-term forecasted rates of return allows us to assess the sophistication of analysts' implementation of each RI valuation method since the effects of competition require that rational forecasts of long-term RNOA and ROE converge toward firms' weighted average and equity costs of capital, respectively.

Second, we find that analysts' DCF and ROE-RI valuations are often materially different from each other, while analysts' RNOA-RI valuations are very close to their DCF estimates. Specifically, we observe that ROE-RI valuations are lower than their DCF counterparts by an average of 5% and just 9% (44%) of ROE-RI valuations are within +/- 1% (5%) of DCF valuations. In contrast, RNOA-RI valuations are on average almost exactly equal to their DCF counterparts and 34% (93%) are within +/- 1% (5%) of DCF valuations. The magnitude of the difference in the differences between DCF vs. RNOA-RI and DCF vs. ROE-RI valuations lead us to hypothesize that analysts' ROE-RI valuations are created independently of their DCF valuations, whereas analysts' RNOA-RI valuations are purely a repackaging of their preexisting DCF data inputs and valuations.

Third, we find that RNOA-RI valuations are optimistic relative to realized one-year-ahead prices by an average of 7% and contain forecasted RNOAs that increase toward a terminal year median of 28%. We argue that because a terminal year RNOA of 28% is economically implausible, and because analysts' DCF and RNOA-RI valuations are so similar to each other, analysts' RNOA-RI and DCF valuations reflect an equal lack of sophistication in economic forecasting. In contrast, analysts' ROE-RI valuations are more sophisticated in that they are unbiased relative to future prices and contain future ROEs that more sensibly decline over time toward a terminal year median of 17%.

Fourth, we propose that the divergent trajectories in analysts' forecasts of RNOA and ROE highlight a previously unrecognized practical advantage of using ROE-RI. This is that by focusing on the evolution of just ROE instead of the evolutions of both RNOA and financial leverage, ROE-RI reduces the risk that the user will make the economically unreasonable financial leverage assumption that management will allow future residual NOI to build up in the form of cash on the firm's balance sheet instead of being paid out to shareholders. We argue that the reason that analysts' forecasts of RNOA increase over time while their forecasts of ROE decrease is that in their RNOA-RI and DCF models analysts are making exactly this assumption, and to such a degree that its negative effect on ROE more than compensates for the positive impact of increasing RNOAs.

Lastly, we examine the role of different valuations in determining target prices by regressing analysts' target prices on analysts' DCF, RNOA-RI, and ROE-RI valuations. We find that between DCF and ROE-RI valuations, analysts' target prices are more determined by their ROE-RI valuations than their DCF counterparts. In contrast, between DCF and RNOA-RI valuations, only DCF matters in explaining analysts' target prices. The latter result supports our hypothesis that RNOA-RI valuations are mere derivatives of underlying DCF valuations, but that ROE-RI valuations are not.

Overall, we conclude from our data that ROE-RI valuation is in practice superior to DCF and RNOA-RI, and suggest that this makes its infrequent use by practitioners puzzling. We also conclude that while DCF has been criticized as promoting upwardly biased value estimates because it rarely reports the RNOAs that underlie projected free cash flows (Bernard, 1994), simply making the RNOAs visible as is the case in the RNOA-RI valuations we study does not necessarily yield more conservative valuations than DCF. We argue that the benefits of RI can only be obtained when practitioners explicitly allow their long-term forecasts to reflect the pervasive effects of competition, which in turn necessitates that analysts' forecasted RNOAs and ROEs fade toward the weighted average and equity costs of capital, respectively. We hope that our findings and perspectives will encourage both analyst and non-analyst practitioners to use ROE-RI valuation more frequently.

The remainder of our paper proceeds as follows. In section 2 we review the academic and practitioner literatures on DCF and RI valuation, and in section 3 motivate our interest in RI as undertaken by sell side equity analysts. In section 4 we present the criteria we use to arrive at a set of analyst reports that contain dual DCF and RI valuations. In section 5 we present our findings on the characteristics and performance of the DCF, RNOA-RI and ROE-RI valuations in our dataset. We conclude in section 6.

2. Prior academic and practitioner literature on DCF and RI valuation

2.1 DCF valuation

The literature on DCF is often seen as beginning with two important texts: Irving Fisher's *The Theory of Interest* (1930) and John Burr Williams' *The Theory of Investment Value* (1938). In the latter book—based on his Ph.D. thesis, the topic of which was suggested to him by Joseph Schumpeter—Williams argues that the value of an asset should be evaluated by "the rule of present worth." Applied to common stock, this meant that the intrinsic value of equity should rationally be viewed as the present value of expected future cash flows in the form of dividends and selling price.[1]

From this starting point, finance academics in the 1960s began to flesh out the dividend discount model (DDM), initially by focusing via the CAPM on the discount rate. As MBA programs that finance academics taught in grew in size and stature, they began to pay more attention to the practical limitations of the DDM due to its focusing on the distribution of cash to shareholders, the magnitude and timing of which Modigliani and Miller (1961) argue are irrelevant to shareholder value.[2] This concern led to the development of the current warhorse approach to valuation taken in the classroom, research and Wall Street, namely the "discounted cash flow" or DCF model. Isomorphic to the DDM, in the DCF model valuation centers on forecasting the cash flows generated by the firm's operating and investing activities, rather than the distribution of cash paid out via the firm's financing activities. The DCF model is typically implemented by predicting the expected future free cash flows to all investors, discounting them by the firm's weighted average cost of capital, and then subtracting the value of the firm's net financial liabilities to arrive at equity value.

Although the DCF method was well laid out and promoted by prominent academics and practitioners such as Copeland and Weston (1979), Brealey and Myers (1981, 1984), Rappaport (1986), and Copeland, Koller and Murrin (1990, 1995), until the late 1990s the main capital market users of DCF were investment banks in supplying fairness opinions to target shareholders in

[1] See Wikipedia's entries for John Burr Williams, and for Discounted Cash Flow.

[2] To quote Penman (2012, p.6), "A conundrum has to be resolved (in implementing the DDM): Value is based on expected dividends, but forecasting dividends is irrelevant to valuation."

corporate mergers and change of control transactions such as management buyouts (DeAngelo, 1990).[3] Even until the late 1990s sell-side equity analysts focused on multiples and tended to ignore DCF models (Arnold and Moizer 1984, Block 1999, Barker, 1999; Bradshaw, 2002; Demirako, Strong and Walker, 2004; Asquith, Mikhail and Au, 2005). However, starting in the early 2000s, analysts placed a greater emphasis on DCF models, a change that Imam, Barker and Clubb (2008) and Imam, Chan and Shah (2013) attribute to the lack of rational valuation methods used in the Internet bubble and associated criticisms of the research quality of investment analysts. The place of DCF as of today in the practitioner world is such that virtually every equity valuation model used by leading investment banks is based on DCF (Viebig, Poddig and Varmaz, 2008).[4]

Somewhat in contrast to this prevalence, however, relatively little in the way of finance research has centered on research questions that require or use explicitly derived DCF valuations. Kaplan and Ruback (1995) examine the DCF method in the context of highly leveraged transactions and find that that DCF valuation has approximately the same valuation accuracy as EV/EBITDA multiples. In the context of firms emerging from Ch. 11, Gilson, Hotchkiss and Ruback (2000) find that DCF valuations have a similar degree of accuracy as valuations that use comparable-firm multiples. More recently, motivated by studies that find that analysts use target prices to justify their recommendations (Bradshaw, 2002) and that analysts' target prices are useful to investors (Brav and Lehavy, 2003), a few papers have investigated the degree to which analysts' price targets are based on underlying DCF versus multiples-based valuations. Results suggest that while multiples-based valuation dominates DCF in importance when setting target prices (Imam, Barker and Clubb, 2008), DCF models are significantly more likely to be met at the end of a 12-month forecast horizon than are price-to-earnings models (Demirakos, Strong and Walker, 2010).

2.2 Residual income valuation

The academic literature on RI in part parallels that of DCF, but has some notable differences. The first parallel is that like DCF, the origins of RI date to the late 1930s when Preinrich (1938) derived from a 1925 paper by Hotelling an expression for 'capital value' that equated capital value to

[3] Per DeAngelo (1986, p.101), "Directors can be held liable for breach of fiduciary duty if they fail to consider explicit valuation evidence before acting on a bid. This standard of caser is usually satisfied by an investment banker's opinion that the offer is inadequate. Thus, managers who resist a hostile bid typically hire an investment bank to provide them a DCF-based opinion that the offer terms are inadequate. It should also be noted that DCF is only one of multiple valuation approaches that investment banks may provide their client in such situations, other examples being comparable firm valuations, comparable acquisition valuations, and asset-based valuations."

[4] Viebig, Poddig and Varmaz (2008, p.9) state that "The most sophisticated DCF models used by financial analysts today are, in our opinion, Credit Suisse's Cash Flow Return on Investment (CFROI) model, Morgan Stanley's ModelWare and UBS's Value Creation Analysis Model (VCAM). In Part VI [of our book] we discuss leveraged buyout (LBO) models used by Goldman Sachs, UBS and other leading investment banks."

book value plus discounted excess profits.[5] Despite subsequent work by Edwards and Bell (1961, Ch. 2, Appendix B), Peasnell (1982) and Brief and Lawson (1992), the use of RI in valuation was largely ignored until the 'rediscovering' attention paid to it in the seminal papers of Ohlson (1995) and Feltham and Ohlson (1995). The second parallel of RI with DCF is that RI is now widely taught in MBA programs alongside DCF (Lundholm and Sloan, 2006, 2007, 2013) as well as in the CFA curriculum (Pinto, Henry, Robinson and Stowe, 2010; CFA 2014 Level II Program curriculum).

However, the use of RI by academics and practitioners differs sharply from the use of DCF by academics and practitioners. Unlike DCF, since 1995 RI valuation has been fruitfully used in many areas of research, including the value-relevance literature (Barth, Beaver and Landsman, 2001), identifying mispriced stocks (Lee, 1999; Ali, Hwang and Trombley, 2003), estimating firms' costs of capital (Li and Mohanram, 2014), and understanding risk and growth (Penman 2011; Penman and Reggiani, 2013). Moreover, unlike DCF, informally derived evidence suggests that RI is only infrequently used by practitioners to value stocks.[6] For example, and as reflected in our analyst reports dataset containing dual DCF and RI valuations, of investment banks only Morgan Stanley has historically embraced RI (Harris, Estridge and Nissim, 2008).

The attraction of RI valuation to academics—especially accounting researchers—arises for both theoretical and empirical reasons. On the theory side, RI is algebraically isomorphic to DDM; it exhibits the Modigliani and Miller (1958, 1961) dividend displacement property; it focuses on the creation not distribution of value; by moving away from pure cash accounting it nests the DCF model within it as a special case; and it makes central to valuation the long-term expected return on net operating assets or equity. In terms of empirics, among other benefits RI has been seen as one way to legitimize the use of cross-sectional 'price levels' regressions. It also provides a compact way to embed analysts' near term earnings forecasts into models of intrinsic value, and provides a way for cost of capital estimates to be extracted from stock prices. At the same time, however, RI has generated its share of academic controversy, most notably with regard to how and why large-scale machine-driven implementations of DCF and RI valuations at times yield very different results, even

[5] Specifically, Preinrich (1938, p.240) states that "By means of elementary operations, the capital-value formula [equation] (43) can easily be converted into [equation] (57)" in which capital value equals book value plus discounted excess profits. Equation (43) comes from the capital value concept advanced in Hotelling (1925) that equates the capital value of a single machine to the discounted net rental of the machine plus the discounted scrap value of the machine. This said, however, Cwynar (2009) argues that Alfred Marshall's *Principles of Economics* (1890) and Robert Hamilton's *An Introduction to Merchandize* (1777) contain even earlier demonstrations of the concept of residual income.

[6] Residual income does form the basis of the approach taken by many practitioners to evaluate firm performance, the most noteworthy example of which is Stern Stewart & Co.'s economic value added or EVA metric.

though both approaches should yield the same output given the same inputs (Penman and Sougiannis, 1998; Francis, Olsson and Oswald, 2000; Lundholm and O'Keefe, 2001a, 2001b; Penman, 2001).

3. Research motivation and method

3.1 Research motivation

We seek to contribute to the literature on RI valuation by providing evidence on the use of RI by U.S. sell-side equity analysts. The chief motivation for our research is the argument that because sell-side equity analysts are economically important stock market participants, studying their use of RI valuation sheds light on the economic importance of RI methods. If RI valuation leads to more economically sensible analyst forecasts and yields less biased analyst valuations than other approaches such as DCF, then the view that the development of RI valuation methods has had practical value is supported. On the other hand, if analysts' RI valuations are more biased than their DCF valuations, then it may be that the teaching of RIV by academics to their MBA students who take jobs on Wall Street has been flawed, or for reasons that are not well understood RI valuation has attributes that diminish its practical usefulness which in turn warrants understanding by scholars.

3.2 Research method

Our research method is to directly analyze the subset of sell side equity analysts reports that contain dual equity valuations—one from a DCF model and (at least) one from an RI model.[7] As compared to collecting one set of analyst reports that only contain DCF valuations and a separate set that only contains RI valuations, the strength of our approach is that it controls for many of the potential determinants of variation in DCF and RI valuations that arise when such valuations are done by different analysts for different firms in different reports on different dates. These include the identities and experience of the issuing analysts, the date and macroeconomic timing of the report, the report's stock recommendation, the identify and history of the firm, the firm's industry, the equity and weighted average costs of capital used by the analysts, and the quantitative and qualitative components of the analysts' information set outside of the inputs used in the DCF and RI valuations.[8] In addition, because analysts can use either RNOA-RI or ROE-RI valuations (or both), our dual-valuation approach allows us to assess different roles that RNOA-RI and ROE-RI valuation methods

[7] Awe view understanding the reasons behind when and why analysts use multiple valuation methods in general (not limited to DCF and RI, but broadened to DCF, RI, sum of the parts, dividend discount, and multiples) as being a worthwhile topic for future research, but outside the defined scope of our paper.

[8] Work by Bonini, Zanetti, Bianchini and Salvi (2010), Bilinkski, Lyssimachou and Walker (2013) and Bradshaw, Huang and Tan (2014) indicates that the accuracy and optimism in analysts' target prices is a complex function of many economic determinants that vary across analysts, firms, time, institutional incentives and legal regimes.

play relative to DCF in analysts' reports. However, we recognize that the benefits we achieve in terms of high internal validity come with the counterweight that our findings may have a low degree of external validity because the choice of whether to use only DCF, only RI, or both DCF and RI may be systematically associated with the characteristics and performance of equity valuations produced by each method. To the extent that this is so, we expect that our results will not fully generalize back to the population of actual or potential users of DCF and RI valuation methods.

We adopt a hand-collection, textual content-based approach to investigating the role of RI valuation in analyst reports because we are unaware of any preexisting archival database that contains reliable information on the valuation methods used by, and modeling details associated with, analyst valuations.[9] Content-based analysis has gained greater academic acceptance in recent years due to the advantages it can offer with regard to addressing research questions that seek to look inside the 'black box' of analysts' the decision processes (Schipper, 1991; Bradshaw, 2011; Brown, call, Clement and Sharp, 2013; Green, Hand and Zhang, 2014; Markou and Taylor, 2014).

4. Sell-side equity analyst reports that contain both DCF and RI equity valuation models

4.1 Sample selection and examples of DCF and RI valuations

Table 1 presents the criteria we employ to identify sell-side equity analyst reports that contain both a DCF and a RI model, and their associated valuations. We searched Investext to identify analyst reports issued over the period 1/1/98 – 12/31/13 that contained the keywords "residual income" and either "DCF" or "discounted cash flow*" in their Table of Contents (panel A). We then retained only those reports that were for companies, for the U.S., and provided by brokers. This yielded an initial set of 478 reports. After inspecting each report, for reasons listed in panel B we excluded 56 reports as they lacked certain data items, such as no dollar per share figure provided for either the DCF or RI valuation. The final dataset of 422 reports covers 103 different firms.

We impose the restriction that the keywords be present in the Table of Contents, rather than the weaker requirement that the keywords be present only in the Text, in order to maximize the likelihood that the resulting reports will contain fully developed DCF and RI valuation models, rather than just single number or single sentence mentions of the keywords without supporting valuation structures. Although using the weaker requirements yielded 3,050 reports, untabulated analysis reveals that almost all of these reports (outside the initial set of 478 obtained under the Table of Contents restriction) do not contain full blown DCF and RI models.

[9] We therefore differ from the indirect type of approach taken by Gleason, Johnson and Li (2013) who infer the type of valuation model used by analysts in setting their price targets by comparing actual price targets with pseudo-price targets that the authors create using an ROE-based RI model and a PEG model.

We note that searching Investext for reports over the 1998-2013 period that contain only the keywords “residual income” and not also “DCF” or “discounted cash flow*” in the Table of Contents yielded 2,426 reports, while similarly searching for only the keywords “DCF” or “discounted cash flow*” but not also “residual income” resulted in 46,878 reports. The former figure suggests that residual income has been infrequently used by sell-side analysts working for U.S. brokers, both in an absolute sense (our data imply that one report containing an RI model was issued every two business days) and relative to DCF (present in about 10 reports per business day and thus 18 times more common than RI).

Panel C shows that all but five of the analyst reports were issued by a single broker, Morgan Stanley. The dominance of Morgan Stanley stems from the initiatives put into place by Professor Trevor Harris of Columbia University while he was an advisor to and employee at Morgan Stanley. This dominance likely reduces the generalizability of our results over and above the aspects of our quasi-experimental approach highlighted in section 3.2, but is an unavoidable feature of our design.[10]

Per panel D, each analyst report in our final dataset contains a DCF and an RI valuation. We note that of the 422 reports, 156 contain an RI model that centers on forecasting NOI and/or RNOA, 155 contain an RI model that centers on forecasting NI and/or ROE, and 111 contain both RNOA-based and ROE-based valuations. The RNOA-RI method parallels DCF by estimating the value of the entire firm, from which net financial liabilities are subtracted in order to arrive at the value of equity, while the ROE-RI method estimates the value of equity directly and is the approach most commonly (although not exclusively) taught in MBA classes and used in academic research.

In Figures 1 and 2 we supply illustrative examples of the dual valuations in our dataset. Figure 1 is taken from p.10 of Morgan Stanley’s report on Nike issued on 12/12/02, and shows the DCF and RNOA-RI valuations exactly as disclosed. The DCF model is structured in a standard manner, both with regard to numerator components that culminate in forecasted free cash flows to all investors, and the components of the firm’s weighted average cost of capital (WACC). The RNOA-RI model located immediately below the DCF model is also conventional in structure and detail, although in places it uses terminology different to that in most valuation texts.[11] Figure 2 comes from Morgan Stanley’s report on Carnival Corp. issued on 1/29/04, and shows the DCF and ROE-RI valuations shown in that report on p.9 and p.10, respectively. Similar to Figure 1, the DCF model in panel A is structured in a standard and detailed manner, as is the ROE-RI model in panel B.

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[10] We note that Joos and Piotrosk (2013) and Joos, Piotroski and Srinivasan (2014) also use data from a single broker (Morgan Stanley) to informative and interesting ends.

[11] For example, the model uses ROCE to denote return on capital employed rather than to denote return on common equity. In this report, capital (and ‘invested capital’) is net operating assets not assets or equity. The model also uses EVA to denote the dollar amount of abnormal net operating income.

4.2 Descriptive statistics on analysts, firms and forecasted financial statements in reports

In Table 2 we present descriptive statistics pertaining to the analysts and firms in our dataset of 422 equity analyst reports. Panel A shows that the reports are authored or coauthored by 86 different analysts, many of whom hold the CFA professional qualification but none of whom have a CPA, MD or PhD. The mean number of analysts authoring a report is 2.2 and the median number of pages in a report is 15. Of reports, 84% are updates/revisions rather than initiations, and of the stock recommendations given, 50% are overweight or outperform, 43% are neutral or equal-weight and 7% are reduce or underweight. Per panel C, firms are distributed across 26 of the 48 Fama and French (1997) defined industry classifications. Firms also vary widely in size, with market capitalizations as of the analysts' report date ranging between $224 million and $187 billion.

4.3 Descriptive statistics on key components of analysts' valuation models

In panel A of Table 3 we summarize what analysts report about the costs of capital they use across their DCF, RNOA-RI and ROE-RI valuation models. Outside of the maturity horizon for the risk free rate, analysts disclose the risk free rate, beta, equity market premium, cost of equity capital, and weighted average cost of capital almost 98% of the time. The median values of all items appear reasonable given the 1998-2011 window during which analysts wrote their reports.[12]

Panel B reports statistics on the distribution of the fraction of equity value made up by the present value of the post-terminal year free cash flows, residual net operating income and residual net income in analysts' valuation models. A common complaint leveled by practitioners against DCF is the typically very high fraction of equity value represented by the terminal value, since small changes in the firm's discount rate or assumed rate of growth in free cash flows in perpetuity beyond the terminal year can generate large changes in the firm's estimated equity value. Given the role of the book value of net operating assets or equity in RI models, we expect to observe that the fraction of equity value represented by the present value of post-terminal year residual net operating income or residual net income will be markedly lower than the fraction of equity value represented by the present value of post-terminal year free cash flows. We find that this is the case for ROE-RI where the median is 26% as compared to 65% for DCF valuation, but less so for RNOA-RI where the median is a much larger 53%.

[12] The 98% rate of disclosure for the components of firms' costs of capital is substantially higher than the median of 48% rate reported by Green, Hand and Zhang (2014) for a random sample of 120 analyst reports issued during 2012-13 that each contains a DCF valuation model. Since we focus on analyst reports that include both DCF and RI models, we posit that such analysts tend to be more sophisticated and thus disclose more information in their reports. In addition, our sample is dominated by Morgan Stanley, which has a higher reputation than most brokerage firms.

Lastly, panel C gives distributional statistics on the forecasted rates of growth in key components of analysts' DCF, RNOA-RI, and ROE-RI valuations in the terminal year T and in perpetuity beyond T. Where available, this data is taken from what analysts disclose in their models, examples of which are shown in Figures 1 and 2, or is reasonably inferable from their models.[13] From panel C we note that the median length of the explicit forecast horizon for ROE-RI valuations is 19 years, twice as long as the 10 years for DCF and RNOA-RI models. Also, the median rate of growth in post-terminal year residual income is 1.0%, somewhat lower than the 2.3% rate of growth in residual net operating income in RNOA-RI models and the 2.4% rate of growth in free cash flows in DCF models. All else held equal, this suggests that ROE-RI models may yield more conservative valuations than either RNOA-RI or DCF valuations.

5. Performance of DCF, RNOA-RI and ROE-RI valuation models

5.1 Comparison of DCF with RNOA-RI and ROE-RI valuations

In panel A of Table 4 we report statistics on the proximity of analysts' DCF valuations to the RNOA-RI and ROE-RI valuations they make for the same firm in the same report at the same point in time. Contrary to the theoretical prediction that DCF and RI should yield identical valuations, we document that analysts often produce different DCF and RI valuations. The visible nature of these differences—they are clearly visible in the layouts of analysts' valuations—suggests that not only are rounding errors and material differences in underlying assumptions exist across different valuation models, but that analysts are comfortable with presenting different valuations to their clients.

In panel A, we note that of the RNOA-RI and ROE-RI methods, ROE-RI is the approach that most often produces value estimates that markedly differ from analysts' DCF valuations, with just 9% (44%) of ROE-RI valuations being within 1% (5%) of the accompanying DCF figure. This contrasts with RNOA-RI valuations where a much larger 34% (93%) of valuations are within 1% (5%) of the DCF figure. The magnitude of the difference in the differences between DCF vs. RNOA-RI and DCF vs. ROE-RI valuations, combined with the strong similarities in forecast horizon and the positioning of RNOA-RI directly underneath (rather than above) the DCF valuation lead us to hypothesize that analysts' RNOA-RI valuations are merely a repackaging of preexisting DCF data inputs and valuations, while analysts' ROE-RI valuations are created more independently of their DCF valuations.

[13] For example, given the present value of terminal value of free cash flows PV_TV, free cash flows FCF_T in period T, and weighted average cost of capital WACC, we take the rate of growth in post-terminal year free cash flows g to be that which equates PV_TV with $FCF\_T*(1+g)/[(WACC-g)*(1+WACC)^T]$.

5.2 *Target prices and expected returns*

For the subset of reports where there is an analyst price target, panel B of Table 4 describes the distribution of stock prices per CRSP as of one trading day prior to the analyst report date, the target prices stated in the report, and the expected annualized returns implied by the target prices.[14] We define realized annual returns on a without-dividend basis, and unexpected returns as realized less expected.[15] Panel B allows us to calibrate our dataset of analyst reports against others in the literature, given that the pervasive finding in prior research is that target prices are on average highly optimistic, both in the U.S. and around the world. For example, Bradshaw, Brown and Huang (2013) and Bradshaw, Huang and Tan (2014) find that analysts' 12-month ahead target prices are upward biased by an average of 15% for U.S. firms and 18% for non-U.S. firms, respectively.

Panel B reveals that the mean (median) expected return implicit in analysts' target prices in our dataset is 14% (16%), with 91% of individual expected returns being positive. We find that the mean unexpected target price return in our dataset is insignificantly different from zero (-2%, t-statistic = -0.8) although the median unexpected return is a reliably negative -5% (Binomial z-statistic = -3.2). We interpret these results as indicating that there is less optimism displayed in the target prices issued by the analysts in our study than in other studies. To the extent that optimism in target prices reflects less than fully rational information processing, the relative paucity of optimism in the target prices in our dataset suggests that the analysts we study may be more sophisticated than the typical analyst, consistent with their using RI-based valuation methods, or that using both DCF and RI valuation methods leads to less optimistic target prices in general.

5.3 *Expected, realized and unexpected returns in DCF, RNOA-RI and ROE-RI valuations*

We evaluate the return performance of analysts' DCF and RI valuations by measuring the expected, realized and unexpected 12-month signed returns associated with them. This is possible because the valuations provided by analysts in their reports are either directly stated by analysts to be 12-month ahead forecasts, or can be projected to be because of their tight proximity in magnitude to analysts price targets which almost always have a 12-month forecast horizon.

Since there are an average of 4.1 reports per firm in our dataset (viz., 422 reports covering 103 firms), there is material overlap within and across firms in the 12-month windows over which we measure expected, realized and unexpected returns. We seek to mitigate the effects of the resulting lack of independence across observations by aggregating returns by firm and across time. For each

[14] Virtually all target prices are associated with a 12-month forecast horizon.

[15] We define realized returns as not including any dividends paid between the analyst report date and the target price date because analysts' target prices typically are defined as the stock price that will be in place on the target date.

firm and for each valuation method, we sort individual returns by report date from earliest to latest. Then beginning with the earliest return, we average into one firm-valuation-method observation all subsequent returns for that same firm and same valuation method for which the report date is within 12 months of the earliest return. We then repeat the process using the first report issued after the last report that is part of the just-defined 12 month window. In terms of aggregated returns, this process yields 136, 70 and 93 triplets of expected, realized and unexpected returns associated with DCF-based, RNOA-based and ROE-RI valuations, respectively.

In panel C we report statistics pertaining to these aggregated returns. Since our experimental approach is to directly compare and contrast DCF and RI valuations on a within-firm and within-report basis, we use only those 70 (93) of the 136 DCF returns that match to the 70 RNOA-based (93 ROE-based) RI returns. Based on these returns, we highlight the following results in panel C.

First, per the uppermost part of panel C, in terms of accuracy the mean unexpected return associated with both DCF and RNOA-RI valuations is -7% (t-statistic = -1.7) while the median unexpected returns are each -8% (binomial z-statistics = -2.4 and -2.6 versus a null of 50%). We interpret this as indicating that DCF and RNOA-RI valuations are optimistic when they are provided in the same report. Virtually the same value estimates from DCF and RNOA-RI valuations suggest that RNOA-RI is not independent from DCF, confirming our more anecdotal observation that analysts typically derive their operating income or ROA forecasts from the cash flow spreadsheet. Second, the mean unexpected return associated with ROE-RI valuations is 5% (t-statistic = 1.3), and the median expected return is 2% (t-statistic = 0.7). This suggests that ROE-RI valuations are unbiased predictors of 12-month ahead stock prices. Third, when directly evaluated against each other, ROE-RI valuations are more conservative than DCF valuations, since the mean difference in expected returns is 5% (t-statistic = 3.4) and the median difference is 2% (t-statistic = 2.0).

Finally, we examine the subsample of analyst reports that contain all three of DCF and RNOA-RI, and ROE-RI valuations. Panel D of Table 4 shows that DCF and RNOA-RI valuations produce virtually the same value estimates, confirming the finding in Panel C. Although ROE-RI valuations are less optimistic than their DCF counterparts, the differences are not statistically significant due to our small sample size of 28 observations. The finding of less optimistic ROE-RI valuations in this subsample, similar to what observed in Panel C, helps rule out the self-selection concern that analysts who construct ROE-RI models are sophisticated and that such sophistication manifests itself in both their ROE-RI and DCF valuations. Our results indicate that ROE-RI valuations provide relatively independent information to DCF whereas RNOA-RI valuations are a manifestation of DCF. Analyst reports with ROE-RI valuations tend to be less optimistic, possibly because their more independent estimates from ROE-RI help analysts to adjust their DCF estimates.

5.4 *Long-run forecasted RNOAs and ROEs in analysts' dual DCF and RI valuations*

Since RI methods are typically promoted as making long-term forecasted RNOAs or ROEs the central features of valuation, in Figure 3 we display the median annual RNOAs and ROEs forecasted by analysts in our dataset, together with the median weighted average and equity costs of capital that analysts employ. Panel A is shown in event time starting with the first forecasted year beyond the most recent year of realized data available to the analyst, while panel B is in event time relative to the terminal year of the valuation, denoted "0". Panel C limits the view taken in panel B to only the reports in which analysts provide all three valuations—DCF, RNOA-RI and ROE-RI.

From Figure 3 it is clear that median forecasted RNOAs in analysts' RNOA-RI valuations increase both as the forecast horizon increases per se (panel A) and as the forecast horizon approaches the terminal year (panels B and C). For example, per panel B median RNOAs rise from 19% one year out from the report to 28% in the terminal year at which point they are 20 percentage points larger than analysts' median WACCs of 8%. Since panel C of Table 4 reported that RNOA-RI valuations are very close in size to their DCF counterparts, the median RNOAs shown in Figure 3 must also be the median RNOAs embedded in, but not visibly presented on the face of analysts' DCF valuations. In contrast, Figure 3 makes plain that median forecasted ROEs taken from the ROEs that are visibly presented in analysts' ROE-RI valuation models decrease as the forecast horizon increases. Median ROEs fall from 21% one year out beyond the report date to 17% in the terminal year at which point they are 8 percentage points larger than analysts' median REs of 9%.

The striking results reported in Figure 3 lead us to argue that DCF and RNOA-RI valuations reflect a lack of sophistication in long-term economic forecasting that is not shared by analysts ROE-RI valuations. We arrive at this conclusion because the effects of competition require that rational forecasts of long-term RNOA and ROE converge toward firms' weighted average and equity costs of capital, respectively, yet of the long-horizon paths in RNOA and ROE shown in Figure 3, only that of ROE declines toward its cost of capital benchmark. Not only does the increasing path of RNOAs not make economic sense, but all else held equal it predicts that RNOA-RI valuations will be optimistic per se, and more optimistic than ROE-RI valuations. The evidence on unexpected returns in panel C of Table 4 supports these predictions—RNOA-RI valuations are optimistic relative to realized one-year-ahead prices by an average of 7%, while ROE-RI valuations are unbiased.

We draw one additional conclusion from the divergent trajectories of RNOA and ROE in Figure 3 when combined with the relatively similar RNOA-RI and ROE-RI valuations in Table 4. This is that ROE-RI has a previously unrecognized practical advantage over DCF and RNOA-RI stemming from the fact that ROE combines a firm's operating profitability with its financing stance.

Since ROE = RNOA + [FLEV x SPREAD], where FLEV = net financial liabilities divided by common equity and SPREAD = net financial expense divided by net financial liabilities, by focusing on the evolution of just ROE rather than the evolutions of both RNOA and financial leverage, ROE-RI reduces the risk that a practitioner will make the economically implausible financial leverage assumption that management will allow future residual NOI to build up in the form of cash on the firm's balance sheet instead of being paid out to shareholders. We argue that the reason that analysts' forecasts of RNOA increase over time in Figure 3 while their forecasts of ROE decrease is that in their RNOA-RI and DCF models analysts are making the assumption that management will allow future residual NOI to build up in the form of cash on the firm's balance sheet instead of being paid out to shareholder, and to such a degree that its negative effect on ROE more than compensates for the positive impact of increasing RNOAs. Equivalently, we conjecture that for either unconscious behavioral or consciously strategic reasons, analysts who use DCF or RNOA-RI optimistically project increasing RNOAs and then allow FLEV x SPREAD to turn highly negative in order for their resulting valuations to not be wildly in excess of current prices. We therefore posit that a practical advantage of ROE-RI over DCF and RNOA-RI is that it prevents analysts from visibly presenting two mostly offsetting errors (an ever increasing RNOA and an ever more negative FLEV x SPREAD) to their clients.

5.5 The role of different valuation models in determining analysts' target prices

The last aspect of analysts' dual DCF and RI valuations that we study is to explore the role of different valuation models in determining analysts' target prices. We do so by regressing analysts' target prices on their DCF, RNOA-RI, and ROE-RI valuations. If RNOA-RI is just a manifestation of DCF, we expect the coefficient on DCF valuation to be close to one and the coefficient on RNOA-RI valuation to be close to zero. If ROE-RI plays a more significant role in determining target prices than DCF does, we expect the coefficient on ROE-RI valuation to be higher than that on DCF valuation. Finally, if analysts use multiple valuation methods because they believe that averaging different valuations from different methods yields less noisy and more accurate results, then their target prices will reflect the influence of multiple methods, and we will observe significant regression coefficient estimates on more than one type of valuation.

Table 5 reports the regression results. In model 1, analysts' price targets—where provided, which is less in 100% of reports—are projected onto analysts' DCF and RNOA-RI valuations. The results clearly show that DCF valuations are tightly associated with target prices (t-statistics on estimated coefficients relative to nulls of zero and one are 5.5 and -0.5, respectively, with an adjusted R^2 = 96%), while RNOA-RI valuations are incrementally irrelevant (t-statistic = -0.4). This result also confirm the idea that analysts' RNOA-RI valuations are entirely derived from, and are not in any economically meaningful sense independent of, analysts' DCF valuations.

In contrast, in model 2 where analysts' price targets are projected onto DCF and ROE-RI valuations, both independent variables exhibit reliably non-zero coefficient estimates. Moreover, in a manner opposite to that of model 1, in model 2 ROE-RI valuations and not DCF valuations are the primary determinant of analysts' price targets: the estimated coefficient on the RNOE-based RI valuation is 1.10 (t-statistic = 14.6) while the estimated coefficient on the DCF valuation is -0.18 (t-statistic = -2.4). This suggests analysts' ROE-RI valuations are materially independent of analysts' DCF valuations, consistent with analysts' using the two types of valuation methods because each method has a degree of non-overlapping practical benefit to it. In analyst reports with both DCF and ROE-based methods, ROE-RI valuations are the main driver of target prices.

In model 3 we restrict the data sets used in models 1 and 2 to the subset of observations where both RNOA-RI and ROE-RI valuations accompany analysts' DCF valuations, and then simultaneously project all three valuations onto target prices. The resulting parameter estimates and their associated t-statistics indicate that in this situation all three valuations are important, although the very high correlation between DCF and RNOA-RI valuations is the likely cause for the large and similarly sized but oppositely signed coefficient estimates on DCF and RNOA-RI. Consistent with this, in model 4 we keep the dataset used in model 3 but include DCF and ROE-RI valuations, and exclude RNOA-RI valuations, the results parallel those of model 2 in that we observe that both DCF and ROE-RI valuations drive analysts' target prices: the estimated coefficient on the RNOE-based RI valuation is 0.71 (t-statistic = 5.4) while the estimated coefficient on the DCF valuation is 0.26 (t-statistic = 2.0).[16]

Overall, the results in Table 5 indicate that in analyst reports with both DCF and RNOA-RI, RNOA-RI valuations are not independent of DCF since target prices are solely driven by DCF valuations. However, in analyst reports with both DCF and ROE-RI, analysts largely rely on ROE-RI in setting their target prices. Analysts' preference for ROE-RI over DCF or RNOA-RI valuations is sensible given that ROE-RI valuations are empirically unbiased while DCF and RNOA-RI valuations are not. We also note that the finding that ROE-RI and not DCF valuations largely determine target prices helps alleviate the concern that our study suffers from the selection bias that those analysts who choose to use ROE-RI are of higher ability than those who use DCF. This is because if ROE-RI does not play an active role, we should not expect ROE-RI valuations to load more significantly than DCF valuations in determining target prices, but they do.

[16] We note that the estimated coefficients on DCF valuations in models 2 and 4 have the opposite sign. We are not able to offer a satisfactory explanation for why this is the case.

6. Conclusions

In this study, we contribute to the residual income valuation literature by providing the first academic evidence on the use of RI in practice by sell-side equity analysts. We do so by comparing the hand-collected characteristics and performance of RI valuations with those of DCF when both methods are used by the same analysts for the same firm in the same report.

We find that analysts are equally likely to adopt RI valuations built around forecasting net operating income as around net income. However, we observe that the economic properties of RNOA-RI and ROE-RI are quite different along several dimensions. First, contrary to the theoretical equivalence of DCF and RI, analysts' DCF and ROE-RI valuations are often materially different from each other, while their RNOA-RI and DCF valuations are very close to each other. Second, we conclude that the reason that analysts' RNOA-RI and DCF valuations are so similar is that analysts' RNOA-RI valuations are simply a repackaging of their DCF data inputs and valuations. Not only do analysts visually place their DCF valuations before and above their RNOA-RI valuations and use the same forecast horizon for each, but between DCF and RNOA-RI valuations, only DCF matters in explaining analysts' target prices. In contrast, between DCF and ROE-RI valuations, analysts' target prices are more determined by their ROE-RI valuations than their DCF counterparts.

Third, we document that analysts' RNOA-RI valuations are optimistic relative to future prices and contain forecasted returns on net operating assets that increase toward a terminal year median of 28%, whereas ROE-based RI valuations contain returns on equity that are unbiased relatively to future stock prices and decline toward a terminal year median of just 17%. As such, we conclude that analysts' RNOA-RI and DCF valuations reflect a lack of sophistication in economic forecasting that is not found in their ROE-RI valuations because their RNOA forecasts fail to reflect the effects of competition require that rational forecasts of long-term RNOA should converge toward firms' weighted average costs of capital.

Lastly, by focusing on the evolution of just ROE instead of the evolutions of both RNOA and financial leverage, we argue that ROE-RI reduces the risk that the user will make the economically unreasonable financial leverage assumption that management will allow future residual NOI to build up in the form of cash on the firm's balance sheet instead of being paid out to shareholders. We conjecture that for either unconscious behavioral or consciously strategic reasons, analysts who use DCF or RNOA-RI optimistically project increasing RNOAs and then allow FLEV x SPREAD to turn highly negative in order for their resulting valuations to not be wildly in excess of current prices.

Overall, our results corroborate early evidence in the valuation literature that DCF results in overly optimistic valuations. While DCF has been criticized as promoting upwardly biased value estimates because it rarely highlights the RNOAs that underlie projected free cash flows (Bernard, 1994), our results indicate that simply making the RNOAs visible as is the case in the RNOA-RI valuations we study does not necessarily yield more conservative valuations than DCF. With their attention on DCF and with RNOA-RI being only repackaging of DCF, analysts appear to ignore the economically implausible and persistently increasing RNOAs that are implicitly detailed in the presentation of their RNOA-RI valuations. In contrast, our dataset demonstrate the superiority of ROE-RI valuations when used by equity analysts. Analysts' ROE-RI valuations generate economically sensible ROE forecasts, drive their target prices, and are unbiased relative to future stock prices. All told, we propose that ROE-RI models deserve more attention from practitioners, and express the hope that our findings will encourage analyst and non-analyst practitioners to use ROE-RI valuation more frequently.

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TABLE 1

Criteria applied in arriving at 422 sell-side equity analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations (May 1998 – Nov. 2011), and descriptive statistics on authoring brokers, report dates, and types of analysts' RI models.

Panel A: Investext search criteria

Asset class:	**All**
Dates:	**Custom,** 01/01/98 **to** 12/31/13
Keyword(s):	DCF or ("discounted cash flow*") in **Table of Contents** and "residual income" in **Table of Contents**
Report type:	**Company**
Geography:	**United States**
Contributor:	**Non-broker research excluded**

Panel B: Sample refinement criteria

Base sample:	478 analyst reports	
Excluded:	No $/share DCF valuation provided	26
	No $/share RI valuation provided	19
	Firm is a non-U.S. company	5
	No determinable valuation date	3
	No target price provided	2
	Insufficient stock price/return data	1
Final sample:	422 analyst reports covering 103 different firms	

Panel C: Number of sampled analyst reports by authoring broker, and distribution of report dates

Broker	# reports in sample
Morgan Stanley	417
Cowen & Company	4
HSBC Global Research	1

Date of report	
Min.	19980513
25th pctile	20011105
Median	20021163
75th pctile	20041019
Max.	20111003

Panel D: Frequency of DCF and RI valuation models used by analysts in sample reports

Type of equity valuation model contained in analysts' report		
DCF to all investors	422	
Residual income (RI), of which:	422	
1. To all investors, forecasting NOI and RNOA		168
2. To equity investors, forecasting NI and ROE		152
3. Both types of RI valuation models		102

TABLE 2

Descriptive statistics on the analysts and firms in the 422 analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations (May 1998 – Nov. 2011).

Panel A: Number of reports authored by analysts, analysts' professional qualifications, and number of analysts on the analyst team

# reports analyst is on	
Min.	1
Median	2
Mean	10.9
Max.	142

# analysts on team	
Min.	1
Mean	2.2
Max.	5
# unique analysts	86

# pages in report	
Min.	6
Median	15
Mean	20
Max.	110

Type of report	#
Initiation	67
Update/revision	355

Stock recommendation	#
Reduce or underweight	26
Neutral or equal-weight	184
Overweight or outperform	212

% of reports with one or more CFAs on analyst team	28%

Panel B: Industry and market cap of covered firms

Industry	#
Business services	89
Consumer goods	77
Apparel	55
Recreational products	30
Construction materials	26
Chemicals	24
Retail	24
Transportation	16
Computers	14
Business supplies	11
Restaurants, hotel, motel	11
Construction	9
Electronic equipment	8

Industry (continued)	#
Telecommunications	6
Personal services	4
Rubber & plastic products	3
Aircraft	2
Automobiles & trucks	2
Shipping containers	2
Trading	2
Wholesale	2
Agriculture	1
Coal	1
Food products	1
Insurance	1
Machinery	1

Market cap ($ mil.)		
Min.	$	224
Median	$	7,529
Mean	$	16,825
Max.	$	187,763

TABLE 3

Statistics on the components of costs of capital, and the terminal and post-terminal rates of growth in key components of the DCF, RNOA-based RI and ROE-based RI valuations, that are forecasted by analysts in the 422 analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations (May 1998 – Nov. 2011).

Panel A: Components of analysts' cost of capital estimates

Components of costs of capital	# obs	Min.	Median	Mean	Max.
RF horizon (yrs)	295	10	30	21	30
RF	412	3.0%	5.0%	4.9%	6.5%
BETA	412	0.68	1.00	1.14	2.55
MKTPREM	412	2.5%	4.0%	4.0%	8.0%
RE	417	6.7%	9.0%	9.3%	14%
WACC	418	5.8%	8.8%	8.9%	13%

Panel B: Fraction of total equity value represented by the present value of post-terminal year free cash flows (DCF model), residual net operating income (RNOA-RI model), and residual income (ROE-RI model)

pv(TV)/Eq_value	# obs	Min.	Median	Mean	Max.
DCF	409	17%	65%	64%	289%
RNOA	266	10%	53%	50%	280%
ROE	243	-0.5%	26%	32%	75%

Panel C: Forecasted rates of growth in key components of DCF valuations and RNOA-based and ROE-RI valuations in terminal year T (denoted by the prefix "g_"), and in perpetuity beyond T (denoted by "g_perp > T")

	Terminal value-related item	# obs	Min.	Median	Mean	Max.
DCF	# years ahead is T	416	5	10	11	40
	g_perp > T	402	-8.0%	2.4%	2.6%	7.6%
	g_REV_T	386	-15%	4.2%	4.6%	15%
	g_CAPEX_T	403	-65%	2.4%	2.4%	40%
	g_FCF_T	403	-20%	5.2%	6.2%	79%
RNOA	# years ahead is T	267	5	10	10	24
	g_perp > T	265	-5.9%	2.1%	2.1%	6.3%
	g_RNOI_T	264	-58%	5.2%	5.2%	28%
ROE	# years ahead is T	253	5	19	17	40
	g_perp > T	235	-32%	1.0%	2.1%	11%
	g_RI_T	232	-80%	4.1%	3.2%	30%

TABLE 4

Statistics on the valuations, target prices and returns associated with the DCF, RNOA-based RI and ROE-RI valuations in the 422 analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations (May 1998 – Nov. 2011).

Panel A: Proximity of analysts' DCF valuations to their RNOA-RI and ROE-RI valuations of the same firm in the same report

		Difference in analysts' valuations			
Valuation comparison	# obs	Exactly the same	Within 1%	Within 2%	Within 5%
DCF vs. RNOA	267	6%	34%	59%	93%
DCF vs. ROE	254	2%	9%	21%	44%

Panel B: Analysts' target prices and the annualized expected, realized and unexpected stock returns associated with them (only for subset where there is a target price provided by analysts)

	# obs	Min.	Median	Mean	Max.	t-stat.	% > 0	Binomial z-stat.
Current stock price	285	$ 6.60	$ 31.55	$ 35.94	$ 246.10			
Target stock price	285	$ 9.00	$ 35.00	$ 42.28	$ 320.00			
Expected return in target	285	-27%	16%	14%	53%	21.5	91%	-13.9
Realized return	285	-68%	8%	13%	134%	6.9	62%	4.0
Unexpected target return	283	-69%	-5%	-2%	121%	-0.8	41%	-3.2

Note: Target price horizon is almost always 12 months beyond report date.

Panel C: Comparisons of the expected, realized and unexpected returns in analysts' valuations, where observations are aggregated by firm and across time, by 12-month windows

Unexpected return = realized - expected (on an aggregated basis)	# obs	Min.	Median	Mean	Max.	t-stat.	% > 0	Binomial z-stat.
DCF when there is an RNOA valuation	70	-110%	-8%	-7%	86%	-1.7	36%	-2.4
RNOA valuation	70	-110%	-8%	-7%	83%	-1.7	34%	-2.6
DCF when there is an ROE valuation	93	-88%	0%	0%	116%	0.0	52%	0.3
ROE valuation	93	-85%	2%	5%	118%	1.3	54%	0.7

Expected return (on an aggregated basis)	# obs	Min.	Median	Mean	Max.	t-stat.	% > 0	Binomial z-stat.
DCF when there is an RNOA valuation	70	-23%	15%	15%	69%	6.3	77%	4.5
RNOA valuation	70	-20%	13%	15%	60%	6.5	76%	4.3
DCF - RNOA	70	-8%	-1%	0%	14%	0.4	39%	-1.9
DCF when there is an ROE valuation	93	-23%	19%	19%	96%	7.7	77%	5.3
ROE valuation	93	-35%	15%	13%	65%	6.2	74%	4.7
DCF - ROE	93	-29%	2%	5%	53%	3.4	60%	2.0

Realized return (on an aggregated basis)	# obs	Min.	Median	Mean	Max.	t-stat.	% > 0	Binomial z-stat.
RNOA valuation	70	-67%	7%	8%	106%	2.2	64%	2.4
ROE valuation	93	-68%	16%	19%	107%	5.5	76%	5.1

TABLE 4 (continued)

Panel D: Comparisons of the unexpected returns in analysts' valuations, where observations are restricted to analyst reports that contain all three of a DCF, RNOA-RI and ROE-RI valuations. Valuations are aggregated by firm and across time, by 12-month windows.

Unexpected return when all 3 present	# obs	Min.	Median	Mean	Max.	t-stat.	% > 0	Binomial z-stat.
DCF	28	-71%	8%	9%	86%	1.3	61%	-1.1
RNOA	28	-68%	6%	8%	83%	1.3	61%	-1.1
ROE	28	-72%	0%	6%	79%	1.0	50%	0.0
DCF - ROE	28	-15%	3%	2%	14%	2.2	61%	-1.1

Notes:

Since there are an average of 4.1 reports per firm in our dataset (422 reports covering 103 different firms), there is overlap within and across firms in the 12-month windows over which we measure expected, realized and unexpected returns. In panel C we seek to minimize the impacts of this lack of independence by aggregating returns by firm and across time. For each firm and for each valuation method, we sort individual returns by report date from earliest to latest. We start with the earliest return, and average together into one firm-valuation-method observation all subsequent returns for that same firm and same valuation method for which the report date was within 12 months of the earliest return. We then repeat the process using the first report issued after the last report that is part of the just-defined 12 month window. In terms of aggregated returns, this process yields 136, 70 and 93 triplets of expected, realized and unexpected returns associated with DCF-based, RNOA-based and ROE-RI valuations, respectively.

TABLE 5

OLS regressions of analyts' target prices on analysts' DCF valuations, RNOA-based RI valuations, and ROE-based RI valuations. Sample is the subset of the 422 analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations (May 1998 – Nov. 2011), and for which there is an analyst target price. t-statistics relative to a null parameter value of zero are in parentheses.

Independent variables:	Pred. sign on coef.	Model 1	Model 2	Model 3	Model 4
Intercept		$5.28	$3.16	$1.52	$1.77
		(8.5)	(5.8)	(3.2)	(3.4)
DCF valuation	+	0.92	-0.18	-2.32	0.26
		(5.5)	(-2.4)	(-3.6)	(2.0)
RNOA-based valuation	+	-0.06		2.80	
		(-0.4)		(4.1)	
ROE-based valuation	+		1.10	0.49	0.71
			(14.6)	(3.7)	(5.4)
Adj. R-squared		96%	98%	99%	99%
# obs.		183	183	84	84

FIGURE 1

Example of an analyst report in which both DCF and RNOA-based RI valuations are presented, and on one single page as shown below. Firm is Nike Inc. (12/12/02, Morgan Stanley, p.10).

Exhibit 12

Nike Discounted Cash Flow Model

Discounted Cash Flow Analysis	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Operating Revenue	9,893	10,457	10,978	11,567	12,163	12,816	13,504	14,228	14,992	15,796
Revenue Growth		5.7%	5.0%	5.4%	5.4%	5.4%	5.4%	5.4%	5.4%	5.4%
EBITDA	1,344	1,481	1,611	1,785	1,964	2,069	2,180	2,297	2,420	2,550
EBITDA Margin	13.6%	14.2%	14.7%	15.4%	16.1%	16.1%	16.1%	16.1%	16.1%	16.1%
- Depreciation	(224)	(234)	(246)	(259)	(272)	(273)	(294)	(314)	(335)	(356)
- Amort. of Non-Deduct. Goodwill	(53)	(55)	(51)	(47)	(44)	(44)	(44)	(44)	(44)	(44)
EBIT	1,068	1,192	1,315	1,478	1,648	1,752	1,842	1,939	2,041	2,150
- Imputed Taxes on EBIT	(392)	(436)	(478)	(534)	(592)	(628)	(660)	(694)	(730)	(768)
EBIAT	676	756	837	944	1,056	1,123	1,182	1,245	1,312	1,382
+ Depreciation & Amortization	277	289	297	306	316	317	338	358	379	400
- Capital Expenditures	(303)	(225)	(225)	(264)	(279)	(393)	(414)	(436)	(459)	(484)
- + Change in WC and Other Assets	97	(63)	6	2	13	0	0	0	0	0
Net Investment in Capital	71	0	78	44	50	(76)	(76)	(78)	(80)	(84)
Free Cash Flow to Debt & Equity	746	756	915	989	1,105	1,048	1,106	1,167	1,231	1,298
FCF growth rate		1.4%	20.9%	8.1%	11.8%	-5.2%	5.6%	5.5%	5.5%	5.5%
Discount Factor		0.919	0.845	0.777	0.714	0.656	0.603	0.554	0.510	0.468
PV of Free Cash Flow to Debt & Equity		$ 695	$ 773	$ 768	$ 789	$ 688	$ 667	$ 647	$ 627	$ 608
Sum PV of Free Cash Flow		$ 15,769								
+ MV of Equity Investments		$ -								
+ MV of Non-Operating Assets		$ -								
+ Other		$ -								
= **Enterprise Value**		**$ 15,769**								
- MV of Net Debt		$ (529)								
- Capitalized Off Balance Sheet Leases		$ -								
- Pension & Other Non-Funded Liability		$ -								
- MV of Non-Convert. Preferred Stock		$ -								
- PV of Minority Interest		$ -								
- MV of Options Outstanding		$ -								
Equity Value		**$ 15,239**								
Shares Outstanding (mil)		272.2								
Equity Value/Share		**$ 55.99**								
Long-Term Sustainable Growth Rate	5.0%									

Weighted Average Cost of Debt & Equity Capital (WACC)	
Shares Outstanding (mm)	272.2
Price Per Share	$ 39.83
Market Value of Equity (MVE)	$ 10,842
Levered Beta for This Company	0.88
30 Year Risk Free Rate	5.5%
Equity Risk Premium	4.0%
Cost of Equity:	**9.0%**
Market Value of Total Interest Bearing Debt (MVD)	$ 529
Marginal Cost of Long-Term Debt	7.0%
Marginal Tax Rate	35.0%
After-Tax Cost of Debt:	4.6%
MVE/(MVD+MVE)	95.3%
MVD/(MVD+MVE)	4.7%
Weighted Average Cost of Capital	**8.79%**

Return on Capital Employed	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Beginning Capital		$ 4,202	$ 4,201	$ 4,124	$ 4,079	$ 4,029	$ 4,105	$ 4,181	$ 4,259	$ 4,340
Revenues / Beg. Capital		2.49	2.61	2.81	2.98	3.18	3.29	3.40	3.52	3.64
Capital Growth Rate		NA	0.0%	-1.9%	-1.1%	-1.2%	1.9%	1.9%	1.9%	1.9%
EBIAT		$ 756	$ 837	$ 944	$ 1,056	$ 1,123	$ 1,182	$ 1,245	$ 1,312	$ 1,382
Adjusted Return on Capital Employed (ROCE)		18.0%	19.9%	22.9%	25.9%	27.9%	28.8%	29.8%	30.8%	31.8%
WACC Based on Beta		8.8%	8.8%	8.8%	8.8%	8.8%	8.8%	8.8%	8.8%	8.8%
ROCE - WACC		9.2%	11.1%	14.1%	17.1%	19.1%	20.0%	21.0%	22.0%	23.1%
EVA		$ 386	$ 467	$ 582	$ 697	$ 769	$ 821	$ 877	$ 937	$ 1,001
Discount Factor		0.919	0.845	0.777	0.714	0.656	0.603	0.554	0.510	0.468
PV EVA		$ 355	$ 395	$ 452	$ 498	$ 505	$ 495	$ 486	$ 477	$ 469
Sum PV EVA		$ 11,413	72% is value from growth + understated book value							
+ Invested Capital at Mid Year		$ 4,383	28% is value from existing book value							
+ MV of Equity Investments		$ -	0% is value from investments							
+ MV of Non-Operating Assets		$ -	0% is value from non-op. assets							
+ Other		$ -	0% is value from other							
Enterprise value		**$ 15,796**	100%							
- MV of Net Debt		$ (529)								
- Capitalized Off Balance Sheet Leases		$ -								
- Pension & Other Non-Funded Liability		$ -								
- MV of Non Convert. Preferred Stock		$ -								
- MV of Minority Interest		$ -								
- MV of Options Outstanding		$ -								
Equity value		**$ 15,266**								
Shares Outstanding (mil)		272.2								
Equity Value/Share		**$ 56.08**								

Total Capital Provided	1Q02
ST Debt	$ 223
- Cash & Securities	$ (430)
+ LT Debt	$ 736
+ Capitalized Leases Net of Depreciation	$ -
+ Pension & Other Non-Funded Liability	$ -
+ Deferred Tax Liability	$ -
+ Minority Interest	$ -
+ Preferred Stock	$ -
+ Equity	$ 3,673
=Total Capital Provided	**$ 4,202**

Source: Morgan Stanley research

FIGURE 2

Example of an analyst report in which both DCF and ROE-based RI valuations are presented, using two pages as shown below. Firm is Carnival Corp & Plc (1/29/04, Morgan Stanley, pp. 9-10).

Panel A: The DCF model, disclosed on p.9 of the report

Exhibit 15

Carnival Discounted Cash Flow Analysis

US$mn	2004e	2005e	2006e	2007e	2008e	2009e	2010e...
Operating Revenue	9,526	10,608	11,337	12,065	12,802	13,543	14,328
Revenue Growth (%)		*11.4*	*6.9*	*6.4*	*6.1*	*5.8*	*5.8*
EBITDA	**2,907**	**3,416**	**3,762**	**4,071**	**4,368**	**4,649**	**4,946**
EBITDA Growth (%)	*30.5*	*32.2*	*33.2*	*33.7*	*34.1*	*34.3*	*34.5*
- Depreciation	(811)	(925)	(989)	(1,011)	(1,034)	(1,060)	(1,087)
EBIT	2,096	2,491	2,773	3,060	3,334	3,589	3,859
- Imputed Taxes on EBIT	(63)	(75)	(83)	(92)	(100)	(108)	(116)
EBIAT	2,033	2,416	2,690	2,968	3,234	3,482	3,743
+ Depreciation & Amortisation	811	925	989	1,011	1,034	1,060	1,087
- Capital Expenditures	(3,380)	(1,480)	(1,480)	(1,537)	(1,606)	(1,677)	(1,752)
- + Change in WC and Other Assets	208	141	232	260	282	168	182
Net Investment in Capital	(2,361)	(414)	(258)	(266)	(289)	(450)	(483)
Free Cash Flow to Debt & Equity	**(328)**	**2,002**	**2,431**	**2,702**	**2,945**	**3,032**	**3,260**
FCF Growth Rate (%)	*nm*	*nm*	*21.4*	*11.1*	*9.0*	*3.0*	*7.5*
Discount Factor	1.000	0.924	0.853	0.788	0.728	0.672	0.621
PV of Free Cash Flow to Debt & Equity	(328)	1,849	2,074	2,129	2,143	2,038	2,023
Sum PV of Free Cash Flow	9,905						
Terminal value (US$)	37,947						
Enterprise Value	**47,852**						
- MV of Net Debt (Ex Convertible)	(6,241)						
Equity Value	**41,610**						
Shares Outstanding (mn)	818.0						
Equity Value/Share (US$)	**50.9**						
Long-Term Sustainable Growth Rate	**2.5**						
Weighted Average Cost of Debt & Equity (WACC)							
Shares Outstanding (F/D, mm)	818.0						
Price Per Share	42.00						
Market Value of Equity (MVE)	34,356						
Levered Beta for This Company	1.00						
Risk Free Rate (%)	5.0						
Equity Risk Premium (%)	4.0						
Cost of Equity: (%)	**9.00**						
Market Value of Total Interest Bearing Debt (MVD)	6,241						
Marginal Cost of Long-Term Debt (%)	4.4						
Marginal Tax Rate (%)	3.0						
After-Tax Cost of Debt: (%)	**4.3**						
MVE/(MVD+MVE) (%)	84.6						
MVD/(MVD+MVE) (%)	15.4						
Weighted Average Cost of Capital (%)	**8.3**						

Source: Morgan Stanley Research estimates

FIGURE 2 (continued)

Panel B: The ROE-RI model, disclosed on p.10 of the report

Exhibit 16

Carnival Residual Income Model

Inputs - Single Period Decay Model:		**Outputs**	**US$**	**Other Statistical Output**	**(%)**		**(%)**
Number of Shares Outstanding (mn)	818	Current Share Price (Local Currency)	42.0	5 Year Net Income CAGR	14.7	Year 1 ROE	15.3
Required Rate of Return (%)	9.00	RI Value Per Share (With Perpetuity)	48.1	10 Year Net Income CAGR	12.0	Year 5 ROE	18.0
2014… decay of ROE (%)	(2.0)	Value of Perpetuity	13.1	15 Year Net Income CAGR	10.6	Year 10 ROE	15.5
		RI Value Per Share (Without Perpetuity)	35.0	20 Year Net Income CAGR	9.9	Year 15 ROE	14.0
						Year 20 ROE	12.6

US$ million	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Net Income	1,760	2,124	2,512	2,880	3,208	3,488	3,795	4,119	4,461	4,820	5,452	5,909	6,393	6,903	7,441	8,005	8,597	9,217	9,864	10,539
Growth (%)		*20.7*	*18.3*	*14.6*	*11.4*	*8.8*	*8.8*	*8.5*	*8.3*	*8.0*	*13.1*	*8.4*	*8.2*	*8.0*	*7.8*	*7.6*	*7.4*	*7.2*	*7.0*	*6.8*
Dividends paid	409	491	589	677	779	896	1,030	1,185	1,362	1,567										
Total Return of Capital	**409**	**491**	**589**	**677**	**779**	**896**	**1,030**	**1,185**	**1,362**	**1,567**	**1,635**	**1,773**	**1,918**	**2,071**	**2,232**	**2,402**	**2,579**	**2,765**	**2,959**	**3,162**
Total Payout Ratio (%)	23.2	23.1	23.4	23.5	24.3	25.7	27.1	28.8	30.5	32.5	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Sharehldrs' Equity ex g/w	11,514	13,147	14,780	16,703	18,906	21,334	23,927	26,692	29,627	32,726	35,979	39,795	43,932	48,407	53,239	58,447	64,051	70,069	76,520	83,425
ROE (%)	15.3	17.2	18.0	18.3	18.0	17.3	16.8	16.3	15.8	15.5	15.2	14.8	14.6	14.3	14.0	13.7	13.4	13.2	12.9	12.6
Residual Income	**724**	**941**	**1,182**	**1,376**	**1,506**	**1,568**	**1,642**	**1,717**	**1,795**	**1,875**	**2,213**	**2,328**	**2,439**	**2,547**	**2,649**	**2,745**	**2,832**	**2,911**	**2,977**	**3,031**
PV of Residual Income	**724**	**863**	**995**	**1,063**	**1,067**	**1,019**	**979**	**939**	**901**	**863**	**935**	**902**	**867**	**831**	**793**	**754**	**713**	**673**	**631**	**589**

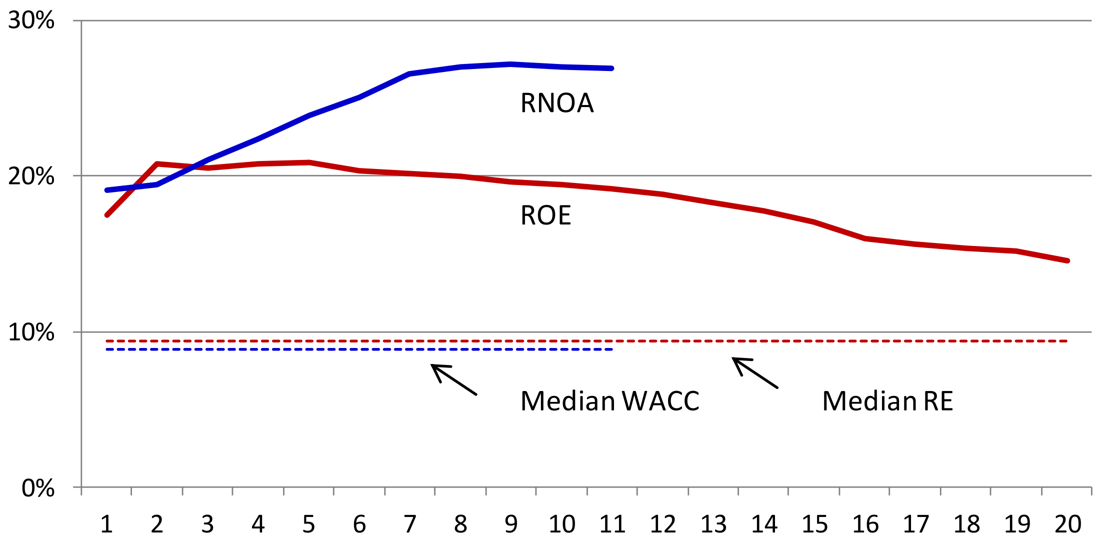
Value Per Share Breakdown		(%)
Shareholder's Equity	14.1	29
Analyst's Forecast	11.5	24
Extended Forecast	9.4	20
Terminal Value	13.1	27
Total Value	**48.1**	**100**

Source: Morgan Stanley Research estimates

FIGURE 3

Median annual RNOAs and ROEs forecasted by analysts in the 422 analyst reports in Investext issued by U.S. brokers that contain both DCF and RI equity valuations. Panel A is in event time starting with the first year explicitly forecasted by analysts. Panel B is in event time relative to year 0, defined as the terminal year of the analyst's valuation model.

Panel A: Median future annual RNOAs and ROEs forecasted by analysts



Panel B: Median annual RNOAs and ROEs forecasted by analysts up to the terminal year 0

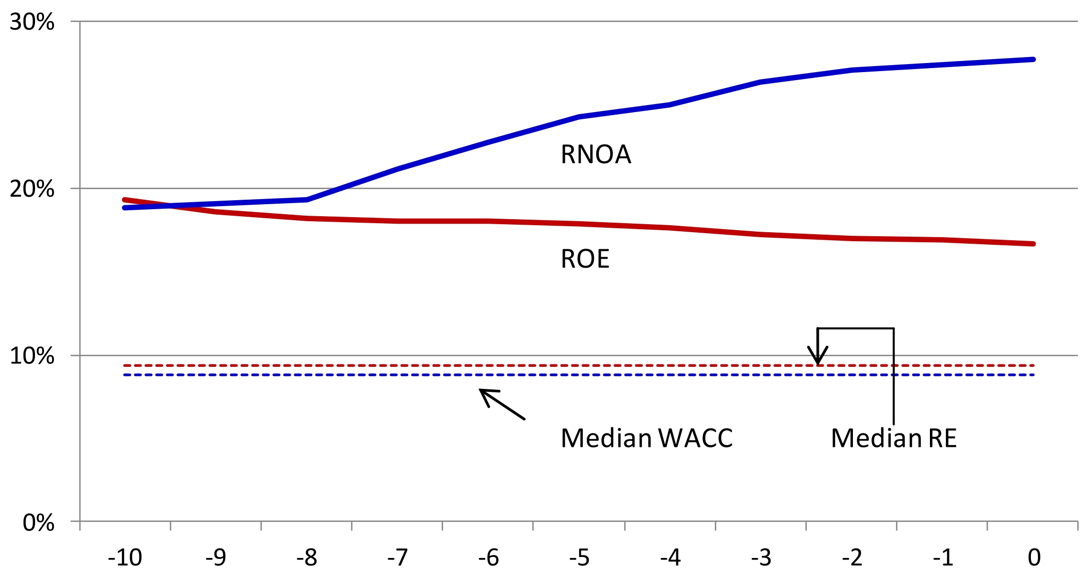


FIGURE 3 (continued)

Panel C: Median annual RNOAs and ROEs forecasted by analysts up to the terminal year 0 for the subsample of analyst reports with all three of DCF, RNOA-RI, and ROE-RI valuations.