RESIDUAL INCOME VERSUS DISCOUNTED CASH FLOW VALUATION MODELS: AN EMPIRICAL STUDY

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ABSTRACT

Valuation plays a central role in the financing, investing and operating decisions of companies and many methods are employed to approximate the true value of a company. Although these techniques are based on similar theory, they may generate different results in application. This study incorporates an empirical approach to compare the outcomes of two different methods: residual income and discounted cash flow valuation models. The aim of this study is to test whether these methods result in different values and to contribute to the understanding of why these two valuation techniques, although similar in theory, may generate different results when applied to real life companies. There are a number of studies that compare these two methods theoretically. Some studies claim the superiority of one method over the other and some argue that these two methods should yield the same results when applied properly. In this study, the residual income and discounted cash flow models are applied to nine Turkish companies and the results are compared. We have obtained the data for the study with site visits to the companies and with the help of the managements of the companies.

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KEYWORDS: Valuation, Residual Income Model, Discounted Cash Flow Model, Accounting Based Valuation, Case Study, Turkey

INTRODUCTION

Valuation has been an important topic of finance research for a long time. The estimation of the true value of a business firm challenged academicians as well as practitioners, company owners, managers, and consulting firms in the past and it will most likely continue be a challenging issue in the future. Companies need their equities valued for various reasons such as borrowing, initial public offering, and merging or being acquired. Valuation is of growing importance especially in emerging countries, such as Turkey, which is a country with a growing economy and with a lot of attraction for foreign investments.

The valuation models can be classified into three categories, which can be associated with the income, market, and cost approaches, respectively: discounted cash flow valuation, relative valuation, and contingent claim valuation. There is also a fourth category usually added to these three categories, accounting based valuation (Bertoncel, 2006). Each approach embodies different models and these models often produce significantly different values (Damodaran, 2002). The most widely used model among these is the discounted cash flow valuation model.

The aim of the discounted cash flow models is to approximate intrinsic value and the main principle of the models is to find the present value of the future expected cash flows on an asset. To find the present value of an asset the models require the knowledge of the life of the asset, expected annual cash flows over the life of the asset, and an appropriate discount rate as inputs. Based on empirical evidence, these models can be found to work best when the cash flows produced by an asset is positive (Damodaran, 2002). Relative valuation depends on finding similar assets that are priced in a market, determining a standardized price through multiples, and controlling for the differences between the asset being valued

and the similar assets (Damodaran, 2005). Contingent claim valuation is based on option pricing, which regards the asset subject to valuation as a real option and uses option pricing techniques to find the value of it. This model is found to be most useful for the companies in trouble or companies with intensive research and development but with no cash inflows. Accounting based valuation focuses on asset based valuation, and the emphasis is on book value (Damodaran, 2005).

The two methods that are compared in this study are the discounted cash flow valuation model and the residual income model, which is a model of a hybrid approach including insights from both the income approach and the cost approach. The residual income model includes in the value of a company not only the discounted future abnormal earnings but also the book value of the company as of the valuation day. These two models are the most examined and compared models to one another. The strength of the discounted cash flow models lies in its corporate finance roots, emphasizing cash flows. Moreover, practical books on valuation assert that cash flows dominate accounting earnings and, therefore, the discounted cash flow valuation model is preferred over accounting based models (AAA FASC, 2001). However, there is also evidence that support the accuracy of the residual income model.

Ohlson (1995) develops a residual income model where he provides a framework of how market value is related to three accounting data: earnings, book value, and dividends. The model developed in his paper relies on the clean surplus relationship: The change in the book value equals earnings minus dividends net of capital contributions. The first paper to mention this relation was Preinreich (1938) where the author states that "capital value equals book value plus the excess profits." Lundholm (1995) claims that this notion was largely ignored in the literature since then and its revival is a major contribution to financial accounting literature.

The objective of this paper is to study the reasons behind the different results obtained by two different valuation models by applying the discounted cash flow and residual income models to real life companies. In the next section, we review the empirical literature on the discounted cash flow and residual income methods. The data and methodology of the paper are explained in the section that follows. We present our research results in the section titled "empirical findings." The last section concludes the paper.

REVIEW OF RELATED LITERATURE

The literature is rich in papers examining the accuracy of the residual income model and questioning the superiority of the discounted cash flow model over the residual income model. One of the earliest empirical studies on accounting based valuation models is by Bernard (1995). He estimates the intrinsic value for a large sample of firms during the 1978-1993 period to demonstrate the validity of the model over short horizons. The study states that the model explains, on average, 68 percent of the cross-sectional variation in share prices. The author prefers the model for its accuracy and for its reliance on earnings and book value predictions over relatively short time periods as compared with the longer time periods needed in the discounted cash flow models (AAA FASC, 2001). Another study by Lee et al. (1999) estimates the intrinsic value of the Dow Jones Industrial Average over the period from 1963 to 1996 using the residual income model. The estimates of intrinsic value in the study predict both the future value of the index and the future stock returns to the index. Based on the results of the study, the authors support the use of the residual income model over other valuation models.

One of the papers that support the superiority of accounting earnings over cash flows is a study by Penman and Sougiannis (1998). The authors claim that accrual accounting overcomes a shortcoming of the discounted cash flow models. The shortcoming is that the discounted cash flow models subtract capital investments from operating cash flows to estimate free cash flows, and for some companies this may cause negative free cash flows for many years. Accounting-based valuation models do not fall prone

to this shortcoming because they place these investments on the statement of financial position and match the cost of these investments against inflows generated from them through depreciation allocations. However, Lundholm and O'Keefe (2001) state that these two models are derived from the same underlying assumption and the differences in their outcomes imply the difficulty of applying the same input assumptions to different models and conclude that neither of the models is superior to one another.) In response to this paper Penman and Sougiannis (1998) state that "the empirical papers dismissed by Lundholm and O'Keefe provide evidence that GAAP accrual accounting has advantages over cash accounting" and "…the partitioning in Penman and Sougiannis (1998) identifies cases where GAAP accounting performs relatively better (and worse)."

Another advantage of the residual income model, and accounting based valuation models in general, is that the discounted cash flow valuation models require burdensome efforts to convert accounting measures into cash flows, whereas, different accounting choices on conservatism, expensing or capitalizing research and development costs, and different depreciation methods, do not affect the computation of value as long as the clean surplus relationship applies (AAA FASC, 2001).

Penman and Sougiannis (1998) compare the dividend discount, discounted cash flow, and residual income models using actual realizations of dividends, free cash flows, and earnings. They report that the residual income model yields smaller valuation errors, as measured against current stock prices, than either of the other two models.

Francis et al. (2000) state that the greater accuracy of the residual income model can be due to the sufficiency of book value of equity as a measure of intrinsic value and also because the predictability and precision of abnormal earnings are greater. In their paper, the authors compare the accuracy of the dividend discount model, the residual income model, and the discounted cash flow valuation model and find that the residual income model explains about 71 percent of the cross-sectional variation in stock prices. According to the tests, the residual income model significantly outperforms the dividend discount and the discounted cash flow valuation models.

There are other studies in the literature that claim that the residual income model is not superior in explanatory power over other models. Dechow et al. (1999) test the residual income model on a large sample of firms using analysts' earnings forecasts. They show that a simple valuation model, which capitalizes analysts' short-term earnings forecasts in perpetuity, provides greater explanatory power for current stock prices than does the residual income model. The authors do not advocate the superiority of earnings capitalization approach to other valuation models, but they only state that this simple benchmark model outperforms the residual income model in explaining current stock prices.

Most of the studies conducted use large samples of firms and provide average results across firms or through time. Kaplan and Ruback (1995) examine the accuracy of the models at the firm level. In their study, the authors compare the accuracy of the discounted cash flow model with the method of multiples in valuing 51 highly leveraged transactions during the 1983-1989 period and conclude that the discounted cash flow valuations based on management forecasts of cash flows are within 10 percent of the realized transaction value and superior to the multiples approach.

Accounting academicians mostly prefer residual income methodology because of its direct relation to earnings and book values that are central concepts in accrual accounting whereas discounted cash flow valuation has its roots in finance theory (AAA FASC, 2001).

The studies mentioned above, and many others, claim either the superiority of the residual income model over the other valuation models such as the dividend discount model, and the discounted cash flow model, or vice versa, in explaining stock prices and stock returns. The issue is still controversial. Most

studies that claim that the residual income model is a better alternative than the other valuation models use sample firms with multiyear security analysts' forecasts of both earnings and dividends. Most studies use current stock price as the benchmark to evaluate the explanatory power of the valuation models assuming that stock prices reflect intrinsic value (AAA FASC, 2001).

The goal of this study is to contribute to the understanding of the differing outcomes observed under the residual income and discounted cash flow valuation models by applying them to nine Turkish companies.

DATA AND METHODOLOGY

In order to compare the discounted cash flow and residual income models on an empirical basis, nine Turkish companies from different sectors are valued using the two models. Some descriptive information for the companies is provided in Table 1. Each valuation process included an industry analysis and a general examination of the company. Information about the operating procedures of the companies is obtained through site visits and meetings with company officials. The forecasts regarding future sales and working capital requirements, used in the valuation process, are discussed with the managements of the companies. Information about future capital investment projects, capital structure and dividend policies are the most realistic estimations made by the managers. The companies were provided with a valuation report at the end of the process. The details about the valuation process are held confidential since the companies did not grant permission for their being published.

Table 1 below provides descriptive information about the companies that were included in the study. The companies are from various different sectors such as energy, textile, construction, hygienic products, metal products and chemical products. Five of the nine companies are manufacturing companies, three are merchandising companies and one is a service company. The book value of shareholders' equity for the nine companies vary from 0.16 million to 254.88 million U.S. dollars and their sales revenues for the last fiscal period varies from 0.72 million to 61.19 million U.S. dollars.

Table 1: Descriptive Information for the Nine Companies Included in the Study

No.	Company (Sector)	Company (Type)	Shareholders' Equity as of Last Year (million U.S. dollars)	Total Sales Revenue for the Last Year (million U.S. dollars)
1	Textile Retailer	Merchandising	0.25	16.17
2	Hygienic Products Manufacturer	Manufacturing	6.04	5.57
3	Textile Manufacturer	Manufacturing	15.19	13.30
4	Energy Manufacturer	Manufacturing	254.88	54.42
5	Metal Products Manufacturer	Manufacturing	25.60	61.19
6	Metal Products Wholesaler	Merchandising	7.89	23.81
7	Construction Material Assembler	Manufacturing	0.68	3.73
8	Construction Project Designer	Service	0.16	0.72
9	Chemical Products Retailer	Merchandising	2.84	1.90

This table presents some descriptive information for the nine companies included in the study.

Table 2 below summarizes the descriptive statistics of the data set, which consists of eighteen data gathered from the two different valuation methods applied to nine different companies.

Table 2: Descriptive Statistics of the Data Set

Method	N	Range	Minimum	Maximum	Mean	Standard Deviation
DCF	9	1,144.43	5.57	1,150.00	153.24	374.67
RIM	9	467.24	4.6	471.84	69.00	151.75

This table presents the descriptive statistics of the data set, which consist of the results of two different valuation methods applied to nine different companies.

Table 3 presents the discount rates used under the discounted cash flow and residual income models. Since the discounted cash flow model uses free cash flows to firm, the appropriate discount rate is the firm's weighted average cost of capital. Since the residual income model uses net income to calculate excess returns, the appropriate discount rate is the firms' cost of equity.

Table 3: Cost of Equity and Weighted Average Cost of Capital Statistics for the Nine Companies Included in the Study

Company	Cost of Equity	Weighted Average Cost of Capital
Textile Retailer	16.00%	15.00%
Hygienic Products Manufacturer	9.00%	9.00%
Textile Manufacturer	15.00%	15.00%
Energy Manufacturer	12.60%	11.00%
Metal Products Manufacturer	13.14%	11.99%
Metal Products Wholesaler	13.16%	12.00%
Construction Material Assembler	15.74%	15.74%
Construction Project Designer	15.60%	14.30%
Chemical Products Retailer	15.00%	11.00%

This table presents the cost of equity and weighted average cost of capital statistics for the nine companies included in the study.

The Discounted Cash Flow Model

The assumption on which the discounted cash flow models are based is that the reason behind the purchase of an asset is the anticipation of collecting cash inflows from that asset in the future. Thus, in discounted cash flow valuation, the value of an asset is determined by discounting the future expected cash flows to that asset at an appropriate discount rate that reflects the riskiness involved in the cash flows (Damadoran, 2005). The discounted cash flow model can be applied in different ways. The model applied in this study values the company as a whole by discounting the free cash flows of the company using the weighted average cost of capital as the discount rate and then subtracting the value of non-equity stake from the value of the company to reach the value of equity. The value of the company can be expressed as the sum of the expected cash flows from year one to infinity discounted at the weighted average cost of capital employed in the company.

The expected free cash flow to a firm in a given year is calculated by using the following formula:

Free cash flow to firm = After-tax operating income − (Capital expenditures − Depreciation) – Change in non-cash working capital.

For each of the nine companies, a forecast period is selected, after consulting with the company managers, and detailed cash flow forecasts are made for that period. After the forecast period, a steady growth is assumed to perpetuity. The discount rate used is the weighted average cost of capital. The cost of equity component of the discount rate is calculated using the market model.

The Residual Income Model

Ohlson (1995) develops a residual income model. The model relies on capital budgeting techniques and the net present value rule. The model assumes that a project has value only if it has a net present value meaning that the return on capital invested must exceed the cost of capital invested. Excess return models, in general, use this principle and they state the value of a company in two components: the book value of the capital invested and the present value of the excess returns on the capital invested. The model used in this study can be stated as follows:

Value of Equity = Book Value of Equity + Sum of the expected residual incomes in perpetuity discounted at the cost of equity capital employed in the company

Residual income is expressed as the net income minus the capital charge for each year. Discounting the residual incomes with the cost of equity and adding it to the book value of current equity gives the value of equity according to the residual income model. The book value of equity for each of the years in forecast period is estimated depending on the clean surplus relationship, that is, book value of equity changes depend on the net income of the period and the dividends distributed during the period.

As is the case for the discounted cash flow methodology, the forecasts in the residual income model are divided between a forecast period and a terminal value, where the terminal value is calculated based on last year's residual income growing at a constant rate in perpetuity.

The results of the two valuation methods for the nine companies constitute the data set for the statistical test. Since the data set consists of a small sample, a nonparametric test is applied. The test applied is the Wilcoxon for related samples.

EMPIRICAL FINDINGS

Table 4 summarizes the empirical results of the valuation models, the differences between the model outcomes, and the percentage difference. Of the nine company valuations, eight are higher with the discounted cash flow (DCF) valuation method. Only one company in the sample has a higher value with the residual income model (RIM) than with the discounted cash flow method. The percentage differences between the findings with the two valuation methods appear to be quite large.

Table 4: The Valuation Results with the Discounted Cash Flow and Residual Income Models

Company	DCF Valuation (millions of U.S. $)	RIM Valuation (millions of U.S. $)	Difference (millions of U.S. $)	Difference as a % of DCF Valuation
Textile Retail Company	8.62	12.64	-4.02	-46.67%
Hygienic Products Manufacturer	45.98	23.56	22.41	48.75%
Textile Manufacturer	30.46	13.22	17.24	56.60%
Energy Manufacturer	1,150.00	471.84	678.16	59.00%
Metal Products Manufacturer	87.36	52.87	34.48	39.47%
Metal Products Wholesaler	26.44	21.26	5.17	19.57%
Construction Material Assembler	18.39	15.52	2.87	15.63%
Construction Project Designer	6.32	4.60	1.72	27.27%
Chemical Products Retailer	5.57	5.46	0.11	2.06%

This table presents the results of the valuation methods applied to nine companies and differences between the valuation results in U.S. dollars and as a percentage.

The Wilcoxon nonparametric related samples test is applied to the results. The test statistic is 0.028, which is significant at the 5% level. This test indicates that the valuation results with the two methods are significantly different.

CONCLUDING COMMENTS

Comparing the valuation models has been a controversial issue in the literature. The residual income method is generally preferred by academicians in the accounting field, whereas the discounted cash flow method is the method of choice in the finance field. Empirical studies have reached conflicting results and failed to prove the superiority of one method over the other.

In this study, the residual income and discounting cash flow methods are applied to nine Turkish companies and the results are compared. Unlike most previous empirical studies on the issue that use

large samples, this study uses a case study approach with data from nine Turkish companies with the forecasts of future operations and cash flows being generated with the help of the managements of the companies.

We find that the residual income model results in lower company valuation compared with the discounted cash flow model. This finding may be due to certain specific characteristics of Turkish companies. For example, due to positive expectations as a result of the political stability and the geopolitical advantages of the country, Turkish companies have made substantial fixed asset investment in recent years. Therefore, the depreciation expense is quite high for most companies. The high depreciation expense decreases the net income (an input in the residual income method) and it increases the cash flow (a main input in the discounted cash flow method).

Partly because of limited competition among firms, the cost of equity is quite high in Turkey. Since the cost of equity is used as the discount rate in the residual income method, it results in low valuation figures. Since equity capital is only one of the capital components, it only has a partial effect on the weighted average cost of capital, which is used as the discount rate in the discounted cash flow method.

In emerging economies, it is a common practice for employers to employ relatives in the company with eligible expenses that reduce the company's residual income and would result in a relatively low valuation with the residual income method. These expenses may not affect the company's cash flows. Therefore, we believe that the discounted cash flow method may give a better valuation result compared with the residual income method in emerging economies.

This paper should be regarded as a preliminary study with data from an emerging economy. The companies were not randomly chosen and only the companies that agreed to be included in the study were chosen. As a result, the research sample includes only nine companies. Therefore, the results cannot provide statistically meaningful evidence. Yet the aim of the study is to help understand why the two models would yield different results by spending a substantial amount of time with each of the companies to get a thorough understanding. Further studies might be conducted on emerging economies by concentrating on sectors and by using larger samples.

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