

AN OVERVIEW OF COMPANY VALUATION TECHNIQUES WITH
IMPLEMENTATION TO MAJOR TURKISH COMPANIES

by

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ABSTRACT

AN OVERVIEW OF VALUATION TECHNIQUES WITH IMPLEMENTATION TO MAJOR TURKISH COMPANIES

The objectives of this thesis are to review the theoretical literature on company valuation, to define a valuation procedure based on findings and to implement such procedure on four major Turkish companies from different industries.

Under the scope of thesis, an extensive literature survey on the company valuation is undertaken. The literature survey covers a review of the main company valuation techniques, their fundamental assumptions, application areas and limitations, alternative methods and an overall comparison. The survey focuses on discounted cashflow valuation and relative valuation while a general introduction to contingent claim valuation is made.

Then, a valuation procedure based on discounted cashflow valuation and relative valuation techniques is developed by using the findings of the literature survey. The procedure is composed of successive steps expressed in mathematical form where appropriate.

Finally, the valuation procedure is implemented on four major Turkish companies from different industries. By implementing the procedure, a valuation range for each company is calculated. Then, the results obtained with the valuation procedure are compared with the observed market values of these companies on Istanbul Stock Exchange between 25 May 2005 and 25 May 2006. The results show that the valuation procedure can be used to identify the long-term value range of the companies covered in this study.

ÖZET

ŞİRKET DEĞERLEME TEKNİKLERİNİN GENEL AÇIKLAMASI VE ÖNEMLİ TÜRK ŞİRKETLERİ İÇİN UYGULANMASI

Bu tezin amacı, şirket değerlemesi ile ilgili akademik literatürün incelenmesi, bu incelemenin sonuçları kullanılarak bir değerlendirme yönteminin tanımlanması ve bu değerlendirme yönteminin farklı sektörlerde yer alan dört önemli Türk şirketine uygulanmasıdır.

Çalışma kapsamında öncelikle şirket değerlemesi ile ilgili kapsamlı bir akademik literatür incelemesi yapılmıştır. Literatür incelemesi, şirket değerlemesinde kullanılan ana teknikleri, bu tekniklerin temel varsayımlarını, uygulama alanlarını, kısıtlarını, alternatif yöntemlerini ve genel bir karşılaştırılmalarını kapsamaktadır. Literatür incelemesinde, şirket değerlemesinin en önemli teknikleri olan indirgenmiş nakit akımları değerlendirme ve göreceli değerlendirme üzerinde yoğunlaşmış, şarta bağlı talepler değerlemesine ise genel bir giriş yapılmıştır.

Daha sonra, literatür araştırmasının sonuçları kullanılarak indirgenmiş nakit akımları değerlendirme ve göreceli değerlendirme tekniklerine dayanan bir değerlendirme yöntemi geliştirilmiştir. Yöntem, imkan verdiği ölçüde matematiksel formda tanımlanmış olan ve birbirini takip eden adımlardan oluşmaktadır.

Bu değerlendirme yöntemi, farklı endüstrilerde faaliyet gösteren dört büyük Türk şirketine uygulanmış ve her şirket için bir değerlendirme aralığı belirlenmiştir. Bulunan değerlendirme aralığı, bu şirketlerin İstanbul Menkul Kıymetler Borsası'ndaki 25 Mayıs 2005 ve 25 Mayıs 2006 arasında gerçekleşen piyasa değerleri ile karşılaştırılmıştır. Sonuçlar, değerlendirme yönteminin, tez kapsamında incelenen şirketlerin uzun vadedeki değerlerinin belirlenmesinde kullanılabileceğini göstermiştir.

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LIST OF SYMBOLS/ABBREVIATIONS

CF_t	Company cashflow in period t
D	Value of debt
E	Value of equity
$E(R)$	Expected return on an asset
$E(R_{GNP})$	Expected return on a portfolio with a beta of one on the industrial production factor and zero on all other factors
$E(R_I)$	Expected return on a portfolio with a beta of one on the inflation factor and zero on all other factors
$E(R_m)$	Expected return on market portfolio
$E(R_n)$	Expected return on a portfolio with a beta of one on such defined macroeconomic variable n and zero on all other factors
g_{stable}	Growth rate of company cashflows after period t
k	Discount rate
k_d	Cost of debt
$k_{d(after-tax)}$	Cost of debt after tax
$k_{d,t}$	Borrowing cost of the firm for its longer term debt with t years
k_e	Cost of equity
n	The last period of forecast period
r_f	Risk free rate
$r_{f,t}$	Yield of a US Treasury bond with a term of t years
T	Corporate tax rate
X	Terminal value of the company
β	Beta
β_I	Beta relative to changes in inflation
β_{GNP}	Beta relative to changes in industrial production
β_n	Beta relative to changes in a defined macroeconomic variable defined as n

β_u	Unlevered beta
Δ_d	Spread for the debt of the company
$\bar{\sigma}_{equity}$	Volatility of the country bond market
$\bar{\sigma}_{countrybond}$	Volatility of the equity market
AMORT	Amortization
APV	Adjusted present value
APM	Arbitrage pricing model
ARPU	Average revenue per user
B/M	Book value of equity to market value of equity
CAPM	Capital asset pricing model
CAPEX	Capital expenditures
COGS	Cost of goods sold
DCF	Discounted cashflow valuation
EBIT	Earnings before interest and tax
EBITDA	Earnings before interest, tax, depreciation and amortization
EPS	Expanded polystyrene
EXP.	Expense
EV/B	Enterprise value to book
EV/EBIT	Enterprise value to earnings before interest and tax
EV/EBITDA	Enterprise value to earnings before interest,tax, depreciation and amortization
EV/S	Enterprise value to sales
EV/SUBSCRIBER	Enterprise value to the number of subscriber
FTE	Flows to equity
GAAP	Generally accepted accounting standards
HEPP	Hydroelectric power plant
INV	Inventory
IPO	Initial public offering
KWH	Kilowatt-hour
MN	Million
MOU	Minutes of usage
NETREV	Net Revenues

OPEX	Operating expenses
OTW	Otherwise
NOPAT	Net operating profit after tax
NPV	Net present value
P/CFO	Price-to-cashflows from operations
P/B	Price to book value ratio
P/E	Price to earnings ratio
P/EBIT	Price to earnings before interest and taxes ratio
P/EBIT	Price-to-earnings-before-interest-taxes-depreciation-amortization ratio
P/S	Price-to-sales
PEG	Price earnings to growth
PU	Polyurethane
SQM	Square meter
TIPS	Treasury inflation protected securities
TEIAS	Turkey electricity transmission company
TRADEREC	Trade receivables
TRADEPAY	Trade payables
TRY	New Turkish Lira
TWH	Terrawatt-hour
UK	United Kingdom
US	United States
US\$	United States Dollar
WACC	Weighted average cost of capital
WC	Working capital
XPS	Extruded polystyrene

1. INTRODUCTION

Company valuation is one of the most widely studied fields of finance. Its theory has been vastly implemented in stock market transactions, merger and acquisitions, initial and secondary public offerings, company restructurings, capital budgeting as well as performance evaluation techniques.

The objectives of this thesis are to review the theoretical literature on company valuation, to develop a valuation procedure based on the findings of literature survey and to implement such procedure on four major Turkish companies from different industries.

The rest of the thesis is organized as follows. Chapter 2 gives an overview of the company valuation techniques in the literature with their fundamental assumptions, application areas, limitations, alternative methods and also an overall comparison of such techniques. The chapter mainly focuses on discounted cashflow valuation technique and relative valuation technique while contingency claim valuation technique is briefly presented. Under the scope of discounted cashflow valuation technique, main alternative methods and theory of discount rate are summarized.

Chapter 3 explains the valuation procedure used in the thesis. The procedure consists of two parts: Discounted cashflow valuation and relative valuation. The procedure is developed in consecutive steps. Mathematical definition of each step is provided where appropriate.

As for discounted cashflow valuation, weighted average cost of capital method is selected. First, cashflows of the company are projected based on the industry, revenue, operating cost, capital expenditure, working capital and tax forecasts. An overview of the industry with a focus on its development path, the company's historical performance and its business plan are incorporated in the projection process. Then, the applicable discount rate is estimated in accordance with the CAPM model. Under this scope, weighted cost of capital is calculated based on the estimates of cost of equity and cost of debt. Finally, equity value of the company is calculated as the sum of the discounted value of cashflows

throughout the defined projection period and the value of cashflows after the projection period less debt.

As for relative valuation, the first step consists of finding peer companies which can be compared to the company being valued. The second step involves selection of the benchmark multiples and standardizing values of the peer companies based on such multiples. Finally, the averaged values of the defined multiples are applied to the firm in order to arrive at a valuation range.

Chapter 4 includes the implementation of the procedure on selected four Turkish companies from different industries. Turkcell is the market leader telecommunications company in Turkey with operations in other countries. Turkcell is selected for implementation in order to apply the valuation model in telecommunication industry. Akenerji is the largest private power producer in Turkey operating in free market. Akenerji is selected in order to implement the valuation model in electricity industry which is being transformed into a liberal market. Migros is the largest retailer in Turkey. The company has also international operations in some neighbor countries. Migros is listed on Istanbul Stock Exchange. Retail industry provides an interesting growth story and Migros is the best option to understand the envisaged growth on values of the companies. İzocam provides a good opportunity for the implementation of the valuation model on manufacturing industry. The implementation of the procedure on Turkcell is explained in detail in the chapter. The overview of the implementation of the valuation procedure on Akenerji, Migros and İzocam are provided in the chapter while detailed explanations on such implementations are presented in appendixes. At the end of the chapter, the results obtained with the valuation procedure are compared with the observed market values of these companies on Istanbul Stock Exchange between 25 May 2005 and 25 May 2006.

Chapter 5 is devoted to conclusions drawn from the study. The chapter includes a detailed discussion on the results obtained with the implementation of the valuation procedure on Turkcell, Akenerji, Migros and İzocam and their comparison with realized market values. The chapter also includes a general review of the limitations of the company valuation and the valuation procedure. Proposals regarding further research on the company valuation are also presented.

2. LITERATURE SURVEY

All assets – whether financial or real – have a value. Calculation of such value provides an essential baseline to establish a price for an asset and also to increase its value and attract capital. There are a broad variety of business and legal situations triggering the need to know the value of an asset: capital budgeting decisions, mergers and acquisitions, joint ventures, initial and secondary public offerings, portfolio decisions and employee stock ownership plans.

Damodaran (2002) identifies three main techniques of company valuation developed and used in practice:

- Discounted cash flow valuation measures the value of an asset based on the present value of future cashflows that it is expected to generate.
- Relative valuation estimates the value of an asset based on the values of comparable assets relative to a common variable such as book earnings, cashflows or number of customers.
- Contingent claim valuation relies on option pricing models to measure the value of an asset with option characteristics such as patents and reserves.

Despite the differences in their application, all valuation techniques rely on the same basic principles. These basic principles help the interested parties not only determining the value, but also identifying the drivers of the value. Such drivers shape the management decisions of a company in the modern business world where the objective of each company is maximizing shareholder value. Hence, the key to successfully investing in and managing a company lies in understanding the principles of valuation.

The remainder of the literature survey has been organized as follows: The first part provides the description of discounted cash flow valuation. Research on three main alternative methods of DCF valuation and their comparison are listed and summarized. In connection with the method, a detailed review of research on discount rates used in DCF valuation is also undertaken. The second part explains the relative valuation and important

literature on the topic. The survey is finalized with a broad overview of the contingency claim valuation method.

2.1. Discounted Cashflow Valuation Technique

Discounted cashflow valuation technique constitutes the foundation for the other two valuation approaches, namely relative valuation and option-pricing valuation. Accordingly, a full understanding of the fundamental concepts of discounted cashflow valuation technique is essential to apply all valuation methods properly. As such, discounted cashflow valuation received the most attention in the company valuation literature.

DCF valuation technique involves cashflows to firm discounted at the appropriate discount rate to obtain the value of the company. It can be generally defined with the Formula 2.1.

$$\text{Company Value} = \sum_{t=1}^{t=\infty} \frac{CF_t}{(1+k)^t} \quad (2.1)$$

where CF_t is the company cashflow in period t and k is the discount rate that reflects the risk level of the cashflow of the company.

As seen in Formula 2.1, the main elements of a DCF valuation model are the valuation attribute to be discounted and the discount rate. From the perspective of company valuation, the appropriate choice of valuation attribute and discount rate has been subject to theoretical and practical debate. Nantell and Carlson (1975) define three main methods of DCF valuation technique as “Weighted Average Cost of Capital Method”, “Flows to Equity Method” and “Adjusted Present Value Method”. These methods employ different choices of valuation attribute and discount rate.

2.1.1. Weighted Average Cost of Capital Method

Weighted average cost of capital is the most preferred method of discounted cash flow valuation technique amongst practitioners. WACC method involves discounting pre-

interest but after-tax cashflows at a rate that reflects a blend of the costs of the different sources of capital. Such discount rate is defined as weighted average cost of capital. If a firm uses debt and equity as the sources of capital, then the weighted average cost of capital will be the weighted average of the cost of equity and the cost of debt, where the weights are the market values of debt and equity as percentages of the market value. The discounting process yields enterprise value, or the value of operations which is equal to the total of value of equity and value of debt. As such, the firm's equity value can be calculated by subtracting the value of debt from enterprise value.

Although WACC method has been in use for a very long time, its theoretical basis has been provided by Modigliani and Miller (1958). They set forth the Proposition I, which stipulates that, in an ideal world, a firm's value is independent of its capital structure. By an ideal world, it is meant that investors act rationally, that the capital market is perfectly competitive, that there are no corporate or personal income taxes or transaction costs, and that the companies can be divided into homogenous risk classes so that the shares of two companies in the same risk class are perfectly substitutes. The direct conclusion is that the cost of capital to any firm is constant with the choice of capital structure. Therefore, Proposition II stipulates that, if Proposition I holds, the cost of capital to a firm is a linear function of the debt/equity ratio. Another direct conclusion is Proposition III, which stipulates that the cut-off rate for the investment decisions of the firm will be its average cost of capital and such decisions are irrelevant of the security used to finance such investment.

Solomon (1960) formulated WACC method based on the theoretical fundamentals developed by Miller and Modigliani (1958).

Booth (2002) states WACC method as the first choice for practitioners. Inselbag and Kaufold (1989) also observed the same with regards to the preference of the practitioners.

2.1.2. Adjusted Present Value Method

Contrary to the findings of their paper in 1958, Modigliani and Miller (1963) proved that the capital structure will have an effect on the cost of capital, hence on the value of the

company through extending their analysis into an ideal world with corporate taxes and tax-deductible interest payments. They emphasize that this effect is purely due to the tax-deductibility of the interest payments on debt. As a result, they concluded that the value of a levered firm is equal to the value of an unlevered firm plus the market value of the stream of tax savings on interest payments associated with the debt.

Although Modigliani and Miller (1963) proposed extra debt brings value due to the tax deductibility, Myers (1977) discussed the existence of bankruptcy costs and more subtle value losses due to the loss of financial flexibility. Combining his analysis with the propositions of Modigliani and Miller, Myers (1977) introduced APV method as a response to the shortcomings of WACC approach.

Miller (1977) states that Adjusted Present Value method (APV) consists of a number of stages: First of all, the value of the firm is calculated as a fully equity financed firm by discounting the cashflows to firm at the cost of equity. Then, the value created by the debt, which is the present value of the tax savings from interest payments discounted at the cost of debt, are added to the value of firm calculated in the first step. Finally, the value taken away by the debt due to the increased bankruptcy risk is deducted from the previous total.

In comparison to WACC method's popularity amongst practitioners, APV method has been very popular amongst theoreticians. Initiated with the studies of Miller and Modigliani (1963) and Myers (1977), numerous papers were focused on the approach. Inselbag and Kaufold (1989), Inselbag and Kaufold (1997), Arzac (1996) and Luehrman (1997) demonstrated the advantages of APV method in highly-leveraged transactions like leveraged buyouts and leveraged recapitalizations. Luehrman (1997) even stated that, with its advantages, APV is more versatile and reliable such that it will replace WACC method in practice gradually.

2.1.3. Flows to Equity Method

Flows to equity method involves discounting the cashflows available to the equity holders at the equity holders' required rate of return, or cost of equity in other words. Cashflows to equity holders are cashflows adjusted with net borrowing, which is equal to

the net of debt withdrawals, principal repayments and interest payments. The discounting process yields the value of equity, as opposed to the case in WACC approach at which the discounting process yields the total of equity value and debt value, which is called as enterprise value.

Booth (2002) states that flows to equity method is most popular with leveraged leasing, leveraged buyout, real estate and project finance specialists at which the cashflows to equity holders can be forecasted with a higher degree of certainty.

2.1.4. Comparison of Alternative Methods of DCF Valuation Technique

There is a continuing theoretical debate on the comparison of the alternative DCF valuation methods.

Arditti (1973) defined and proved the WACC method is correct only if the project is financed at the company's optimal financing mix, or debt-capital ratio, and the project does not change the risk profile of the assets.

Nantell and Carlson (1975) tackle on the previous criticisms of WACC method and they proved that, as long as the cashflows are consistently specified, any discount rate formulation is usable.

Taggart (1977) has shown that under a number of simplifying assumptions, the WACC, FTE and APV methods are equivalent. He proposed that, under these simplifying assumptions, there is no logical reason to prefer one approach to another other than convenience for the calculation of cost of capital.

The ambiguity regarding the choice of WACC and APV methods were clarified by Miles and Ezzel (1980), who proved that, if a firm adjusts in each period to keep a constant leverage ratio, WACC method can be validly used. In case, the firm chooses to maintain a fixed dollar amount of debt, then APV method is more useful. Chambers *et al.* (1982) affirmed the findings of Miles and Ezzel (1980), however they stated that the constant debt assumption did not fit well with their observed practice. Booth (1982) also affirmed this

approach. Therefore, the key issue becomes the firm's debt policy—that is, whether that policy is framed in terms of maintaining a fixed debt ratio or a fixed dollar amount of debt.

Clubb and Doran (1995) aimed to measure the possible errors for the misuse of the methods. They found that although APV had been more powerful for a variety of debt management assumptions, WACC approach's errors are insignificant.

Inselbag and Kaufold (1997) confirmed that both APV and WACC methods were equivalent under different financing strategies. However, they also stated that it was more convenient to apply the APV technique when the firm targeted the fixed (dollar) level of debt outstanding in the future and the WACC approach when the firm instead intended to hold the debt/value ratio fixed in the future.

Inselbag and Kaufold (1997), Arzac (1996) and Luehrman (1997) demonstrated the advantages of APV approach in highly-leveraged transactions like leveraged buyouts and leveraged recapitalizations. This is due to the fact that the WACC method is inappropriate when the capital structure of the target isn't constant during the forecast period, a condition that frequently occurs when the additional debt used to finance the acquisition in an LBO or leveraged recapitalization is reduced over a period of years to a sustainable long-term level. In this situation, many analysts turned to the employment of APV method in valuation practice.

Booth (2002) undertook a thorough review of DCF methods with a view to comparing three methods. He identified that, with the optimal debt-equity assumption, WACC and FTE methods give the same results. FTE is more useful for the projects at which the absolute debt amount is known. He found that APV approach is frequently unreliable and it should only be used in conjunction with more conventional valuation approaches. Although he confirmed that its practical usage is confined to leveraged buy-outs, project financing and real estate financing which include structured finance schemes, the theoretical concepts it include may lead to a wide margin of error. As a result, he concluded that WACC approach is more robust approach with respect to the other two approaches.

Copeland *et al.* (2000) also stated that WACC, FTE and APV methods are identical with the condition that “correct” discount rates are utilized. While all three methods use different definitions of cashflow and discount rates, they will yield consistent estimates of value as long as the same and valid set of assumptions is utilized.

Summary of the alternative discounted cashflow valuation methods are provided in Table 2.1.

Table 2.1. Methods of discounted cashflow valuation technique

<u>DCF Methods</u>	<u>Cashflows to be Discounted</u>	<u>Discount Rate</u>	<u>Result of the Discounting Process</u>
WACC Method	Cashflows to Firm	Weighted Average Cost of Capital	Enterprise Value
Flows to Equity Method	Cashflows to Equity Holders	Cost of Equity	Equity Value
APV Method	Cashflows to Firm & Tax Benefit of Debt	Cost of Equity for Cashflows to Firm & Cost of Debt for the Tax Benefit of Debt	Enterprise Value

It is difficult to apply discounted cashflow valuation technique to companies which do not have positive cashflows currently or companies whose cashflows can not be projected with a satisfactory degree of reliability. Damodaran (2002) discusses examples of such companies such as distressed firms, cyclical firms, firms with unutilized assets, firms with patents or reserves, firms involved in acquisition and private firms.

2.1.5. Discount Rate in Discounted Cashflow Valuation Technique

Each DCF valuation model consists of two main entities: valuation attribute (the concept to be discounted) and the discount rate. Projection of the related valuation attribute is straightforward provided that the income statement and balance sheet projections are developed. The same situation is not valid for the discount rate, which should be estimated.

The discount rate used for WACC method is the weighted average of cost of debt and cost of equity based on the financing mix. For FTE and APV approaches, cost of equity is used as the discount rate. Estimation of cost of debt is relatively easy as it is generally available from the market. However, cost of equity can not be observed in the market.

As a result, various models were developed in the literature for the estimation of cost of equity. Of these, three main models were mainly used: Capital Asset Pricing Model, Arbitrage Pricing Model and Multi-Factor Models. Copeland *et al.* (2000) recommends using Capital Asset Pricing Model or Arbitrage Pricing Model models for the estimation of cost of equity.

CAPM is the most preferred model for estimating cost of equity in practice. The foundations of CAPM were laid by the pioneering work of Markowitz (1952) and Tobin (1958). Markowitz (1952) discussed how increasing diversification lowers the risk of a portfolio. The theory was defined in a complete form with the additional studies of Sharpe (1964), Lintner (1965) and Mossin (1966).

CAPM postulates that the cost of equity for a firm is equal to the return on risk-free securities plus the firm's systematic risk multiplied by the market price of risk. The firm's systematic risk is called as beta and the market price of risk is called as market risk premium. Copeland *et al.* (2000) formulates CAPM as follows:

$$k_s = r_f + \beta [E(r_m) - r_f] \quad (2.2)$$

where r_f is the risk-free return, $E(r_m)$ is the expected rate of return on market portfolio, $[E(r_m) - r_f]$ is the market risk premium and β is beta.

CAPM model breaks down the risk into two components: (i) Market risk which is systematic and undiversifiable and (ii) Specific risk which is firm-specific and diversifiable. Diversified investors are concerned with market risk. Beta is an asset's contribution to the risk of a fully diversified portfolio. Beta is calculated by regressing the asset's return against the market portfolio. Thus the beta of the market portfolio is 1.00.

CAPM model is based on simplified market conditions, where there are no taxes or transaction costs and all assets are traded. It also assumes that every investor has access to the same information and therefore cannot find undervalued or overvalued assets in the market place. Making these assumptions allows investors to keep diversifying without additional cost. As diversification is required for decreasing the risk of portfolio and it can be achieved without any cost under the assumptions of the model, the investors are assumed to hold a market portfolio, in which every traded asset in the market is represented with identical weights in the market. This can also be put as a combination of riskless assets and risky assets that represent a combination of all remaining assets such as stocks and real assets.

The restrictive assumptions on transactions costs and private information in CAPM model and the model's dependence on the market portfolio have long been viewed with skepticism by both academicians and practitioners. It has been argued that CAPM only relies on the market returns and this reliance ignores the relationship to other factors. As a result, Ross (1976) suggested an alternative model for measuring risk called the arbitrage pricing model.

APM relies on the notion that a few systematic factors affect the average returns of assets as opposed to CAPM which relies only on market returns.

Like CAPM, APM breaks down the risk into firm-specific and market risk components. While firm-specific risk can be eliminated with diversification, market risk can not. Market risk is defined to include unanticipated changes in a number of economic variables, including gross national product, inflation, and interest rates. Return is formulated according to APM as follows:

$$R = E(R) + m + \varepsilon \quad (2.3)$$

where R is the actual return, $E(R)$ is the expected return, m is the market-wide component of unanticipated risk and ε is the firm-specific component of risk.

Contrary to CAPM which assumes that the market risk is captured in the market portfolio, APM assumes multiple sources of market-wide risk and measures the sensitivity of returns to changes in each source. As a result, expected return of an asset according to APM is formulated as follows:

$$E(R) = r_f + \beta_1[E(R_1) - R_f] + \beta_2[E(R_2) - R_f] + \dots + \beta_j[E(R_j) - R_f] \quad (2.4)$$

where $E(R)$ is the expected return on an asset, r_f is the expected return on a zero-beta portfolio, β_j is the sensitivity of investment to unanticipated changes in factor j and $E(R_j)$ is the expected return on a portfolio with a factor beta of one for factor j and zero for all other factors. The terms in the brackets can be considered as risk premiums for each of the factors in the model. CAPM can be considered as a special case of the arbitrage pricing model, where there is only one economic factor driving market-wide returns.

Accordingly, application of APM requires estimates of each of the factor betas and factor risk premiums in addition to the riskless rate. This can be achieved by a statistical factor analysis on historical data on asset returns. With factor analysis, the number of common factors and betas can be estimated. However, from the definition of APM, such factors can not be tied into intuitive macroeconomical variables.

In order to overcome the weakness of APM regarding explaining returns in real factors, multifactor statistical models were developed. In these models, the unidentified statistical factors in arbitrage pricing model are replaced with specific economic factors such that the resultant model should have an economic basis while still retaining much of the strength of the arbitrage pricing model. For instance, Chen *et al.* (1986) suggest that the following macroeconomic variables are highly correlated with the factors that come out of factor analysis: industrial production, changes in default premium, shifts in the term structure, unanticipated inflation, and changes in the real rate of return. These variables can then be correlated with returns to come up with a model of expected returns, with firm-specific betas calculated relative to each variable. As such, an example of multifactor models is set forth in Formula 2.5.

$$E(R) = R_f + \beta_{GNP}[E(R_{GNP}) - R_f] + \beta_1[E(R_1) - R_f] + \dots + \beta_n[E(R_n) - R_f] \quad (2.5)$$

where $E(R)$ is the expected return on an asset, R_f is risk-free rate, β_{GNP} is the beta relative to changes in industrial production, $E(R_{\text{GNP}})$ is the expected return on a portfolio with a beta of one on the industrial production factor and zero on all other factors, β_I is the beta relative to changes in inflation and $E(R_I)$ is the expected return on a portfolio with a beta of one on the inflation factor and zero on all other factors, β_n is the beta relative to changes in a defined macroeconomic variable defined as n and $E(R_n)$ is the expected return on a portfolio with a beta of one on such defined macroeconomic variable n and zero on all other factors.

Since its inception, CAPM has been the standard model for estimating market risk in both theory and practice. Despite its popularity, its validity has been criticized numerous times. Roll (1977) discussed that since the market portfolio can never be observed, CAPM can never be tested empirically. This means empirical tests of CAPM only assess whether the model works for the given proxy.

Basu (1977) showed that stocks with low price-earnings ratios earned significantly higher returns than stocks with low earnings/price ratios. His results indicated that differences in beta could not explain these return differences. A later study by Jaffe *et al.* (1989) confirmed this finding. This is in contradiction with CAPM; which assumes that beta should be the single explanatory factor for the change in returns.

Banz (1981) and Reinganum (1981) showed that small firms had higher risk-adjusted returns than large firms. These papers found size as another factor for the explanation of the returns in addition to beta. In addition, Basu (1983) found the time effect. Stock returns are affected from seasonality – which is called as January effect.

DeBondt and Thaler (1985) showed that the stocks with poor returns history have much higher average returns than the other stocks over the next three to five years. Chopra *et al.* (1992) displayed that beta can not account for this difference in average returns. This tendency of returns to reverse over long horizons is yet another contradiction of the CAPM.

Bhandari (1988) found that firms with high leverage (high debt/equity ratios) have higher average returns than firms with low leverage for the 1948-1979 period. This result persisted after size and beta were included as explanatory variables. High leverage increases the risk level of a firm's equity, but this increased risk should be reflected in a higher beta coefficient. Consequently, Bhandari's results were yet another deviation from the CAPM predictions.

In an article which attracted significant attention, Fama and French (1992) found that there is no relationship between stock returns and betas. They showed that the main prediction of the CAPM, a linear cross-sectional relationship between mean excess returns and exposures to the market factor, is violated for the US stock market. Exposures to two other factors, a size-based factor and a book-to-market-based factor, often called a “value” factor, explain a significant part of the cross-sectional dispersion in mean returns.

These results have been contested on three fronts. First, Amihud *et al.* (1992), used the same data, performed different statistical tests and showed that differences in betas did, in fact, explain differences in returns during the time period. Second, Kothari and Shanken (1995) estimated betas using annual data, instead of the shorter intervals used in many tests, and concluded that betas do explain a significant proportion of the differences in returns across investments. Third, Chan and Lakonishok (1993) looked at a much longer time series of returns from 1926 to 1991 and found that the positive relationship between betas and returns broke down only in the period after 1982. They also found that betas are a useful guide to risk in extreme market conditions, with the riskiest firms (the ten per cent with highest betas in 1926) performing far worse than the market as a whole in the ten worst months for the market between 1926 and 1991

Fama and French (1996) found that most anomalies (size, price-earnings, book-to-market equity anomalies) resulting from the use of CAPM disappears in a three factor model consistent with APM.

However, Jaganathan and McGrattan (1995) pointed out that there were other studies which contradicted such findings. They also found that CAPM to hold in a conditional

sense meaning that beta and market risk premia may vary over time. Their specification manages to explain the cross-section of average returns in a satisfactory way.

As a summary, initially, APM was proven to be more effective for the explanation of the differences of past returns. It is evident that a multi-factor statistical model can explain differences in past returns better than a single factor model like CAPM. However, application of APM model involves projection of factor premiums and betas which are volatile, so the inherent estimation errors may eliminate the benefits. The regression models also have an estimation problem, since the variables that work best as proxies for market risk in one period may not be the ones that work in the next period.

As a result, CAPM is used as the default model in real world applications due to its intuitive appeal and the failure of more complex models to deliver significant improvement in terms of estimating expected returns. Damodaran (2002) advises judicious use of the CAPM, without an over reliance on historical data, as the most effective way of dealing with risk in modern corporate finance. Although there are also a number of alternative techniques in use, CAPM is still the mostly used method in the practice for the calculation of cost of equity.

2.2. Relative Valuation Technique

Relative valuation estimates the value of an asset based on the values of comparable assets relative to a common variable such as book earnings, cashflows or number of customers. While the objective of DCF valuation is to calculate the intrinsic value of an asset based on its cashflow projections, risk profile and growth characteristics, relative valuation relies on choosing the assets with similar characteristics in the market which are already priced, linking their prices to a common variable and use that link to value the asset in question. As such, Damodaran (2002) explains that relative valuation consists of two main steps:

- i) In order to allow comparison within the assets, the prices of assets are standardized with respect to defined metrics by converting the price to a multiple of a variable such as earnings, revenues or an operation variable such as number of customers.

- ii) Comparable assets which carry similar characteristics with the asset in question and their market values have to be found in order to undertake a comparison.

Although relative valuation technique does not enable the valuation analyst to incorporate all assumptions with respect to the firm and its operating environment and thereby assess the sources of value, its simplicity and intuitive appeal gives a strong advantage against discounted cashflow valuation technique.

A number of surveys demonstrated that practitioners frequently prefer relative valuation to other company valuation techniques. The studies of Graham and Harvey (2002), Manigart *et al.* (2000) and Dittmann *et al.* (2004) are amongst these. Moreover, the technique's success has been displayed in the empirical studies undertaken by Kaplan and Ruback (1995) and Gilson *et al.* (2000).

In his survey of U.K. analysts and fund managers, Barker (1999) found that both groups rank the price-earnings model and the dividend yield model as the most important, and both groups rate the DCF and dividend discount models as unimportant. Barker's findings on the importance of price-earnings multiple support the results of Arnold and Moizer (1984) for the U.K., Pike *et al.* (1993) for Germany and the U.K., and Block (1999) for the U.S., all of whom investigate the valuation models used by analysts using survey-based approaches.

Demirakos *et al.* (2002) undertook a study in order to explain the valuation practices of financial analysts in UK by reviewing the valuation methodologies contained in 104 analysts' reports from international investment banks for 26 large listed companies in London Stock Exchange. They found that the analysts tailor their valuation methodologies to the circumstances of the industry: In some industries such as beverage, relative valuation is preferred while in some other industries such as pharmaceuticals DCF is preferred. In either case, analysts typically choose either a price-earnings model or an explicit multi-period DCF valuation model as their dominant valuation model. They also employ more detailed analyses of price-to-sales multiples, growth options, or profitability analysis. They also noted that none of the analysts use the price-cashflows-from-operations as their

dominant valuation model and some analysts who construct explicit multi-period valuation models still adopt a comparative valuation model as their preferred model.

Bradshaw (2002) studied the content of 103 U.S. analysts' reports to identify how analysts justify their stock price recommendations. He found that valuations based on P/E multiples and expected growth are more likely to be used to support favorable recommendations, while qualitative analysis of a firm's fundamentals was more likely to be employed to justify less favorable recommendations.

For relative valuation, the most common metrics utilized are accounting-based multiples. Such multiples are widely used by the research analysts for the valuation of public companies and by the investment bankers for the preparation of fairness opinions for mergers and acquisitions. Stowe *et al.* (2002) identified four main sets of multiples commonly in use for relative valuation:

- Earnings multiples: price-earnings ratio (P/E) or earnings multiple, price-earnings-growth ratios (PEG)
- Revenue multiples: price-to-sales ratio (P/S) and enterprise-value-to-sales ratio (EV/S)
- Cashflow multiples: price-to-earnings-before-interest-and-taxes ratio (P/EBIT), price-to-earnings-before-interest-taxes-depreciation-amortization ratio (P/EBITDA), price-to-cashflows-from-operation ratio (P/CFO) and enterprise-value-to-earnings-before-interest-taxes-depreciation-and-amortization ratio (EV/EBITDA)
- Asset multiples: price-to-book (P/B), enterprise-value-to-book-value (EV/B) or book value of equity-to-market value of equity (B/M) ratios.

Expression of “price” in the multiples as explained by Stowe *et al.* (2002) corresponds to the equity value of the firm. For a firm listed on a stock exchange, market capitalization, which is the multiple of the share price and number of shares, corresponds to the value of equity. Enterprise Value is defined as the total of market capitalization and book value of debt less cash.

Earnings multiples are used when the historical earnings figures are reliable and they can be forecasted with high confidence. Cashflow multiples are mostly employed in the relative valuation of companies operating in industries characterized by low or negative earnings due to large non-operating expenses or for cyclical companies with high earnings volatility. In the cases where earnings are negative or declining, or where earning figures are not comparable or not representative for the future, revenue multiples are used.

Boatsman and Baskin (1981) compared the accuracy (measured by absolute values of prediction errors as a percentage of actual values) of the value estimated based on P/E multiples of firms from the same industry. They found that, relative to randomly chosen firms, valuation errors are smaller when comparable firms are matched on the basis of historical earnings growth. This meant similar growth characteristics increased the accuracy of relative valuation.

Zarowin (1990) examined the cross-sectional determinants of P/E ratios. He showed that forecasted growth in long-term earnings was a dominant source of variation in these ratios. Other factors, such as risk, historical earnings growth, forecasted short-term growth, and differences in accounting methods, seemed to be less important.

Alford (1992) examined the accuracy of the P/E valuation method when comparable firms are selected on the basis of industry, firm size, and earnings growth, to see which factor is the most important for more accurate valuations. His findings showed that selecting comparable firms by industry is relatively effective. He also found that a finer classification using size in addition to industry membership does not improve the accuracy of the P/E valuation method. He also investigated the effect of adjusting earnings for cross-sectional differences in leverage. His findings showed that adjusting P/E multiples for differences in leverage across comparable firms actually decreases accuracy. He also found a positive relationship between the company size and valuation accuracy.

Lie and Lie (2002) evaluated various multiples used by practitioners for relative valuation. In their analysis, they employed trailing P/E, forecasted P/E, EV/S, EV/B, EV/EBITDA and EV/EBIT multiples for prediction performance. They found that asset multiples generally produce more accurate valuation results compared to earnings

multiples or sales multiples. They also observed that adjusting for the debt situation of the companies does not improve the accuracy. However, usage of forecasted earnings achieved better performance with respect to the historical earnings. Another finding was that EBITDA based multiples yielded better estimates of value than the EBIT multiples. However, they also noted that company size, profitability and the intangible value of the company had a significant effect in overall accuracy of relative valuation methods as well as relative performances of the multiples. For all company sizes they examined, asset multiples performed the best while sales multiples performed the worst.

Liu *et al.* (2002) evaluated the ability of various multiples to explain the observed stock prices in 10 different countries including Australia, Canada, France, Germany, Hong Kong, Japan, South Africa, Taiwan, UK, and US. They utilized four classes of relative valuation multiples: Earning based, dividend based, cashflow based and sales based. They concluded that earning multiples gave the best results while sales multiples gave the worst results and dividend & cashflow multiples exhibited intermediate performance. Earning multiples were proven to be a reasonably accurate technique because for over half the firms in the different countries being within 30 percent of observed stock market valuations. In line with other studies in the literature, they also showed that using forecasts improved performance over multiples based on reported numbers, with the greatest improvement being observed for earning multiples and the smallest improvement being observed for sales multiples. Finally, they observed a gradual decrease in the explanatory power of relative valuation starting from 1997, which they attributed to the increasing variety within the same industries.

Cheng and McNamara (2000) evaluated two dimensions of the relative valuation. First, they compared the valuation accuracy of P/E, P/B and hybrid P/E and P/B multiples by selecting the comparable firms based on the industry membership, size and return equity as well as their combinations. They found that P/E multiples outperformed P/B multiples and their hybrid multiples outperformed each of P/E and P/B multiples. These results implied that, for their study period, earning based multiples were more accurate than asset multiples; however each of these two categories did not perfectly substitute each other. Second, they tried to assess the defining variables for the comparable firms. They found that within each valuation methods, the best definition of comparable firms was

provided on the basis of industry and return on equity. However for the hybrid method, industry criterion itself was sufficient to define the comparable firms. As a result, they concluded that hybrid of P/E and P/B multiples by selecting comparable firms based on industry yielded the most accurate results.

Kim and Ritter (1999) discussed the use of multiples in valuing initial public offerings. They employed P/BV, P/S, EV/S and EV/CFO multiples in their analysis. They found that EV/EBITDA multiple yields the most accurate result for valuation. They concluded that P/E, P/BV and P/S multiples have a limited predictive ability in valuation of initial public offerings due to the wide variation of these ratios for the young firms in the industry. They also set forth that the accuracy of multiples increase when adjustments are made reflecting differences between the profitability and growth rates of the firms. They found that P/E multiples with forecasted earnings have a higher predictive ability with respect to P/E multiples with historical trailing earnings. It is also important to note that such valuation discrepancies were higher for the young firms with respect to the older firms.

By focusing on the listed companies contrary to Kim and Ritter (1999) who focused on IPOs, Liu *et al.* (2002) arrived at the same result that forecasted earning multiples performed better than the historical earning multiples for relative valuation. They concluded that, in terms of accuracy of the relative valuation, the performance of forecasted earning multiples was followed by that of historical earning multiples, cash flow multiples, asset multiples, and finally, sales multiples. They noted that this ranking was valid for all industries and their findings contradicted the general belief that different industries had different “best” multiples.

Park and Lee (2003) undertook empirical tests to assess the relevance of relative valuation model and different multiples in Japanese stock market. Their results shown P/B multiple is the best in terms of prediction accuracy with respect to P/E, P/S and P/CFO multiples.

Kaplan and Ruback (1995) reviewed the valuation methods used in high levered transactions. They undertook the relative valuation of their sample based on EV/EBITDA

multiple. The benchmark multiples were the median multiples for the listed companies in the same industry, companies that were involved in similar transactions or companies in the same industry that were involved in similar transactions. For comparison, the authors also computed valuations with DCF method. For their sample of 51 highly levered transactions, they found that both the DCF and relative valuation methods similarly yielded satisfactory results with close precision levels with respect to actual transaction values.

Several important results emerge from these studies. First, the choice of which multiple to use affects accuracy results. In terms of accuracy relative to current prices, forecasted earnings perform relatively well; the price-to-sales and price-to-book ratios perform relatively poorly. Second, industry membership is important in selecting comparable firms. The relation between historical growth rates and P/E ratios is unclear, with studies reporting conflicting results, but forecasted growth rates are important. Other measures, including risk-based metrics (leverage and size) do not seem to provide much additional explanatory power for P/E multiples.

Fama and French (1992) showed that the B/M ratio is one of the best explanatory variables of historical stock returns.

In an important study, Liu *et al.* (2005) showed that, contrary to the widely accepted assumption, stock prices are better explained by reported earning multiples than cashflow multiples. The intuitive guidance is that cashflows multiples are more reliable as earnings (i) cannot be formally linked to value, (ii) are noisy measures of value changes as they are based on estimates and potentially irrelevant historical costs, and (iii) could be biased because they are easier to manipulate than cashflows. However, their study show that earning multiples outperform cashflow multiples from the perspective of accuracy. They proposed that the underperformance of cashflow multiples may have been due to the low correlation between the reported and expected cashflows due to temporary changes in each year such as capital expenditures or change in working capital.

An important issue in relative valuation is to choose the averaging method for the peer group multiples. Baker and Ruback (1999) discussed the advantages of using harmonic means – which was, the inverse of the average of inversed ratios when

aggregating common market multiples. They examined econometric problems associated with different ways of computing industry multiples, and compared the relative performance of multiples based on EBITDA, EBIT and sales. They provided theoretical and empirical evidence that absolute valuation errors are proportional to value. They also showed that industry multiples estimated using the harmonic mean were close to minimum-variance estimates based on Monte Carlo simulations. Using the minimum-variance estimator as a benchmark, they found that the harmonic mean dominated alternative simple estimators such as the simple mean, median, and value-weighted mean. Finally, they used the harmonic mean estimator to calculate multiples based on EBITDA, EBIT, and sales, and found that industry-adjusted EBITDA multiples performed better than EBIT and sales multiples.

Beatty *et al.* (1999) examined different linear combinations of value drivers derived from earnings, book value, dividends, and total assets. They derived and documented the benefits of using the harmonic mean, and introduce the price-scaled regressions which are currently in use. They found the best performance was achieved by using (1) weights derived from harmonic mean book and earnings multiples and (2) coefficients from price-scaled regressions on earnings and book value.

The major strength and at the same time major weakness in this method of common stock valuation is the peer finding process which is implemented in a subjective way and therefore subject to biases and even manipulation.

Despite relative valuation's simplicity in practice, little theory is available for the right selection of the comparable firms. Bhojraj and Lee (2002) discussed that the subjectivity involved in the choice of selected firms threatened the relative valuation method's reliability as a serious alternative in valuation. As a possible solution, they introduced an approach to formalize the peer selection process. They discussed that the choice of comparable firms should have been a function of the variables that drive cross-sectional variation in a given market multiple such as profit margins, growth rates and cost of capital. Based on the weightings, they calculated a benchmark called "warranty multiples" and selected peer firms from the pool of companies with closer warranty

multiples. They tested the efficacy of this approach with empirical tests and concluded that their approach bring improvements.

Dittmann and Weiner (2005) investigated for the most successful comparable selection method in terms of the accuracy of the price forecasts when valuing European companies with the EV/EBIT multiple by considering USA as the reference point. They found that selecting comparable companies with similar return on assets increases the efficacy of the results compared with selections based on industry membership or total assets. They also examined the possible country choice in order to maximize the accuracy of the relative valuation based on EV/EBIT multiple. For most European countries, choosing comparables from the 15 European Union member states yielded the best forecasts. In contrast, for the UK and the US, comparables should be chosen from the same country only.

An important fact in using relative valuation approach is that relative valuation models only give relative investment recommendations. A stock selling at a P/E that is low relative to the P/E of another comparable stock is relatively undervalued. If the comparison stock is overvalued (in an absolute sense) so might be the stock the relative valuation model identified as undervalued.

Relative valuation technique is useful when a good set of comparable companies exists, when the market is not at a valuation extreme and when the company's fundamentals are not difficult to forecast. While the relative valuation technique by-passes explicit projections and present value calculations, it relies on the same principles underlying DCF approach: Value is an increasing function of future cashflows and a decreasing function of risk.

2.3. Contingent Claim Valuation Technique

DCF valuation underestimates the value of assets those provide payoff that are contingent to the occurrence of an event because it fails to account for the set of flexibility options in the business decisions. Trigeorgis (1996) presents some examples of possible options such as optimal timing of an investment, option to expand, abandon or suspend the

project, strategic options, option to modularity, learning options. While each scenario implies a different valuation, a rigid application of DCF approach omits these choices. For such assets, the real options approach is an effective method of economic analysis of investments in projects or non-financial assets ("real assets") under market and technical uncertainties, because it considers the value of managerial flexibility to react to these changing scenarios.

Dixit and Pindyck (1994) present a comprehensive explanation of the differences between DCF and real options approach to value investment opportunities under uncertainties. The presence of managerial flexibility in the decision making process under uncertainty provides important gains in the valuation of the investment opportunity, especially for low net present value projects. These low NPV opportunities are more difficult for decision-makers' analysis about whether to undertake or reject the project. Regarding strategic sequential investments, the NPV rule turns out to be a difficult application and can even fail in trying to quantify the hidden options value provided by the investment. Such investments are precisely those where the real options approach aggregates more economic value.

Finance literature presents several cases of applications of real options to value natural resource investments, such as Tourinho (1979) and Brennan and Schwartz (1985). Paddock *et al.* (1988) present the classical model of real options for exploration and production of an oilfield, exploiting the analogy between the concession value and the (financial) American call option. Leslie and Michaels (1997) state that the value of keeping one's options open is clearest in investment-intensive industries, such as oil extraction, in which the licensing, exploration, appraisal, and development processes fall naturally into stages, each pursued or abandoned according to the results of the previous stage. Quigg (1993) showed the existence of a real option for undeveloped urban land. Dias (2001) gives an overview of real options applications in petroleum. Schwartz and Trigeorgis (2001) present other applications of real options to natural resources investment opportunities.

Contingent claim valuation basics can be extended to the firms. Merton (1974), as well as Black and Scholes (1973), suggested that corporate securities could be viewed as

options on the underlying assets of the company. The underlying assets include plant and equipment, franchise value, customer relationships, etc. Myers (1973) also observed that Black-Scholes model could be used to value investment opportunities in the market.

Although relatively recent, the real options approach has been adopted by an increasing number of modern corporations. A large survey reported in Graham & Harvey (2002) on corporate finance practice, with answers from 392 CFOs of different firms in the USA and Canada, shows that 26.59 per cent of the firms "always or almost always" consider the value of real options in projects.

There exist several alternative valuation models using real option theory. One method is to value a security relative to the value of a portfolio of other traded securities. This approach was proposed by Black and Scholes (1973) for financial markets. A second approach is using a binomial option value method proposed by J. Cox *et al.* (1979). This model is based on Black and Scholes model. Another approach is using a Jump model proposed by Willner (1995). There are also two models proposed by Titman (1985) and by Quigg (1993), both used for evaluating land prices.

Despite increasing theoretical research on real options, its use in practice has been limited due to a number of reasons. The method is complex and it requires a great deal of mathematical knowledge. In addition, there is not a standard theory for application: Finally, the assumptions used in contingent valuation models may not hold in real life.

3. DEVELOPMENT OF THE VALUATION PROCEDURE

The objective of this research is to develop a step-by-step procedure for the company valuation and to implement this procedure on a number of firms in Turkey.

There are three main techniques for company valuation in use: Discounted cash flow valuation technique measures the value of an asset based on the present value of future cashflows that it is expected to generate. Relative valuation technique estimates the value of an asset based on the values of comparable assets relative to a common variable such as book earnings, cashflows or number of customers. Contingent claim valuation technique relies on option pricing models to measure the value of an asset with option characteristics such as patents and reserves.

Discounted cashflow valuation provides the foundation for the relative valuation and contingent claim valuation methods. In addition to calculating value, it also enables the analyst to determine the sources of value. Moreover, a good understanding of the essentials of discounted cashflow valuation is also required to comprehend and correctly apply the remaining two methods.

On the other hand, relative valuation is the most easily applicable method. It allows the analyst to determine a good benchmark value without having to deal with the details and assumptions required in discounted cashflow valuation approach. It eliminates the need for constructing complex financial models for projection and allows a quick comparison based on simple metrics.

Due to the limited applicability of the contingent claim valuation, discounted cashflow valuation and relative valuation techniques were focused on in this study.

3.1. The Valuation Procedure: Discounted Cashflow Valuation

Discounted cashflow valuation involves calculating the present value of future cashflows generated by asset through discounting them with an appropriate discount rate.

It can be generally defined with Formula 2.1. As discussed in Chapter 2, there are three main alternative methods of DCF valuation in use in the practice: Flows to Equity method, Adjusted Present Value method and Weighted Average Cost of Capital method.

WACC method is the most preferred method in the theory and the practice. With that respect, in this thesis, WACC method was selected for the implementation of DCF technique.

WACC method values the entire firm, which includes, besides equity, the other claimholders in the firm (bondholders, preferred stockholders, etc.). The method involves discounting of the cashflows to firm at the weighted average cost of capital, which is the cost of the different components of financing used by the firm, weighted by their market value proportions. The method can be formulated as follows:

$$EV = \sum_{t=1}^{t=\infty} \frac{CF_t}{(1+WACC)^t} \quad (3.1)$$

where EV is the enterprise value of the firm, CF_t is the cashflows to firm defined as the residual cashflows after meeting all operating costs, investments, working capital changes and taxes, but prior to any payments to both debt or equity holders in period t and WACC is defined as the weighted average cost of capital.

WACC method defines the firm value as the addition of value of held by the equity holders (equity value) and the value of debt held by the debt holders (debt value). Hence, the firm's equity value can be calculated by subtracting the value of debt from enterprise value.

$$EV = E + D \quad (3.2)$$

where D is the value of debt, E is the value of equity and EV is the enterprise value of the firm.

As for the valuation procedure, four consecutive steps are developed for the implementation of discounted cashflow valuation technique according to WACC method. In the Sections 3.1.1 to 3.1.4, consecutive steps in the valuation procedure are explained.

Table 3.1. The valuation procedure – discounted cashflow valuation

• Step I: Projection of cashflows
○ Step I-a: Collection of historical financial statements
○ Step I-b: Development of industry forecasts
○ Step I-c: Development of earning forecasts
○ Step I-d: Development of capital expenditure forecasts
○ Step I-e: Development of change in working capital forecasts
○ Step I-f: Development of tax forecasts
○ Step I-g: Development of cashflow forecasts
• Step II: Estimation of the discount rate
○ Step II-a: Cost of equity estimation
○ Step II-b: Cost of debt estimation
○ Step II-c: WACC estimation
• Step III: Calculation of terminal value
• Step IV: Calculation of the equity value

3.1.1. Step I: Projection of Cashflows

According to the discounted cash flow methodology, the value of a firm is the present value of its expected cashflows over its life. Since firms are supposed to have infinite lives, valuation is undertaken in two stages. First, cashflows to firm are projected for a defined forecast period. Then, the value of cashflows to firm after the forecast period is calculated as at the end of forecast period. Such value is called terminal value. Once the terminal value and cashflows to firm have been estimated, they are discounted back to the present to yield the enterprise value. Calculation of enterprise value is formulated in Formula 3.3.

$$EV = \sum_{t=1}^{t=n} \frac{CF_t}{(1+WACC)^t} + \frac{X}{(1+WACC)^n} \quad (3.3)$$

where EV stands for enterprise value of the firm, CF_t is the cashflow to firm in period t, n stands for the forecast period for the firm, X stands for the terminal value of the firm as at the end of forecast period and WACC is the weighted average cost of capital. Accordingly, in order to employ WACC method, the analyst should determine a forecast period and develop cashflow projections throughout this period. For the cashflows after the forecast period, the analyst should calculate terminal value.

3.1.1.1. Step I-a: Collection of Historical Financial Statements. This step involves collection of historical financial statements of the firm in order to provide the base for projections. Review and understanding of historical financials allows the analyst to better comprehend the firm and its business. Moreover, the analyst can determine the time trends which can be utilized for the purposes of projections. The projection process can be incorporated in a financial model which calculates the projections based on certain assumptions. Such financial model includes the historical financial and operating performance of the firm. For this purpose, the historical financial statements should be prepared and inserted in the financial model. If required, they should be organized and converted into a base currency.

3.1.1.2. Step I-b: Development of Industry Forecasts. Projection of market forecasts is essential as they provide the basis for the revenue and production volume projections for the firm. Industry growth assumptions are utilized in order to project market size in the future years. Growth rates can be tied to macroeconomic variables such as GDP or sector specific variables such as per capita consumption or usage benchmarks. A common way to do it is to determine target benchmark rates which are derived from comparison of Turkey with countries having similar levels of economic development and to assume Turkey will reach at such level in certain years.

3.1.1.3. Step I-c: Development of Earning Forecasts. Revenue projections are developed based on the assumptions on industry growth, market share and price development. The relation between these variables is defined by the analyst based on historical data and expectations.

$$Revenues_{(t)} = f(\text{Market Parameters}_{(t)}, \text{Market Share}_{(t)}, \text{Price}_{(t)}) \quad (3.4)$$

Market share projections of a firm rely on the competitive situation in the market for now and future and business strategy of the firm. It should be emphasized that market share projections are closely interdependent with the sales price and marketing and production cost projections of the firm.

The analyst should incorporate the price expectations in the market, historical price trends and overall strategy of the firm in order to develop sales price projections.

In DCF approach, cashflow projections are built on the earning projections for the firm. With that respect, the firm's earning projections should be developed on top-down basis throughout the projection period.

By employing profitability assumptions, earnings are projected after deducting the production and operating expenses from the revenues. The first earning measure of a firm is "Gross Profit" which equals the profit of the company after cost of goods sold.

$$Gross\ Profit_{(t)} = NetRev_{(t)} - COGS_{(t)} \quad (3.5)$$

where $Gross\ Profit_{(t)}$ is the gross profit in period t, $NetRev_{(t)}$ corresponds to the net revenues of the firm in period t and $COGS_{(t)}$ corresponds to cost of goods sold for the firm in period t. From gross profit, the operating profit is calculated as follows:

$$Operating\ Profit_{(t)} = Gross\ Profit_{(t)} - OPEX_{(t)} \quad (3.6)$$

where $Operating\ Profit_{(t)}$ is the operating profit of the company in period t, $Gross\ Profit_{(t)}$ corresponds to the gross profit of the firm in period t and $OPEX_{(t)}$ corresponds to operating expenses of the firm in period t. Operating profit is also equivalent to earnings before interest and tax, which is abbreviated as EBIT.

$$Operating\ Profit_{(t)} = EBIT_{(t)} \quad (3.7)$$

Cost forecasts can be based upon a large set of assumptions. An approach is to estimate the costs based on their ratio to revenues in accordance with the historical

development and expectations throughout the forecast period. Another approach would be to categorize all expenses in detail and implement a bottom-up approach by forecasting variable costs based on production units and unit costs and forecasting fixed costs separately. In practice, a combination of both methods is applied. ,

As COGS and OPEX include non-cash expenses such as depreciation and amortization expenses, EBIT should be adjusted with such non-cash expenses in order to arrive at an approximation of cashflow from operations before interest and taxes. This measure is called earnings before interest, tax, depreciation and amortization expenses, which is abbreviated as EBITDA.

$$EBITDA_{(t)} = EBIT_{(t)} + Depr_{(t)} + Amort_{(t)} \quad (3.8)$$

where $Depr_{(t)}$ corresponds to the depreciation charges in period t and $Amort_{(t)}$ corresponds to the amortization charges in period t.

3.1.1.4. Step I-d: Development of Capital Expenditure Forecasts. Operating cashflows should be adjusted with capital expenditure, which is a measure of how much a firm is reinvesting back for future growth. Capital expenditure of a firm involves two main components: (i) Capital expenditure required for maintenance of existing asset base at its current performance level and (ii) Capital expenditure required for expansion such as production capacity increase. Maintenance capital expenditures differ according to the type of machinery and operating conditions. For example, a specific production may require renewal of all machinery in every five years. Capital expansion investments should be estimated based on the volume growth of business and outstanding capacity constraints.

3.1.1.5. Step I-e: Development of Working Capital Forecasts. Another factor that can change the level of cash generated by the firm is the working capital needs. Increase in working capital ties up more cash and hence is a cash outlay. On the other hand, decreases in working capital releases cash and hence is a cash generating item. Working capital can be broadly defined as set forth in Formula 3.9.

$$WC_{(t)} = TradeRec_{(t)} + Inv_{(t)} - TradePay_{(t)} \quad (3.9)$$

where $\text{TradeRec}_{(t)}$ corresponds to the trade receivables in period t , $\text{Inv}_{(t)}$ corresponds to the inventory level in period t and $\text{TradePay}_{(t)}$ corresponds to the trade payables in period t and $\text{WC}_{(t)}$ corresponds to the Working Capital level in period t . Based on this definition, change in working capital can be defined as:

$$\Delta \text{WC}_{(t)} = \text{WC}_{(t)} - \text{WC}_{(t-1)} \quad (3.10)$$

where $\Delta \text{WC}_{(t)}$ is the change in working capital in period t .

3.1.1.6. Step I-f: Development of Tax Forecasts. The following step is to estimate the portion of this income that would go towards taxes. Tax is incorporated in cashflow calculations according to Formula 3.11.

$$\text{NOPAT}_{(t)} = \text{EBIT}_{(t)} (1 - T_{(t)}) \quad (3.11)$$

where $\text{NOPAT}_{(t)}$ is the net operating profit in period t and $T_{(t)}$ corresponds to the corporate tax rate in period t . It is important to note that the corporate tax rate to be used is the marginal corporate tax rate, namely the applied corporate tax rate as opposed to the effective corporate tax rate.

3.1.1.7. Step I-g: Development of Cashflow Projections. By using the data as formulated from Section 3.1.1.3 to 3.1.1.6, cashflows to firm in period t can be defined as follows:

$$\text{CF}_{(t)} = \text{EBIT}_{(t)} \times (1 - T_{(t)}) - \Delta \text{WC}_{(t)} - \text{CAPEX}_{(t)} \quad (3.12)$$

where $\text{CF}_{(t)}$ is cashflow to the firm in period t and $\text{CAPEX}_{(t)}$ is the capital expenditure in period t .

3.1.2. Step II: Estimation of the Discount Rate

Firms are financed by equity investors and creditors. Both groups of investors make their investments expecting to make a return. The equity investors expect a premium for the equity risk in their investment. Expected return of the equity investors is labeled as the

cost of equity. Similarly, the expected return that lenders hope to make on their investments includes a premium for default risk and the expected return of the debt investors is labeled as the cost of debt. If all of the financing sources that the firm takes on are considered, the composite cost of financing will be a weighted average of the costs of equity and debt and this weighted cost is the cost of capital.

WACC method involves discounting cashflows to firm at a discount rate that reflects a blend of the costs of the different sources of capital. Such discount rate is defined as weighted average cost of capital. WACC can be defined based on the cost of the different sources of capital as follows:

$$WACC = k_e \frac{E}{EV} + k_d \frac{D}{EV} \quad (3.13)$$

where k_e is the cost of equity, k_d is the cost of debt, D is the market value of debt, E is the market value of equity and EV is the enterprise value of the firm.

If the cashflows to be discounted are after-tax, WACC also should reflect the potential savings from tax. In that case, Formula 3.13 can be rewritten as follows where $k_{d(\text{after-tax})}$ is the after-tax cost of debt:

$$WACC = k_e \frac{E}{EV} + k_{d(\text{after-tax})} \frac{D}{EV} \quad (3.14)$$

It should be reminded that the weight of equity and debt are estimated based on the financing choice of the firm. In addition, input can also be supplied from the financing choices of the companies in the world operating in the similar business.

Thus, in order to calculate the weighted average cost of capital, cost of equity and cost of debt for the firm should be estimated. Estimation of the cost of debt for a firm is straightforward as it can easily be observed from the outstanding debt of the firm any time. However, in comparison, estimation of cost of equity requires a more detailed approach including specific assumptions.

3.1.2.1. Step II-a: Cost of Equity Estimation. The cost of equity is the rate of return investors require on an equity investment in a firm. There are three main asset pricing models used for the calculation of cost of equity: Capital Asset Pricing Model, Arbitrage Pricing Model and Multi-factor Models. CAPM is one of the most common risk estimation models in finance. It is a single factor model which measures economy-wide influences through the risk of an individual asset relative to a market portfolio. Arbitrage pricing model is a generalization of CAPM, which relates expected return of a security to a number of different factors unlike CAPM which only takes into market risk account. A statistical factor analysis is used to determine the number of factors which affect the asset returns and the sensitivity (or beta) of the returns to such factors. Multi-factor models employ statistical factor analysis in the same sense arbitrage pricing models do, however unlike the arbitrage pricing model which is based on unidentifiable factors which do not attach to any specific real world variable, multi-factor models estimate sensitivities of the variance returns to a number of real macro economical factors such as economy growth rate, anticipated inflation, change in oil price.

CAPM has a clear theoretical foundation and is simple to implement in comparison to other asset pricing models. As a result, the risk and return model that has been in use the longest and is still the standard in most real world analyses is the capital asset pricing model.

According to CAPM, the cost of equity include a riskless rate, a risk premium and a firm's sensitivity to market risk, which is described as a coefficient called beta. These inputs are used to arrive at cost of equity using the CAPM under the following formula.

$$k_e = r_f + \beta [E(r_m) - r_f] \quad (3.15)$$

where k_e is the cost of equity, r_f is the risk-free return, $E(r_m)$ is the expected rate of return on market portfolio, $[E(r_m) - r_f]$ is the market risk premium and β is beta.

If market risk premium is estimated as the addition of country risk and equity risk, then Formula 3.15 can be rewritten as follows:

$$k_e = r_f + \beta [\text{equity market risk} + \text{country risk premium}] \quad (3.16)$$

Hence, estimation of cost of equity requires estimation of risk free rate, equity risk, and country risk premium as well as beta coefficient.

CAPM model envisages two main criteria for a risk-free rate. First, there should not be any default risk. This means only government securities can be used for the risk free rate estimation because, theoretically, they do not default, purely due to the fact that they can control printing of currency. Second, there should not be any reinvestment risk. This means the underlying security should be a zero-coupon. The alternative for using a zero-coupon bond is to use the duration of the security.

In addition, the choice of the risk free rate should be consistent with the implication area, which incorporates three dimensions:

- Time duration of the analysis: The duration used for the estimation of risk free rate should be consistent with the duration used for the estimation of risk free rate. If the analysis is made for ten years, risk free rate should be calculated for a ten year security.
- The currency of the analysis: In theory, there should be only one risk free rate effective in the world and such risk free rate should not change according to the currency as each currency carries a currency risk. However, for simplicity, a risk free rate consistent with the currency used in the valuation procedure was estimated. If the analysis is made in Euro, risk free rate for Euro zone should be calculated. Such an application is in line with the practice.
- Nominal & Real Values: If the analysis is made in real terms, the risk free rate should also be calculated in real terms. Vice versa, if the analysis is in nominal terms then the risk free rate should incorporate inflation.

In line with the practice, the yields of US Government Bonds were employed as risk free rate throughout this study. This is also in line with the currency of analysis which was set as US Dollar. In order to meet the time criteria, a bond with duration of the length of projection period (five or ten years) should be used as a benchmark. In case there is no

such bond available with the exact targeted duration, the yield curve developed on the basis of existing bond issues can be used as an estimation tool for the yield of a bond with the targeted duration.

As the projections under the scope of this thesis are developed in real basis, the risk-free rate should be estimated in real terms. Actually, the US Government also issues securities which are indexed to inflation. These are called TIPS or Treasury Inflation Protected Securities. The yields of TIPS provide the real risk free rate as they do not include any inflation component.

The yields of TIPS bonds are set forth in Table.3.2. Yields are interpolated by the US Treasury from the daily yield curve. This curve, which relates the yield on a security to its time to maturity, is based on the closing market bid yields on actively traded Treasury securities in the over-the-counter market. These market yields are calculated from composites of quotations obtained by the Federal Reserve Bank of New York. The yield values are read from the yield curve at fixed maturities, currently one, three and six months and one, two, three, five, seven, ten and twenty years. This method provides a yield for a ten year maturity, for example, even if no outstanding security has exactly ten years remaining to maturity.

Table 3.2. Yields of US Treasury inflation protected securities

<u>Maturity</u>	<u>5 year</u>	<u>7 year</u>	<u>10 year</u>	<u>20 year</u>
Annualized Yields (20 December 2005)	2.06%	2.06%	2.07%	2.04%

As a result, the risk free rate for the valuation of Turkish companies was accepted as 2.04 per cent.

It has been observed in some practical applications that return on a Turkish Eurobond with a long maturity is accepted as a risk free rate. This is not in line with the definition of risk free rate because risk free rate should not include any country risk component whereas the yield of a Turkish Eurobond includes such risk by definition.

As for the calculation of country risk premium, default spreads were calculated based upon traded country bonds over a default free government bond rate based on the country ratings of the rating agencies. As these spreads were related with default risk, they were converted to equity risk.

Table 3.3 summarizes the latest bond ratings and appropriate default spreads for different countries. These numbers can be used as rough estimates of country risk premiums based on default spreads:

Table 3.3. Adjusted default spreads based on Moody's ratings

<u>Long-Term Rating</u>	<u>Adjusted Default Spread</u>
Aaa	0
Aa1	60
Aa2	65
Aa3	70
A1	80
A2	90
A3	95
Baa1	120
Baa2	130
Baa3	145
Ba1	250
Ba2	300
Ba3	400
B1	450
B2	550
B3	650
Caa1	750
Caa2	750

Default spread for Turkey has been calculated on the rating received from Moody's. In December 2005, Moody's raised the country ceiling for foreign-currency debt and the Turkish government's foreign- and domestic-currency issuer ratings to Ba3 from B1. This level corresponds to a default spread of 400 basis points, or 4 per cent. This becomes a measure of the added country risk premium for that country.

It is accepted that equity country risk premium is likely to be greater than the country's default spread. In order to calculate equity risk premium, the default spread of the country is multiplied with the market volatility for that market:

$$\text{Country Risk Premium} = \text{Country Default Spread} \left(\frac{\delta_{\text{equity}}}{\delta_{\text{Country bond}}} \right) \quad (3.17)$$

For that, the general conclusion for the emerging markets that equity markets are about 1.5 times more volatile than bond markets is used to estimate country risk premium. In order to calculate the equity risk premium for a specific country, the equity risk premium for a mature market is added to the country risk premium.

For the equity risk in a mature equity market, the historical risk premium for United States estimated from US historical data calculated as 4.84 per cent is used.

Based on these assumptions, total country risk for Turkey on US Dollar basis is calculated as set forth in Table 3.4.:

Table 3.4. Turkey country risk premium

Long Term Rate for Moody for Turkey (May 2006)	BA3
Default Spread for Corresponding Moody's Rating	4.00%
Equity Market Volatility as % of Debt Market Volatility	150.00%
Country Risk Premium	6.00%
Equity Risk (Calculated on Historical US Data)	4.84%
Turkey Country Risk Premium	10.84%

In the CAPM, the beta of an investment is the risk that the investment adds to a market portfolio. There are three alternative methods for estimating beta for a security: (i) Usage of historical data on market prices (ii) Estimation from the fundamental characteristics of the investment (iii) Usage of accounting data

The most common method used for estimation of beta is the historical method which involves a regression of the historical returns of a security against the historical returns of a market index. The slope of the regressed line is called beta of the security.

There is an additional adjustment required for beta. The beta of a firm is determined by three main factors (1) the type of business the firm is in, (2) the degree of operating leverage of the firm and (3) the firm's financial leverage. This means that, other things remaining equal, an increase in financial leverage will increase the beta of equity of a firm. Higher leverage increases the variance in net income and makes equity investment in the company riskier. The change of beta according to the financial leverage of a firm was first formulated by Hamada in 1972 as follows:

$$\beta_u = \frac{\beta}{1 + (1 - T) (D/E)} \quad (3.18)$$

where β_u is unlevered beta, β is the beta, T is the tax rate, D is the market value of debt and E is the market value of equity.

The unlevered beta is generally called the asset beta whereas the calculated beta from the regression is called equity beta. The average debt/equity should be the general financing composition of the company and the industry.

3.1.2.2. Step II-b: Cost of Debt Estimation. Cost of debt is the required return on a firm's debt by its creditors. In general terms, cost of debt is determined by the following variables:

- Riskless rate: As the riskless increases, the cost of debt for firms will also increase.
- Default risk (and associated default spread) of the company: As the default risk of a firm increases, the cost of borrowing money will also increase.
- Tax advantage associated with debt: Since interest is tax deductible, the after-tax cost of debt is a function of the tax rate. The tax benefit that accrues from paying interest makes the after-tax cost of debt lower than the pre-tax cost. Furthermore, this benefit increases as the tax rate increases.

Riskless rate calculated for the cost of equity can be used for the calculation of the riskless rate for the cost of debt.

For the estimation of default spread, it is advised to look at the yields of the long term bonds of a company which are actively traded. If the firm does not have any bond actively traded in the market, the alternative is to have a look at the borrowing history of the company in order to estimate the current spreads. This can be achieved by considering the existing spreads charged to the firm for its existing debt.

If the firm does not have any long maturity date, the spreads for the existing debt of the company on the riskless rate is calculated as follows:

$$\Delta_d = k_{d,t} - r_{f,t} \quad (3.19)$$

where Δ_d is the spread for the debt of the company, $k_{d,t}$ is the borrowing cost of the firm for its longer term debt with t years, and $r_{f,t}$ is the yield of a US Treasury bond with a term of t years. By considering the US Treasury bond yields as riskless rate, the yield of US treasury bonds with duration of t years are used as the basis rate.

After calculation of the spread for t years, the same spread for the calculation of the cost of debt for the firm is applied as follows:

$$k_d = r_f + \Delta_d \quad (3.20)$$

where k_d is the cost of debt for the firm, r_f is the riskless rate which is estimated as the yield of the longest maturity US bond and Δ_d is the spread charged to the firm. As the valuation implementations in this research are on real basis, riskless rates should be based on the yield of the Treasury Inflation Protected Securities issued by US Treasury with the longest maturity

As cashflows to be discounted are calculated after tax, cost of debt should also reflect the tax savings due to the interest expense paid on debt. With that respect, cost of debt should be adjusted with tax as formulated below:

$$k_{d(after-tax)} = k_d (1-T) \quad (3.21)$$

where $k_{d(after-tax)}$ is the cost of debt after tax, k_d is the cost of debt and T is the tax rate.

3.1.2.3. Step II-c: WACC Estimation. After calculation of cost of equity and cost of capital and assumption of debt/equity ratio, WACC is calculated according to Formula 3.13. The debt/equity ratio should reflect the general financing composition of the company and the industry instead of the current level.

3.1.3. Step III: Calculation of Terminal Value

According to the discounted cash flow methodology, the value of a firm is the present value of its expected cashflows over its life. Since firms are supposed to have infinite lives, valuation is undertaken for two stages. First, cashflows to firm are estimated in detail for the forecast period. Then, the value of cashflows to firm after the forecast period is calculated as at the end of forecast period. This is called “terminal value” and formulated as follows:

$$X = \sum_{t=n+1}^{\infty} \frac{CF_t}{(1+WACC)^{t-n}} \quad (3.22)$$

where X is the terminal value, CF_t is the cashflows to firm in period t, n is the forecast period and WACC is defined as the weighted average cost of capital. The discounting process yields the terminal value.

There are three approaches for the calculation of terminal value:

Liquidation value approach assumes that the Company’s assets will be liquidated in terminal year. Accordingly, resale value of the assets of the company should be estimated as at the terminal year minus liabilities as at that time. Liquidation method implicitly assumes that the company ceases operations and sells its assets.

Multiple method involves estimation of the terminal value by applying a multiple to forecasted revenue, profit or book value at the terminal year. Multiples are based on comparable firms, which introduce difficulties for the purpose of valuation study. The fact that multiple method is mainly a relative valuation brings two complexities: Firstly, it is not certain that the current level of multiples will stay at the same level at the terminal date. Secondly, it is mostly not easy to find identical or similar firms with the same level of profitability and growth prospects which is a critical issue for relative valuation. In addition, the multiples used in relative valuation correspond to a particular set of assumptions in cashflow basis method.

Cashflow basis method assumes that the cashflows will continue growing at a constant rate forever. This allows application of perpetuity model. Assuming that the company generates a cashflow to firm of CF_t at terminal year t and such cashflow grows with a constant growth rate of g_{stable} after terminal year, net present value of cashflows to firm after year t discounted at a discount rate of WACC can be calculated as follows:

$$X = \frac{CF_{n+1}}{WACC - g_{stable}} \cdot \frac{1}{(1 + WACC)^n} \quad (3.23)$$

where X stands for the terminal value as at the beginning of forecast period. Formula 3.23 can be rewritten based on the definition of g_{stable} :

$$X = \frac{CF_n(1 + g_{stable})}{WACC - g_{stable}} \cdot \frac{1}{(1 + WACC)^n} \quad (3.24)$$

As for the estimation of growth rate, if it is envisaged that the Company will generate most or all of its cashflows from a domestic economy, its growth should be bound to the overall growth of overall economy.

3.1.4. Step IV: Calculation of Equity Value

Once the terminal value and cashflows to firm have been estimated, they are discounted back to the present to yield the value of the operating assets of the firm. The calculation of enterprise value was formulated in Formula 3.3 as follows:

$$EV = \sum_{t=1}^{t=n} \frac{CF_t}{(1+WACC)^t} + \frac{X}{(1+WACC)^n} \quad (3.3)$$

where EV stands for enterprise value of the firm, CF_t is the cashflow in period t, n stands for the forecast period for the firm, X stands for the terminal value of the firm and WACC is the weighted average cost of capital.

Enterprise value is the value of the operations of the firm and it is owned by both equity holders and debt holders. In order to calculate the value of equity, claims of bondholders or net indebtedness should be deducted from the enterprise value. Therefore, Formula 3.2 can be rewritten as follows in order to calculate equity value.

$$E = EV - D \quad (3.25)$$

where EV stands for enterprise value of the firm, D stands for net debt and E stands for Equity Value of the firm.

After calculation of equity value, sensitivity analysis was undertaken with respect to the country risk premium and terminal growth rate.

3.2. The Valuation Procedure: Relative Valuation

Relative valuation allows valuation of assets based upon how similar assets are currently priced in the market. Relative valuation is used widespread in practice – both professionals in the equity research for valuing companies in the stock market and investment banking professionals for valuing mergers & acquisitions. The main reason for the wide usage is its simplicity. In addition, the methodology allows the valuation analyst to determine the position of the particular company with respect to its benchmarks from the market valuation angle. The outcome is whether the particular company is overvalued or undervalued compared to other companies in the sector.

However, from its definition, the relative valuation does not indicate the intrinsic value of the company. Hence, it is exposed to produce erroneous results, e.g. if all

companies in a given sector are undervalued or overvalued. Another pitfall of the relative valuation is the intrinsic “similarity” feature which allows the analyst to assume the benchmarks are similar to the particular company of interest. This is wrong considering the different characteristics of each company – cashflows, market position, growth prospects, and management.

Despite its shortfalls, relative valuation provides a good benchmark for the valuation of firms. With that respect, it should be employed in a company valuation process that provides a cross-check as a comparison. As for the valuation procedure, three consecutive steps are developed for the implementation of relative valuation technique as set forth in Table 3.5

Table 3.5. The valuation procedure – relative valuation

• Step I: Finding Comparable Firms
• Step II: Selection of multiples
• Step III: Application

3.2.1. Step I: Finding Comparable Firms

Step I involve finding the similar firms, which is difficult to do since no two firms are identical and firms in the same business can still differ on risk, growth potential and cashflows. The question of how to control for these differences, when comparing a multiple across several firms, becomes critical.

3.2.2. Step II: Selection of Multiples

For Step II, four main set of multiples are employed in relative valuation analysis:

- Earning Multiples: Valuation as a multiple of earnings such as book profit or Earnings before Interest, Depreciation and Amortization Expense (EBITDA).
- Book Value Multiples: Valuation as a multiple of book value or replacement value of assets
- Revenue Multiples: Valuation as a multiple of revenues

- Sector Specific Multiples: Valuation as a multiple of sector specific multiple such as capacity, number of subscribers, or number of hits

3.2.3. Step III: Application

Step III involves standardizing the value of firms on a multiple basis and applying the average of benchmarks to the firm.

4. IMPLEMENTATION OF THE VALUATION PROCEDURE ON TURKCELL, AKENERJİ, MİGROS AND İZOCAM

The valuation procedure was implemented on four companies from different sectors.

Turkcell is the market leader telecommunications company in Turkey with operations in other countries. Turkcell is listed on Istanbul Stock Exchange and New York Stock Exchange. Turkcell is selected for implementation in order to apply the valuation model in telecommunication industry. Turkcell business is characterized with high growth, high investment requirements and increasing competition. In addition, the company's large scale and international operations allow a comparison with international telecommunication players.

Akenerji is the largest private power producer in Turkey operating in free market. Akenerji is listed on Istanbul Stock Exchange. Akenerji is selected in order to implement the valuation model in electricity industry which is being transformed into a liberal market. Akenerji business is characterized with liberalizing industry, high investment requirements and lack of profitability from the current operations due to the current levels of gas and electricity prices. Akenerji is also in the process of investing into two new hydro plants with a view to decreasing its cost base.

Migros is the largest retailer in Turkey with operations also in some neighbor countries. Migros is listed on Istanbul Stock Exchange. Retail industry provides an interesting growth story and Migros is the best option to understand the envisaged growth on values of the companies. Migros business is characterized with high growth, negative working capital. Migros also merged with Tansaş in the beginning of year 2006. The company's scale allows an international peer comparison.

İzocam is the largest insulation material producer in Turkey. The company is listed on Istanbul Stock Exchange. İzocam provides a good opportunity for the implementation of the valuation model on manufacturing industry. The company's business is characterized with aggressive growth, high margins due to limited competition and high

capital expenditures to be undertaken each five year because of the manufacturing technology.

Implementation of the valuation procedure on Turkcell is provided in Section 4.1. The overview of the implementations on Akenerji, Migros and İzocam are provided in Sections 4.2, 4.3 and 4.4 while detailed explanations regarding such implementation are presented in Appendixes A, B and C.

4.1. Implementation of the Valuation Procedure on Turkcell

Turkcell İletişim Hizmetleri Anonim Şirketi was incorporated on October 5, 1993 and commenced operations in 1994. It is engaged in establishing and operating a global system for mobile communications network in Turkey and neighboring states.

In April 1998, Turkcell signed a license agreement with the Ministry of Transportation and Communications of Turkey, under which it was granted a 25 year GSM license in exchange for a license fee of US\$500 million. The License permits Turkcell to operate as a stand-alone GSM operator and frees it from some of the operating constraints in the Revenue Sharing Agreement. Under the License, Turkcell collects all of the revenue generated from the operations of its GSM network and pays the Undersecretariat of Treasury an ongoing license fee equal to 15 per cent of its gross revenues. Turkcell continues to build and operate its GSM network and is authorized to, among other things, set its own tariffs within certain limits, charge peak and off-peak rates, offer a variety of service and pricing packages, issue invoices directly to subscribers, collect payments and deal directly with subscribers.

In July 2000, Turkcell completed an initial public offering with the listing of its ordinary shares on the Istanbul Stock Exchange and American Depositary Shares, or ADSs, on the New York Stock Exchange.

Turkcell owns a 41.45 per cent interest in Fintur Holdings B.V., which holds the majority of the Company's international GSM investments, with majority ownership in GSM operations in Azerbaijan, Georgia, Kazakhstan and Moldova.

4.1.1. DCF Valuation of Turkcell - Step I: Projection of Cashflows

4.1.1.1. Step I-a: Collection of Historical Financial Statements. Turkcell financials published according to US GAAP were used for the implementation. As the reporting currency is US Dollar, there is no need to make any conversion into another base currency. Balance sheet and income statement information for Turkcell is provided in Table 4.1 and Table 4.2.

Table 4.1. Summary balance sheet of Turkcell

(US\$ million)	31.12.2004	31.12.2005
ASSETS	4,361	4,406
Current Assets		
Cash and Cash Equivalents	809	795
Trade Receivables and Accrued Income	272	321
Due from Related Parties	104	139
Inventories	13	14
Pre-paid expenses	24	32
Deferred Tax Assets	278	100
Other Current Assets	326	80
Total Current Assets	1,825	1,480
Pre-paid expenses	6	7
Due from Related Parties	66	66
Investments	198	218
Investment Securities	10	11
Fixed Assets	1,061	1,465
Construction in Progress	230	313
Intangibles	882	789
Goodwill	1	1
Other Long Term Assets	2	6
Deferred Tax Assets	80	50
Total Long Term Assets	2,537	2,926
LIABILITIES AND SHAREHOLDERS' EQUITY	4,361	4,406
Current Liabilities	1,796	1,432
Short Term Borrowings	549	567
Trade Payables	617	71
Due to Related Parties	7	3
Taxes Payable	100	407
Deferred Tax Liabilities	0	0
Other current liabilities and accrued expenses	523	384
Long Term Liabilities	580	256
Long Term Trade Payables	266	70
Long Term Borrowings	214	83
Long Term Lease Obligations	3	10
Retirement Pay Liability	13	13
Deferred Tax Liabilities	12	15
Minority Interest	64	60
Other Long Term Liabilities	8	6
Total Liabilities	2,376	1,689
Total Shareholders' Equity	1,985	2,717

Table 4.2. Summary income statement of Turkcell

<u>US\$ million</u>	<u>2004</u>	<u>2005</u>
Revenues	3,201	4,269
Gross profit	1,200	1,878
Operating income	713	1,237
EBITDA	1,339	1,933
Net interest expense	31	-8
Translation loss	-11	-8
Income (loss) before taxes	793	1,318
Net income	512	911

In order to have a consistency with the discounted cashflow valuation methodology, the cashflows after the forecast period are projected to have a stable growth rate. As Turkcell is a high-growth company, the forecast period should be long enough to make the stable growth assumption after the forecast period reasonable. With that respect, a forecast period of 10 years is selected for the valuation of Turkcell starting from 2006 until 2015.

4.1.1.2. Step I-b: Development of Industry Forecasts. In order to develop forecasts for the mobile market, a two stage approach is used. First, the growth of market is forecasted in terms of subscribers. Then, average revenue per subscriber is forecasted. Market size is projected based on these two inputs.

The most widely used benchmark for the development of a mobile telecom services in a country is “penetration”, which is defined as the ratio of mobile subscribers to the population. Mobile penetration depends on a number of factors including economical development of the population, income distribution, tariff levels, connection fees, taxation and pricing of mobile telephones in a country. While many parts of Western Europe have nearly 100 percent mobile market penetration rates, only 53 percent of Turkey's 72 million people use mobile phones. Mobile penetration for Turkey compared to developed European markets is set forth in Table 4.3.

Table 4.3. Mobile penetration in Turkey compared to EU countries

<u>Country</u>	<u>Mobile Penetration in 2005 (%)</u>
Italy	111%
UK	101%
Spain	99%
Germany	85%
EU 15	95%
Turkey	60%

Mobile penetration in Turkey is envisaged to grow significantly in the coming years. The underlying factors can be summarized as follows:

- Turkey has a very young population. Nearly, 47 per cent of the population is under the age of 21, compared to EU average of 31 per cent in EU-15.
- In real terms, Turkish economy has been posting significant growth at annual rates of around six per cent for the last four years. Increased level of household income enabled the consumers to finance mobile subscriptions.
- Due to the competition, the operators started to impose very low prices for the new subscribers, who are generally young customers acquiring their first subscription. Acquisition of mobile handsets is a major entry barrier for the new subscribers. These prices drove a strong growth of the new subscribers.

Table 4.4 summarizes subscriber and penetration forecasts. It was forecasted that, in terms of penetration, Turkey will reach the level of developed countries in year 2015.

Table 4.4. Market forecasts for Turkish mobile market

(mn unless otw. stated)	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>
Turkey Population (year-end)	69.6	70.7	71.9	73.0	74.2	75.4	76.6	77.7	78.9	80.1	81.2	82.3	83.4	84.5
Population Growth (%)		1.61%	1.61%	1.61%	1.61%	1.61%	1.60%	1.50%	1.50%	1.50%	1.40%	1.40%	1.30%	1.30%
No of mobile subscribers	23.3	27.9	34.7	43.6	51.4	60.2	65.0	69.6	73.7	78.2	81.3	83.7	86.2	88.8
Mobile Subscriber Growth (%)	27%	20%	24%	26%	18%	17%	8%	7%	6%	6%	4%	3%	3%	3%
Subscriber penetration (%)	34%	39%	48%	60%	69%	80%	85%	89%	93%	98%	100%	102%	103%	105%
Increase in penetration (%)	8%	6%	9%	11%	10%	11%	5%	5%	4%	4%	3%	2%	2%	2%

For the market size forecasts, average revenue per user per month (which is abbreviated as ARPU) is used. ARPU can also be defined as the multiple of minutes of usage per month per subscriber (“MOU”) and average tariff per minute.

ARPUs in high GDP/capita markets are in the range of US\$30-50 per month. In most new growth markets, this drops below US\$20 per month and is declining. In particular, many new subscribers bring very low ARPUs, typically much less than US\$10 per month. ARPU levels for a couple of markets are provided in Table 4.5:

Table 4.5. ARPU comparison in some markets

<u>Company – Country (2005/6)</u>	<u>US\$/month/subscriber</u>
Vodafone – Germany	31
Vodafone – Italy	36
Vodafone – U.K.	43
Cosmo – Greece	36
Cosmo – Albania	19
Cosmo – Bulgaria	13
Cosmo – FYROM	11
Cosmo – Romania	13

Although forecasting average market ARPU based on separate line forecasts of minutes of usage and tariff levels and multiplying it with the number of subscribers is a widely used methodology for the estimation of market size, such approach can be discussed as being erroneous. This is because MOU and tariffs in a market are, in fact, interrelated and the real world experience generally displays decreasing tariffs with increasing MOU levels. As an example, development of US mobile market from 1994 to 2002 is provided in Table 4.6. It is observed that there has been a wide variation in MOU and tariff levels although ARPU levels stabilize at an equilibrium point.

Table 4.6. Development of US mobile market

<u>Year</u>	<u>Average Minutes of Usage per month (min/month)</u>	<u>Tariff (US\$/min/month)</u>	<u>ARPU (US\$/month)</u>
1993	140	0.44	62
1994	119	0.47	56
1995	119	0.43	51
1996	125	0.38	48
1997	117	0.37	43
1998	136	0.29	39
1999	185	0.22	41
2000	255	0.18	46
2001	380	0.12	46
2002	427	0.11	47

Therefore, instead of developing separate line-by-line MOU and tariff projections, the size of mobile sector with respect to GDP is calculated. This ratio explains how much of an average household income is devoted to the mobile sector. Table 4.7 provides a comparison of some countries in terms of mobile sector as a percentage of GDP.

Table 4.7. Mobile sector as per cent of country GDP

<u>Country</u>	<u>GDP per Capita (US\$)</u>	<u>Mobile Sector as % of GDP</u>
Bangladesh	420	0.5%
Pakistan	600	0.5%
Denmark	40,650	0.6%
Sweden	35,770	0.7%
Norway	52,030	0.8%
Ukraine	1,260	1.2%
Turkey (before tax)	3,750	1.7%
Brazil	3,090	1.3%
Italy	26,120	1.5%
Greece	16,610	1.8%
Hungary	8,270	2.0%
Malaysia	4,650	2.6%
Turkey (after tax)	3,750	3.8%

As seen from Table 4.7, the levels in Turkey are already one of the highest in the world. This means the sector already represents a very high proportion of average spending. One of the main obstacles for the further growth of Turkish mobile market is high tax burden. Turkey ranks first in the world in terms of taxes on mobile services and mobile handsets. Nearly 55 per cent of a mobile services invoice directly goes to the State in the form of indirect taxes and license fees. Moreover, the State also collects a corporate tax of 20 per cent on the profits of mobile firms and withholding tax of 10 per cent on the dividends of mobile service firms.

With that respect, in the valuation of Turkcell, ARPU is not forecasted to remain its existing levels. On the other hand, due to the market power of Turkcell and market expectation that new operators will also focus on value, a downward move in ARPU levels in the medium term is not also forecasted, which would endanger the health of the sector in the long run. As such, projections of mobile sector growth are provided in Table 4.8. As seen from this table, the projections correspond to around 4.0 per cent levels for before-tax and 2.0 per cent levels for pre-tax.

Table 4.8. Development of Turkish mobile market

(US\$ bn unless otw. stated)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<u>GDP Growth Figures</u>														
GDP-Turkey	183	240	303	382	407	434	461	488	513	538	565	593	623	654
Annual Growth (%)		31%	26%	26%	7%	7%	6%	6%	5%	5%	5%	5%	5%	5%
<u>No of Subscribers (mn)</u>														
Turkcell Subscriber	16	19	23	28	32	37	39	41	42	44	45	45	45	45
Other Subscriber	8	9	11	16	19	23	26	29	31	34	37	39	41	44
Total No of Subscribers in Turkey	23	28	35	44	51	60	65	70	74	78	81	84	86	89
<u>ARPU Levels (US\$/months/subs)</u>														
Turkcell ARPU	12	11	13	13	13	12	12	12	12	11	11	11	10	10
Other Operators Assumed ARPU	8	8	9	10	10	10	10	10	10	10	10	10	10	10
<u>Mobile Market Size as % of GDP</u>														
Total Market Size after Taxes	2.9	3.3	4.8	6.3	7.3	8.3	8.8	9.3	9.7	10.1	10.3	10.4	10.6	10.7
GSM Market as % of GDP	1.6%	1.4%	1.6%	1.7%	1.8%	1.9%	1.9%	1.9%	1.9%	1.9%	1.8%	1.8%	1.7%	1.6%
<u>Mobile Market Size as % of GDP</u>														
Tax Rate	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%	56%
Total Market Size before Taxes	7	7	11	14	16	19	20	21	22	23	23	24	24	24
GSM Market as % of GDP	3.6%	3.1%	3.6%	3.8%	4.1%	4.4%	4.4%	4.3%	4.3%	4.2%	4.1%	4.0%	3.9%	3.7%

As for development of market share projections, a short history of the competitive situation in Turkish mobile telecom market is hereby provided. Two 900MHz concessions were awarded to Telsim and Turkcell in 1993 to provide GSM cellular services under a revenue-sharing basis with Türk Telekom. In April 1998, these two operators became stand-alone companies. A partially successful license sale in April 2000 saw a third GSM license, at 1800MHz, awarded to a Telecom Italia/IsBank consortium, for US\$2,525 million, although the government failed in its efforts to sell another license. A further GSM 1800MHz license was awarded to Türk Telekom. Nevertheless, establishing fair and transparent interconnection agreements with the market leaders, Telsim and Turkcell, proved more difficult to achieve than expected, and the IS/TIM business merged with Türk Telekom's GSM 1800 business in February 2004 to create Turkey's only nationwide GSM 1800 platform under the brand name Avea.

Being the market leader of the mobile market since its inception in 1999, Turkcell has been the dominant market leader. The Company managed to sustain its market share around 67 per cent levels without any major problem. After issuance of mobile licenses, the company acquired the market leadership position by capitalizing on the financial power of its partners and the technical know-how of its strategic partner.

Telsim was founded in 1994 by Uzan Group. The Company has around 2000 personnel. As at September end, Telsim has 9.7 million subscribers, corresponding to a market share of 25 per cent. Telsim recorded revenues of US\$700 million in year 2004. The envisaged revenues for year 2005 are US\$1 billion. Being the second largest company in the sector, Telsim was formerly owned by the Uzan family. The government took over Telsim, along with 200 other Uzan companies, to collect debts stemming from the failure of the family's flagship bank, İmarbank. In October 2005, Telsim was acquired by Vodafone, the second largest mobile operator in the globe. Vodafone provides service to 171 million people across 27 countries.

Avea is a partnership between Turk Telecom and Telecom Italia Mobile, which has about 6.5 million users. Turk Telekom was sold to a Saudi Oger Telecom-led consortium in July 2005.

Currently, Turkish mobile market indicates a nearly monopolistic market structure. Turkcell capitalizes on its on-net advantage to retain the high value customers and attract new customers. Turkcell also has the most developed network in Turkey and prevented other operators to use that network with several measures. The market is highly dependent on prepaid cards, which represent around 75 per cent of the total. Postpaid growth is flat. Prepaid subscription is also expected to compromise 95 per cent of net additional subscription in the coming periods.

The competitive situation in mobile market is expected to change after year 2005 significantly. There are two main drivers behind the expected change

- In 2005, competitors of Turkcell had been acquired by financially strong and committed companies. The entry of Vodafone in the market is expected to significantly change the landscape. The main leverages for Vodafone will be (i) its financial power and strategic know-how (ii) operational synergies (i.e. Vodafone will treat all calls made to countries that it already provides services to as if they are being made within the same network) and (iii) its aggressive marketing strategy such as offering handsets cheap or free to contract customers to lure away customers from rivals (Handset subsidies, common in Europe, are non-existent in Turkey). Vodafone states that the company plans to invest significantly in Telsim's infrastructure, to ensure superior network performance and greatly enhanced customer service Vodafone has pledged to invest US\$1 billion in Telsim in the short term and is expected to plow US\$1.5 billion into its radio and core network, and on areas such as billing platforms, call centers and data centers over the next two to three years. Oger Telekom, which is the owner of Türk Telekom, is also consolidating its shareholding in Avea and aims to capitalize on synergies between fixed lines and mobile lines.
- The Authority is working on important subjects that will critically affect the market dynamics such as number portability, draft law amending the wireless law, draft electronic communications law and draft law amending environmental law. Number portability law will diminish existing competitive first-mover advantage of Turkcell.

However, it is also envisaged that aggressive price competition is unlikely. New investors are all financially related and they both emphasize value and profitability for the successful growth of businesses. With the exception of one or two cases, Vodafone has not had a disruptive impact on these markets, but rather opted for steady growth with the markets, with the emphasis on branding and profitability.

With that respect, as for market share, it has been conservatively assumed that Turkcell will have a lower market share in the medium term. Market share projections of Turkcell are set forth in Table 4.9.

Table 4.9. Turkcell market share development

(million unless otw. stated)	<u>2002A</u>	<u>2003A</u>	<u>2004A</u>	<u>2005A</u>	<u>2006E</u>	<u>2007E</u>	<u>2008E</u>	<u>2009E</u>	<u>2010E</u>	<u>2011E</u>	<u>2012E</u>	<u>2013E</u>	<u>2014E</u>	<u>2015E</u>
No of Turkcell Subscribers	15.7	19.0	23.4	27.9	32.3	37.0	39.1	40.9	42.4	43.9	44.6	44.9	45.1	45.3
No of Other Operator Sub.	7.6	8.9	11.3	15.7	19.2	23.2	25.9	28.7	31.3	34.2	36.7	38.8	41.1	43.5
Market Share of Turkcell (%)	67%	68%	67%	64%	63%	61%	60%	59%	57%	56%	55%	54%	52%	51%
Market Share of Other Operators (%)	33%	32%	33%	36%	37%	39%	40%	41%	43%	44%	45%	46%	48%	49%

4.1.1.3. Step I-c: Development of Earning Forecasts. Turkcell's blended ARPU was US\$13 per month per subscriber in year 2005. Telsim's ARPU for 2005 is estimated around US\$9.5 per month per subscriber for 2005. Such ARPU figures are stated before mobile taxes. As stated in Section 4.1.1.2, Turkey ranks first in the world in terms of taxes on mobile services and mobile handsets. Nearly 55 per cent of a mobile services invoice directly goes to the State in the form of indirect taxes and license fees. This means that average monthly cost of the mobile services for a Turkcell subscriber in 2005 is around US\$30 per month per subscriber. This fact should be incorporated in the comparisons with other benchmark countries, where tax makes up from 0 per cent to 10 per cent of total cost of a mobile invoice.

As a summary, Turkcell revenue projections were developed on ARPU level and number of subscribers. ARPU levels are assumed to remain at their current levels throughout the projection period. Revenue projections of Turkcell are provided in Table 4.10.

Turkcell cost projections are based on margins in correlation with the historical levels. Direct cost of revenues mainly include ongoing license fees, interconnection expenses, base station rents, depreciation and amortization charges, repair and maintenance expenses directly related to services rendered. General and administration expenses mainly consist of repair and maintenance, insurance, consulting, payroll, travel, project, rent, training, legal and bad debt provision expenses. Selling and marketing expenses mainly consist of advertising expenses, promotional expenses and frequency usage fees. Cost projections for Turkcell are provided in Table 4.11.

4.1.1.4. Step I-d: Development of Capital Expenditure Forecasts. For mobile companies, the capital expenditure estimates are generally stated as per cent of revenues. Capital expenditure plan does not include the required investment for the issuance 3G license. It is not currently decided whether the 3G license will be awarded. In addition, the business model relying on such a license will be entirely different from the current one. Details of capital expenditure calculations are set forth in Table 4.12

4.1.1.5. Step I-e: Development of Working Capital Forecasts. Working capital projections are projected on the basis of percentage of revenue. In the net, Turkcell runs a working capital near to 18 per cent of its revenues. Such level is also used for the working capital forecasts. Details of working capital calculations are set forth in Table 4.13

4.1.1.6. Step I-f: Development of Tax Forecasts. As the valuation is based on the cashflows to firm, tax forecasts are based on the operating profit of Turkcell. 20 per cent is used as the corporate tax rate.

4.1.1.7. Step I-g: Development of Cashflow Forecasts. Cashflows of Turkcell are calculated in Table 4.14.

Table 4.14. Cashflow projections of Turkcell

(US\$ mn unless otw. stated)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Revenues	1,974	2,219	3,201	4,269	4,620	5,190	5,563	5,706	5,793	5,847	5,837	5,737	5,605	5,467
Cost of Revenues	-1,367	-1,613	-2,001	-2,391	-2,588	-2,907	-3,116	-3,196	-3,244	-3,275	-3,269	-3,213	-3,139	-3,062
Gross Profit	607	606	1,200	1,878	2,032	2,283	2,447	2,510	2,548	2,572	2,568	2,524	2,466	2,405
<i>Gross Margin (%)</i>		27.3%	37.5%	44.0%	44.0%	44.0%	44.0%	44.0%	44.0%	44.0%	44.0%	44.0%	44.0%	44.0%
Sales & Marketing Exp.	-223	-295	-349	-489	-529	-594	-637	-653	-663	-669	-668	-657	-642	-626
General Adm. Exp.	-105	-137	-137	-152	-164	-185	-198	-203	-206	-208	-208	-204	-200	-195
Operating Profit	279	174	713	1237	1339	1504	1612	1654	1679	1695	1692	1663	1624	1585
Add: Depreciation & Amortization		422	424	696	565	718	784	823	852	870	878	880	872	854
EBITDA	704	643	1,339	1,933	1,904	2,223	2,397	2,477	2,531	2,564	2,570	2,543	2,497	2,439
<i>EBITDA Margin (%)</i>	36%	29%	42%	45%	41%	43%	43%	43%	44%	44%	44%	44%	45%	45%
EBITDA	704	643	1,339	1,933	1,904	2,223	2,397	2,477	2,531	2,564	2,570	2,543	2,497	2,439
Less: CapEx	-128	-173	-487	-778	-693	-778	-834	-856	-869	-877	-876	-861	-841	-820
Less: Tax				-247	-268	-301	-322	-331	-336	-339	-338	-333	-325	-317
Less: Change in WC	-279	-311		-66	-65	-105	-69	-26	-16	-10	2	18	24	25
Cashflow to Firm	127	709		1,089	1,146	1,339	1,493	1,594	1,646	1,677	1,696	1,700	1,680	1,644

4.1.2. DCF Valuation of Turkcell - Step II: Estimation of the Discount Rate

In order to calculate the WACC for Turkcell, cost of equity and cost of debt and their relative weight should be estimated according to Formula 3.13.

4.1.2.1. Step II-a: Cost of Equity Estimation. Estimation of the cost of equity for Turkcell is undertaken pursuant to CAPM approach according to Formula 3.16. As Turkcell is a public company, beta is estimated from the historical correlations between the return of Turkcell stock and ISE. By applying the Formula 3.18, assuming 10 per cent for debt as a share of total financing for Turkcell and a tax rate of 20 per cent, unlevered beta of Turkcell is calculated as 1.06. Calculation of cost of equity for Turkcell is provided in Table 4.15.

Table 4.15. Cost of equity estimation for Turkcell

Real Risk Free Rate	2.07%
Turkey Country Risk Premium	10.84%
Unlevered Beta of the Firm	1.06
Risk Premium for the Firm	11.49%
Cost of Equity for the Firm	13.56%

4.1.2.2. Step II-b: Cost of Debt Estimation. Since Turkcell does not have a bond currently, the borrowing history of the company is reviewed in order to estimate the current spreads. As at 31 March 2006, the longest debt term for Turkcell is around two years. The interest rate for these loans is at 8.33 per cent. By applying Formula 3.19 and 3.20, cost of debt for Turkcell is calculated in Table 4.16.

Table 4.16. Cost of debt estimation for Turkcell

Interest Rate of Existing Firm Debt	8.33%
Risk Free Rate for the term of Existing Firm Debt	4.37%
Spread for the Existing Firm Debt	3.96%
Risk Free Rate for 10 years	4.38%
Nominal Cost of Debt for the Firm	8.34%
Less: Implied Inflation	2.31%
Real Cost of Debt for the Firm	6.03%
Tax Rate	20%
Cost of Debt for the Firm (after tax)	4.82%

4.1.2.3. Step II-c: WACC Estimation. The weighted average cost of capital is simply the weighted cost of the capital supplied by the debt and equity financiers at different costs. In order to compute WACC, the market value of debt and equity should be considered.

For Turkcell, the debt value has decreased significantly as a policy of the company. With that respect, the financing policies of global mobile telecom companies were investigated with a view to understanding the extent of financial leverage employed in the business. From these, 10 per cent debt – 90 per cent equity is understood to be the generally accepted financing mix for the mobile companies.

Based on these assumptions, WACC of Turkcell is calculated according to Formula 3.13 as set forth in Table 4.17.

Table 4.17. WACC estimation for Turkcell

Cost of Equity	13.56%
Equity as % of total financing	90%
Cost of Debt (after tax)	4.82%
Debt as % of total financing	10%
WACC (after tax)	12.7%

4.1.3. DCF Valuation of Turkcell - Step III: Calculation of Terminal Value

Cashflow value method was selected for Turkcell in order to calculate terminal value according to Formula 3.24. As for the estimation of growth rate, if it is envisaged that the company will generate most or all of its cashflows from a domestic economy, its growth should be bound to the overall growth of overall economy. With that respect, 3 per cent were taken as the growth rate for the terminal value calculation. Calculation of terminal value for Turkcell is set forth in the Table 4.18:

Table 4.18. Calculation of terminal value for Turkcell

WACC (%)	12.7%
Terminal Growth Rate (%)	3%
Cashflows to Firm at 2015 (US\$ mn)	1,644
Terminal Value at 2015 (US\$ mn)	17,461
Years between 2005 – 2015	10
Discount Factor between 2005 and 2015	3.31
Discounted Terminal Value at 2005 end (US\$ mn)	5,282

4.1.4. DCF Valuation of Turkcell - Step IV: Calculation of Equity Value

By adding the discounted cashflows between 2006 and 2015 to the discounted terminal value, enterprise value is calculated according to Formula 3.3. From Formula 3.25, equity value of Turkcell can be calculated according to Table 4.19. As Turkcell has a negative debt position (corresponding to net cash), value of debt is negative and as such, equity value is higher than the enterprise value.

Table 4.19. Calculation of equity value for Turkcell

(US\$ million)	<u>2005-end</u>
Discounted Cashflows to Firm	8,285
Discounted Terminal Value (from 2015)	5,282
Enterprise Value at the end of 2005 (Turkey)	13,567
Add: Value of Other Subsidiaries	500
Enterprise Value at the end of 2005 (Total)	14,067
Less: Value of Debt	-148
Equity Value	14,215

Finally, a sensitivity analysis was undertaken with respect to the country risk premium and terminal growth rate.

Table 4.20. Sensitivity analysis for Turkcell

(US\$ million)		<u>Terminal Growth Rate</u>		
<u>Country Risk</u>	<u>WACC</u>	<u>2%</u>	<u>3%</u>	<u>4%</u>
<u>4.00%</u>	<u>10.8%</u>	16,488	17,440	18,672
<u>6.00%</u>	<u>12.7%</u>	13,675	14,215	14,879
<u>8.00%</u>	<u>14.6%</u>	11,703	12,033	12,425

4.1.5. Relative Valuation of Turkcell- Step I: Finding Comparable Firms

In order to undertake a relative valuation for Turkcell, the publicly quoted mobile telecommunication companies in the emerging markets were used as benchmarks. There is not any other publicly quoted mobile telecommunication company in Turkey.

Mobile TeleSystems (MTS) is the largest mobile phone operator in Russia and the CIS, operating exclusively in GSM standard. Together with its subsidiaries, the company provides its services to over 54.1 million customers, in a license footprint area covering a population of 233.1 million in 86 out of 88 regions in Russia and the entire territories of Ukraine, Belarus, Uzbekistan and Turkmenistan.

MTN Group is an Africa-focused holding company that invests in the telecommunications industry, providing cellular, satellite and Internet access services to 14 African countries.

Orascom Telecom is a leading mobile telecommunications company with GSM operations in seven emerging markets in the Middle East, Africa and South Asia, having a total population under license of approximately 460 million with an average mobile telephony penetration of approximately 8 per cent. Orascom Telecom operates GSM networks in Algeria, Pakistan, Egypt, Tunisia, Iraq, Bangladesh and Zimbabwe. Orascom Telecom had 17.5 million subscribers as of March 31, 2005.

VimpelCom is a leading international provider of mobile telecommunications services in Russia and Kazakhstan, with newly acquired operations in Ukraine. The VimpelCom Group's license portfolio covers approximately 200 million people.

Geographically it covers 78 regions in Russia (with 136.5 million people, representing 94 per cent of Russia's population) as well as the entire territory of Kazakhstan and Ukraine. VimpelCom was the first Russian company to list its shares on the New York Stock Exchange. As of September 30, 2005, VimpelCom's total number of subscribers was 40.1 million, with 8.9 million subscribers in the Moscow license area, 29.5 million subscribers in the regions outside Moscow and 1.7 million subscribers in Kazakhstan. As of November 17, 2005, there were 42.4 million subscribers on VimpelCom's network, including 1.8 million in Kazakhstan and 0.2 million in Ukraine.

Partner Telecom is a leading mobile telecom company based on Israel.

4.1.6. Relative Valuation of Turkcell- Step II: Selection of Multiples

For Turkcell, P/B, P/E, EV/EBITDA and EV/Subscriber multiples were used under the scope of relative valuation.

4.1.7. Relative Valuation of Turkcell- Step III: Application

In this step, the earning multiples for international firms were averaged and applied to Turkcell in order to calculate the equity value. Relative valuation of Turkcell is provided in Table 4.21. Following criteria were used for the relative valuation of Turkcell.

- 2005 EBITDA: US\$1.93 billion
- 2006 EBITDA: US\$1.904 billion
- Book Value (31 December 2005): US\$2.7 billion
- 2005 Net Profit: US\$0.9 billion
- 2006 Net Profit: US\$1.0 billion

Table 4.21. Relative valuation of Turkcell

Company	P/BV	P/E		EV/EBITDA	
	2006e	2005e	2006e	2005e	2006e
Mobile TeleSystems	3.3x	12.2x	12.8x	6.1x	5.5x
MTN Group	3.5x	16.8x	15.3x	8.8x	6.0x
Orascom Telecom	3.9x	17.6x	12.6x	8.1x	6.0x
Partner	4.4x	10.6x	9.6x	4.5x	4.6x
VimpelCom	2.5x	13.5x	12.1x	6.8x	5.7x
Vodafone Egypt	5.1x	22.7x	16.0x	8.9x	6.8x
Average Multiples	3.8x	15.6x	13.1x	7.2x	5.8x
Equity Value (US\$ bn)	10.3	13.9	13.5	14.0	11.2

As seen Table 4.21, the relative valuation gives market value of Turkcell in the range of US\$10.3 billion to US\$14.0 billion.

4.2. Implementation of the Valuation Procedure on Akenerji

Akenerji is one of the largest private free market power producers in Turkey. As at the beginning of 2006, the Company operates 12 natural gas fired thermal power plants throughout Turkey to supply electricity and steam to its customers. Installed power and steam generating capacity of the Company are 541 MW and 1107 tons/hour. The Company is currently investing in two hydro power plants which will increase its capacity to 715 MW.

Summary of the results obtained with the implementation of the valuation procedure on Akenerji is set forth in Section 4.2.1 and Section 4.2.2. Detailed analysis regarding the implementation of the valuation procedure on Akenerji can be found in Appendix A.

4.2.1. DCF Valuation of Akenerji

For the last 10 years, Turkey has been one of the fastest growing electricity markets in the world with an average growth rate of seven per cent. It is expected that energy consumption will reach from 160 billion kWh in 2005 to 500 billion kWh in 2020 with conservative growth assumptions. In comparison, the maximum production that can be

attained with the current generation capacity is around 220 billion kWh. These growth rates show that, the existing capacity will not be sufficient after 2008-2009

Akenerji generates revenue from three main sources:

- Electricity Revenues from Existing Gas Plants
- Steam Revenues from Existing Plants
- Electricity Revenues from New Hydro Plants

As for the power plant portfolio, the value of existing power plants in operation and two hydro plants under construction are taken into consideration.

Akenerji sells at a fixed discount to the market price of electricity. Based on the dynamics of the sector, a level of the medium term electricity price which will attract new investments in the industry is calculated. As a result, it is forecasted that electricity prices will have to be increased in the coming years.

Steam revenues are forecasted based on the historical realizations.

Costs of Akenerji has been categorized as fuel cost, other production costs of natural gas fired power plants, cash production costs of hydro power plants, operating expenses and depreciation. Fuel cost of the gas plants are estimated based on the efficiency levels of the existing power plant portfolio. A fixed figure in line with the realizations is used for the other operation costs. For the cash production cost of each hydro power plant, a fixed figure is also projected. Annual operating expenses are also assumed to remain at a fixed level throughout the projection period. Depreciation is forecasted as a percentage of fixed assets.

Capital expenditure forecasts consist of maintenance expenditures of the existing power plants and required investment for the new hydro plants. Working capital levels are forecasted on the basis of days.

Estimation of the cost of equity for Akenerji is undertaken pursuant to CAPM approach according to Formula 3.16. As Akenerji is a public company, beta is estimated from the historical method which involves a regression of the historical returns of a security against the historical returns of a market index. For Akenerji, the calculated beta is 0.82. As Akenerji has a net cash position, Formula 3.18 was not applied.

Cost of debt for Akenerji is extrapolated from the existing borrowing costs.

It was observed that 20 per cent debt – 80 per cent equity is the generally accepted financing mix for the electricity companies in the world

Results of DCF valuation of Akenerji is presented in Table 4.22. As Akenerji has a negative debt position (corresponding to net cash), value of debt is negative and as such, equity value is higher than the enterprise value.

Table 4.22. Summary DCF valuation of Akenerji

Cost of Equity	10.96%
Equity as % of total financing	80%
Cost of Debt (after tax)	4.8%
Debt as % of total financing	20%
WACC (after tax)	9.72%
2005 end	(US\$ million)
Discounted Cashflows to Firm from 2006 to 2015	203.2
Discounted Terminal Value (from 2015)	333.2
Enterprise Value	536.4
Less: Value of Debt	-102.0
Equity Value	638.4

Finally, a sensitivity analysis was undertaken with respect to the country risk premium and terminal growth rate.

Table 4.23. Sensitivity analysis for Akenerji

(US\$ mn)		<u>Terminal Growth Rate</u>		
<u>Country Risk</u>	<u>WACC</u>	<u>0%</u>	<u>1%</u>	<u>2%</u>
<u>4.00%</u>	<u>8.4%</u>	715	772	846
<u>6.00%</u>	<u>9.7%</u>	602	638	686
<u>8.00%</u>	<u>11.0%</u>	519	545	576

4.2.2. Relative Valuation of Akenerji

After comparing Akenerji with its peers in the emerging markets, Akenerji equity value is calculated as US\$1.2 billion based on installed capacity multiple. Results of relative valuation model are provided in Table 4.24.

Table 4.24. Relative valuation of Akenerji

<u>Company</u>	<u>Country</u>	<u>Enterprise Value (US\$ mn)</u>	<u>Installed Power (MW)</u>	<u>EV/Installed Capacity (US\$m per MW)</u>
GENER	Chile	1,770	2,428	0.73
ENDESA	Chile	25,547	13,986	1.83
MALAKOFF BHD	Malaysia	3,286	2,293	1.43
YTL POWER	Malaysia	4,814	1,212	3.97
Weighted Average of the Multiple				2.03

4.3. Implementation of the Valuation Procedure on Migros

Migros Türk was founded in 1954 as a joint initiative of the Swiss Migros Cooperatives and Istanbul Municipality. The company was acquired by Koç Group in 1975. The company is currently operating in Turkey, Russia, Kazakhstan, Azerbaijan, Bulgaria and Macedonia. It has more than 481,987 sqm. net sales area in 566 stores, employing 11,821 people in 2005 before Tansaş acquisition. Migros Türk is listed on ISE since 1991.

Summary of the results obtained with the implementation of the valuation procedure on Migros is set forth in Section 4.3.1 and Section 4.3.2. Detailed analysis regarding the implementation of the valuation procedure on Migros can be found in Appendix B.

4.3.1. DCF Valuation of Migros

Migros operates in a number of countries, of which Turkey and Russia are the most important. With that respect, separate projections were developed for Turkey, Russia and remaining countries. Revenues projections are based on shopping area forecasts and revenue per square meter forecasts. Such forecasts are ensured to include the additional growth coming from the acquisition of Tansaş.

Migros margin projections are mainly based on the historical levels. Capital expenditure projections of Migros were developed based on the envisaged growth of square meter per area. Working capital projections are projected on the basis of days. As Migros has a negative working capital, growth in revenues brings additional cashflows to the company. Working capital changes of Migros are calculated based on percentage of revenues.

Estimation of the cost of equity for Migros is undertaken pursuant to CAPM approach according to Formula 3.16. Beta of Migros is 0.8. Due to the special situation of retail sector, Migros uses a negative debt/equity ratio of 13%. By applying Formula 3.18, with a tax rate of 20 per cent, unlevered beta of Migros is calculated as 0.89. Cost of debt is estimated by extrapolating the cost of debt on the balance sheet. WACC is calculated by assuming -15 per cent debt and 115 per cent equity as the financing mix.

Results of the discounted cashflow valuation of Migros are provided in Table 4.25.

Table 4.25. Summary DCF valuation of Migros

Cost of Equity	11.71%
Equity as % of total financing	115%
Cost of Debt after tax	4.2%
Debt as % of total financing	-15%
WACC (after tax)	12.8%
<u>(US\$ million)</u>	<u>2005-end</u>
Discounted Cashflows to Firm from 2006 to 2015	1,136
Discounted Terminal Value	1,011
Enterprise Value	2,147
Less: Value of Debt	277
Equity Value	1,870

Finally, a sensitivity analysis was undertaken with respect to the country risk premium and terminal growth rate.

Table 4.26. Sensitivity analysis for Migros

(US\$ mn)		<u>Terminal Growth Rate</u>		
<u>Country Risk</u>	<u>WACC</u>	<u>2%</u>	<u>3%</u>	<u>4%</u>
<u>4.00%</u>	<u>10.8%</u>	2,324	2,511	2,754
<u>6.00%</u>	<u>12.8%</u>	1,768	1,870	1,996
<u>8.00%</u>	<u>14.9%</u>	1,395	1,456	1,528

4.3.2. Relative Valuation of Migros

Based on the peer averages, equity value of Migros is calculated as US\$1.25 billion based on EV/Sales multiple and US\$1.63 billion based on EV/EBITDA multiple. Relative valuation of Migros is set forth in Table 4.27.

Table 4.27. Relative valuation of Migros

<u>Company</u>	<u>Market Capitalization (30 April 2006)</u>	<u>2006E EV/S</u>	<u>2006E EV/EBITDA</u>
Tesco	45,102	0.80	9.73
Ahold	12,315	0.32	7.26
Sainsbury	9,795	0.47	8.28
Carrefour	37,554	0.52	8.25
Delhaize	6,827	0.50	5.36
Casino	7,651	0.45	7.39
Metro	16,735	0.33	7.10
Average		0.48	7.62

4.4. Implementation of the Valuation Procedure on İzocam

Established in 1965, İzocam Ticaret ve Sanayi A.Ş. is the market leader thermal insulation company in Turkey. İzocam mainly manufactures, markets and sells (i) fibre insulation materials such as glass wool and rock wool; (ii) plastic insulation materials such as extruded polystyrene foam, expanded polystyrene foam and elastomeric rubber flex, (iii) necessary materials and solutions to a myriad of heat, sound and fire insulation and waterproofing; and (iv) roof and wall claddings - including PU and mineral wool panels - lightweight steel construction systems and suspended ceiling and partition wall systems. In domestic market, the Company has been the market leader in each major thermal insulation sub-segment. In addition to its leadership in domestic market, the Company exports around 30 per cent of its mineral wool production mainly to Middle Eastern, Balkan and CIS countries, by capitalizing on high manufacturing quality, low cost base and proximity to such markets. The Company is a part of Koç Group.

Summary of the results obtained with the implementation of the valuation procedure on İzocam is set forth in Section 4.4.1 and Section 4.4.2. Detailed analysis regarding the implementation of the valuation procedure on İzocam can be found in Appendix C.

4.4.1. DCF Valuation of İzocam

For İzocam, revenues are forecasted on line-by-line basis for each thermal insulation product. Volume and price projections were developed separately. As for the domestic market, it is projected that İzocam will maintain its market share for mineral wools and

XPS products which makes up around 60 per cent of total revenue. For EPS and elastomeric rubber, a lower growth rate is projected. For Tek-Iz products, a growth in parallel with the market is assumed. As for export projections, historical growth trend for the projections is used.

İzocam margin projections are mainly based on the historical levels. Direct cost of revenues mainly includes raw material costs, labor costs, overhead and depreciation expenses. Depreciation expenses are projected based on the fixed asset base of the company. Operating expenses consist of selling and marketing expenses and general administration expenses.

Capital expenditure projections for İzocam consist of capacity expansion investments and maintenance investments. It must be underlined that, because of the production technology, the furnaces used for the manufacturing of mineral wools are destroyed and rebuilt in each five years. İzocam uses this required investment as an opportunity for an increase in capacity in order to cope with the growing demand. Required level of capacity increase is calculated according to the production volumes. Annual maintenance expenditures are projected in line with the historical levels.

Working capital projections are projected on the basis of percentage of revenue.

Estimation of the cost of equity for İzocam is undertaken pursuant to CAPM approach according to Formula 3.16. Beta value for İzocam is 0.81.

By applying Formula 3.18, assuming 10 per cent for debt as a share of total financing for İzocam and a tax rate of 20 per cent, an unlevered beta of 0.74 is calculated for İzocam. Cost of debt is forecasted based on the existing borrowing cost of the company. For İzocam, a 10 per cent debt – 90 per cent equity is projected as the financing choice.

The results of the discounted cashflow valuation are provided in Table 4.28. İzocam has a net cash position, as such equity value is higher than the enterprise value.

Table 4.28. Summary DCF valuation of İzocam

Cost of Equity	10.13%
Equity %	90%
Cost of Debt (after tax)	4.5%
Debt %	10%
WACC (after tax)	9.6%
<u>(US\$ million)</u>	<u>2005-end</u>
Discounted Cashflows to Firm from 2006 to 2015	106
Discounted Terminal Value	154
Enterprise Value	260
Less: Value of Debt	-6
Equity Value	266

Finally, a sensitivity analysis was undertaken with respect to the country risk premium and terminal growth rate.

Table 4.29. Sensitivity analysis for İzocam

(US\$ million)		<u>Terminal Growth Rate</u>		
<u>Country Risk</u>	<u>WACC</u>	<u>2%</u>	<u>3%</u>	<u>4%</u>
<u>4.00%</u>	<u>8.2%</u>	303	340	395
<u>6.00%</u>	<u>9.6%</u>	245	267	297
<u>8.00%</u>	<u>10.9%</u>	205	219	237

4.4.2. Relative Valuation of İzocam

Results of relative valuation model are provided in Table 4.30.

Table 4.30. Relative valuation of İzocam

	<u>Market Capitalization</u> (US\$ mn) (25/05/2006)	<u>P/E Multiple (x)</u> 2005	<u>EV/EBITDA Multiple (x)</u> 2005	<u>EV/S Multiple (x)</u> 2005
Alarko Carrier	112.4	7.6	6.0	0.6
Borusan Mannesmann	181.7	12.7	6.4	0.4
Ege Profil	130.3	12.7	9.5	1.4
Türk Demirdöküm	316.2	14.8	6.4	0.8
Average		12.0	7.1	0.8
İzocam Equity Value (US\$ mn)		180	201	121

4.5. Results of the Implementation

Summary of the results of the implementation is provided in Table 4.31. The results obtained with the implementation of the valuation procedure for Turkcell, Migros and Izocam are within the observed range of market values on ISE in the last year. The results obtained for Akenerji are very high with respect to observed market values. As such, it may be claimed that the valuation procedure is successful in a broad sense in identifying the valuation range of companies.

Table 4.31. Results of the implementation of the valuation procedure

(US\$ million)	<u>Results of the Valuation Procedure</u> <u>DCF Valuation Part</u>	<u>Results of the Valuation Procedure</u> <u>Relative Valuation Part</u>	<u>Minimum and Maximum Market Value on ISE between 25 May 2005 and 25 May 2006</u>
Turkcell	11,703-18,672	10,300– 14,000	7,716 – 14,709
Akenerji	519-846	1,200	167 – 351
Migros	1,395 – 2,754	1,250 – 1,630	856 – 1,730
İzocam	205 – 395	180-201	69 – 251

As for Turkcell, it is observed that results obtained with the implementation of the valuation procedure are within the range of market values observed within the last year. Accordingly, it can be claimed that, the assumptions for the valuation procedure used in this thesis is in line with the market's general view on valuing Turkcell.

As for Akenerji, the results obtained with the implementation of the valuation procedure are far below from the market values observed within last year. It is evident that, the market is currently focused on the existing lack of profitability in Akenerji business and does not factor in the future unavoidable increases in the electricity prices. This discrepancy provides a good case where the assumptions of the market and the assumptions used in this thesis are significantly different.

For Migros, it is observed that results obtained with the implementation of DCF part of the valuation procedure is close to the upper range of the observed market values whereas the results obtained with the implementation of relative valuation part of the valuation procedure is within the observed range. This may be due to the fact that the market is mainly focused on 2005 and 2006 results at which relative valuation is mainly focused while it does not fully factor in the continuing growth for the coming years.

For İzocam, it is also observed that the result obtained with DCF part of the valuation procedure is not within the observed market values range while it is very close to the upper boundary. On the other hand, the relative valuation part of the valuation procedure is within the range of realized market values. Like Migros, this may be attributed to the market' focus on existing earnings than the growth to come in the medium term.,

5. CONCLUSIONS

Company valuation theory is being implemented in a wide array of real life stock market transactions, merger & acquisitions, initial and secondary public offerings, company restructurings, capital budgeting as well as performance evaluation techniques.

In portfolio management and securities research, valuation plays a central role for active investors and fundamental analysts. They use valuation methods to determine the undervalued or overvalued companies in the stock exchange by comparing their analysis results with the market price. Although foreign investors have been utilizing these techniques for a very long time, increased use of the detailed valuation models and advanced techniques is also becoming a market standard in Turkey.

Mergers and acquisitions is another area of practice of which valuation is of key importance. The buyer in a merger and acquisition transaction should determine the fair value of the target for itself so that it can bid a lower or equal price which will satisfy its return requirements. This is also valid for the seller, who should determine what to ask for from the investor. With the increased level of merger & acquisition activity reaching US\$40 billion in year 2005, correct valuation of Turkish companies from a merger & acquisition prospective has become of crucial importance for each investor and seller.

Copeland *et al.* (2000) discusses that, “corporate strategy” and “corporate finance” have come together with a resounding crash in the last decades. The defined objective of a company’s existence, “maximizing of its value on behalf of its shareholders” brings a challenge to the business managers. They need to manage value and focus on value in their corporate and business-level strategies. As such, a clear thinking about valuation and skill in using valuation to guide business decisions are prerequisites for success in today’s business environment. In parallel with the continuing restructuring of Turkish conglomerates and increased spin-off and new business expansion activity, valuation models have also been in widely use in Turkish corporate management world.

Amongst the valuation techniques, discounted cash flow and relative valuation techniques are the most preferred ones. Thus, in this thesis, a procedure for valuing companies was developed based on these methods:

The procedure was then implemented for the valuation of four Turkish companies from different industries: telecommunication, energy, retail and manufacturing. The implementation required full understanding of the company's operations, its industry dynamics and financial performance.

For DCF valuation, cashflows to firm were projected by considering the industry dynamics, price and market share development, historical financial performance of the firm, investment requirements, working capital policy and tax outlays. Afterwards, an appropriate discount rate is calculated by considering the risk level of the country and company and financing mix. Projected cashflows were discounted to the end of year 2005 at the calculated discount rate in order to arrive at the enterprise value of the company. Finally, indebtedness is deducted from the enterprise value in order to calculate equity value.

For relative valuation, comparable firms with similar characteristics were found out. Depending on the level of information available, comparable firms were selected from Turkey or other emerging markets. Then, the multiple set which will be used as a basis for the comparison was selected based on their appropriateness and availability. As a final step, average multiples of the comparable firms were applied at the related parameters of the firm in order to calculate equity value.

Before evaluating the results of the valuation procedure, the following points of critical importance should be emphasized for a correct analysis.

Firstly, the success of the valuation procedure can not be measured by itself from its definition. There is no doubt that the outcome obtained with a valuation study is dependent on the inputs, which leave plenty room for subjective judgments. The analyst's own views with respect to the future development of the country, market and company is of subjective

nature to certain degree. This brings a bias, which should be always reminded in order to correctly evaluate the results of a valuation study.

Second, a valuation study is not timeless. Valuation procedure is affected from changes in input information with time. Continuous change in information set brings continuous need for updating valuations. Although this is sometimes erroneously defined as an “inconsistency”, a good anecdote regarding Lord Keynes explains the situation. When he was criticized for changing his position on a major economic issue: he responded with the following sentence: “When the facts change, I change my mind. And what do you do, sir?”

Another point to consider is the level of error in any valuation. It is unrealistic to expect or demand absolute certainty in valuation, since cashflows and discount rates are estimated with unavoidable error. This also means that a reasonable margin for error in making recommendations on the basis of valuations should always be considered.

It should also be noted that one of the weaknesses of DCF approach is its deterministic structure. Specifically DCF assumes that future cash flow streams are highly predictable. With that respect, the cashflow projections are deterministic and the effects of uncertainty are therefore tackled implicitly by discounting the expected value of the cash flows at a risk-adjusted interest rate. However, under uncertainty, future cash flows of these companies can no longer be characterized by a single value but rather by a range of values of its possible consequences.

Considering these points, the results of the implementation compared with the range of market capitalization on Istanbul Stock Exchange between 25 May 2005 and 25 May 2006 is set forth in the Table 5.1.

Table 5.1. Results of the study

(US\$ million)	<u>Results of the Valuation Procedure DCF Valuation Part</u>	<u>Results of the Valuation Procedure Relative Valuation Part</u>	<u>Minimum and Maximum Market Value on ISE between 25 May 2005 and 25 May 2006</u>
Turkcell	11,703-18,672	10,300– 14,000	7,716 – 14,709
Akenerji	519-846	1,200	167 – 351
Migros	1,395 – 2,754	1,250 – 1,630	856 – 1,730
İzocam	205 - 395	180-201	69 – 251

First of all, the high volatility in the observed market values should be underlined. The ratio of maximum market value observed to the minimum value observed is two for Turkcell, Akenerji and Migros whereas this ratio is four for İzocam. This is due to the significant increase in market valuation in the last year due to the increased investor appetite for Turkish equities.

The results obtained with the implementation of the valuation procedure are either within the range of observed market values and close to the upper limit or above the range of observed market values. This may be attributed to the shorter term focus of the stock market investors as opposed to the long term focus of the valuation procedure. The country risk premium attached by the stock market investors to Turkey can change significantly in short time periods and such abrupt changes in the country risk premium lead to a volatility in the stock market. In addition, Turkish stock market is not very liquid with respect to the stock markets in developed countries, as such, major money inflows to the stock market and outflows from the stock market affect the market values significantly in a very short time frame. Such points are also supported with the fact that the realized valuations in the mergers, acquisitions and privatizations observed in Turkey are generally higher than the observed valuations in the stock market. Considering these factors, it may be claimed that the valuation procedure is more successful in identifying the long term valuation range of companies.

As for Turkcell, it is observed that results obtained with the implementation of the valuation procedure are generally within the range of market values observed within the last year. Accordingly, it can be claimed that, the assumption and the valuation procedure

used in this thesis is in line with the market's general view on valuing Turkcell. It is also observed that the DCF yields results above the observed market value ranges.

As for Akenerji, the results obtained with the implementation of the valuation procedure are far below from the market values observed within last year. It is evident that, the market is currently focused on the existing lack of profitability in Akenerji business and does not factor in the future unavoidable increases in the electricity prices. The discrepancy between discounted cash flow valuation and market values provides a good case where the assumptions of the market and the assumptions used in this thesis are significantly different. However, it should be reminded that relative valuation does not give healthy results for electricity companies, especially for international comparisons as the revenue and cost structures are mostly entirely different within countries.

For Migros, it is observed that results obtained with the implementation of DCF part of the valuation procedure is close to the upper range of the observed market values whereas the results obtained with the implementation of relative valuation part of the valuation procedure is within the observed range. This may be due to the fact that the market is mainly focused on 2005 and 2006 results at which relative valuation is mainly focused while it does not fully factor in the continuing growth for the coming years.

For İzocam, it is also observed that the result obtained with DCF part of the valuation procedure is not within the observed market values range while it is very close to the upper boundary. On the other hand, the relative valuation part of the valuation procedure is within the range of realized market values. Like Migros, this may be attributed to the market' focus on existing earnings than the growth to come in the medium term.

It is also worthwhile to focus on the limitations of the valuation procedure. It is difficult to apply discounted cashflow valuation technique to companies which do not have positive cashflows currently or companies whose cashflows can not be projected with a satisfactory degree of reliability. Damodaran (2002) discusses examples of such companies such as distressed firms, cyclical firms, firms with unutilized assets, firms with patents or reserves, firms involved in acquisition and private firms. Discounted cashflow valuation is

simple for good assets with easily forecastable cashflows, however the real challenge of the valuation theory is to extend the framework to cover the firms in that extent.

Relative valuation techniques are useful when a good set of comparable companies exists, when the market is not at a valuation extreme and when the company's fundamentals are not difficult to forecast. While the relative valuation by-passes explicit projections and present value calculations, it relies on the same principles underlying DCF approach:

Further studies may include a more refined valuation on more detailed cashflow projections of the companies valued in this thesis. In addition, the techniques which were not applied in this thesis such as APV or contingency claim valuation may be implemented on assets in Turkey. Another interesting topic would be to make parallel valuations in Turkish Lira and US Dollars and compare the results in order to assess the level of error brought by making the valuation in foreign currencies, which is generally the case in practice in Turkey. Also, the deterministic structure of discounted cashflow valuation model can be challenged and the effect of developing stochastic cashflow projections as opposed to deterministic cashflow projections on valuation can be analyzed. Finally, another approach could be to incorporate statistical forecasting models in the financial projection stage of DCF valuation technique and assess the results with the observed market values.

APPENDIX A: VALUATION OF AKENERJİ

Akenerji is one of the largest private free market power producers in Turkey. As at the beginning of 2006, the Company operates 12 natural gas fired thermal power plants throughout Turkey to supply electricity and steam to its customers. Installed power and steam generating capacity of the Company are 541 MW and 1107 tons/hour. The Company is currently investing in two hydro power plants which will increase its capacity to 715 MW. Electricity is transmitted to customers either directly from Akenerji bus bar via direct lines or via the national interconnection system, whereas heat energy steam/hot water is supplied directly through pipelines. Power plants of Akenerji are set forth in Table A.1.

Table A.1. Power capacity of Akenerji

<u>Power Plants</u>	<u>Electricity Capacity (MW)</u>	<u>Steam Capacity (tons/hour)</u>
Yalova	60	470
Çerkezköy	98	144
Bozüyük	132	141
Alaplı	6	10
Çorlu	10	22
Bursa-Orhangazi	5	11
Denizli	16	22
Bursa-Gürsu	16	33
Uşak	16	33
İzmir-Batıçim	45	67
Yalova Akal	10	22
İzmir Kemalpaşa	127	132
Existing Capacity	541	1,107
Gürsu HEPP	95	-
Akocak HEPP	79	-
Total Capacity	715	1,107

A.1.DCF Valuation of Akenerji- Step I: Projection of Cashflows

A.1.1. Step I-a: Collection of Historical Financial Statements

Akenerji publishes financial information in accordance with International Financial Reporting Standards. Reporting currency is Turkish Lira. With that respect, financials were converted into US Dollar. For the conversion of the annual income statement, average exchange rate throughout the year was used. For the conversion of the balance sheet, year-end exchange rate was used. In order to have a consistency with the discounted cashflow valuation methodology, the cashflows after the forecast period is assumed to have a stable growth rate. This requires an equilibrium stage. As Akenerji is a high-growth company, the forecast period should be long enough to make the stable growth assumption after the forecast period reasonable. With that respect, a forecast period of 10 years is selected for the valuation of Akenerji starting from 2006 until 2015.

Balance sheet and income statement information for Akenerji is provided in Table A.2 and Table A.3.

Table A.2. Summary balance sheet of Akenerji

(TRY mn)	<u>31/12/2003</u>	<u>31/12/2004</u>	<u>31/12/2005</u>
Current Assets	211	220	228
Cash and Near Cash	173	178	140
S/T Trade Receivables	28	30	60
Inventories	5	9	16
Other Current Assets	5	3	12
Long Term Assets	249	317	399
Total Assets	460	537	628
Current Liabilities	50	46	64
Financial Debt	22	11	10
Trade Payables	21	32	51
Other ST Payables	7	2	3
Long Term Liabilities	16	35	75
Financial Debt	14	34	36
Other LT Liabilities	2	1	38
Minority Interest	1	1	1
Shareholders' Equity	394	455	488
Total Liabilities and Shareholders' Equity	460	537	628

Table A.3. Income statement of Akenerji

(TRY mn)	<u>31/12/2003</u>	<u>31/12/2004</u>	<u>31/12/2005</u>
Net Sales	258	279	403
Cost of Sales	(233)	(266)	(431)
Gross Profit	25	13	(29)
Operating Expenses	(11)	(13)	(45)
Operating Profit/(Loss)	13	(1)	(74)
EBITDA	45	36	(1)
Net Other Income	17	18	(8)
Financial (Expenses)/Income	(2)	(3)	(2)
E.Ord Income / (Expense) (Net)	2	1	(0)
Tax	(5)	(0)	4
Net Monetary Pos. Gain / (Loss)	(20)	(28)	0
Minority Income	0	0	0
Net Profit Loss	5	(13)	(79)

A.1.2. Step I-b: Development of Industry Forecasts

The fundamental factors in Turkey for growth in electricity demand are strong growth in the economy, young and growing population, increased formation of households, high rates of urbanization, and strong penetration of electrical appliances. Turkey has been one of the highest growth economies in the globe for the last five years.

- Turkey has been the 19th largest economy in the world. Average GDP growth rate has been around 6 per cent for the last five years in real terms. In US Dollar terms, GDP nearly doubled from US\$182 billion in 2002 to US\$382 billion in 2005.
- The current population is estimated to be around 72 million, of which approximately 47 per cent are below 20 years of age. Young and growing population of Turkey is leading towards increased formation of households and higher penetration of electrical appliances.

For the last 10 years, Turkey has been one of the fastest growing electricity markets in the world with an average growth rate of 7 per cent. Electricity output in year 2005 reached to 161 billion kWh from 150 billion kWh in year 2004. It is expected that energy consumption will reach from 160 billion kWh in 2005 to 500 billion kWh in 2020 with conservative growth assumptions. In comparison, the maximum production that can be attained with the current generation capacity is around 220 billion kWh. These growth rates show that, the existing capacity will not be sufficient after 2008-2009

TEIAS, the State owned transmission company, undertook a detailed projection study regarding Turkish electricity market in year 2005. Summary results of the study are provided in Table A.4. These figures imply that the more than 50,000 MW of new generation capacity is required until 2020. Considering that the State has largely withdrawn from investing in electricity generation sector, this generation capacity increase is to be developed by private investors.

Table A.4. Electricity production requirement forecast for Turkey

	<u>1996</u>	<u>2004</u>	<u>2010E</u>
Installed capacity (thousand MW)	14	37	96
Production requirement (billion kWh)	86	150	499

Turkey mainly meets its electricity from three different energy sources: Gas, hydro and coal. Figure A.1 displays the breakdown of electricity generation with respect to sources in year 2005. As seen from the figure, in year 2005, around 44 per cent of electricity generation is produced from natural gas fired plants. Natural gas is followed by hydro which meets 24 per cent of electricity generation and domestic lignite and hard coal which meets 20 per cent of electricity generation.

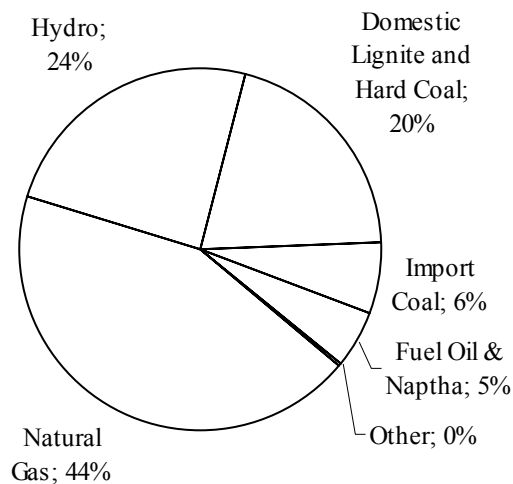


Figure A.1. Breakdown of power generation in Turkey according to fuel

Natural gas is imported mainly from Russia and Iran through pipelines. Natural gas was promoted by the State due to take-or-pay commitments of the state through these

import contracts. For the current case, natural gas is the most expensive fuel for the production, whereas fuel cost per kWh hovers around 5.8 ¢/kWh. As natural gas fired plants make a significant portion of production, they will continue setting the price in Turkish electricity market.

For the current case, hydro energy is supplied from hydro plants with reserves operated by the State. There are two types of hydro plants (i) dam hydros and (ii) river hydros. Big dam hydros are very hard to finance (high investment cost, environment, socio-economic issues) while river hydros (especially the ones with some reserve area) are very profitable with relatively low investment costs and nearly zero operating costs.

Coal: Turkey has vast reserves of lignite and black coal reserves. The calorific value of such reserves is generally low and only suitable for electricity generation instead of heating purposes. The domestic coal fired power plants have significantly low fuel costs with fuel cost per kWh hovers around 1-2 ¢/kWh.

Under the scope of its study, TEIAS also forecasted the development of various fuel types for the growth of electricity supply. The study shows that, despite its current cost advantages, Turkey will continue relying on natural gas for the envisaged capacity growth. Summary findings of this study are presented in Figure A.2. Despite the popularity of the “local fuels”, the reserves of these fuels are limited. The study envisages that that domestic hydro and coal reserves are fully exploited until 2020 and, even in this case, natural gas capacity is required to double in the coming 15 years.

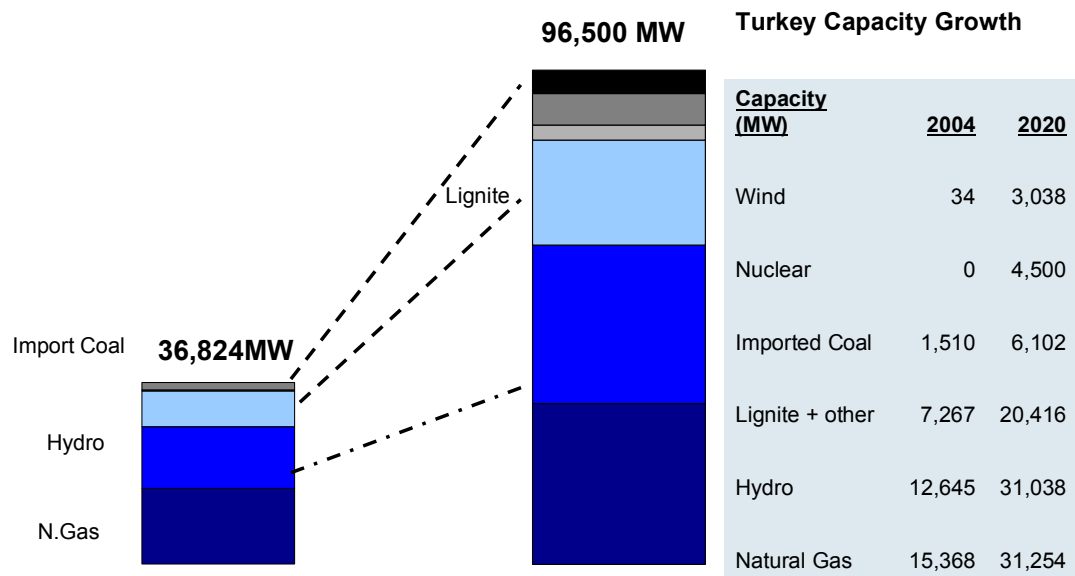


Figure A.2. Turkey capacity growth forecast

Accordingly, the electricity prices should be at a level which will (i) ensure that current natural gas capacity will remain operational and (ii) more importantly, which will stimulate new investment in natural gas fired plants. This a crucial fact in order to understand the development of electricity prices in Turkey. Any other scenario will indicate “a crisis scenario” due to supply-demand imbalance for Turkish electricity market, which will again mean increased energy prices.

Power generators in Turkish Electricity Generation Market can be categorized as follows:

“Contracted IPP Producers” are private operators selling electricity exclusively to the State pursuant to special contracts developed in the scope of various models such as Build-Operate, Build-Operate-Transfer and Transfer-of-Operating-Rights. Their capacity as at the end of 2004 was 10,654 MW or 70 billion kWh. These producers are selling at high prices around 8 cents per kWh on average. Their prices are secured with contracts under Treasury guarantee. It is also worthwhile to note that nearly 9,800 MW of such capacity is natural gas fired and they directly transfer the increase in natural gas cost to the State with pass-through mechanisms.

EUAS (State Owned Power Generator) operates the power plants which are owned by the State. EUAS plants are categorized in two main categories:

- **Big Hydros:** This group involves 17 hydro plants with a total capacity of 6,189 MW or 25 billion kWh. Three of these dams, (Keban, Karakaya and Ataturk) make up 5,200 MW of total capacity. These plants operate with very low operating costs. They are used to blend their cheap electricity with the high cost electricity of contracted IPP producers.
- **Portfolio Gencos:** These plants involve the 3 natural gas plants, 12 coal plants and 10 hydro plants owned by the State. These plants will be privatized in year 2007. Coal plants have a fuel cost of around 1-2 cents per kWh, while natural gas plants have high electricity costs around 6 cents per kWh due to their old technology. Total capacity of Portfolio Gencos was around 15,600 MW or 76 billion kWh in year 2004.

“Private Free Market Producers” group includes power plants owned by the private investors which sell electricity to mainly industrial customers in the free market. Vast majority of these plants are natural gas fired due to the lower investment cost such plants compared to plants burning other fuels. Most of these plants were initially developed to supply electricity to their own developers under autoproduction model and sell excess electricity to the State. However, the State stopped buying electricity from autoproducers due to the excess capacity situation emerged in the beginning of 2000s. This coupled with the implementation of liberal market rules which allows industrial customers with a consumption limit above a certain threshold (6 million kWh now) to select their electricity supplier. As a result, these power plants started to market electricity to the industrial customers throughout Turkey. Although the model was proven to be successful, they currently suffer from high fuel costs due to natural gas prices. Total capacity of free market producers is around 4,381 MW or around 32 billion kWh.

Figure A.3 summarises the route from the electricity generator to the electricity consumer in year 2005. The figure omits losses in the distribution side.

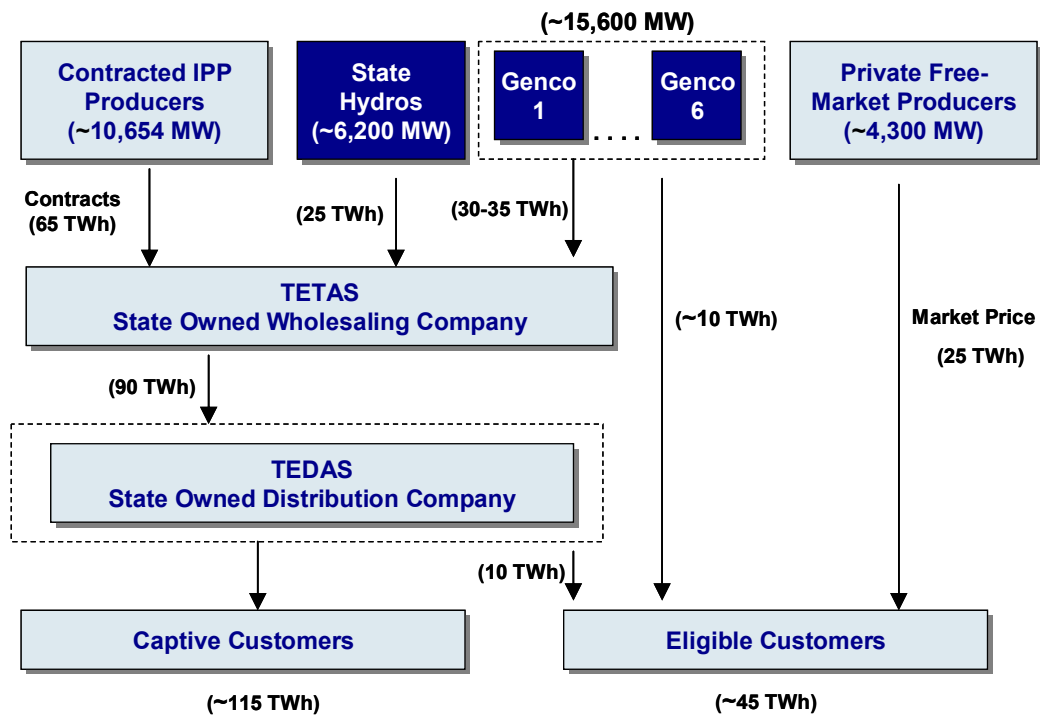


Figure A.3. Overview of Turkish electricity market

Figure A.4 sets forth the electricity prices in Turkish market as at the end of year 2005. Although the industrial tariff for TEDAS was around 8.8 cents per kWh at the end year 2005, the discounts provided under different mechanisms such as time-variable pricing and capacity commitment pricing lead an effective decrease in the tariff.

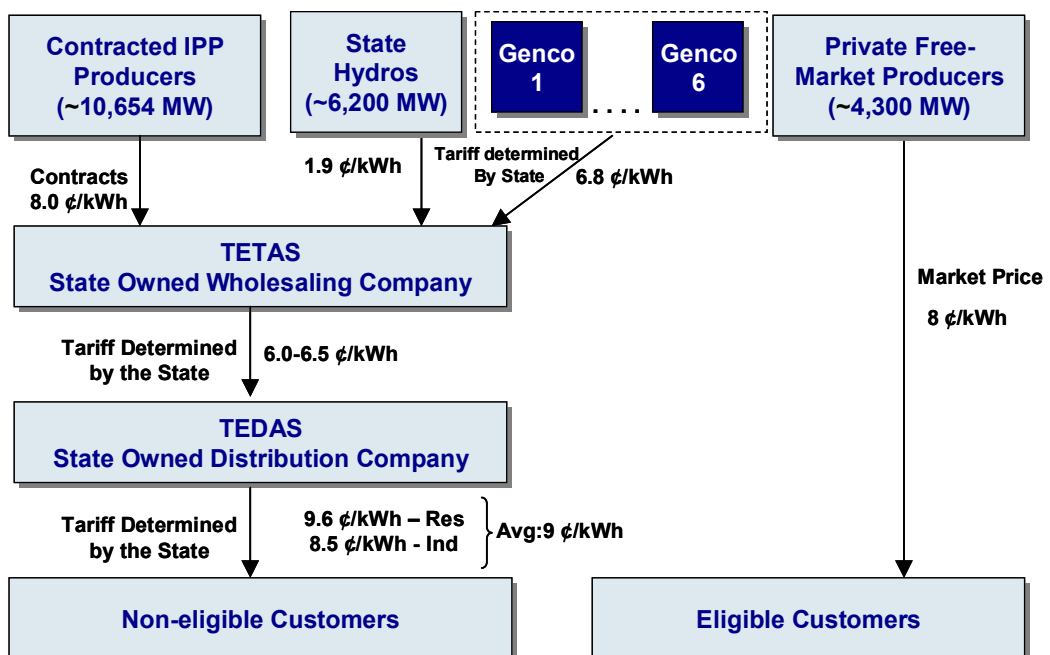


Figure A.4 Electricity prices in Turkish market

A.1.3. Step I-c: Development of Earning Forecasts

Akenerji generates revenue from three main sources:

- Electricity Revenues from Existing Gas Plants
- Steam Revenues from Existing Plants
- Electricity Revenues from New Hydro Plants

As for the power plant portfolio, the value of existing power plants in operation and two hydro plants under construction are taken into consideration .

It was assumed that Akenerji will generate around 3.5 billion kWh of electricity from its existing gas fired plants with a total capacity of 541 MW. This figure also includes the generation from Kemalpaşa plant with a capacity of 125 MW, which was put into operation in the last months of year 2005. Although the gas fired plants can normally work with capacity usage factors of around 90 per cent, Akenerji runs its plants with lower capacity factors around 74 per cent. The main reason for the low capacity usage is due to the stoppages in the nights, during which electricity prices of the State decreased significantly. Production projections for Akenerji are supplied in Table A.5.

Based on the current steam sales levels, it was projected that Akenerji will supply around 2.8 million tons of steam to its customers. Although Kemalpaşa plant has also steam generation capacity, it will use the steam for recovery of heat and generate electricity instead of supplying it to other customers.

For the electricity to be generated from new hydro plants, an annual average figure is estimated in the planning based on the average water flow levels for the last 50 years. Calculations show that Akenerji will be able to produce an average level of 362 million kWh from Gürsu hydro plant after the completion of construction at the end of 2007 and 257 million kWh from Akçakoca plant after the completion of the construction at the end of 2008.

Akenerji sells electricity at a discount to TEDAS prices. Therefore, it is assumed that such discount will remain at the same levels throughout the projection period. Akenerji currently suffers from the high natural gas costs with respect to high electricity costs. Although the Company used to have a very profitable operation which allows the Company to grow, Akenerji can not operate with profits under the current pricing scheme. In order to explain the situation, natural gas prices have increased from 16 cents per cubic metre levels in the beginning of year 2004 to 25 cents per cubic metre levels in the second half of 2005. On the other hand, electricity prices increased only from 8.3 cent per kWh to 8.9 cent per kWh levels.

In the beginning sections, it is discussed that the sustainable development of Turkish electricity market relies on ensuring that the current plants remain operational and the capacity growth in natural gas fired plants will resume. These days, the private power producers are complaining about the current pricing framework and they state that they could shut down their plants unless the State does not make any adjustments. As expected, the current levels of electricity and gas prices also do not stimulate investment in the sector. With that respect, in this thesis, it is forecasted that the current level of prices will not prevail in the future as they do not let build-up of new capacity.

With that respect, a required level of long-term electricity prices which will ensure the sustainability of Turkish electricity market growth is calculated. The basics of the calculation are explained below:

- Average configuration (efficiency, capacity, etc.) of Akenerji plants are used as a sample for a new producer.
- For the current level of electricity and gas prices, Akenerji does not make any operating profit or loss.
- Required level of electricity prices is calculated by assuming that the natural gas prices will remain constant.
- With that respect, the investment payback is calculated as follows:
 - Cost of a 1 MW of a natural gas fired plant is US\$600,000.
 - Assume that the plant is financed with 6 per cent interest with a payback period of 6 years.

- Therefore, average required debt service in each year is US\$100,000 principal and US\$18,000 interest repayment or US\$118,000 in total.
- With current Akenerji usage rates, 1 MW natural gas plant capacity corresponds to a generation of 6.4 million kWh (74 per cent capacity factor and one per cent internal loss)
- As a result, the required additional level of investment payback is found as 1.8 cents per kWh.
- Allowing potential inefficiencies due to Akenerji's structure (old technology, etc.), a conservative level of payback at 1.3 cents per kWh is calculated.

Considering also the free market producer discount, it was projected the long-term level of electricity prices as 10.3 cents per kWh. Therefore, the valuation procedure implementation incorporated such results. It was assumed that the prices will increase to the determined levels gradually. Revenue projections for Akenerji are provided in Table A.6.

Costs of Akenerji include fuel cost of existing gas-fired plants, other production costs for gas-fired plants, cash production costs of HEPPs, depreciation.

Fuel cost of the gas plants are estimated based on the efficiency levels of the existing power plant portfolio, which also incorporated the overall increase in efficiency after Kemalpaşa plant was put into operation. The efficiency level of Akenerji plants is around 35 per cent. This means that in order to produce 35 kWh of electricity energy, 100 kWh of heat input is required. By making the necessary unit conversions and assuming the calorific value of natural gas supplied BOTAS, annual required level of natural gas was calculated. Based on these costs, natural gas cost is projected based on the assumption that current gas prices will be maintained during the forecast period.

Other production costs include other variable costs such as material and maintenance cost in addition to labour cost. For these costs, a total lump-sum figure of around US\$52 million per annum is used.

For the cash production cost of each hydro power plant, an annual figure of US\$0.5 million is assumed.

Operating expenses of Akenerji mainly consist of general administration costs. For operating expenses, an annual level of US\$15 million was forecasted in line with the actual levels.

For depreciation, an annual 13 per cent level was assumed on the fixed asset base, which incorporates the current level of fixed assets and new capital expenditures.

Cost projections of Akenerji are supplied in Table A.7.

Table A.6. Revenue assumptions for Akenerji

(€/kWh unless otw. stated)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Benchmark electricity prices		8.78	9.2	9.6	9.8	10	10.2	10.3	10.3	10.3	10.3	10.3
Akenerji Electricity Discount and Connection Fees (%)		12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
Akenerji post discount electricity sales price		7.7	8.1	8.4	8.6	8.8	9.0	9.1	9.1	9.1	9.1	9.1
Electricity Sales (kWh mn)		2,984	3,458	3,458	3,820	4,077	4,077	4,077	4,077	4,077	4,077	4,077
Akenerji Electricity Sales Price		7.73	8.10	8.45	8.62	8.80	8.98	9.06	9.06	9.06	9.06	9.06
Electricity Sales Revenues (US\$ mn)		231	280	292	329	359	366	370	370	370	370	370
- Steam Sales (mn ton)		2.6	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
- Steam Price (US\$/ton)		20	20	20	20	20	20	20	20	20	20	20
Steam Revenues (US\$ mn)		53	56	56	56	56	56	56	56	56	56	56
- Electricity Sales Revenues (US\$ mn)		231	280	292	329	359	366	370	370	370	370	370
- Steam Revenues (US\$ mn)		53	56	56	56	56	56	56	56	56	56	56
Total Revenues (US\$ mn)	0	283	336	348	385	414	422	425	425	425	425	425

A.1.4. Step I-d: Development of Capital Expenditure Forecasts

An annual maintenance expenditure level of around US\$10 million was projected for the existing gas plants of Akenerji.

Cooperation between DSI (State Hydraulic Works) General Directorate and EMRA (Energy Market Regulatory Authority) has gained momentum for private sector investments with HEPPS that will be built on the rivers of the country. There are a total of 64 private HEPP projects on 18 rivers.

On 14 March 2005, Akenerji has submitted the highest bid for Çınarcık Dam and Gürsu Power Tunnel & HEPP Project which was the first tender for a HEPP Project opened to private sector by EMRA, and it has been granted with the right to operate it for 40 years. Çınarcık Dam, being an integral part of this project, has been completed by 95 per cent by DSI and its remaining part is foreseen to be completed in 2006 by DSI as well. The project itself is planned to be completed at the end of 2007 at latest. When Uluabat Power Tunnel & HEPP Project located within Susurluk Basin in Marmara Region is commissioned, it will have an installed power of 95 MW and an annual generation of 362 millions kWh.

The license for Çınarcık Dam and Gürsu Power Plant was awarded to Akenerji for electricity generation with a value of TRY33.8 million (approximately US\$25 million) for 40 years. Since 95 per cent of the Çınarcık Dam is already completed by DSI (State Hydraulic Works), Akenerji will pay the relevant amount to DSI in 10 installments starting from the 5th year of operations. The total investment for the construction and equipment is estimated to be US\$90 million excluding the license. Despite higher set up costs, production costs are very low with hydroelectric power plants. Akenerji has further been awarded the contract for the second HEPP tender held by EMRA on 25 April 2005, and thus it has similarly been granted with the right to operate Erikli, Akocak Regulators and Akocak Hydroelectric Power Plant Project in Araklı county of Trabzon province for 40 years. The license fee is TRY952,000 (approximately US\$700,000) and total planned investment is US\$60 million. For this run-of-river plant, the installed power will be 79 MW. The plant is planned to generate 258 millions kWh of energy per year.

The capital expenditures for new hydro power plants were estimated by reviewing the construction and equipment plans and budgets. Total construction and equipment investment required for the completion of Gursu plant is around US\$90 million. In addition, Akenerji will pay a total of US\$72 million to DSI in 10 annual installments starting from the fifth operation year of Gursu power plant in exchange for the investment borne by DSI so far. For Akocak plant, total investment is around US\$60 million.

Capital expenditure projections of Akenerji is set forth in Table A.8

A.1.5. Step I-e: Development of Working Capital Forecasts

Working capital projections are projected on the basis of days. Receivables were estimated based on revenues while all other working capital items were used on the basis of days of cost of goods sold.

Working capital projections of Akenerji is set forth in Table A.9.

A.1.6. Step I-f: Development of Tax Forecasts

As the valuation is based on the cashflows to firm, tax forecasts based on the operating profit are calculated. A tax rate of 20 per cent was used for the projection.

A.1.7. Step I-g: Development of Cashflow Forecasts

Cashflows of Akenerji are calculated in Table A.10.

Table A.10. Cashflow projections of Akenerji

US\$ mn unless otw. stated	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Revenues	279	283	336	348	385	414	422	425	425	425	425	425
Cost of Revenues	(266)	(308)	(344)	(340)	(345)	(350)	(349)	(344)	(340)	(336)	(334)	(332)
Gross Profit	13	(25)	(8)	8	40	64	73	81	85	89	91	93
<i>Gross Margin (%)</i>	4.7%	-8.8%	-2.3%	2.3%	10.5%	15.5%	17.3%	19.0%	20.0%	20.9%	21.5%	21.9%
Operating Expenses	(13)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
Operating Profit	(1)	(40)	(23)	(7)	25	49	58	66	70	74	76	78
Add: Depreciation & Amortization	37	39	40	36	41	46	44	40	36	32	30	28
EBITDA	36	(1)	17	29	66	95	102	106	106	106	106	106
<i>EBITDA Margin (%)</i>	13%	0%	5%	8%	17%	23%	24%	25%	25%	25%	25%	25%
EBITDA	36	(1)	17	29	66	95	102	106	106	106	106	106
Less: CapEx Licence and Investment			(75)	(75)	(30)	(10)	(10)	(10)	(17)	(17)	(17)	(17)
Less: Tax on Operating Profit			-	-	(5)	(10)	(12)	(13)	(14)	(15)	(15)	(16)
Less: Change in WC			(5)	(2)	(5)	(4)	(1)	(1)	(0)	(0)	(0)	(0)
Cashflows to Firm			(63)	(48)	26	71	80	82	74	74	73	73

A.2. DCF Valuation of Akenerji- Step II: Estimation of the Discount Rate

In order to calculate the WACC for Akenerji, cost of equity and cost of debt and their relative weight should be estimated according to Formula 3.13

A.2.1. Step II-a: Cost of Equity Estimation

Estimation of the cost of equity for Akenerji is undertaken pursuant to CAPM approach according to Formula 3.16.

As Akenerji is a public company, beta is estimated from the historical method which involves a regression of the historical returns of a security against the historical returns of a market index. For Akenerji, the calculated beta is 0.82.

As Akenerji has a net cash position, Formula 3.18 was not applied. Calculation of cost of equity for Akenerji provided in Table A.11.

Table A.11. Cost of equity estimation for Akenerji

Real Risk Free Rate	2.07%
Turkey Country Premium	10.84%
Unlevered Beta of the Firm	0.82
Risk Premium for the Firm	8.88%
Cost of Equity for the Firm	10.96%

A.2.2. Step II-b: Cost of Debt Estimation

As at 31 March 2006, the longest debt term for Akenerji is around two years. The interest rate for these loans is at 8.33 per cent. By applying Formula 3.19 and Formula 3.20, cost of debt for Akenerji is calculated in Table A.12.

Table A.12. Cost of debt estimation for Akenerji

Interest Rate of Existing Firm Debt	8.33%
Risk Free Rate for the term of Existing Firm Debt	4.37%
Spread for the Existing Firm Debt	3.96%
Risk Free Rate for 10 years	4.38%
Nominal Cost of Debt for the Firm	8.34%
Less Implied Inflation	2.31%
Real Cost of Debt for the Firm	6.03%
Tax Rate	20%
Real Cost of Debt for the Firm (after tax)	4.82%

A.2.3. Step II-c: WACC Estimation

The weighted average cost of capital is simply the weighted cost of the capital supplied by the debt and equity financiers at different costs. In order to compute WACC, the market value of debt and equity should be considered.

Akenerji has a net cash position. It was observed that 20 per cent debt – 80 per cent equity is the generally accepted financing mix for the electricity companies in the world.

Calculation of WACC for Akenerji according to Formula 3.13 is provided in Table A.13.

Table A.13. WACC calculation for Akenerji

Cost of Equity	10.96%
Equity as % of total financing	80%
Cost of Debt (after tax)	4.8%
Debt as % of total financing	20%
WACC (after tax)	9.7%

A.3. DCF Valuation of Akenerji- Step III: Calculation of Terminal Value

Terminal value for Akenerji estimates the value of all cashflows beyond 2016 as an ongoing concern. Cashflow value method was selected for Akenerji in order to calculate terminal value according to Formula 3.24.

As for the estimation of growth rate, if it is envisaged that the Company will generate most or all of its cashflows from a domestic economy, its growth should be bound to the overall growth of overall economy. With that respect, 3 per cent were taken as the growth rate for the terminal value calculation. Calculation of terminal value for Akenerji is set forth in Table A.14.

Table A.14. Calculation of terminal value for Akenerji

WACC (%)	9.7%
Terminal Growth Rate (%)	1%
Cashflows to Firm at 2015 (US\$ mn)	73
Terminal Value at 2015 (US\$ mn)	843
Years between 2005 – 2015	10
Discount Factor (2005-2015)	2.53
Discounted Terminal Value at 2005 end (US\$ mn)	333

A.4. DCF Valuation of Akenerji- Step IV: Calculation of Equity Value

In order the equity value, value of debt is deducted from the discounted value of cashflows to firm. As at the end of September 2005, Akenerji has a net cash position of US\$102 million, which should be added to the enterprise value to arrive at equity value. Equity value calculation for Akenerji is set forth in Table A.15.

Table A.15. Calculation of equity value for Akenerji

(US\$ million)	<u>2005-end</u>
Discounted Cashflows from 2006 to 2015	203.2
Discounted Terminal Value (from 2015)	333.2
Enterprise Value at the end of 2005	536.4
Less: Value of Debt	-102.0
Equity Value	638.4

A.5. Relative Valuation of Akenerji

As Akenerji is a power producer with no distribution asset, similar companies from emerging markets are accepted as peers.

For Akenerji, due to poor results in year 2005 (zero EBITDA and minus net profit), relative valuation models based on profitability can not be applied meaningfully. In addition, application of EV/S multiple is not reliable because the difference will be mainly due to different level of electricity prices in the world.

Instead, the capacity per MW metrics compared with other electricity generation companies throughout the world is used for relative valuation.

Results of comparison and standardizing process are provided in Table A.16

Table A.16. Comparison of Akenerji with selected peers

<u>Company</u>	<u>Country</u>	<u>Enterprise Value (US\$ mn)</u>	<u>Installed Power (MW)</u>	<u>EV/Installed Power</u>
GENER	Chile	1,770	2,428	0.73
ENDESA	Chile	25,547	13,986	1.83
MALAKOFF BHD	Malaysia	3,286	2,293	1.43
YTL POWER	Malaysia	4,814	1,212	3.97
Weighted Average				2.03

Based on these averages, enterprise value of Akenerji is calculated as US\$1.2 billion for installed capacity. Hydroelectricity plants were not incorporated in the capacity calculation as their investment has just started. With that respect, this value also ignores the potential upside from the hydro plants.

Due to the potential upside from these, it is not fair to incorporate the relative valuation based on installed capacity in valuation of Akenerji. Akenerji operates in very different environment with respect to these companies: Its fuel mix, the electricity sales price and natural gas varies significantly amongst countries. As a result, in this thesis, relative valuation is not considered as an appropriate tool for comparing power assets.

APPENDIX B: VALUATION OF MİGROS

Migros Turk was founded in 1954 as a joint initiative of the Swiss Migros Cooperatives and Istanbul Municipality. The Company was acquired by Koç Group in 1975. The Company is currently operating in Turkey, Russia, Kazakhstan, Azerbaijan, Bulgaria and Macedonia. It has more than 481,987 sqm. net sales area in 566 stores, employing 11,821 people in 2005 before Tansaş acquisition.

Migros Türk is listed on ISE since 1991. The Company's majority is owned and controlled by Koç Holding, Turkey's largest conglomerate and domestic market leader in automotive, consumer durables, FMCG, retailing, finance, oil and LPG business.

B.1. DCF Valuation of Migros- Step I: Projection of Cashflows

B.1.1. Step I-a: Collection of Historical Financial Statements

Migros publishes financial information in accordance with International Financial Reporting Standards. Reporting currency is Turkish Lira. With that respect, financials were converted into US Dollar. For the conversion of the annual income statement, average exchange rate throughout the year was used. For the conversion of the balance sheet, year-end exchange rate was used. A forecast period of 10 years is selected for the valuation of Migros starting from 2006 until 2015. Balance sheet and income statement information of Migros is provided in Table B.1 and Table B.2 respectively.

Table B.1. Summary balance sheet of Migros

US\$ million converted from TRY financial statements	2004	2005
Cash and Banks	162	235
Marketable securities	104	45
Trade receivables	22	24
Due from group companies	4	6
Inventories	110	198
Other current assets	26	42
Total current assets	428	550
Investments	1	138
investments in property	35	41
Investments in associates	2	0
Goodwill	-1	129
Property, plant and equipment, net	497	695
Intangible assets, net	3	135
Other non-current assets	14	66
Total non-current assets	552	1,204
Total assets	980	1,754
ST bank borrowings	19	47
ST lease obligation	1	25
Trade payables	286	503
Due to group companies	22	24
Taxation on income	1	0
Other current liabilities	25	60
Total current liabilities	353	660
LT bank borrowings	101	485
LT lease obligations	0	0
Provision for employment termination		
Benefits	5	7
Deferred tax liability	26	0
Other non-current liabilities	2	13
Total LT liabilities	134	505
Total liabilities	488	1,165
minority interest	7	63
Shareholders' equity	485	525
Share capital	103	102
Adjustment to share capital	0	0
Capital surplus	149	153
Translation reserve	0	0
Retained earnings	233	270
Total SH Equity	485	525
Total liabilities and shareholders' equity	980	1,754

Table B.2. Summary income statement of Migros

US\$ million converted from TRY based financial statements	2003	2004	2005
Net sales	1,327	1,694	2,808
Cost of sales	(1,036)	(1,314)	(2,140)
Gross profit	291	381	668
Sales and distribution expenses	(27)	(33)	(385)
General and administrative expenses	(232)	(290)	(176)
Income from operations	31	57	108
EBITDA	81	106	186
EBITDA margin (%)	6.1	6.2	6.6
Other (expense)/ income - net	-1	0	36
Financial expenses - net	4.1	(32)	(59)
Fair value loss of investments	-	-	-
Income before gain on net monetary position and taxation on income	32	71	86
Profit before taxation on income	39	80	86
Taxes on income	13	(22)	(20)
Profit from ordinary activities after tax	52	58	66
Extraordinary items	-	-	-
Income before minority interest	52	58	66
Net loss attributable to minority interest – Ramstore	(1)	(2)	(3)
Net income	51	56	64

B.1.2. Step I-b: Development of Industry Forecasts

Until the late 1980s, the Turkish food retail market was dominated by small markets and corner stores with the exception of both Migros and Gima who each had minimal presence. The majority of organized retailers such as Tansaş, BİM, Metro and Carrefour commenced operations in Turkey in the early 1990s, attracted by high urbanisation, increasing consumer mobility, lucrative investment incentives for the development of retail sites as well as demographic changes in consumer and working habits.

Marmara, Aegean and Central Anatolia are the most populated and wealthy regions in Turkey and have witnessed the most rapid growth since early 1990s, followed by the Mediterranean and Black Sea regions. As a result, the available real estate for retail development in these three regions has substantially diminished.

The aggregate market share of the three largest organized retailers in Turkey is 13 per cent when compared to the European average of 65 per cent in 2003. Turkey, with one

of the lowest concentrations in the European retail sector as a whole, is expected to undergo further consolidation, especially due to the entrance of further global players, trying to increase sales to achieve and/or secure economies of scale globally for their price leadership strategy to work.

The size of the Turkish food retail sector was US\$27.1 billion in 2004. The size of the organized retail market stood at US\$9.9 billion in 2004, corresponding to 36.5 percent of the total food retail market. Tansaş had a 8.1 per cent share of the organized retail market and a 3.0 per cent share of the total food retail market in 2004. The unorganized segment of the food retail market is characterized by small traditional family run stores (totaling 124,000 in number) and open bazaars with 63.5 per cent. market share in the Turkish food retail market in 2004.

Turkish food retail market can be categorized according to the store format as follows:

- Organised food retail – larger store selling a wide range of fresh and dry food products and some non food items;
- Local chains – store chains of less than five in number focused in particular localised regions and can be of a range of sizes up to supermarket size;
- Unorganized food retail
- Grocery stores – independent retailers selling fresh fruit and vegetables;
- Open bazaars – traditional Turkish bazaars selling a wide range of fresh fruits and vegetables and locally produced products; and
- Family run stores – kiosks, “mom and pop” shops.

The breakdown of the fragmented Turkish food retail market is highlighted in Figure B.1. The figure shows that the fastest growing segment of the food retail market is organized food retail.

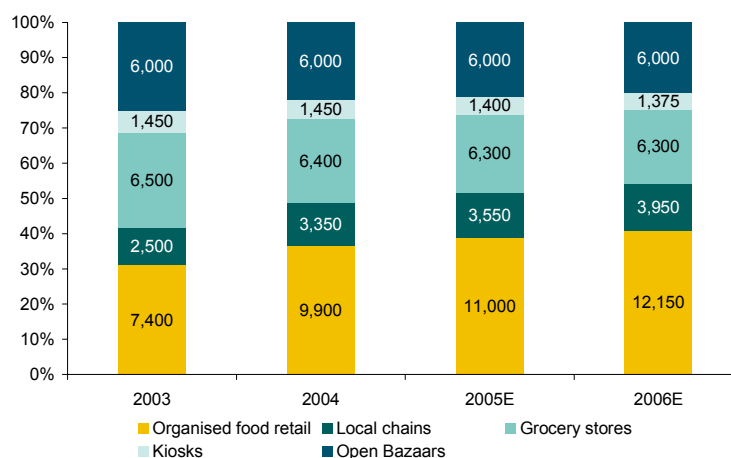


Figure B.1. Breakdown of Turkish food retail industry by segment

Traditionally, bazaars and family run stores have dominated the market due to their relative proximity to people's houses relative to most of the super- and hypermarkets, where some form of private transportation is required, which limits the target market due to the low per capita car ownership in Turkey. However, with the increasing number of female workers, urbanization, credit card usage, popularity of one-stop shopping experience and increasing living standards going forward, the market share of the organized food retail sector in Turkey is expected to continue to grow and increase from c. 37 per cent in 2004 to 41 per cent in 2006.

Increasingly, customers have been driven to larger stores due to the availability of a wide range of products in a single location and lower product prices. This has resulted in an upwards trend in the average basket size and a decreased shopping frequency. Competition among the Turkish retailers has additionally led to the rapid deployment of a wide range of customer incentives to secure customer loyalty.

Market shares of Turkish food retailer companies are provided in Figure .

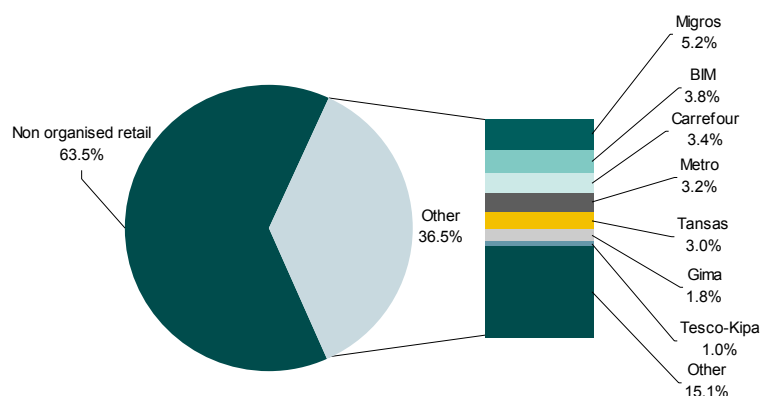


Figure B.2. Market shares in food retail market

Migros operates in a number of countries, of which Turkey and Russia are the most important. With that respect, separate projections were developed for Turkey, Russia and remaining countries. Revenues projections are based on shopping area forecasts and revenue per square meter forecasts.

It is worthwhile to note that 2005 growth figures incorporate the additions from Tansas, which was purchased by Migros in 2005.

B.1.3. Step I-c: Development of Earning Forecasts

Migros margin projections are mainly based on the historical levels.

Revenue projections of Migros are provided in Table B.3. Margin projections are set forth in Table B.4.

B.1.4. Step I-d: Development of Capital Expenditure Forecasts

Capital expenditure projections of Migros were developed based on the envisaged growth of square meter per area.

B.1.5. Step I-e: Development of Working Capital Forecasts

Working capital projections are projected on the basis of days. As Migros has a negative working capital, growth in revenues brings additional cashflows to the company. Working capital changes of Migros are calculated based on percentage of revenues.

B.1.6. Step I-f: Development of Tax Forecasts

A tax rate of 20 per cent was used for the projection of Migros cashflows.

B.1.7. Step I-g: Development of Cashflow Forecasts

Cashflows of Migros are calculated in Table B.5.

Table B.5. Cashflow projections of Migros

US\$ mn unless otw. stated	<u>2005A</u>	<u>2006E</u>	<u>2007E</u>	<u>2008E</u>	<u>2009E</u>	<u>2010E</u>	<u>2011E</u>	<u>2012E</u>	<u>2013E</u>	<u>2014E</u>	<u>2015E</u>
EBITDA	179	248	278	307	338	372	410	453	501	555	617
Tax	-18	-29	-33	-36	-40	-44	-49	-54	-60	-67	-74
Capital Expenditure	-343	-138	-122	-99	-109	-115	-131	-150	-172	-198	-228
Change in Working Capital	123	32	24	24	29	12	9	6	14	1	9
Cashflow to Firm	-59	112	148	195	217	225	239	255	283	292	323

B.2. DCF Valuation of Migros- Step II: Estimation of the Discount Rate

In order to calculate the WACC for Migros, cost of equity and cost of debt and their relative weight should be estimated according to Formula 3.13.

B.2.1. Step II-a: Cost of Equity Estimation

Estimation of the cost of equity for Migros is undertaken pursuant to CAPM approach according to Formula 3.16. Beta of Migros is 0.8. Migros uses a negative debt/equity ratio of 13% following a common policy in retail sector.

By applying the Formula 3.18, with a tax rate of 20 per cent, unlevered beta of Migros is calculated as 0.89. Based on these data, calculation of cost of equity for Migros is provided in Table B.6.

Table B.6. Cost of equity estimation for Migros

Real Risk Free Rate	2.07%
Turkey Country Risk Premium	10.84%
Unlevered Beta of the Firm	0.89
Risk Premium for the Firm	9.67%
Cost of Equity	11.74%

B.2.2. Step II-b: Cost of Debt Estimation

As at 31 March 2006, the longest debt term for Migros is around five years. The interest rate for these loans is at 7.00 per cent. By applying Formula 3.19 and 3.20, cost of debt for Migros is calculated in Table B.7.

Table B.7. Cost of debt estimation for Migros

Interest Rate of Existing Firm Debt	7.50%
Risk Free Rate	4.37%
Spread for the Existing Firm Debt	3.13%
Risk Free Rate for 10 years	4.38%
Nominal Cost of Debt for the Firm	7.51%
Less: Implied Inflation	2.31%
Real Cost of Debt for the Firm	5.20%
Tax Rate	20%
Real Cost of Debt for the Firm (after tax)	4.2%

B.2.3. Step II-c: WACC Estimation

Assuming -15 per cent debt and 115 per cent equity as the financing mix, Table B.8 provides the calculation of WACC for Migros according to Formula 3.13.

Table B.8. WACC estimation for Migros

Cost of Equity	11.71%
Equity as % of total financing	115%
Cost of Debt (after tax)	4.2%
Debt % of total financing	-15%
WACC (after tax)	12.8%

B.3. DCF Valuation of Migros - Step III: Calculation of Terminal Value

Cashflow value method was selected for Migros in order to calculate terminal value according to Formula 3.24.

As for the estimation of growth rate, if it is envisaged that the Company will generate most or all of its cashflows from a domestic economy, its growth should be bound to the overall growth of overall economy. With that respect, three per cent were taken as the growth rate for the terminal value calculation. Calculation of terminal value for Migros is set forth in Table B.9.

Table B.9. Calculation of terminal value for Migros

WACC (%)	12.8%
Terminal Growth Rate (%)	3.0%
Cashflows to Firm at 2015 (US\$ mn)	323
Terminal Value at 2015 (US\$ mn)	3,383
Years between 2005 and 2015	10
Discount Factor between 2005 and 2015	3.35
Discounted Terminal Value at 2005 end (US\$ mn)	1,011

B.4. DCF Valuation of Migros- Step IV: Calculation of Equity Value

As at the end of December 2005, Migros has a net debt position of US\$277 million. Equity value calculation for Migros is explained in Table B.10

Table B.10. Calculation of equity value for Migros

(US\$ million)	<u>2005-end</u>
Discounted Cashflows from 2006 to 2015	1,136
Discounted Terminal Value from 2015	1,011
Enterprise Value at the end of 2005	2,147
Less: Value of Debt	277
Equity Value	1,870

B.5. Relative Valuation of Migros

Retailer companies are generally compared with EV/S and EV/EBITDA multiples. Results of comparison process are set forth in Table B.11. Based on the peer averages, an equity valuation of US\$1.25 billion based on EV/S multiple and US\$1.63 billion for EV/EBITDA multiple is calculated.

Table B.11. Comparison of Migros with selected peers

<u>Company</u>	<u>Market Cap</u> <u>(30 April 2006)</u>	<u>2006E</u> <u>EV/Sales</u>	<u>2006E</u> <u>EV/EBITDA</u>
Tesco	45,102	0.80	9.73
Ahold	12,315	0.32	7.26
Sainsbury	9,795	0.47	8.28
Carrefour	37,554	0.52	8.25
Delhaize	6,827	0.50	5.36
Casino	7,651	0.45	7.39
Metro	16,735	0.33	7.10
Average Multiples		0.48	7.62

APPENDIX C: VALUATION OF İZOCAM

Established in 1965, İzocam Ticaret ve Sanayi A.Ş. is the market leader thermal insulation company in Turkey. İzocam mainly manufactures, markets and sells (i) fibre insulation materials such as glass wool and rock wool; (ii) plastic insulation materials such as extruded polystyrene foam, expanded polystyrene foam and elastomeric rubber flex, (iii) necessary materials and solutions to a myriad of heat, sound and fire insulation and waterproofing; and (iv) roof and wall claddings - including PU and mineral wool panels - lightweight steel construction systems and suspended ceiling and partition wall systems. In 2004, the Company merged with Tek-İz, another Koc company, through which the products mentioned in (iv) were included.

In year 2005, İzocam generated US\$143.2 million in net revenues and US\$27.6 million in EBITDA from its activities, corresponding to an EBITDA margin of 19.3 per cent. Revenues from mineral wool accounted for around 60 per cent of the Company's turnover while revenues from plastic insulation materials accounted for 30 per cent and revenues from other products made up the remaining 10 per cent.

The Company ranks the largest thermal insulation company in Turkey in terms of its capacity with its 7 manufacturing facilities throughout Turkey. In addition, the Company is the largest mineral wool manufacturer in Middle East and Balkans. The glass wool production capacity is 30,000 tons per annum, rock wool production capacity is 30,000 tons per annum, XPS production capacity is 250,000 m³ and EPS production capacity is 11,000 tons per annum. The Company is in the process of modernizing and increasing its glass wool capacity to 60,000 tons and rock wool capacity to 50,000 tons. The investments will be completed in the first half of year 2007. The Company employs a total of around 350 people.

In domestic market, the Company has been the market leader in each major thermal insulation sub-segment with market shares of 73 per cent in rock wool market, 57 per cent in glass wool market and 25 per cent in XPS market. The Company operates the largest distribution network in the sector encompassing 120 dealers throughout Turkey.

In addition to its leadership in domestic market, the Company exports around 30 per cent of its mineral wool production mainly to Middle Eastern, Balkan and CIS countries, by capitalizing on high manufacturing quality, low cost base and proximity to such markets. The Company is the market leader in Egypt, Greece and Israel glass wool markets with market shares of 64 per cent, 40 per cent and 45 per cent respectively. Exports accounted for 22.7 per cent and 22.8 per cent of gross sales in 2004 and 2005 respectively.

The Company is a part of Koç Group, the largest Turkish conglomerate with business concerns in a wide range of sectors such as automotive, durable goods, energy, retail, financial services, food, tourism and construction materials. Most of such concerns hold leading market positions in their respective sectors.

C.1. DCF Valuation of İzocam - Step I: Projection of Cashflows

C.1.1. Step I-a: Collection of Historical Financial Statements

İzocam publishes financial information in accordance with International Financial Reporting Standards. Financials in Turkish Lira were converted into US Dollar. Income statement was translated from the average exchange rate throughout the relevant period whereas balance sheet was converted from the exchange rate as at the balance sheet date.

A forecast period of 10 years is selected for the valuation of İzocam starting from 2006 until 2015.

Historical financials of İzocam are set forth in Table C.1 and Table C.2:

Table C.1. Balance sheet of İzocam

(US\$ million converted from TRY based financial statements)	<u>31/12/2003</u>	<u>31/12/2004</u>	<u>31/12/2005</u>
ASSETS			
Liquid Assets	3.7	12.1	11.9
Trade Receivables (net)	18.9	26.9	33.3
Inventory	4.1	10.5	12.0
Other Current Assets	0.3	4.8	5.3
Total Current Assets	27.0	54.3	62.5
Financial Assets	8.6	9.6	27.2
Tangible Fixed Assets (net)	35.2	44.7	40.2
Intangible Fixed Assets (net)	0.2	0.2	0.2
Other Fixed Assets	0.0	0.0	0.0
Total Fixed Assets	43.9	54.6	67.6
Total Assets	70.9	108.9	130.1
Financial Loan	1.1	2.3	2.0
Trade Payables (net)	5.6	12.2	13.1
Loan Provisions	-	4.1	6.6
Deferred Tax Liabilities	1.1	-	-
Other Liabilities	1.0	2.2	2.6
Total Short-term Liabilities	8.7	20.8	24.3
Financial Loan (net)	8.3	6.7	3.9
Loan Provisions	1.8	2.5	3.2
Trade Payables (net)	-	0.1	-
Deferred Tax Liabilities	2.5	3.9	3.0
Total Long-term Liabilities	12.5	13.2	10.1
Shareholders' Equity	49.7	74.9	95.8
Total Shareholders' Equity & Liabilities	70.9	108.9	130.1

Table C.2. Income statement of İzocam

(US\$ million converted from TRY based financial statements)	<u>2003</u>	<u>2004</u>	<u>2005</u>
Net sales	69.3	135.2	143.3
COGS	(48.1)	(99.4)	(100.0)
Gross profit	21.1	35.8	43.3
Operating Costs	(14.3)	(21.0)	(23.7)
EBIT	6.8	14.9	19.5
Depreciation	7.5	8.1	8.1
EBITDA	14.3	23.0	27.6
Other operating income/loss	-	0.8	1.7
Net financial expense	1.3	(0.3)	(0.3)
Net gain/loss on investment in Subsidiaries and Participations	-	-	-
Monetary Gain/Loss	0.4	(1.7)	-
Profit before tax	8.5	13.6	20.9
Tax	(0.8)	(4.4)	(5.8)
Net profit	7.7	9.2	15.1

C.1.2. Step I-b: Development of Industry Forecasts

As of 2005, the size of the Turkish thermal insulation market is estimated as 4.0-4.2 million m³ corresponding to a total market size of between US\$160 million and US\$180 million. The thermal insulation materials consumption in Turkey grew at an annual rate of 15 per cent on average for the last four years. There are a number of factors behind the growth of Turkish thermal insulation market.

Despite impressive growth rates, the penetration of thermal insulation materials in Turkey is still low. It is estimated that only 12 per cent of existing buildings are equipped with thermal insulation. The per capita consumption of 0.06 m³ is well below that of the average European average of 0.6 m³ and the US average of 1.0 m³.

TS 825 Standards of Thermal Insulation Rules for Buildings, was introduced on 14 June 1999 and has been obligatory since 14 June 2000. TS 825 standard enforces thermal insulation certification for (i) all new constructions and (ii) renovations that cover more than 15 per cent of the total area of the building. It is expected that, the law will be

extended to require existing buildings to be insulated as well in the coming years. The legislation also regulates product specifications such as density, resistance, etc, which has become important in competing with smaller low-quality producers.

Heating accounts for an estimated 80 per cent of the total energy used by residential units in Turkey. Due to high fuel, natural gas, and electricity, prices, the thermal insulation materials pays back its investment cost relatively quick in Turkey. It is calculated that average payback period of a thermal insulation installation in residential buildings in Turkey is around 4 years.

The demand for new residential units in Turkey is high due to young population and high urbanization rate of 4 per cent per annum. Turkey has a population of 72 million, which is the third largest in Europe, after Russia and Germany. In 1998, 67.6 per cent of the population was below the age of 35 in Turkey.

Turkish construction industry grew by 21 per cent in 2005. Along with monthly interest rates as low as 1 per cent and maturities extending to 360 months, housing loans reaching their all time highs is a solid indicator of the realization of the pent up demand in the construction industry. The industry is expected to grow further by 15 per cent in 2006 and 7 per cent annually afterwards. The Mass Housing Under Secretariat states that around 1.5 million residential housing units are necessary in the 2005-2010 period in its "Housing Needs" Report covering the 2000-2010 decade, which confirms the strong demand and recovering supply of housing. It is also important to note that Turkey is a country where the average number of people per household is declining with an increasing population. Despite a population growth rate of 1.5 per cent, the number of households is increasing 2.5 per cent annually.

Thanks to its proximity, Turkey's well positioned to benefit from the construction activities in a large, rapidly developing region, comprised of Russia, CIS, Eastern Europe, and Middle East including Iraq.

Breakdown of Turkish thermal insulation market according to product segments is set forth in Table C.3. As of 2005, glass wool holds the largest share of the thermal

insulation materials production in Turkey, accounting for 35 per cent of the thermal insulation materials consumption in 2005 on m³ volume basis. Glass wool is followed by EPS, XPS and rock wool, each of which constituting around 15 per cent of thermal insulation material consumption in Turkey on m³ volume basis. The penetration of plastic based insulation materials are much higher in Turkey compared to developed countries. Reportedly, mineral wool products have 85 per cent share in the US market and 65 per cent in European countries, while it is around 50 per cent in Turkey. On monetary basis, it is estimated that mineral wool segment is around US\$60-70 million, XPS segment is around US\$45-50 million and EPS segment is around US\$30-35 million.

Table C.3. Breakdown of thermal insulation market

<u>Thermal Insulation Material</u>	<u>Annual Consumption in 2005 (m³)</u>
Glass Wool	1,500,000
Rock Wool	550,000
EPS	1,000,000
XPS	650,000
Polyurethane	350,000
Others	50,000

As for competition, three companies produce mineral wools, namely İzocam, Izotoprak and Ozpor in Turkey. İzocam is the sector leader in terms of glasswool capacity, accounting for 64 per cent of the total. Izotoprak, which accounts for 23 per cent of glass wool capacity, belongs to the financially troubled Toprak Holding.

In order to capitalize the rapid increase in insulation materials demand during the recent years, many companies started production and trade of plastic-based materials, leading to a stiffer competition. Some small-scale unregistered companies are not helping the competitive environment either. Dow Turkey is one of the leading actors in this field. All major players like İzocam, ODE, Ozpor and BTM have increased capacities within the last two years. Sector representatives expect the share of mineral wool materials to increase in the mid-term. Import competition is much weaker for mineral wool products since domestic price level is below world prices and also high freight costs for transporting such goods pose a kind of entry barrier.

The market is expected to continue its aggressive growth in the coming years. For the first five years, annual growth is assumed to gradually decrease from 15 per cent in 2005 to 5 per cent in 2011 and sustain at that level afterwards.

C.1.3. Step I-c: Development of Earning Forecasts

Revenues are forecasted line-by-line basis for each thermal insulation product. Volume and price projections were developed separately. As for the domestic market, it is projected that İzocam will maintain its market share for mineral wools and XPS products which makes up around 60 per cent of total revenue. For EPS and elastomeric rubber, a lower growth rate is projected. For Tek-Iz products, a growth in parallel with the market is assumed. As for export projections, historical growth trend for the projections is used.

İzocam margin projections are mainly based on the historical levels. Direct cost of revenues mainly includes raw material costs, labor costs, overhead and depreciation expenses. Depreciation expenses are projected based on the fixed asset base of the company. Operating expenses consist of selling and marketing expenses and general administration expenses.

Revenue projections of İzocam are provided in Table C.4, Table C.5 and Table C.6. Earning projections for İzocam are set forth in Table C.7.

Table C.7. İzocam earning forecasts

(US\$ mn unless otw. stated)	<u>2003A</u>	<u>2004A</u>	<u>2005A</u>	<u>2006E</u>	<u>2007E</u>	<u>2008E</u>	<u>2009E</u>	<u>2010E</u>	<u>2011E</u>	<u>2012E</u>	<u>2013E</u>	<u>2014E</u>	<u>2015E</u>
Gross Revenues	73.0	142.0	151.0	160.0	180.5	191.8	202.0	210.6	218.4	226.6	235.5	244.3	253.8
Net Revenues	69.3	135.2	143.3	152.5	171.5	182.3	192.1	200.3	207.9	215.8	224.3	232.7	241.8
Cost of goods sold	(48.1)	(99.4)	(100.0)	(106.8)	(120.0)	(127.6)	(134.5)	(140.2)	(145.5)	(151.0)	(157.0)	(162.9)	(169.2)
Gross Profit	21.1	35.8	43.3	45.8	51.4	54.7	57.6	60.1	62.4	64.7	67.3	69.8	72.5
Gross Profit Margin	30.5%	26.5%	30.2%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%
Operating Expenses	(14.3)	(21.0)	(23.7)	(26.7)	(30.0)	(31.9)	(33.6)	(35.1)	(36.4)	(37.8)	(39.2)	(40.7)	(42.3)
Sales & Marketing	(8.5)	(11.0)	(13.8)	(15.3)	(17.1)	(18.2)	(19.2)	(20.0)	(20.8)	(21.6)	(22.4)	(23.3)	(24.2)
General Administrative	(5.5)	(10.0)	(10.0)	(11.4)	(12.9)	(13.7)	(14.4)	(15.0)	(15.6)	(16.2)	(16.8)	(17.5)	(18.1)
Other Operating Exp.	(0.4)	-	-	-	-	-	-	-	-	-	-	-	-
Operating Profit	6.8	14.9	19.5	19.1	21.4	22.8	24.0	25.0	26.0	27.0	28.0	29.1	30.2
EBIT Margin (%)	9.8%	11.0%	13.6%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Depreciation	7.5	8.1	8.1	8.0	8.7	9.2	10.0	10.4	13.7	14.1	11.5	6.5	6.5
EBITDA	14.3	23.0	27.6	27.0	30.2	31.9	34.0	35.4	39.6	41.0	39.6	35.6	36.7
EBITDA Margin (%)	20.6%	17.0%	19.3%	17.7%	17.6%	17.5%	17.7%	17.7%	19.1%	19.0%	17.6%	15.3%	15.2%

C.1.4. Step I-d: Development of Capital Expenditure Forecasts

Capital expenditure projections for İzocam consist of capacity expansion investments and maintenance investments. It must be underlined that, because of the production technology, the furnaces used for the manufacturing of mineral wools are destroyed and rebuilt in each five years. İzocam uses this required investment as an opportunity for an increase in capacity in order to cope with the growing demand. Required level of capacity increase is calculated according to the production volumes. Annual maintenance expenditures are projected in line with the historical levels. Details of capital expenditure calculations are set forth in Table C.8.

C.1.5. Step I-e: Development of Working Capital Forecasts

Working capital projections are projected on the basis of percentage of revenue. İzocam runs a working capital level of around 23 per cent of its revenues. Such level is assumed to be maintained in percentage wise for the projections. Details of working capital calculations are set forth in Table C.9.

C.1.6. Step I-f: Development of Tax Forecasts

Tax forecasts are based on the operating profit as 20 per cent of revenues.

C.1.7. Step I-g: Development of Cashflow Forecasts

Cashflows of İzocam are calculated in Table C.10.

Table C.8. İzocam capital expenditure forecasts

US\$ mn unless otw. stated	2003A	2004A	2005A	2006E	2007E	2008E	2009E	2010E	2011E	2012E	2013E	2014E	2015E
New Investments	1.0	4.3	3.7	20.5	5.5	2.9	5.6	2.9	23.1	2.8	2.9	5.5	2.6
Capacity Expansion				20.5	3.0	0.4	3.0	0.3	20.5	0.3	0.3	3.0	
Maintenance					2.5	2.5	2.6	2.6	2.6	2.5	2.6	2.5	2.6

Table C.9. İzocam working capital forecasts

US\$ mn unless otw. stated	2003A	2004A	2005A	2006E	2007E	2008E	2009E	2010E	2011E	2012E	2013E	2014E	2015E
Trade receivables	18.9	26.9	33.3	35.5	39.9	42.5	44.7	46.7	48.4	50.2	52.2	54.2	56.3
Inventories	4.1	10.5	12.0	12.9	14.5	15.4	16.2	16.9	17.5	18.2	18.9	19.6	20.4
Trade payables	5.6	12.3	13.1	14.0	15.8	16.8	17.7	18.4	19.1	19.9	20.6	21.4	22.3
Trade working capital	17.4	25.2	32.2	34.3	38.6	41.1	43.3	45.1	46.8	48.6	50.5	52.4	54.5

Table C.10. İzocam cashflow forecasts

US\$ mn unless otw. stated	2006E	2007E	2008E	2009E	2010E	2011E	2012E	2013E	2014E	2015E
EBITDA	27.0	30.2	31.9	34.0	35.4	39.6	41.0	39.6	35.6	36.7
(-) Capital Expenditures	(20.5)	(5.5)	(2.9)	(5.6)	(2.9)	(23.1)	(2.8)	(2.9)	(5.5)	(2.6)
(-) Taxes	(5.4)	(6.0)	(6.4)	(6.8)	(7.1)	(7.9)	(8.2)	(7.9)	(7.1)	(7.3)
(-) Change in working capital	(2.2)	(4.3)	(2.4)	(2.2)	(1.9)	(1.7)	(1.8)	(1.9)	(1.9)	(2.0)
Cashflow to Firm	(1.0)	14.4	20.2	19.4	23.6	7.0	28.2	26.9	21.1	24.7

C.2. DCF Valuation of İzocam- Step II: Estimation of the Discount Rate

In order to calculate the WACC for İzocam according to Formula 3.13, cost of equity, cost of debt and financing mix of the company should be estimated.

C.2.1. Step II-a: Cost of Equity Estimation

Estimation of the cost of equity for İzocam is undertaken pursuant to CAPM approach according to Formula 3.16. Beta value for İzocam is 0.81.

By applying the Formula 3.18, assuming 10 per cent for debt as a share of total financing for İzocam and a tax rate of 20 per cent, an unlevered beta of 0.74 is calculated for İzocam. Based on these data, calculation of cost of equity for İzocam is explained in Table C.11.

Table C.11. Cost of equity estimation for İzocam

Real Risk Free Rate	2.07%
Turkey Country Risk Premium	10.84%
Unlevered Beta of the Firm	0.74
Risk Premium for the Firm	8.06%
Cost of Equity for the Firm	10.13%

C.2.2. Step II-b: Cost of Debt Estimation

Since İzocam does not have a bond currently, the borrowing terms of the company was referred in order to estimate the current spreads. However, the company has minimal amount of debt, and such debt is long term investment credits with low interest rates

With that respect, it was opted to take the market benchmark for companies like İzocam. As for such case, a rate of eight per cent rate is plausible. By applying Formula 3.19 and 3.20, cost of debt for İzocam is calculated in Table C.12.

Table C.12. Cost of debt estimation for İzocam

Interest Rate of Existing Firm Debt	8.0%
Risk Free Rate for the term of Existing Firm Debt	4.4%
Spread for the Existing Firm Debt	3.6%
Risk Free Rate for 10 years	4.4%
Nominal Cost of Debt for the Firm	8.0%
Less Implied Inflation	2.3%
Real Cost of Debt for the Firm	5.7%
Tax Rate	20.0%
Real Cost of Debt for the Firm (after tax)	4.5%

C.2.3. Step II-c: WACC Estimation

For İzocam, a 10 per cent debt – 90 per cent equity is projected as the financing choice. Table C.13 provides the calculation of WACC for İzocam according to Formula 3.13.

Table C.13. Weighted average cost of capital estimation for İzocam

Cost of Equity	10.13%
Equity %	90%
Cost of Debt (after tax)	4.5%
Debt %	10%
WACC (after tax)	9.6%

C.3. DCF Valuation of İzocam- Step III: Calculation of Terminal Value

Cashflow value method was selected for İzocam in order to calculate terminal value according to Formula 3.24.

As for the estimation of growth rate, if it is envisaged that the Company will generate most or all of its cashflows from a domestic economy, its growth should be bound to the overall growth of overall economy. With that respect, 3 per cent were taken as the growth rate for the terminal value calculation. Calculation of terminal value for İzocam is set forth in the Table C.14.

Table C.14. Calculation of terminal value for İzocam

WACC (%)	9.6%
Terminal Growth Rate (%)	3.0%
Cashflows to Firm at 2015 (US\$ mn)	25
Terminal Value at 2015 (US\$ mn)	385
Years between 2005 – 2015	10
Discount Factor between 2005 and 2015	2.50
Discounted Terminal Value at 2005 end (US\$ mn)	154

C.4. DCF Valuation of İzocam- Step IV: Calculation of Equity Value

As at the end of December 2005, İzocam has a net cash position of US\$6 million, which should be added to the enterprise value to arrive at equity value. Calculation of equity value for İzocam is set forth in Table C.15.

Table C.15. Calculation of equity value for İzocam

(US\$ million)	<u>2005-end</u>
Discounted Cashflows from 2006 to 2015	106
Discounted Terminal Value (from 2015)	154
Enterprise Value at the end of 2005	260
Less: Value of Debt	-6
Equity Value	266

C.5. Relative Valuation of İzocam

Global thermal insulation market is significantly consolidated as such İzocam's international competitors are multinational firms operating in global scale. With that respect, the benchmarks for İzocam are chosen from other construction material firms in Istanbul Stock Exchange with market capitalizations around İzocam's market capitalization levels. The comparable firms are chosen as Alarko Carrier, Borusan Mannesmann, Ege Profil and Türk Demirdöküm. Cement companies are not included in the peer group as they are currently excessive margins due to their market position.

Comparison is based on historical P/E, EV/EBITDA and EV/S multiples. A comparison based on forward-looking multiples was not undertaken as the revenue and profitability forecasts of peer group companies are unavailable.

Relative valuation of İzocam is detailed in Table C.16.

Table C.16. Comparison of İzocam with selected peers

US\$ mn unless otw. stated	<u>Market Capitalization</u> (25/05/2006)	<u>P/E</u> <u>Multiple (x)</u> <u>2005</u>	<u>EV/EBITDA</u> <u>Multiple (x)</u> <u>2005</u>	<u>EV/S</u> <u>Multiple (x)</u> <u>2005</u>
Alarko Carrier	112.4	7.6	6.0	0.6
Borusan Mannesmann	181.7	12.7	6.4	0.4
Ege Profil	130.3	12.7	9.5	1.4
T. Demirdöküm	316.2	14.8	6.4	0.8
Average Multiples		12.0	7.1	0.8
İzocam Equity Value (US\$ mn)		180	201	121

Based on the peer averages, an equity valuation of US\$180 million is calculated based on historical P/E multiple, US\$201 million based on historical EV/EBITDA multiple and US\$121 million based on historical EV/S multiple.

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