UNIVERSITY OF LJUBLJANA
FACULTY OF ECONOMICS

# Master thesis

# ESTIMATING COST OF CAPITAL USING ACCOUNTING FUNDAMENTALS

Ljubljana, October 2004 Milena Bošković

# IZJAVA

Študent **Milena Bošković** izjavljam, da sem mentor tega magistrskega dela, ki sem ga napisal pod mentorstvom **prof. Neil Garrod** in v skladu s 1. odstavkom 21. člena Zakona o avtorskih in sorodnih pravicah dovolim objavo magisterskega dela na fakultetnih spletnih straneh.

V Ljubljani, 13.10.2004

Podpis: _____

## *Introduction*

The cost of equity capital is the rate of return that equity investors demand for their invested capital. Even thirty years after the development of the CAPM, calculating the risk premium implied in the cost of capital is a matter of controversy. This is the one of the most important issues in modern corporate finance, because the financial analysts still cannot find a way to avoid the practical problem of estimating a company's cost of equity.

CAPM can give some powerful insights about the equilibrium of the securities market. However, the assumptions on which it lies on are rather unreal, ignoring at least some real life complexities. Many practitioners have serious doubts about the possibility of application of the CAPM to investment decisions. They question whether the only measure of risk that matters is market risk. At the beginning of the development of the model, it was taken up enthusiastically by the universities and business schools. Nevertheless, practitioners were rather skeptical. Soon after, a number of studies criticized the applicability of the model and its ability to predict the cost of capital, as well.

In the last decade there has been a growing number of studies that are using the dividend discount model or the residual income model to estimate the cost of equity. The overall opinion is that the market risk is not the only measure of risk that matters and that firm specific components do influence the cost of capital. There are still considerable debates about the size of the equity premium and the question if it changes with the riskiness of the economy. This indicates that the sensitive question about the cost of equity is still not resolved.

Models that are based on the residual income model are trying to improve upon the estimates of the cost of equity obtained using the traditional approach. The empirical approach to estimating the cost of equity using this model is quite straightforward. It seeks to exploit the information in analysts' forecasts and current prices rather than historical information in time series of prices. In an efficient market, price equals the discounted present value of the sum of book value and forecasted residual earnings. Analysts' forecasts of earnings and dividend payout ratios are used to forecast the residual income streams. The cost of equity is then defined as discount rate that equates the price to the fundamental value. An analogous approach can be employed to calculate the discount rate in the dividend discount model. The information used in this model is quite similar to the one used in residual income models. However, empirical studies have shown that models based on earnings are more accurate.

It is appealing to use forecasted data to estimate the risk premium. On the other hand, there are also downsides. The intuition as to why estimated discount rates are less dispersed is that estimated data are less variable than actual data. Therefore, estimates of discounted rates using forecasted data are also expected to be less volatile. In short, of the three variables in the residual income model, two must be assumed correct to solve for the third.

The main purpose of my master thesis is to calculate the cost equity for the Slovenian market and consequently implied equity premium. As a basis for the estimation I will use the model developed by Easton et al. (2002). The model simultaneously estimates the cost of equity and the growth in residual earnings that is implied by current stock prices, current book value of equity and the short-term forecasting of accounting earnings. What differentiates this model from other residual income models is that instead of assuming the growth rate beyond the forecasts horizon, it calculates it.

In the first chapter I will present some theoretical considerations about the relationship between the accounting data and the capital market. Early researches in this field have not shown strong relationship between financial information and capital markets. However, in the last decade these results have proven to be premature. The relationship between accounting information is becoming stronger, in a way that accounting information influence capital market and capital market influences the accounting standards. Standard setters are paying attention that reported accounting information would have more usefulness in the area of capital markets and equity valuations.

The third chapter deals with different methods of estimating the cost of equity with the special emphasis on the CAPM model and its usefulness in practice. Models that use earnings to predict or to estimate the cost of equity tested the strength of the earnings-return relationship. Numerous studies have shown extremely weak correlation, with $R^2$ hardly ever reaching 10%. Earnings had its central role in financial reporting, but studies have not confirmed it. Reasons for this are not quite clear so far. Reported earnings are usually biased by accounting measurement, valuation principles and in the worst case by manipulation. However, this relationship becomes much stronger if earnings are aggregated over longer intervals. Earnings of one period may contain measurement errors due to recognition lag and/or manipulation, among other reasons; however, economic events will, sooner or later, be recorded. Overstated earnings in one period will be "corrected" by the understated earnings in the next period.

After the description of the Slovenian capital market the model is tested on the sample of 103 companies traded on the Ljubljana Stock exchange from the period of 1996-2002. The model

gives figures about the value of the cost of equity and the growth rate of the residual income for the non-financial companies.

In the conclusion I will present the overall analysis of the results, reliability and the usefulness of the model in calculation of the cost of equity. The downsides of the model will also be presented.

# *1. The role of accounting in valuation*

## *1.1 Relation between financial information and capital markets*

A large fraction of accounting academic literature examines the relation between financial information and capital markets, referred to as capital market research. Main sources of demand for capital market research are fundamental analysis and valuation, test of market efficiency, role of accounting in contracts, political process and disclosure regulations (Kothari, 2001). Those kinds of researches explored the basic question that concerned influence of accounting information on the equity investors. Ball and Brown (1968) reinforced the focus on the usefulness of accounting information in their study:

"Recent developments in capital theory provide justification for selecting the behaviour of security prices as an operational test of usefulness. An impressive body of theory supports the proposition that capital markets are both efficient and unbiased in that if information is useful in forming capital assets prices, than the market will adjust prices to that information quickly…."

Early results of those studies were not quite optimistic. They were inferring that accounting information is not quite useful in the equity valuation. On the individual basis there was strong connection, but not on the overall capital market setting. Main critique was that the only thing that accounting information provide is the assessment of the risk of the company and that is where the usefulness stops. Results of the later studies were rather different. A strong and clear relationship between accounting information and capital market has been shown and this relation was far more sophisticated, than it was stated in the early researches.

Shareholders, investors and creditors have obvious interest in the value of a firm. In an efficient market value of a company is defined as present value of future expected net cash flows, discounted at the appropriate risk-adjusted rate of return. Current performance of a company is summarized in its financial statement, which is not the only input for valuation, but it is the most

important one. Basic principle of accounting rules is to help investors, shareholders and debtors in assessing the value of the company. Therefore, relation between the current financial performance and the future cash flows, as well as between financial performance and price changes is expected to be strong.

The main focus of fundamental analysis is valuation, aimed at identifying mispriced securities. Fundamental analysis captures the information contained in past and current financial statements and in conjunction with industry and macroeconomic data arrives to the company's intrinsic value. A difference between the current price and intrinsic value is an indication of expected reward for investing in securities. Capital market research on valuation examines whether the analysis has successfully identified mispriced securities.

Fama (1991) defines efficient markets as ones in which "security prices fully reflect all available information". Market efficiency is of great importance for investors, managers and other market participants. This is because of the fact that security prices determine allocation of wealth among firm and individuals. Security prices are affected by financial information, which explains the interest of academics and practicing accountants in market efficiency.

A few key concepts about the valuation task and the role of historical-based accounting numbers in valuation should be outlined (Lee, 1999):

- Valuation is essentially *prospective*, it is supposed to estimate the present value of future pay offs to shareholders. In other words, it involves our subjective estimation and imprecision. Some models can reduce imprecision, but no model can guarantee the ultimately correct estimation.

- Valuation is *interdisciplinary*. Accounting information is not designed to measure the value of a company directly. Valuation involves more than just accounting: finance, economics, marketing, corporate strategy, etc.

- Accounting systems are crucial to valuation. "Revenue recognition" and "matching principle" makes earnings a reasonable measure of firm's performance. Financial analysts express their estimation in terms of forecasting earnings, not cash flows or dividends. Even the discounted cash flow method is based on accounting constructs, such as future earnings. Accounting provides useful information about future pay offs to shareholders; we could say that it is the basic task of accounting. Today's estimations of financial analysts can be compared to actual and audited earnings reported in the future.

The existence of this ex-post settling process ensures the integrity of the ex-ante process of estimation. The accounting system recognizes events, even later than the security prices.

- Valuation systems simply reflect the accounting systems. These models help us to assess future events, especially in terms of accounting constructs. They guide us what to forecast, what information is needed to make the forecast, and how to make the stream of future pay offs into value estimate. However, the main task in the process of valuation is not to manage the equations in the model, but to make the forecasts.

The challenge of using accounting numbers for valuation purposes has been tempting accounting researchers and professional financial analysts for years. The linkage between accounting numbers and stock market price, as well as the choice and the measurement of the appropriate accounting numbers have developed some new areas that treated the valuation models. Some of them were simple, based only on current measurement of earnings, other were much more complicated and based on massive amount of accounting numbers. These models can be divided in two large groups, based on the methodology (Lee, 1999):

- Valuation models that are based on the statistical association between accounting numbers and stock market prices.
- Valuation models that are deducted from the theory of capital value

Statistical valuation models are based on some simplified assumptions about the relationship between accounting numbers and stock market prices. An example is with the use of P/E ratio, a simple mathematical relation. On one hand, these models are simple to use, but on the other there are many shortages in modelling logic.

A prerequisite of such model is that observed stock market prices are "correct", the price fully reflect the available information. This relates to "semi strong market efficiency[1]" hypothesis, although it is unclear when this hypothesis holds in practice.

Deduced valuation models do not depend on any assumption about the stock market and prices being efficient in the semi strong sense. These models constitute a good foundation about the relationship between accounting numbers and stock market prices. Statistical problem that concerns the prediction of the appropriate accounting numbers cannot be avoided, though. Such

[1] The market is said to be semi strong efficient if all the public information, including publicly available accounting information is fully reflected in stock market price. (Brigham E. and Daves P., 2002)

models are residual income model or value added model, where the logic of the modelling is the same: capital value is determined as the sum of accounting book measures of capital and the present value of future abnormal profitability.

Financial reporting is also related to the question of market efficiency. Once firms make accounting information publicly available, it will be reflected in the security valuation. In the efficient capital markets investors' gain from the accounting information, even though they have not processed them by themselves. There have been number of studies, which have proved that markets are efficient, such as Ball and Brown (1968) and Beaver (1970).

However, recent studies have shown market inefficiency especially in the area such as post-earnings announcement drifts, market-to-book ratios and contextual accounting issues. Studies that concerned post-earnings announcement drifts[2] (Bernard and Thomas (1990)) found that the subsequent abnormal returns clustered around the subsequent earnings' announcement day. Abnormal earnings are associated with the some inefficient process of earnings' announcement. If the analysts processed the information appropriately then the expected value of the earnings' forecasts errors would be zero. This phenomenon cannot be attributed only to the analysts' behavior. This drift is more pronounced in small-capitalized firms than in bigger ones.

Contextual accounting issues were treated in the study of Sloan (1996), with emphasis on accrual accounting. Key feature of such study is that it requires some amount of accounting knowledge. Studies mentioned above require relatively low knowledge of the distinctive characteristics of how financial statements are prepared, particularly the treatment of earnings and accruals. Accruals seem to be very important part of financial reporting and special disclosure makes them more transparent. He compared the importance that analysts give to the cash flows and accrual components in equity valuation. Conclusion was that capital markets overestimate accrual components in valuation, and undervalue the persistency of cash flows. In other words, mispricing is largely due to abnormal accruals.

[2] There are many anomalies that question the validity of the efficient market hypothesis. One of them is post announcement drift. According to the EMH stock prices adjust instantaneously to new information. Empirical evidence suggests that price changes persist some time after the initial announcement. Other possible anomalies that question the EMH are: Monday effect, size effect, P/E ratio, B/M ratios, Briloff Effect, etc. (White et al., 1997)

## *1.2 On the quality of earnings*

In working with quantitative tools we must attempt to use the most appropriate and reliable information available. The key source of such information is company's accounting information and financial disclosures. The investigation of issues relating to accuracy is often broadly referred as the quality of earnings' analysis. This means that it includes analysis of all financial statements including balance sheet, however, skill in quality of earnings' analysis comes through knowledge of financial statement analysis as well as practical experience. Careful examination of footnotes to accounting statements, and all other relevant disclosures is essential to a quality of earnings' analysis (Cornel and Landsman, 2003).

Some examples of few potential issues with company's earnings are (Stowe et al., 2002):

- Revenues and gains. A company can recognize revenue early, for example: i) bill-and-hold assets, ii) leaser's use of capital lease classification, iii) recording sales of equipment of software prior to installation and acceptance by customer, classification of nonoperating income or gains as part of operations.
  A potential interpretation of these events is that acceleration in the recognition of revenue boosts reported income and declines operating performance. Also, income or gains may be nonrecurring and may not relate to true operations and may disguise a decline in operating performance.
- Expenses and loses. i) A company can differ expenses by capitalizing expenditures as an asset, for example: customer acquisition cost or product development cost; ii) use of nonconservative estimates and assumptions such as: long depreciable lives, long period of amortization, high pension discount rate, low assumed rate of compensation growth for pensions, high expected return on assets for pensions. Deferral of expenses may boost current income at the expense of future income and mask the problem in underlying business. Nonconservative estimates may indicate actions taken to boost reported income. Changes in assumptions may indicate an attempt to disguise the problem with the underlying performance in the current period. If a company capitalized costs that should be expensed immediately, it will affect earnings per share, as well as estimated financial strength of that company. Increased earnings per share will reflect very aggressive accounting since there is no assurance that there would be revenues against which expenses could be matched. If we want to calculate EBITDA[3] it would not reflect the real situation. Costs are not deducted from the reported earnings, and instead the amortization of the capitalized cost is added back. These cash outflow would reduce the funds

[3] EBITDA are earnings before interest, taxes, depreciation and amortization. Because neither depreciation nor amortization are paid in cash, this is a better measure of cash flows than is net income (Brigham, 2002)

available for financing debt and they would affect the company's future performance. In extreme cases it might lead to bankruptcy (Stowe et al., 2002).

- Balance sheet issues. This might be in the case of use of special purpose entities[4]. Consequence of using these kinds of entities is improper reflection of assets on the balance sheet. Income may also be overstated by sales to the special purpose entity or a decline in the value of assets transferred to the SPE.

Analysts recognize many different risk factors that might signal possible future negative surprises (Stowe et al., 2002):

- Poor quality of accounting disclosures
- Existence of related party disclosures
- Existence of officer, employee or director loans
- High management of director turnover
- Excessive pressure on company personnel to make revenue on earnings target
- Management pressure to meet debt covenants or earning expectations
- Material non-audit services performed by audit firm
- Economic, industry, or company specific pressure on profitability or stock price.
- A history of security law violations, reporting violations or persistent late filings, etc.

Firms with high quality earnings are considered less risky than the ones that do not use it. This is because if a company uses conservative accounting it can always increase reported income by switching to less conservative methods. As long as it uses conservative accounting we can assume, to some extent, that there is no accounting manipulation, or at least that there is less room for the manipulation Companies with high quality earnings usually have higher price to earning ratios than companies with lower quality. These kinds of companies are usually risk averse in their business plans or capital structures.

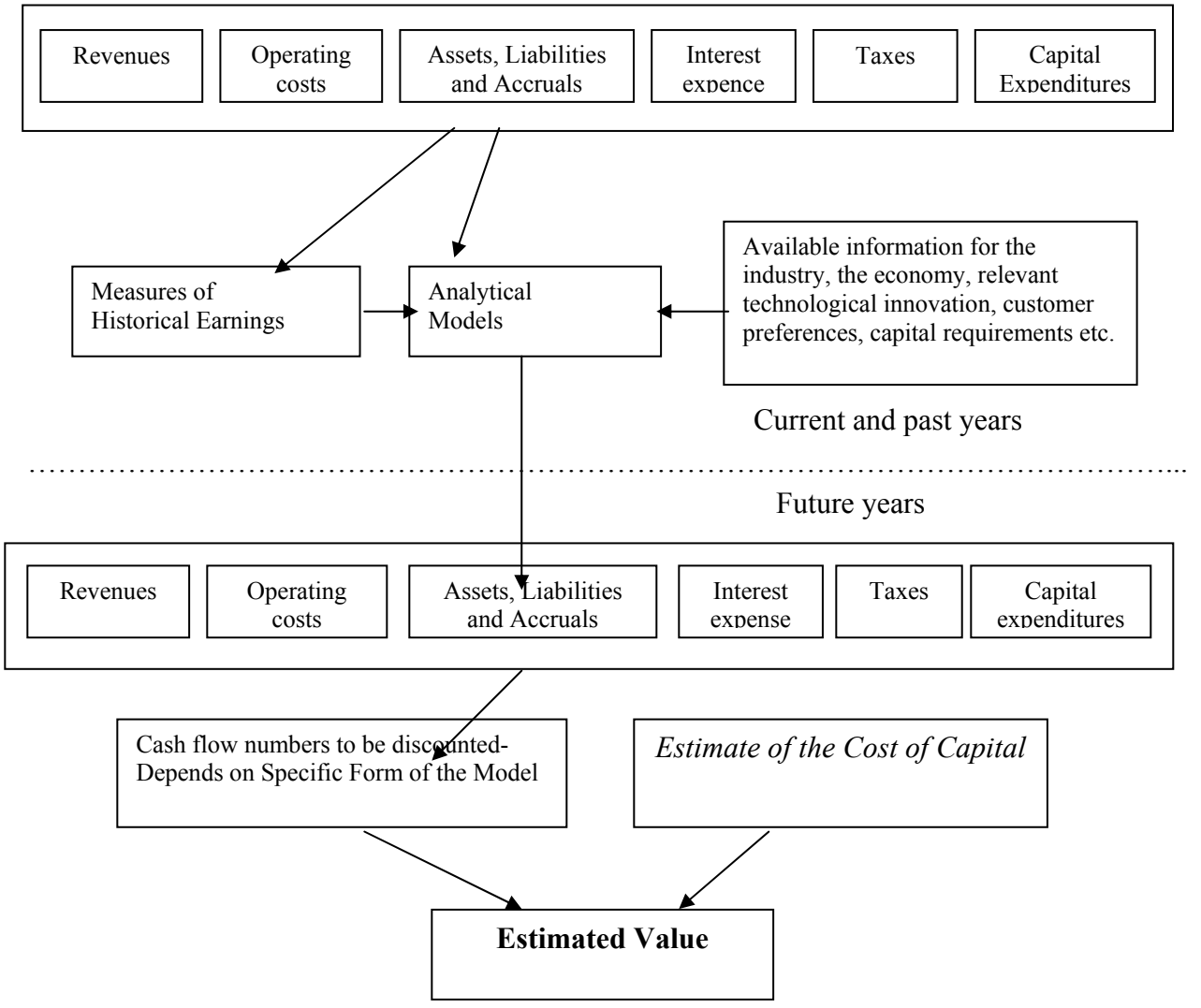
Generally, valuation methods can be based on three measures of earnings (Cornell et al., 2003): free cash flows, operating income and accounting earnings. All of the three measures are of equal quality in present value of future cash flow relation, as long as the clean surplus relation is satisfied, or accounting system periodically recognises additions to value that are distinguished from distribution of value. It is hard to capture all the necessary past value relevant information into one measure. Forecasting future cash flows requires understanding earnings power of company. We need to understand how revenues have grown over time and what the costs of

[4] A special purpose entity is a nonoperating entity created to carry out a specified purpose, such as leasing assets or securitizing receivables. The use of SPEs is related to off-balance-sheet financing (financing that does not currently appear on the balance sheet).

producing those revenues were. "High quality" earnings measure should contain that information. Furthermore, there are no strictly defined criteria about what measure is of the highest quality, since there is no meaningful way of measuring quality. The only way is to put historical data into time series, and than to see what is the best fit to forecasted data, ex post. But once we made the forecast, selecting the best earnings measure becomes irrelevant.

In the figure below the process of connecting the accounting information and valuation is presented.

**Figure 1. Accounting information and Valuation**




Source: Cornell et al., 2003, pg.254

**Figure 1** represents an illustration of the valuation process. The specific application depends on the method used in the valuation. As it was said before, we can use either dividends (Gordon 1962), free cash flows (Cornell, 1993), capital cash flows (Ruback, 2000) or accounting earnings (Ohlson, 1995). As long as the clean surplus relation is satisfied, and an *appropriate discount rate* is used, the results all methods give are similar. They all follow the path shown in the figure above. The accuracy of valuation method used depends on the analysis of the past financial performance with consideration of different factors such as: economic growth, industry developments, technological innovation, changing customer preferences, and each of these factors can influence relation between past financial data and future performance.

Aggregating the past information into one measure of "earnings" as a part of valuation presented in the figure above has some advantages (Cornell et al., 2003):

- First, it reduces a great amount of financial data into a single time series. It makes analysis of large number of companies feasible. However, the efficiency of this computation is unclear, but more important is the understanding of the relation between measure of earnings and future performance than not having that measure.

- Second, it helps comparing valuation between companies. This multiple valuation based on some earnings aggregate is inevitable tool for investment bankers, analysts and other in appraising companies.

For an earnings measure to be useful in comparing companies, it should capture the persistent component of earnings. One-time charges will produce some elements that are not reflected in other's companies' valuations, which will make the comparison useless. The concept of persistent component of earnings goes beyond accounting. One-time charges or write-offs associated with such events as mergers or restructuring can make persistent earnings different from accounting for a number of non-accounting reasons. A company may cut prices in order to spur sales, which is likely to have a non-persistent effect on earnings. But it is also likely that this effect will be hidden in the analysis forecast and not be considered in forecasting earning. Also, current earnings might be affected by internal events, such as management turnover. Adjusting forecast to these kinds of economic changes is equally important as adjusting for accounting changes. In practice, analysts use judgement to decide which measure is the best predictor of multiples.

The bottom line is that there is no general method for making the ranking of earnings measure. The earnings measures will vary among companies and over time. Some investors might even forgo the use of any earnings measure and rely instead on specific components of financial data.

### 1.2.1 Empirical tests of earnings quality

Empirically testing the quality of earnings literally means to find out which measure of earnings works best in practice. The term "works best" is can be defined using following criteria (Cornell et al., 2003):

- *Value relevance method* is based on the separate regression of market price to each of the earnings component. The best measure is the one that yields the highest adjusted $R^2$, the most significant slope coefficient or the slope coefficient most consistent with the predicted amount. Besides using level of variables, depending on the statistical issues changes in the variables can also be used, as well as data over long time interval. Value relevance can also be defined using incremental values, where different measures of earning are added to regression of market price. The best measure is the one that yields the highest incremental explanatory power.

- *Information content method* is based on the reaction of stock prices, measured as risk adjusted market return, to unexpected changes in the competing accounting measures. As before, the best earnings measure is the one that has the highest $R^2$ or the most significant slope coefficient. Issue here is the effect of timeliness that is the extent to which an unexpected measure of earnings explains the net effect of price change over some short interval. Some use short-term window of 2-3 day, some longer interval of 60 days.
- *Predictive ability method* is based on how well past values of specific earning measure predict the future value of that measure. A simple approach is to use last year's measure to predict the next years. The measure with the smallest prediction error is considered the best.

Penman and Sougiannis (1998) produced an interesting empirical study on the quality of earnings measures. Then they compared dividends, cash flows and accounting earnings. Dividend, cash flow and earnings approaches are equivalent when the respective payoffs are predicted "to infinity," but practical analysis requires prediction over finite horizons. In the dividend discount approach, forecasted dividends over the immediate future are often not related to value so the forecast period has to be long or a (often questionable) terminal value calculation

made at some shorter horizon. Alternative techniques forecast "more fundamental" attributes within the firm instead of distributions from the firm; however, these techniques frequently require terminal value corrections also. The valuation techniques are evaluated by comparing actual traded prices with intrinsic values calculated, as prescribed by the techniques, from subsequent payoff realizations.

Their paper documents that valuations based on accounting (accrual) earnings have practical advantages over discounted cash flows and dividends techniques. Thanks to the accruals that bring future payoffs in time, they facilitate valuation over short-term period better than other measures of earnings. They also show that under certain conditions, such as high P/E and P/B ratios, accrual accounting earnings are not satisfactory.

### 1.2.2 Comparability problems

Financial statements, in general, give good amount of information for predicting future performance, although, problems are specially emphasized when comparing the financial results of two different companies (Cornell et al., 2003). There is more than just one acceptable way to present various items according to generally accepted accounting principles. This means that two companies might have equal economic income, yet different accounting income.

Inventory valuation can be done in two ways: LIFO (last-in first-out) and FIFO (first-in first-out). If a company has 1 million units of goods and if this inventory turns once per year, it means that ratio of cost of goods sold to inventory is 1. LIFO system values at the current cost of production, so that the last unit produced is considered to be the first one to be sold. The FIFO system assumes that the units sold should be valued at the original cost.

If the prices of the generic goods were constant over the inventory turnover period, it would not matter what system is used for valuation because the result would be the same- $1 million. However, if we suppose that prices of generic goods rise for 10 % during the year, result will be different for these two systems.

LIFO accounting would result in cost of gods sold of $1, 1 million, where end of the year balance sheet value of 1 million units of generic goods remains $1 million. The balance sheet value of inventories is given as the cost of goods still in inventory. The last goods produced are assumed to be sold at the current cost of $1, 1 million; the goods remaining are at cost of $1

million. LIFO system accurately values cost of goods sold today, but underestimates the current value of remaining inventory.

FIFO system would recognize $ 1 million of cost of goods sold, while end of the year balance sheet value of inventories would be $1, 1 million. Final result is that firms under LIFO system have lower profit and lower balance sheet value of inventories then firms with FIFO system of valuing inventories.

LIFO is preferred over FIFO in computing economic earnings (real sustainable cash flow) because it uses up to date prices to evaluate costs. In practice it results in upward bias of ROE, because the investment base on which return is earned is undervalued.

Depreciation is another source of measurement problem error in evaluating and comparing different companies. There is an economic and an accounting definition of depreciation, which might substantially differ. Economic depreciation is the amount of firm's operating cash flows that must be reinvested in the firm to sustain its real productive capacity at the previous level. Accounting depreciation is the amount of the original acquisition cost of an asset that is allocated to each of the accounting periods over an arbitrary specified life cycle of the asset. This is the number that is reported in financial statements.

Let us assume that we buy a machine of $100 000 with an economic life of 20 years. Firm can choose to depreciate this machine over 10 year period using straight line method, for $10.000 a year of depreciation. After the 10-year period the machine will be fully depreciated and be left with 10 more years of economic life. In computing earnings, this firm will overestimate depreciation in the first 10 years and underestimate it in the next 10 years, which means that accounting earnings will be understated in the first ten years. If the management distributed as dividends only its accounting earnings, it would pay out lower amount in the first ten years relative to the real sustainable cash flow. A security analyst that relied on the reported earnings would see understated accounting earnings and would undervalue the firm.

Firms in the US can use different depreciation method for different purposes (Stowe et al., 2002). For tax purpose they would usually use accelerated depreciation method, while for the public reported financial statement they would use straight-line depreciation method. There are also differences across firms in their estimation of the economic life of assets.

Major problem in depreciating assets is similar to FIFO and LIFO inventory recording system, and that is inflation. Depreciation is recorded at historical cost, while current cost of replacing

that assets are higher. This brings to overstated earnings, thus overestimating intrinsic value of the firm. Inflation can cause distortion in depreciation and measurement of inventories, but more serious problem is calculation of the interest expense. Nominal interest rates includes inflation premium that compensates the lender for the erosion of the value of principal. Therefore, part of the amount that is treated as interest expense should be actually treated as repayment of the debt principal. For example, a company has $ 10 million of outstanding debt with an interest rate of 10 %. If the yearly inflation is 6 % real interest rate is 4 %, which means that $4 million is the real interest expense. Then 6 million that appears as the interest expense on the income statement is an inflation premium, or compensation for the anticipated reduction of the value of the principal. Real income of the firm is understated by $6 million

.

Accounting rules vary among countries, which might be a problem if we want to compare companies from different countries. For example, many countries allow firms considerable discretion in setting aside reserves. Difference between USA and European countries varies to great extent; reported earnings are far more subject to managerial discretion. Germany is a country that allows particularly wide discretion in reserve practice. Treatment of intangibles such as goodwill can vary widely. They can be amortized or expensed. If they are amortized, period of amortization also can vary. These questions can seriously affect reported earnings and estimation of intrinsic value of companies.

## *1.3 Accrual management*

Accrual accounting is an important part of financial reporting Management can improve or harm the quality of financial statements, using their discretionary power over accounting numbers. This is the case when they make voluntary earnings forecasts, voluntary choice of accounting methods and estimations of accruals. There are two kinds of motives for management accruals: opportunistic and signaling (Balsam et al., 2002). They are usually related to compensation contracts, debt covenants, taxes and regulatory behavior. In practice it is difficult to isolate one motive from the other, for example capital markets and compensation contract motives can lead to overestimation of earnings. This is where special attention of analysts is needed, as accruals can be related to special firm characteristic: financial difficulty, loss avoidance, income smoothing, etc.

Discretionary nature of the income statements is something that analyst of the financial information has to be aware off. Two things that are the most important are (White et al., 1997):

- Timing of the occurrence of events
- Classification of the item

Items that require separate disclosure may be the subject of manipulation in the terms of the time of occurrence, i.e., disposal of an asset or discontinuation of the segment, as well as how are these items classified, i.e., ordinary, unusual or extraordinary. Classification of the nonrecurring items most usually affects the usefulness of the income statements, especially the items that reduce the reported income.

The most usual areas where we can find managerial manipulations are (White et al., 1997):

- Classification of good news/bad news
- Income smoothing
- Big bath behaviour
- Accounting changes

Management usually reports good news "above the line", while bad news are reported below the line. This way they give priority to good news and treat them as a part of continuing operations. They can decide, for example, whether the part of company that has been sold meets the definition of a segment and treatment of possible loss as a below the line segment. Losses from disposal are also items that are most usually treated as extraordinary items and registered below the line.

Income smoothing relates to behavior where management decides to reduce earnings in good years and increase them in bad years. These kinds of behavior are recognized when managements wants to stabilize earnings. They can do this in two ways: intertemporal and classical smoothing.
Intertemporal smoothing of earnings refers to timing costs, such as research and development, asset disposal, or choosing of appropriate accounting method, such as capitalization of expenditure. Classical smoothing refers to a choice of treatment of item as ordinary or extraordinary. This is especially the case with the sales of assets, whose treatment can be left to decision of management. Assumption behind these is that analysts do not pay much attention on nonrecurring items and concentrate more on income from continuing operations.

Big bath accounting is opposite to smoothing of income. Management might report in bad years even larger loss then it actually is because they might want to clear all losses  ones and for all. They are hopping that if they to this it will increase future income.

If a company decides voluntary to change accounting method, analysts usually see it as possible earnings manipulation. Large number of studies examined the effect of accounting reaction to forecasted income and reaction of the capital market on it.

Identifying proxies for discretionary accruals is very much related to industry sectors' specifics (Roth et al., 2003). For example, sales are the key nondiscretionary variable that derive current accruals and capital expenditures drive noncurrent accruals. Sector-specific variables are non-performing loans, policy loss reserves, etc. Nature of discretion might be known, but the question is how can it be eliminated and what are the costs of eliminating such behavior.

Sometimes what appears to be manipulation comes from firm's normal operating, financing or investment decision. For example, if a firm decides to increase the length of operational life of an asset, it might be because of earnings' manipulation, but it can also be because of technological improvement. Research on earnings must distinguish manipulation and reflection of firm's normal accounting activity.

## *1.4 Value relevance research*

Value relevance researches examine the relationship between accounting numbers and security prices. An accounting data is value relevant if it is significantly related to dependent variable. It has two major characteristics: it requires in-depth knowledge of accounting standards, institutions and ways of reporting of financial statements; timing is not the key issue.

Knowledge of accounting numbers, criteria standards used, stated objectives on financial reporting gives the richness to value research and gives comparative advantage to the researcher in connecting the accounting numbers and valuation (Ota, 2001).

Value relevance studies include event studies where time is important element, but they also include level studies that relate level of stock prices and accounting data. While event studies are centred on announcement date, level studies examine the level of prices over a long interval. Market prices are functions of set of accounting variables such as assets, liabilities, revenues, expenses, etc. Delayed recognition is a normal attribute of accounting, pronounced in revenue recognition principle. However, accounting numbers are not the unique elements of valuation designs; they also incorporate contextual accounting arguments such as pension assets and obligation. Important thing is that these models concern also terms of measurement of specific

assets or obligation, rather than a global statement of how all assets and liabilities will be measured. These way analysts overcome the lack of general accounting theory and improve ability of prediction of valuation accounting numbers relation.

There are three basic models of valuation (Kothari, 2001). Oldest one is earnings only approach of Miller and Modigliani (1966) where the value of a company is presented by present value of future permanent earnings. Balance sheet approach is presented by the works of Landsman (1986) and Barth (1991). The Ohlson model represents firm's value as function of book value and future abnormal earnings, which is the combination of other two approaches.

# *2. Estimating the cost of capital*

The cost of equity capital is the rate of return that investors demand for their invested equity capital. It is an important input in company valuations, in actuarial pension valuation, capital budgeting, target capital structures, rate of return regulation, etc. An estimate of the equity risk premium implied in the cost of capital has been a matter of controversy. Even thirty years after development of the Capital Asset Pricing Method financial analysts still can' t find a way to avoid the practical problem of estimating a firm's cost-of-equity-capital. This problem is perhaps the single most pressing research issue in corporate finance. The main problem in calculating the cost of capital is problem of forecasting, where the results from the traditional CAPM approach are somewhat imprecise.

## *2.1 The CAPM model-critiques*

The capital asset pricing model is a set of predictions concerning the equilibrium expected returns on risky assets. Harry Markowitz laid down the foundation of modern portfolio management in 1952. William Sharpe[5], John Lintner[6] and Jan Mossin[7] developed the CAPM 12 years later in an article.

The CAPM assumes that security markets are ideal in a sense that: they are large, and investors are price takers; there are no taxes or transaction costs; all risky assets are publicly traded; investors can borrow and lend any amount at a fixed risk-free rate. These assumptions ignore

[5] William Sharpe, " Capital Assets prices: A Theory of Market Equilibrium, ", *Journal of Finance*, September 1964
[6] John Linter, "The Valuation of Risk Assets and the selection of Risky Investments in Stock Portfolios and Capital Budgets", *Review of Economics and Statistics*, February 1965
[7] Jan Mossin, "Equilibrium in a Capital Assets Market", *Econometrica,* October 1966

some real life complexities. Nevertheless, we can gain some powerful insights into the equilibrium of the security markets.

The main implications of the CAPM are as follows (Bodie et al., 2002):

1. All investors will choose to hold a portfolio of risky assets in proportions that duplicate representation of the assets in the market portfolio M, which is a portfolio of all assets traded.
2. The risk premium on the market portfolio will be proportional to its risk and the degree of the risk aversion of the representative investor:

$$E(r_M)-r_f=A\sigma^2_M$$

where $\sigma^2_M$ is the variance of the market portfolio and A is the average degree of risk aversion.

3. The risk premium on the individual stock will be proportional to the risk premium of the market portfolio, M, and the beta coefficient of the security relative to the market portfolio. Beta measures the extent to which returns on the stock and the market move together. It is defined as:

$$\beta_i = \frac{Cov(r_i, r_M)}{\sigma^2_M}$$

and the risk premium on the individual securities is

$$E(r_i) - r_f = \frac{Cov(r_i, r_M)}{\sigma^2_M}\left[E(r_M) - r_f\right] = \beta_i\left[E(r_M) - r_f\right]$$

The model predicts that a firm's expected return is positively related to β (the higher risk, the higher return) and that β is sufficient to describe the cross-sectional variation of expected returns. Estimating beta is important to investors, analysts and management for a number of reasons, but ex-ante beta is required. Since it is not observable, it must be estimated. One way to do this is by using historical firm returns and market returns. Historical beta that are calculated this way are not perfect predictors of future beta, as the regression estimators are subject to number of measurement errors, investments, financing decisions, etc. To partially overcome this problem, betas have been calculated on a portfolio basis; hence, investors are more interested in a portfolio's beta (Bodie et al., 2002).

The main question about CAPM is whether it has real world value and is it testable. Starting point is the market portfolio, which is an efficient portfolio; we consider that CAPM treats all traded risky assets. If we want to test CAPM properly we would have to construct value-weighted portfolio of huge size and test its efficiency, which is practically not feasible. Even greater problem is that CAPM predicts relation among expected return, whereas we can only observe realized returns, which are not necessarily the same as prior expectations. The problem of measuring expectation is related to expected beta-return relationship:

$$E(r_i)=r_f+\beta_i[E(r_M)-r_f]$$

Fact that few real life investors hold market portfolio does not necessarily mean that CAPM is of no practical importance. Reasonably well-diversified portfolio eliminates firm specific risk and it is left with the market or systematic risk. Even if one does not precisely hold market portfolio, a well-diversified portfolio will be so highly correlated with the market that a stock's beta relative to the market will still be a useful measure of risk.

In the last two decades CAPM has dominated the modern finance. Almost every manager uses this model when he wants to decide about projects and risk that is connected with it. The reason is that this model tells them how to calculate rate of return that shareholders demand. This model can be reduced to few simple ideas (Bodie et al., 2002):

- Investor can eliminate some risk, such as risk that workers will strike, by diversifying across industries and regions.
- Diversifying cannot eliminate some risk, such as global recession. Even market portfolio that consists of all assets traded cannot eliminate that risk.
- People must be rewarded for investing in such risky assets more than the ones that invest in risk-free assets, such as Treasury bills.
- The reward only depends on the market risk involved.
- Contribution to the market based risk can be expressed by single measure, beta, which shows relation between investment risk and market risk.

However, when it comes down to practice some problems appear. Economists have found that beta is not very useful for explaining rates of returns on assets. Hence, there are other measures that explain this relation more accurately, for example, ratio of a firm's book value (the value of its assets at the time they entered the balance sheet) to its market value. Some studies have found that firms with higher book-to-market ratios earn excess return over long period even after

adjusting the risk that is associated with beta. This effect has brought the beta into spotlight of many financial analysts. They have agreed that some risk carry higher rewards, but the question that remains is how risk should be measured. If we assume that investors are rational, this book-to-market effect should be captured in the calculation of the risk. Therefore, managers should include this into their hurdle rate. This alternative hurdle rate is called " new estimator of expected return" or NEER (Bodie et al, 2002).

If investors are rational than beta should not be the only measure of risk, therefore managers should stop using it. In other case, if investors are irrational then beta should be the right measure of risk. If it captures the fundamental risk of assets-its contribution to market based risk, than it is the right measure. Rational investors do not make distinction between boosting a firm's long-term value and trying to raise the shares price. However, if he wants to increase today's share price because he wants to sell the stock or to prevent a takeover attempt, then he should not use risk that is only related to beta. For a long-term value he can constantly use beta as the only measure of risk.

### 2.1.1 Practitioners view

To many practitioners, serious doubts exist about various aspects of the application of CAPM to the investment decision. This is especially so with respect to the cost of equity, where varying possible speculations of beta due to different observation periods leave many unconvinced. The question is: is the beta a satisfactory measure of risk and is it correct that only market risk matters.

The first problem about the use of the CAPM in practice concerns the risk-free interest rate (Clements, 2002). Just what is it? Is it the rate on short-term government securities, on long-term government bonds, the index linked yield, or the rate on AAA corporate bonds? Of course, the definition should articulate with the equity risk premium. But practitioners express clear doubts.

The second problem concerns the equity-risk premium. Here too, the practitioner is provided with a wide range of estimates. At first it was suggested that it might be 8% or so. More recently, a school of thought has emerged which puts the figure lower; some such experts are claiming that it is closer 2 to 3%. This datum is obviously important to practitioners because it is the premium, which is multiplied by the beta.

Then there are problems concerning the beta itself. First, finding and applying the company's beta (provided that it can be believed) is not too difficult, but practitioners are advised to

estimate, or calculate, divisional betas and project betas. The result is that several costs of capital exist within one company. Many practitioners see this as dysfunctional and open to manipulation. The second problem concerning the beta is that when it is first calculated, it is usually geared, because the company has borrowings. According to pure theory, this needs to be adjusted. Often practitioners overlook this.

The third problem surrounding the beta is that, in the CAPM formula, the beta provides a measure of risk. The practitioner is concerned that it measures market risk only –firm-specific risk is left out. To the businessman, this creates uncertainty. Should he, or she, ignore firm-specific risk completely and just focus on non-diversifiable risk?

The theory on company valuation is almost as clear as it is on project evaluation. Cash flows need to be discounted to arrive at a net present value. This time, there is a menu of cash flows from which to choose. Those usually recommended are dividends, or free cash flow to equity, or free cash flow to the company. The respective cost of capital to be applied would be the cost of equity in the former two cases or the WACC in the latter. The typical practitioner quickly finds problem with all of these approaches; most of these are connected with the growth rate of dividends or cash flows. Consequently, methods of valuation based on multiples such as the price earnings ratio, value to book value, and value to sales continue to coexist and, even, increase.

### 2.1.2 Empirical researches

Number of studies has compared performance of predictive models based on historical betas with those based on accounting based risk measures. Many of them find stronger link between earnings and market returns, when earnings are expressed as return measure such as ROA or ROE.

Starting point for developing those relations is that earnings' variability is a direct measure of the risk of company's earnings stream, that is, a measure of company's risk. Earnings' variability has systematic and unsystematic factor. Systematic factors relates to general economic conditions, while unsystematic factors are company specific factors. Earnings variability depends on the variability of the demand for company's products (output); variability of sales. To what extent will variability of sales affect earnings depends on the operating and financial leverage. Operating leverage (OLE) is the percentage of fixed cost in the total cost structure, while financial leverage represents the percentage of financial costs. Variability of sales also depends

on the general economic conditions. Accounting beta represents a systematic factor, which defines the relationship between earnings and general economic conditions (White et al., 1997):

$$E_t = a + \beta_{earnings} ME,$$

$E_t$ represent earnings of specific company and ME are index of market earnings. As a measure of market earnings we can use earnings of S&P 500 companies.

On the other hand, variability of earnings also depends on the variability of sales, as well as on operating and financial leverage. Therefore:

$$\beta_{earnings} = f\{FLE,\ OLE, \beta_{sales}\}$$

Bowman (1979) and Hamada (1972) developed interesting relations between stock beta and accounting beta. Logic behind these relations is that if stock beta is associated with the earnings variability, than it is also associated with the accounting beta, variance of sales, operating and financial leverage.

Bowman (1979) showed that for an unlevered firm, relationship between accounting measure of risk and market return is showed by equation:

$$\beta_a = \beta_e = \beta_{earnings} \times \frac{1}{\mathrm{Re}lativeMarketValueOfFirm}$$

$\beta_a$= the "classical" beta used in finance to measure the systematic risk of security
$\beta_e$=unlevered beta, function of firm's assets, that is its operating risk
$\beta_{earnings}$= accounting beta
*Relative market value of the firm* is the ratio of the firm's market value to the total market value of all companies in the economy.

Hamada (1972) developed relationship among stock beta, accounting beta and financial and operating leverage. Beta of a stock is a function of unlevered beta, which is a beta of company with no debt, and financial leverage, measured as debt-to-equity ratio:
If we introduce debt (riskless), equation transforms to:

$$\beta_e = \beta_a + \frac{D}{E} \times \beta_a$$

Adding financial leverage, it increases systematic risk of a firm.

If the debt is risky, the equation becomes:

$$\beta_e = \beta_a + \frac{D}{E} \times (\beta_a - \beta_d)$$ , Where $\beta_d$ is the beta of firm's debt

This equation is analogue to desegregations of the ROA and ROE, where the ROE depends on proportion of debt used for financing and :

$$ROA=ROE + [D/E \cdot (ROA\text{-}cost\ of\ debt)]$$

This similarity shows risk/return trade off, as higher risk requires higher returns; determination of risk should be similar to the determination of returns.

These equations show that firm's beta is related to its underlying assets, that is its operating and financial leverage. More explicit equation developed by Mandelker and Rhee(1984) is:

$$\beta_e = FLE \times OLE \times \left[ \frac{\beta_{sales}}{P/E} \right]$$

Where $\beta_{sales}$ measures the covariance of percentage change in sales with the market return Rm.

Garrod and Mramor (2000) developed a theoretical model that concerns systematic market risk and accounting flow variables. This kind of relationship might be interesting for a number of reasons. Instability of the markets makes the historical betas not good enough predictor of future betas. Introducing the accounting flows variables might improve predictions. As it was mentioned before, CAPM does not include operational factors of a company that might contribute to risk, as this model does. Furthermore, developing the relationship between the systematic market risk and accounting flows might be very useful in situations were estimates of the market risk are not available. Earnings variability is related to the systematic market risk, and their disaggregating into the operational aspect of the company might improve the earnings – return relationship.

Starting with the basic accounting identity

$$NI= (S-VC-FC-I)(1-t),$$

where: $NI$ = net income,
$S$ = sales,
$VC$ = variable costs,
$FC$ = fixed costs,
$I$ = interest payments, and
$t$ = the company's average marginal tax rate.

Model develops to[8]:

$$\beta_{EfDTL} = \frac{EBIT + FC}{EBIT - I}\beta_S = DTL_f \beta_S$$

Where:
$DTL_f$ = the degree of total leverage based on actual accounting data and assuming riskless debt and fixed costs.

This is the theoretical model for levered β based upon disclosed accounting variables. The model is very similar to the model of Mandelker and Rhee (1984) model except that their measure of intrinsic business risk has been replaced by a measure of sales risk. Advantage of relying only on sales and not profit is that it does not include any market-based variables. In contrast to previous model of the Mandelker and Rhee, by developing the model from the fundamental accounting equation they were able to identify the assumption at each stage, which were needed in order to arrive at equivalent of their estimation model. However, they only posted the theoretical framework for connecting the systematic market risk with the accounting variables. Empirical work needs to provide appropriate proxies for accounting measures and test the accuracy of the model.

Some of these theoretical relationships were also empirically tested. Researches tried to explain or predict changes in firm's beta using accounting measures of risk. Some studies tried to explain historical relationship between changes in beta and changes in accounting measures (ex-post).

[8] The actual process is more complicated than this presentation

Other was predictive study, where the researchers tried to ex-ante explain changes in beta, using accounting measures.

For example, one of the explanatory studies is the one that Ball and Brown made (1968). They found a high degree of correlation between accounting and market beta. Correlation with the market beta ranged from 39% to 46%.

Mandelker and Rhee (1984) examined the correlation between market beta and operating and financial leverage of the firm. According to their study 38-48% of the variation in firm's beta was explained by the variations in OLE and FLE. On individual basis only 11% of the variations in beta were explained.

Beaver (1970) made one of the predictive studies, where he had tested the relationship and predictive ability of seven accounting measures. Correlation was significant for four measures on individual and portfolio level: payout ratio, leverage debt, earnings variability and accounting beta. These findings are consistent with theoretical background, presented in the previous equations. Relationships with dividend payout ratio can explained by the fact that firm that are reluctant to cut dividends, face higher beta.

**Table 1: Comparison of market and accounting determined measures of risk**

| | Predicted Association | Findings Confirmed |
|---|---|---|
| Payout dividend/income | Negative | Yes |
| Growth assets (year5)/assets (year1) | Positive | Only period 1 |
| Leverage fin. Debt/assets | Positive | Yes |
| Liquidity, current ratio | Negative | Only period 1 |
| Size | Negative | Only period 2 |
| Earnings variability | Positive | Yes |
| Accounting beta | Positive | Yes |

Source: Beaver W., Kettler P.,and Sholes M. : "The association between market determined and accounting determined risk measures", The Accounting Review, October 1970, pg.669

There were studies that were opposing the usefulness of the CAPM model and ability of beta to predict rate of return. Fama and French (1992) empirically examined the relationship between average monthly return on one side, and beta, size, E/P and B/M on the other. Study showed that beta is the least related to returns, compared to other measures. The CAPM method says that

firm's returns are solely related to its systematic riskβ. Results showed that other measures of risk (accounting measures) are more correlated to returns, than β itself. The CAPM was developed, at least in a part, to explain the differences in equity premium across assets. According to CAPM these differences are due to the different riskiness of the returns on assets. The model asserts that the correct measure of riskiness is β and that risk premium per unit of riskiness is the same across all assets. Fama and French produced two negative conclusions about adequacy of the CAPM: The relation between average return and β, which is unrelated to size, is very weak; β is not sufficient to explain market returns, while other measures do.

The CAP model has two implications: i) regression coefficient of firm's returns to market returns is the only measure of risk and ii) there is positive expected premium for β risk. The positive expected premium for β is true, only if the first assumption is true. However, they showed that size adds to the explanatory power of beta, and size is not the only measure that crashes the model. Other measures that do not relate to beta like earnings/price, cash flow/price, BV/MV, past sales growth, add significantly more explanatory power to average returns. The three-factor model provides a better description of average returns than CAPM, and it captures most of the average return anomalies that are missed byβ. For many markets, evidence suggests that multiple factors drive returns.

The empirical support for the CAPM has been frustrating. Results showed that realized returns do not line up around the CAPM predicted returns. The result of Fama and French (1992) are not surprising:

" Two easily measured variables, size and book-to-market equity, combine to capture the cross-section variation in an average stock returns associated with market beta, size, leverage, book-to-market equity, and earnings price ratios. Moreover, when the test allow for variation in beta that is unrelated to size, the relation between market beta and average return is flat, even when beta is the only explanatory variable."

Are risk measures incrementally associated with the market's assessment and pricing of equity risk beyond other observable risk factors, such as the three factors in the Fama and French (1992) model (market model beta, size and book-to-market ratios)? Research by Fama and French and others shows that the single factor capital asset pricing model may be incomplete because ad hoc factors outside of the model (including factors based on accounting numbers, such as the book-to-market ratio) appear to explain stock returns.

## 2. 1.2 Arbitrage pricing theory

Alternative model that considers multiple factors is arbitrage-pricing theory. Whereas the CAPM adds a single risk premium to the risk-free rate, APT model adds a set of risk premiums. APT models have the form

$$E(R_i) = R_f + (\text{Risk premium})_1 + (\text{Risk premium})_2 + \ldots + (\text{Risk premium})_k$$

Where $(\text{Risk premium}) = (\text{Factor sensitivity}) \cdot (\text{Factor risk premium})_i$.
Factor sensitivity is the assets sensitivity to a particular factor (holding all other factors constant). The factor risk premium is the factor's expected return in excess of the risk-free rate.

One type of the ATP incorporates company specific variables, such as:

- RMRF, return on value-weighted equity index in excess of the one-month T-bill rate
- SMB (small minus big), a size (market capitalization factor). SMB is the average return on three small-cap portfolios minus average return on three large-cap portfolios.
- HML (high minus low), the average return on two high book-to-market portfolios minus average returns on two low book-to-market portfolios.

A second type of APT model includes macroeconomic factors, such as:

- Confidence risk, the unanticipated change in the return difference between 20-year corporate and 20-year government bonds. When investor's confidence is high they should be willing to accept a smaller reward for bearing this risk

.

- Time horizon risk, the unanticipated change in the return difference between 20-year bond government bond and 3-day T-bills. This factor reflects willingness to invest for the long term.

- Inflation risk, the unexpected change in inflation rate. Nearly all stocks have negative sensitivity to this factor, as their returns decline with positive surprises in inflation.

- Business-cycle risk, the unexpected change in level of business activity.

- Market-timing risk, the portion of the return on market index that is not explained by these four factors, almost every stock has positive sensitivity to this factor.

## *2.2 Residual income valuation models and discount rate estimation*

Dividend discount model and the Feltham-Ohlson residual income model are usually used to estimate the discount rates. There is considerable debate and disagreement among academics with respect to the magnitude of the market risk premium and whether and by how much it changes through time with changing riskiness in economy. The cost of capital of an individual firm depends on both market factors and firm specific factors. In spite of vast body of research in finance, the dust has still not settled on the set of priced risk factors. Hence, estimates of price sensitivity to certain factors, such as estimates of relative risk are rather noisy.

Research based on the residual income model attempts to improve upon the cost of equity estimates obtained using traditional approach. The empirical approach to estimating the cost of equity using this model is quite straightforward. It seeks to exploit the information in analyst's forecast and current prices rather than in historical information in time series of prices. In an efficient market, price is the discounted present value of the sum of book value and forecasted residual earnings. Analyst's forecast of earnings and dividend payout ratio are used to forecast the residual income stream. The cost of equity is then defined as discount rate that equates the price to the fundamental value. An analogues approach can be employed to calculate the discount rate in the dividend discount model.

The information used in the residual model is identical to the one used in the dividend discount model, therefore we might conclude that the discount rate would be exactly the same in both models. However, studies using residual income model claim that earnings based model yields discount rate that are more accurate than the one that other models yield. For example, Claus and Thomas (1999, pg. 5) state: "Although it is isomorphic to the dividend present value model, the abnormal earnings approach uses other information that is currently available to reduce the importance of assumed growth rates, and is able to narrow considerably the range of allowable growth rates by focusing on growth in rents (abnormal earnings), rather than dividends."

Estimates of the risk premiums yielded from the residual income model are considerably lower, that the ones estimated from the other models. For example, Claus and Thomas (1999) estimated that the market risk premium for the USA market is 2-3 %, which is much lower to historical risk premium estimated to 8 %.

It is appealing to use forecasted data to estimate the risk premium; however, there is also downside. The intuition for why estimated discount rates are less dispersed is that estimated data are less variable than actual data. Therefore, estimates of discounted rates using forecasted data are also expected to be less volatile. In short, of the three variables in the residual income model, two must be assumed correct to solve for the third.

### 2.2.1 Residual income valuation model

The RIM has its origin in the early works of economists such as Preinreich (1938), Edwards and Bell (1961) and Peasnell (1982). In its *general form* the model presents firm's invested capital and present value of it residual income:

$$Firm's\ value_t = Capital_t + PV\ (all\ future\ "residual\ income")$$

Where each period's "residual income" (RI) is defined as the difference between earnings for the period and its cost-of-capital, expressed in dollars. That is,

$$RI_t = Earnings_t - (r \cdot Capital_{t-1}),$$

Where r is the cost-of-capital, expressed as a rate-of-return, assuming a flat term structure.

In the early 90's Jim Ohlson (1990,1992, 1995) wrote several studies concerning RIM, and even though this model predates his work, he helped the refocusing on the importance of RIM and connection between accounting numbers and the value of a company. The model is conceptually similar to Economic Value Added, advocated by Stewart (1991), where the EVA stands for net operating profit minus charge for the capital invested.

Commercial variations of the model have resulted in brand name products such as Stern Stewart's EVA, Holt Value Associate's CFROI, and McKinsey's Economic Profit Model All these products are variations of the generic RIM.

The residual or abnormal earnings model, referred also as EBO model, since it is based also on work of Edwards and Bell (1961), defines the value of equity as:

$$P_0 = B_0 + \sum_{j=1}^{\infty} \frac{E_j - rB_{j-1}}{(1+r)^j}$$

As $E_t=ROE_tB_{t-1}$, *or* $ROE_t=E_t/B_{t-1}$, the above equation becomes:

$$P_0 = B_0 + \sum_{j=1}^{\infty} \frac{(ROE_j - r)B_{j-1}}{(1+r)^j}$$

The residual income valuation model is based on the no arbitrage assumption and clean surplus relationship: $B_t=B_{t-1}+E_t-d_t$, changes in book value is result of changes in income and dividends. If the $rB_{t-1}$ is required rate of return on equity than the equation can be written as:

$$P_0 = B_0 + \sum_{j=1}^{\infty} \frac{E_a}{(1+r)^j},$$

Where $E_a=E_t-rB_{t-1}$ is defined as residual or abnormal earnings.

Since Ohlson (1995), a number of refinements of the basic RIM have been suggested. Many of these studies have both pedagogical and research applications. Other recent studies that have extended various aspects of valuation theory include Feltham and Ohlson (1996, 1998), Ohlson and Zhang (1998), and Zhang (1998).

Feltham and Ohlson (1995) approach includes many important features of accounting, including accounting clean surplus, earnings as well as transitory earnings, and some form of linear information dynamic. They were adding key features of financial reporting system, conservatism and delayed recognition. Feltham and Ohlson alter the assumption of linear information dynamics and included "other information". Their analysis, in particular, proposes a separation between the net operating assets and the net financial assets of the firm that is important in the presence of conservative accounting.

The model is formulated like:

$$P_0 = B_0 + E_a + v_t,$$

where market value of equity is a function of book value, abnormal earnings and "other information".

Other information ($v_t$) should capture all the value relevant information, that are about to have influence in earnings, that is, all the non-accounting information that will predict future abnormal

earnings. “Other information” emphasize the fact that prices of shares can immediately adjust to new information about current or future earnings, but transaction accounting does not. Assets and liabilities are recorded only when the transaction occurs and when related cash flows and earnings are reasonably quantifiable. This way, Ohlson draws attention to the limitation of transaction accounting in determining the price of share. Explanatory power of current earnings is low, or on the level of explanatory power of “other information”. Most of the analysis ignored the $v_t$ , mainly because it is not measurable, or it is incorrect. Ohlson in his refinement of the model (2000) brought to attention two things about “other information”. First, even if it is of analytic interest to ignore $v_t$, by doing so, they state that only thing that matters for determining the prices are accounting information. On the other hand, $v_t$ can be measured and it is the difference between full information forecast for next period and purely autoregressive forecast

$$v_t = E_t(X^a_{t+1}) + \omega X^a_{t+1}$$

This way the impact of nonfinacial accounting information is included in valuation.

Unlike the residual income model, other models such as dividend discount or free cash flow models forecast future cash flows and find the value of equity by discounting them back to the present using required return on equity. The RIM approaches this process differently. It starts with a value based on balance sheet, the book value of equity and adjusts this value by residual income. The recognition of the value is different, but the total present value, whether we use dividends, free cash flows, book values and residual income should be consistent in theory. However, in practice it is not possible to forecast each of these items with the same precision. For example, if a company has near-term negative free-cash flows and forecast for the terminal value are uncertain; a residual income might be more appropriate. A residual income might also be used in conjunction with other models, as well as to establish justified market multiples such as P/E or P/B. For example, value can be determined using a residual income and divided by earnings to arrive at a justified P/E ratio. The RIM is most closely related to P/B ratio. A stock’s justified P/B ratio is directly related to expect future residual income. Also, more closely concept to RIM is Tobin’s q ratio, which is slightly different to P/B ratio. The numerator includes market value of debt and equity, rather than equity. Further, assets are valued at replacement costs, rather than historical accounting cost; replacement cost take into account effect of inflation.

In practice, the strength of RIM depends on two components book value and future earnings (Stowe et al., 2002). Positive effect is that these two components have a balancing effect on each other. Companies making conservative accounting will have lower book values and higher future

earnings. If a firm employs aggressive accounting, its current book value and earnings would be high, but its forecasted earnings would be lower and its capital charge would be higher. If there are differences in future income, they are offset by initial differences in book value.

The elegant property that the effect of management's choice of accounting methods on earnings in one period is offset by changes in forecasted earnings has some unappealing consequences: First, it renders the model devoid of any accounting model, just as the dividend discount model is not particularly helpful for financial reporting purposes. The accounting content is lost because it does not offer any guidance about firm's choice of accounting method or properties of accounting standards; however, words as unbiased and conservative accounting are often used in the frame of residual income model.

Second, from a standpoint of analysts, even though reduced forecasted earnings offset the effect of aggressive accounting, analyst must forecast future earnings by inducing current earnings from an aggressive accounting method component and get to regular earnings.

Third, the interpretation of abnormal earnings is clouded. Some interpretation is that abnormal earnings represent economic rents. However, the choice of accounting method affects the estimates of future abnormal earnings, so those estimates by themselves are not an indication of economic rents. For example, if a firm chooses the pooling of interest method for a merger it will have higher expected abnormal earnings compared to otherwise identical firms that uses the purchase method of accounting for mergers.

Unfortunately, things are not so simple in practice. The clean surplus relationship does not prevail, and analysts often use past earnings to predict the future ones. International Accounting Standards and U.S. GAAP permit a variety of items to bypass the income statement and be reported directly in stockholders' equity. Further, companies have managed to keep some liabilities off the balance sheet and obscure the results with nonrecurring and nonoperating items.

The following accounting consideration should be addressed in the residual income model (Stowe et al., 2002):

- Violations of the clean surplus relationship
- Balance sheet adjustments for the fair value
- Intangible assets
- Nonrecurring items
- Aggressive accounting practices
- International consideration

Violation of the clean surplus relationship occurs when accounting standards permit charges directly to stockholders equity, bypassing the income statement. An example is the case of long-term investment and the changes in its market value. IAS provides that the change in market value can be reported in current profits or can bypass the income statements and be reported in stockholder's equity. Under the GAAP, the balance sheet includes, at market value, investments considered to be "available for sale"; however, any change in their market value is reflected in stockholders equity as other comprehensive income rather than as income on the income statements. Other comprehensive income is result of other events and transactions that result in change to equity but are not reported on the income statement.
Items that commonly bypass the income statement include

- Foreign currency translation adjustments
- Certain pension adjustments, and
- Fair value changes of some financial instruments.

In all of these cases, the book value of equity is stated accurately, but net income is not from the perspective of residual income.

Differences in accounting standard result in different measures of book values and earnings. Using accounting fundamentals might infer that this model does not work well in different countries. However, Frankel and Lee (1999) have shown that residual income model without any adjustment accounted for 70% of cross-sectional differences among stock prices across 20 countries.

**Table 2: Explanatory power of the residual income model across countries**

| Explanatory power | Country |
|---|---|
| 40-50 % | Germany |
| | Japan |
| 60-70% | Australia |
| | Canada |
| | Japan (consolidated reporting) |
| | United Kingdom |
| More than 70% | France |
| | United States |

Source: Frankel R. And Lee C.,: "Accounting diversity and International valuation", Working Paper, May 1999, pg.134

Germany had the lowest explanatory power. Japan had low explanatory power for companies reporting only for parent company. France and United Kingdom had the highest explanatory

power. They concluded that there are three primary considerations in applying residual income model internationally:

- The availability of reliable earnings forecast
- Systematic violations of the earnings surplus relation, and
- "Poor quality" accounting rules that result in delayed recognition of value changes

Considering the fact that this analysis has been done on unadjusted accounting information, explanatory power on adjusted data should be even higher.

In RIM one way to incorporate risk in empirical applications of the model is to replace the risk-free rate with a risk-adjusted expected return. Accordingly, most prior empirical studies of the properties of residual income model value estimates have assumed cross-sectional constant discount rates based on prevailing risk-free rates plus an *ex post* market risk premium estimate, usually on the order of 6 or 7 percent. This approach is practical, but it lacks theoretical foundation because it is silent about the source of the risk. Risk adjustments should depend on the nondiversifiable risk inherent in future abnormal earnings (or equivalently, future earnings, dividends, and book values).

In the recent literature several alternative strategies have emerged. They are all based on the RIM, where they calculate the implied cost of capital that market uses to discount future cash flows. Early results of such studies are showing more precision than the one based on the CAPM model. In the absence of implemental theoretical guidance, empirical applications of residual income valuation models have incorporated risk into valuation by adding an ad hoc risk premium to a risk-free discount rate, with results that are understandably sensitive to the risk premium assumption. Felthman and Ohlson simplified the role of risk by assuming that investors are risk neutral and discount rates are non stochastic and flat.

For example, Botosan (1997) uses this implied rate in evaluating the effect of disclosure policies on the cost-of-capital. Her results suggest that firms with limited analyst coverage that provide higher levels of disclosure appear to enjoy lower costs-of-capital. Claus and Thomas (1998) use the RIM to estimate an aggregate implied market risk premium. They show that the market risk premium estimated using the RIM is much lower than the risk premium estimated using historical realized returns. They conclude that perhaps the current stock market is not as over-priced as it first appears.

Purpose of the model of Gebhard et al. (1999) was to understand how market perceives implied cost of capital in stock prices, and to examine how it systematically varies across firms and

industries. It distinct from other models on assets pricing in a way that it does not use average realized returns. Models on assets pricing are supposed to use expected returns, but since they are unobservable most researchers used average realized returns. In efficient market where risk should be properly priced, average realized returns should be unbiased estimator. However, cost of capital derived from realized returns showed fairly imprecise. Instead of realized returns, they used the residual income model to calculate implied cost of capital, defined as IRR that equates price of share with present value of all future cash flows to shareholders. They showed that the implied cost-of-capital based on a RIM model is correlated with many firm risk characteristics, while estimates based on historical realized returns are not. They showed a significant effect on implied equity premium. Specifically, they find that the market uses a higher discount rate for firms with higher leverage, lower analyst followings, lower liquidity, and more volatile (and less predictable) earnings. They also find that a large proportion of the cross-sectional variation in the implied cost-of-capital can be explained by these factors, suggesting it is possible to estimate a cost-of-capital based on these factors without appealing to a traditional asset-pricing model. In effect, they generate "expected" yield on forecasted earnings, which can be compared to actual earnings. It is similar to using market multiples, such as P/E ratio. If certain types of firms have consistently higher (lower) P/E ratios, then their earnings should be accorded higher multiples, even if we do not fully understand why market assigns them higher (lower) multiples.

They also tested the correlation between firm's cost of capital and beta; they found that the correlation is surprisingly weak. Conclusion is that beta is of limited importance in the markets assessment of the systematic risk of stock.

Their approach does not depend, neither on average realized returns, nor current stock price. It is a rather long term assessment of cross-sectional relationship between implies rate of return and set of explanatory variables: mean implied industry risk premium, M/B ratio, forecasted long term growth and dispersion in its analyst's forecasts. They showed that these four variables explain the most variability in the implied cost of capital.

Limitation of this approach might be that they use variables that could be result of mispricing of the market, rather than risk factors. Using discounting cash flow method on a finite period always requires simplifying the assumption, which may lead to errors. In its origin RIV model is a simple model. It assumes that investors are risk-neutral, accounting is unbiased, clean surplus always stands, information asymmetry do not exist, tax rates faced by investors are irrelevant, real options are not explicitly taken into account and abnormal earnings evolve in autoregressive manner. The question is if such simplicity is appropriate, how much an empiricist can get from such a theoretical simplifying.

Alternative approach of measuring risk is examined in the study of Baginski and Wahlen (2002). They developed a new accounting based measure of risk, using term price differentials. They measured risk free values, inherent in the residual income model, and prevailing risk free rates of returns. Then they calculated the price differential, which is equal to risk free value minus price of share. According to them, price differential is simple, yet theoretically defensible discount factor inherent in prices of stocks. Their measure of risk depends only on analysts forecast of earnings, residual income, and time value of money at existing risk free rate. The price differential could be measure of the cost of risk because it does *not* depend on any functional form of expected returns, or on explicit parameter estimates of market risk measures (i.e., betas) or risk premium. As they calculated price differentials are positive for nearly all firm-years because risk-free values ignore the discounts for risk in share prices. Their estimates of price differentials are highly positively correlated with estimates of expected rates of return implicit in share prices, but are simpler to compute.

They also developed two accounting based measures of risk, systematic risk and total volatility. They tested whether these two measures explain the cross sectional differences in prices of stock, and whether capital markets price these two measures. Their results suggest that capital markets value only systematic risk measured as volatility of abnormal ROE, and total volatility. Hence, total volatility has more explanatory power in cross sectional price differentials, than systematic risk, beta, size or book to market. These might explain why managers in trying to maximize shares value prefer smooth income to volatile one. These results might contribute to the fact that we can use volatility of abnormal earnings, consistent with the residual income model, to measure the cost of a capital.

Formulation of the RIM has been used to calculate the cost of capital (implied) either directly, or by assuming a terminal growth rate of residual income or both (Easton et al., 2002). From the theoretical point of view RIM is an infinite horizon model, but for empirical purposes it is translated to a finite one, which led to problem of calculating the terminal value. It has been calculated in different ways: Claus and Thomas (1998) developed a method to calculate it beyond the forecast horizon, Frankel and Lee (1999) assumed that growth rates fade to some industry median, whilst Easton et al. (2002) calculated it simultaneously with the cost of capital.

All of the mentioned models assume flat term structure of the discount factor (cost of capital). Alternatively, Garrod and Valentinčič (2004) calculated the time variant cost of capital in short to medium term (1-10 years). The RIM is also split into finite and infinite horizon (terminal value), where the residual cash flows is discounted at time variant discount factor. The terminal

value is calculated using the Gordon growth model except that assumption about the constant cost of capital was relaxed, which led to time variant cost of capital. Influence of the terminal value calculation was reduced in a way that abnormal earnings are first disaggregated into component parts of accounting earnings and book values. Further more, future earnings are redefined into current earnings and changes in future earnings, which also referred to book values. Using changes in earning instead of levels leaves less room for errors in estimated growth rates.

Results of the study were that there were not obvious patterns of the cost of capital and that it followed the underlying economic fundamentals. It was higher in periods of high inflation and more volatile in periods of recession. These results confirmed the usefulness of the model, since they were not consistent with market myopia and excessive optimism.

## *2.3 Equity premium*

Risk aversion is an important element of the security prices and rates of return. Other things held constant, the higher a security's risk, the lower its price and the higher its required return. In a world where risk averse investors dominate, riskier securities must have higher expected return, estimated by the marginal investor, as the less risky securities. If this situation does not exist, buying and selling in the market will force it to occur.

Risk means uncertainty about future rates of returns; it can be measured by probability distribution (Stowe et al., 2002).

We are considering investing some money in stock or bank accounts, risk-free assets such as Treasury bills, or some money market fund. Current price of a stock is $100, with a dividend of $4, hence expected dividend yield is 4%. The total return of that stock will depend on the price at the end of the period. Therefore holding period return, HPR is:

$$HPR = \frac{P_1 - P_0 + Div}{P_o}$$

Definition assumes that dividends are paid at the end of the holding period, and the ones that are paid earlier are not reinvested. Our best guess of the price of a stock at the end of the holding period is $110, so the HPR is 14 %. Estimation of the price contains considerable uncertainty; it depends on many factors such as state of the economy or the stock market. We can quantify the

probabilities of distribution of the returns: If we assume that under normal conditions expected return is 14%, in recession –16 % and in a boom return is 44 %. The expected return is therefore:

$$E(r) = (0,25)*44\%+(0,50*14\%)+(0,25*(-16\%)=14\%$$

Measure of risk is the standard deviation of the rate of return, which is defined as square root of the variance, which in turn is the expected value of the squared deviation from the rate of return. The higher the volatility in the outcomes, the higher will be the average value of these squared deviations:

$$\sigma=\sqrt{\sum p(s)*(r(s)-E(r))^2}$$

This in our example equals

$$\Sigma=0,25*(44-14)^2+0,5*(0,14-0,14)^2+0,25*(-16-14)^2=21\%$$

If we are questioning how much to invest in this stock, we must consider how much of reward is offered for investing in risky asset. This reward is measured as difference between the HRP and the risk-free rate, which we can earn by investing in risk-free assets. This difference is the *risk premium on common stocks*, or *equity premium.* If we assume that the risk free premium is 6 %, the equity premium would be 8 %. The difference between actual return on common stock and risk-free rate is called excess return, which makes the risk premium the expected excess return.

The degree to which the investors are willing to invest in common stock depends on their attitude towards risks. In general, investors are risk averse, which means that if the risk premium would be zero, no one would invest in risky assets.

### 2.3.1. Equity premium puzzle

In the article of Mehra and Prescott (1985) was examined the excess returns in the US stock market over the period 1889-1978. They conclusion is that the historical excess return is too large to be consistent with the reasonable levels of risk aversion. The reward that inventors received for investing in risky assets was overgenerous, and it is hard to be explained with the regular methods of security pricing. This phenomenon was called the equity premium puzzle, and it has been the subject of numerous studies that tried to solve it.

Fama and French (2000) provided some explanation for the puzzle. They argued that estimating the risk premium from the average realized return might be the problem. They used dividend

discount model to estimate the premium; for the period from 1912-1949 it yielded the same expected return as realized, however for the period 1950-1999 the expected return is much smaller than realized ones. IT means that investors have received a lot more for their investment than expected.

In the DDM the expected capital gains will equal the dividend growth rates, and the total return will equal:

$$E(r) = \frac{D1}{P_0} + g$$

Expected returns were calculated in this way, while realized return was calculated as dividend yield plus capital gains. The difference between dividend growth and capital gains rates weren't big in first period (1912-1949), while in the second were significant. They concluded that the equity premium puzzle might be due to unanticipated capital gains in the later period. Important implication of their study is that future excess return will be much lower than those in the recent decades.

Another explanation of the equity premium puzzle is survivorship bias. This puzzle emerged from the long-term average returns of the US market and there are reasons to believe that this emerged because of the survivorship bias, since the American market has been the most successful capitalistic system in the world. This outcome couldn't probably be anticipated several decades ago. Unlike many other countries, US have never been victim of such extreme problems. Estimating risk premium from the experience of the most successful country and ignoring the stock markets that didn't fully survive the sample period will induce an upward bias in the estimates of the premium. The realized US return may not be indicative of required returns.

## *3. Return-earnings correlation*

Accounting earnings are the key decision variable for investors and analysts, yet numerous researches have found surprisingly weak correlation between earnings and returns. Assessing the usefulness of earnings, as major product of financial reports, is not straightforward, given the costs of producing and disseminating information. However, it is of great importance since many equity valuation models use earnings as common variable.

Revision on stock prices when earnings are announced provides evidence that they are correlated. Therefore, larger revisions mean larger usefulness, which is why researchers use $R^2$ of price/earnings correlation as a measure of usefulness. Of course, this is not the ultimate measure of usefulness; it depends on the nature of the research (e.g. prediction of systematic risk, bankruptcy prediction, bond ratings, etc. where earnings showed high explanatory power).

If the information contribution of earnings to investors is large, then the correlation between stock prices and earnings should also be significant. Even if $R^2$ is not complete measure it shows the most important attribute and that is their ability to help predicting the prices of stocks (Chen, 2003). Given that stock prices should reflect information on future earnings, most of the researchers used the term unexpected earnings, with explanation that they should reflect new, unreleased information and that this should increase the power of analysis. This is why they used proxies such as time series or analysts predictions. For $R^2$ to be one several conditions must be fulfilled:

- The earnings are only variables that explain changes in price;
- There are no measurement errors;
- All the investors respond the same to the earnings announcement of all firms.

Nevertheless, numerous studies showed extremely weak correlation, with $R^2$ hardly ever reaching 10%. The importance of earnings was obvious, given its central role in financial reporting, but studies have not confirmed it. When related items were used as proxy such as cash flow component, sales or expenses $R^2$ were not significantly higher.

Reasons for this are not quite clear so far. One of the reasons might be use of wrong methodologies by researchers to support the usefulness. Another reason might be the market inefficiency. If investors fail to recognize important information, overreact or wrongly interpret the information, then the association will be small. Third reason might be that current earnings do not incorporate enough information for future earnings, due to the lag in reporting earnings or manipulation of earnings by managers (Chen, 2003). Reported earnings are usually biased by accounting measurement, valuation principles and in worst case by manipulation.

There are at least four competing hypothesis that are explaining the low $R^2$ of the earnings-return correlation (Kothari, 2001): a) prices lead earnings; b) inefficient capital markets; c) noise in earnings and d) transitory earnings.

(a) Prices lead earnings: Idea developed by Beaver et al. (1980) is that there is a richer set of information in prices than in accounting earnings of that period. In an efficient market, price change instantly as market changes its perception of future net cash flows. Accounting earnings are not capable of that, because of the revenue recognition and expense matching principle. These principles are basis for determining earnings and this is why they record information with a lag. This is called "prices lead earnings". The term accounting recording lag generally captures two effects: value relevant events that are observed by the market in the a priori period that are included in the accounting earnings of the current period and value relevant events that are observed by the market in the current period and captured by the accounting earnings of the current period. Implication of this is that even though successive changes in earnings are unpredictable using information in past time-series, price has information about future changes in earnings; thus, from the market perception changes in earnings are predictable. When returns are correlated with earnings changes only a portion of the earnings change is a surprise to market. If we use inappropriate proxies for market changes then the earnings-returns correlation will be weak.

(b) The "noise in earnings" argument defines earnings as sum of "true earnings" plus value irrelevant noise that is uncorrelated with stock price. This idea is presented in the work of Beaver et al. (1980). This approach advocates that only true earnings define firm's value. However, there are number of evidences that accruals are informative and it is unlikely that earnings without accruals would be true income. There is no economic intuition behind this idea of transaction-based approach.

(c) Inefficient capital markets: If markets are not efficient enough to recognize the information contained in earnings change on time, the price change associated with price change will be too small. Markets recognize changes in earnings only gradually over time; they under react to earnings changes.

(d) Transitory earnings. Some sources of earnings might be characterized as transitory, as traditional accounting approach and financial statement analysis does. There are several reasons for transitory earnings. First, some business activities, like asset sales, produce one-time gain or loss. These kinds of business activities are exogenous. If managerial incentives were to influence the occurrence of these events, then they would be endogenous. Second, because of the asymmetry of information between managers and outsiders there is a need for conservative accounting numbers.

Conservatism is defined as difference in speed with which accounting numbers reflect economic gains and loses. Loses are disclosed more quickly than gains. Accounting recognition criteria is developed to record loses more strict, that is, expected loses can be recorded while expected gains cannot. Recognition of anticipated loses, like market value changes, are transitory. Finally, managerial motivations rooted in agency theory might contribute to transitory gains and loses. Those kinds of transitory earnings should be separated; some even say removed, from the income statement because of the following attributes (Ohlson, 1999): First, they are unpredictable, at least in a sense that current transitory earnings are not able to forecast following transitory earnings. Second, transitory earnings are totally irrelevant in forecasting total earnings for future period. Third, they have no value, that is, do not have any value information. However, transitory items should be differed from non-recurring items, such as write-offs, which might also be value irrelevant. Non-recurring items, in contrast to transitory earnings, are question of whether accounting properly reflects the firm's economic reality given the underlying transactions.

## *3.1 Normalization of earnings*

In order to estimate the earning power of company, earnings should be examined and adjusted. Earning power means, stable, but growing at long-term rate, permanent earnings without temporary, non-recurring and extraordinary items. In practice this is very hard thing, since even the definition of term "noise in earnings" differs from analyst to analyst.

For a non-cyclical companies normalization of earnings include removing non-recurring items (Stowe et al., 2002):

- Accounting changes
- Realized capital gains or loses
- Gains or loses on the repurchase of debt
- Catastrophes such as natural disasters or accidents
- Strikes
- Impairment or "restructuring" charges
- Litigation or government actions
- Discontinued operations

The impact of these items should be disclosed in footnotes, or in some cases in the Management Discussion and Analysis. If it is given on pre-tax basis, than tax effect on EPS should also be disclosed.

Accounting changes as frequent source of non-recurring items, either mandatory (caused by changes in accounting standards) or voluntary (instigated by management), should be segregated from normalized income. Some changes like changes in depreciation lives or pension assumptions are very difficult to track.

When interest rates change, a company may find it reasonable to retire part of its debt. Accounting gains or loses which form that kind of operations might differ from the economic effect and this is way they should be treated as non-recurring items, whether or not are they reported as extraordinary items.

Another source of non-recurring items are income tax adjustments. If a company, for example, has a tax reduction form prior years, this item should be segregated because it misrepresent the pre tax and after tax income. Tax carry forward is usual reason for distortion of income.

Reduction of LIFO inventory quantities cannot be treated as it happens continuously, and it should be referred to as non-recurring item. This item distorts gross margins and it has impact on the operating earnings.

Restructuring provision items have also become usual in income statements. These items are estimates and they represent either cost of prior period, like underdepriciated assets, or of later period, like severance and post employment benefit plans, lease cost.

Capital gains and loses are very variable nonoperating income source. A company often report gains or loses from sales on the assets side, but we do not know if it is a sale of an assets, investments in affiliates or marketable securities. They reflect more management decisions than real economic event, since timing of reporting these gains or losses is discretionary.

Normalized income usually significantly differs from the reported one, as we get to the real trend of operating earnings and earning power of company. However, we should not ignore non-recurring items and let management to sweep their mistakes under the carpet. We should consider which of those items effect, that is provide information about:

- Future cash flows

- Future reported income
- Valuation
- Management behaviour

Non-recurring items with none of these should be ignored. Problem of normalizing income is especially difficult if we compare companies with different accounting standards, but most important things to look on are:

1. Inventory method
2. Depreciation
3. Goodwill amortization
4. Extraordinary and other non-recurring items

## *3.2 Aggregation of earnings*

Aggregation is one of the basis characteristics of financial reports but the aggregation refers to events within the business year. Given that primary focus of financial reports is giving information about earnings and its components, number of papers studied effect of aggregating earnings within a given time period (Jorgensen, Mikkelsen (2003), as well as aggregation over time (Easton, Harris, and Ohlson, 1992).

The fact that earnings can be aggregated over time is a fundamental attribute of accounting. Earnings are calculated for a period of any length: a quarter, a year, or several years; also, the sum of four consecutive quarterly earnings are the annual earnings and the sum of five consecutive annual earnings are the earnings for a period of five years. This attribute allows us to make meaningful interpretations of the sum of several consecutive annual earnings (Ryan and Zarowin, 2003).

Another fundamental attribute of accounting is the Law of Conservation of Income: accounting earnings will eventually record true changes in wealth (Ryan et al., 2003). Earnings of one period may contain measurement errors due to recognition lag and/or manipulation, among other reasons; however, economic events will, sooner or later, be recorded. That is, overstated earnings of one period will be "corrected" by the understated earnings of the next period. These two accounting attributes together allow aggregation of earnings over a longer interval and these aggregated earnings are expected to have fewer measurement errors.

Literature examines the effect of earnings aggregation focusing mainly on the contemporaneous explanatory power of earnings (or components of earnings) for stock returns (prices). A study of Easton, Harris and Ohlson (1992) analyzed the contemporaneous relation between market returns and earnings for a long return interval, with a special attention on increasing the strength of this relation as the time period for calculating returns and earnings increases. Their analysis is developed on the basis of earnings aggregation over time and the assumption that "errors" in aggregate earnings should become less important as time for aggregation increases. As explanatory variable of earnings they used level of earnings, not changes in earnings. The traditional market-based researches used changes in earnings deflated by the beginning of period price, as explanatory variable for returns. They used following arguments: unexpected earnings explain theoretically correct variable of earnings, the change in unexpected earnings fit the change in earnings and that the price at the beginning of the cumulating period is the correct deflator for earnings. They examined how characterization of earnings level affects the earnings-return correlation.

Question is under what circumstances level of earnings is more/less correlated to returns than the changes in the earnings. Study of Ohlson and Shroff (1992) addressed this question. In earlier researches of correlation between earnings and return, used time period was from several days to one year, like in Ball and Brown's study (1968), where they used period of one year as it aligns with the period of reporting the income. First, they portioned groups into "good news/bad news companies". Based on a company's reported income, a company was classified as good (bad) news if the reported income was above (below) those predicted by time-series forecasting model. They showed a clear empirical relation between earnings and returns, as good (bad) news companies showed abnormally positive (negative) returns. However, reaction to good/bad news started one year prior to announcement date. Hence, there is little information content to announcement itself. This suggested that although earnings are reasonable measure of firm's performance, by the time they are published they become redundant and have little market impact. The market anticipation of returns raised question of timeliness of annual reports and reminder that annual report is not the only source of information in market evaluation.

Easton et al. (1992) base their study only on two kinds of errors: event that happened and recognized in earnings during the period of return, and event that happened before return period, but recognized in current earnings. However, in long time return period these kinds of mistakes will not be important, since they will be self corrected during that interval. Their logic is similar to a firm whose life matches the long interval for which aggregation is done, in which case there will be no "errors" in earnings. They define the model in a way that the market return variable is a function of aggregate earnings (level) variable.

The following notation is used:

$P_t$ = the firm's market value at date t
$d_t$ = dividends paid at date t
$R_t = (P_t+d_t-P_{t-1})/P_{t-1}$ = market return for the (t-1, t) period
$X_t$ = earnings for the (t-1, t) period
$R_f$ = one plus risk free rate of return

Term structure of interest rates is flat and nonstochastic. The dates run from t=1 to t=T.

The firm's market performance is determined by $R_{t+1}$, which poses no problems for interval t, t+1. However, if we extend this to (0, T) interval, an assumption that concerns dividends must be introduced. This study assumes that dividends are reinvested in risk-free assets, in which case market return is

$$Y_t=[P_t+FVS\ (d_1,\ldots\ldots d_t)-P_o]/P_o$$

Where,

$$FVS\ (d_1,\ldots.d_t)=d_1(R_f^{T-1})+d_2(R_f^{t-2})+\ldots.+d_{t-1}(R_f)+d_t=FVS_T$$

*FV* and *FVS* stand for future value, and *S* stands for a stock of value.

*FVSt* is total amount that investor can withdraw at date *T* due to the payment and subsequent investment of dividends in risk-free assets.
*PV + FVS* presents the total amount that can be withdrawn at time *T*. If we divide this value with the initial market price Po, we get the market return Yt.

The construction of earnings requires an adjustment for dividends. The earnings consist of two variables: aggregate earnings over (0,T) and earnings due to the investment of dividends in risk-free assets.

$$Z^1{}_T=[AX_T+FVF(d_1,\ldots..d_t)]/P_o$$

where

$$AX_T=\sum_{t=1}^{T}x_t$$

and

$$FVF(d_1,.....d_t)=d_1(R_f^{T-1}-1)+d_2(R_f^{t-2}-1)+....+d_{t-1}(R_f-1)=FVF_T$$

*FVF* represents earnings due to the investments, where F indicates the flow concept. Therefore, *AXt+FVFt* are earnings that would have been earned by the firm had it not paid the dividends and instead invest them in the risk-free assets.

Intertemporal aggregation is central feature of earnings variable and it has been supported by accounting standards, since it is possible to sum them up over one year period, e.g. four quarterly earnings make one year one. If the time period of aggregation is large enough, than the choice of accounting standards to be use should be irrelevant. For example, the uses of LIFO or FIFO for cost of goods sold are unlikely to materially differ for the ten-year period. This is a part of the idea that the most important value relevant event will be a part of earnings for the period T. In practice explicit recognition of value relevant earnings is impossible, however higher level of their incorporation in earnings as period lengthens is possible. If we define the difference between market value and book value as goodwill, thus

$$P_t-P_o=(BV_t-BV_0)+(g_t-g_o),$$

in general,

$BV_t-BV_{t-1}=X_t-d_t$, which is "clean surplus" relation

$$BV_T-BV_o=\sum_{t=1}^{T}X_t-\sum_{t=1}^{T}d_t=AX_T-\left[FVS_t-FVF_T\right]$$

If we combine the relations we get

$$(P_t-P_o)/P_o+FVS_t/P_o=(AX_t+FVF_t)/P_o+\Delta g_t/P_o$$

Which comes to,

$$y_t=z_t+g_t^*, \text{ where}$$

$$g_t^*=\Delta g_t/P_o$$

The change in goodwill captures the "measurement errors" in aggregate earnings. The co variation between $y_t$ and $z_t$ approaches one as the variance of $g_t$* divided by he variance of $z_t$ approaches zero as $T \rightarrow \infty$.

The basic cross-sectional regression model is expressed as

$$Y_{tj}=\alpha_t+\beta_t z_{tj}+\varepsilon_{tj},$$

where j denotes firm j and $\varepsilon_t$ is omitted factor. The subscript T denotes that regression coefficient may depend on return interval. This model has been developed without any reference to expected or unexpected earnings, which distinct it from other models developed in previous literature.

Results of the regression were impressive. For the 10-year interval and $R_f$ of 1,1, $R^2$ was 63%, which is much higher that results for the one-year interval. The results for the shorter interval of five, two and one year confirm the hypothesis that while decreasing the period of return the correlation with earnings also decrease. The $R^2$ are 38 % for five-year interval and 28 % for two year.

Interesting aspect of this study is that it gives framework for empirical analysis. This is specially the case for market-based researches, where long return intervals may have a better chance of providing useful evidence for many empirical issues. The earnings are more likely to reflect value relevant events over longer periods, which go to the conclusion that investors buy earnings.

Shroff (1999) did similar study and investigated the relation between earnings and returns over longer period. Lags in recording earnings become less important as the period for which we count return lengthens. This was proven in Easton, Harris, Ohlson study. However, their estimated slope coefficient was increasing as the interval increased and for the ten year interval slope coefficient was significantly greater than one (1,7). They couldn't explain why this was happening. Shroff in her study tried to explain why coefficient can go over one in specific aggregating period, and how much it can contribute to increase in $R^2$. She used identity that return equals earnings (scaled by beginning price) plus economic goodwill (scaled by beginning price) to test the earnings aggregation. The change in economic goodwill is omitted variable. For this reason, $R^2$ depends on the ratio of scaled earnings to returns, that variable effect, and covariance between scaled earnings and change in economic goodwill. She found that variance effect is less then one and covariance effect is negative, which explains that: as aggregation interval increases the variance between earnings and return increases, and covariance between

earnings and change in goodwill (which is negative) increases to zero. These factors lead to $R^2$ increasing.

She created example where return lag and current earnings are positively related to accounting lag, where accounting lag is defined as value relevant earnings of current period that are recognized in the next one. When current earnings and accounting lag have zero correlation, the slope coefficient is always below one. In case when they have positive covariance, which means that with aggregation increase covariance increases also, regression coefficient can be higher than one. Conclusion is that accounting lags persist even over longer intervals, which leads to positive correlation an increasing $R^2$.

However, higher explanatory power among different models does not imply smaller magnitude of errors when inferring price from earnings; it only indicates that a larger portion of the total variation is explained by the model, rather than by the residual error. Another empirical question is whether earnings aggregation reduces the magnitude of errors in inferring price from accounting data; in other words, whether earnings of a shorter interval or earnings of a longer interval generate smaller errors when inferring price from earnings and book value.

The summary of studies on the improvement of return-earnings relation is given in the Appendix.

## *3.3 The financial determinants of growth rate*

Basic logic concerning the growth rate can be seen in the calculation of it using the so called DuPont analysis, which shows relationship between growth rate and earnings retention ratio and return on equity. If we define a sustainable growth as the rate of growth of dividends (and earnings) growth that can be sustained for a given level of return on equity, keeping the capital structure constant over time and without issuing additional common stocks.

The expression for calculating the sustainable growth rate is (Stowe et al., 2002)

$$g = b \cdot ROE$$

where
$g$=growth rate of dividends
$b$=earnings retention rate (1-dividend payout ratio)
$ROE$=return on equity

Logic for defining sustainable growth is that in terms of growth, internally generated funds (retained earnings) are cheaper then externally generated funds (secondary issues of stock). Continuous issuance of new stock is not a practical funding alternative for companies, in general. Therefore, a company's sustainable growth is a function of its ability to generate return on equity

Estimation of future growth rate is an important part of valuation methods and it influences the accuracy of the model to a great extent (Easton et al., 2002). This is especially the true for the forward-looking approaches such as dividend discount model and residual income model. Dividend discount model is based on dividend yield, which is easily measured, and the growth in dividends, which is a problem (Claus and Thomas, 2001). Residual income model tries to mitigate this problem recognizing that dividends equal earnings less changes in accounting (book) values of equity. This allows that future dividends can be replaced by a current book values plus a function of future accounting earnings.

The Gordon growth model is formulated as follows (Brigham and Daves, 2002):

$$P_0 = \frac{d_1}{k-g} \Rightarrow \quad k = \frac{d_1}{P_0} + g$$

where,

$P_0$=current price
$d_t$=dividend at the end of the year t
$k$=expected return on equity
$g$=expected dividend growth rate in perpetuity

Expected dividend growth rate is expected to be equal to the forecasted growth in earnings. It is usually forecasted for the period of next five years and obtained by the financial analysts.

The abnormal earnings model is formulated as follows (Claus and Thomas, 2001):

$$P_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + ..... + \frac{ae_5}{(k-g_{ae})(1+k)^5}$$

where,

$bv_t$=expected book (or accounting) value of equity at the end of year t

$ae_t$=expected abnormal earnings for year t
$k$=expected rate of return on equity investment
$g_{ae}$=growth in abnormal earnings usually assumed by researcher

Abnormal earnings are proxies for economic profits or a rent, which leads to the fact that growth in abnormal earnings, are easier to assume than growth in accounting earnings. First, it is expected that economic rents will not grow at high rates because of the general economic factors such as antitrust, global competition etc. In addition, growth in rents to some extent follows value relevant indicators such as P/B, P/E or ROE:

Dividend growth defined in Gordon growth model is hypothetical and it leaves much room for errors. It is not necessarily related to historical or near term forecasted growth rates. In contrast, estimates of growth rates in abnormal earnings are more accurate because of the fundamental characteristics of abnormal earnings. If the book value is accurately reported, economic rents will be reflected into future abnormal earnings. This means that growth in abnormal earnings is not affected by transitory changes of dividends, but rather by broader economic factors, already mentioned. This does not mean that growth in abnormal earnings approach zero growth (Claus and Thomas, 2001). This kind of assumption would be too strict, since we have to consider growth in investments, which increases the base of generating abnormal earnings.

## 3.4 *Using forecasts of earnings to simultaneously estimate growth rate and the rate of return on equity investment*

Easton et al. (2001) developed a model for simultaneously calculating the cost of capital and growth rate of abnormal earnings. Their method is similar to estimating internal rate of return of a bond, using market price of bond and coupon payments. They inverted the residual income model in order to get rate of return and growth rate. Calculating equity premium and comparing it with other analysts' calculations tested model.

Starting point was residual income model, and inversion of it using current market prices, current book values and short-term forecasts of accounting earnings.

Growth rate is defined as perpetual rate of growth in residual income such that market price equals book value plus present value of residual income growing in perpetuity. They used a four-

year period income, as they calculate aggregate earnings for the four-year subsequent periods. There are two unknown variables in the model: rate of return *r* and growth rate *g*.

By inverting the residual income model, price is expressed as book value plus four-year aggregate earnings. Since *g* corresponds to *r* (the market has given *r*-*g*), if there is mistake in *g*, clearly there will be mistake in discount rate. If *g* is not implied by market prices, book values and earnings forecasts, then there will be noise in estimating *r*. This is why this method breaks *r* and *g* , and calculate *g* on the basis of market prices, book values and earnings.

Multiples on book value and earnings are function of *r* and *g*. Rearranging this expression leads to a simple linear relation between the ratio of the sum of earnings forecasts for the subsequent four years to current book value and the current price-to-book ratio. This way we get to regression line where, both intercept and slope coefficient are functions of *r* and *g*.
Model was also tested on groups of companies separated by industries they belong, which can help in calculating the cost of capital for companies that are not traded.

Model is based on two premises: first, earnings may be summed over long periods. In studies mentioned before, it was shown that the longer the period of aggregation earnings, the higher is explanatory power of the return-earnings relation. It is based on the fact that quarterly earnings are summed in order to get yearly. For long periods of aggregation accounting lag becomes less important. Second, by inverting the residual income model price can be expressed as linear function of current book values and four-year aggregate earnings. Estimation of rate of return is obtained using prices, book values, and aggregate earnings and estimated growth perpetual.

To develop the model we must start from the formulation of the residual income model:

$$P_o = B_o + \sum_{t=1}^{m} (1+r)^{-t} E_0\left[X_t - rB_{t-1}\right]$$

where
$P_0$ is the market price per share at time 0,
$B_0$ is the book value per share at time *0,*
$E_0$ is the expectation operator with expectations conditional on the information available at time 0,
$r$ is the expected rate of return on equity,
$X_t$ is the (comprehensive) earnings per share for fiscal period $t$-1 to $t$, and
$[X_t - r\,B_{t-1}]$ is the residual earnings per share for period t-1 to t.

The no arbitrage assumption, as well as clean surplus is sufficient to derive the presented equation. Rubinstein (1976) introduced the no arbitrage assumption[9] in order to develop dividend discount model. Clean surplus accounting means that the current book value equals book value of equity at time t-1 plus net income available at time t-1 and dividends at time t. Clean surplus relation requires that all items affecting the book value must be included in earnings (except the transactions with shareholders). All the prior studies assumed g, and then the terminal value was calculated. Rate of return is then the only variable, which can be calculated from the model.

Basic equation above can be rewritten, in order to isolate the finite period for which we have aggregate data:

$$P_0 = B_0 + \sum_{t=1}^{4}(1+r)^{-t}E_0\left[X_t - rB_{t-1}\right] + \sum_{t=1}^{\infty}(1+r)^{-t}E_0\left[X_t - rB_{t-1}\right]$$

The firs summation, for the finite period can be rearranged, if we involve clean surplus relation,

$$B_t = B_{t-1} + X_t - d_t$$

Where $d_t$ represents net dividend payment at time t, which are equal dividends minus capital contribution of shareholders.

$$\sum_{t=1}^{4}(1+r)^{-t}E_0\left[X_t - rB_{t-1}\right] = \sum_{t=1}^{4}(1+r)^{-4}\left\{E_0\left[X_t\right] - r\left[\sum_{t=1}^{3}Bt + X_t - d_t\right]\right\}$$

$$= \sum_{t=1}^{4}(1+r)^{-4}\left\{E_0\left[X_t\right] - r\left[(B_3 + X_3 - d_3) + (B_2 + \right]\right\}$$

This can be written as:

$$(1+r)^{-4}\left\{\sum_{t=1}^{4}E_0\left[X_t\right] + \sum_{t=1}^{3}((1+r)^{4-t} - 1)E_0\left[d_t\right] - ((1+r)^{-4} - 1)B_0\right\}$$

[9] Arbitrage generally means simultaneously baying and selling the same commodity or security in two different markets at different prices, and pocketing a risk-free return (Brigham and Daves, 2002). No arbitrage assumption means that there are no:

- Violation of the Law of one price
- Sure free lunches or possible free lunches
- Profitable opportunities without the cost or risk

If we denote

$(1+r)^4 = R$, as four year aggregate return on equity, upper equation can be rewritten

$$(1+r)^{-4}\left\{\sum_{t=1}^{4} E_0[X_t] + \sum_{t=1}^{3}((1+r)^{4-t}-1)E_0[d_t] - ((1+r)^{-4}-1)B_0\right\} = R^{-1}\{X_{cT} - (R-1)B_0\}$$

This term present the present value of expected future four-year residual profitability.

If we consider notion recognized by Ohlson, that dividend paid at period t, reduces the next years earnings by $rd_t$, term $X_{cT}$ captures that, which is consistent with no arbitrage assumption:

$$X_{ct} = \sum_{t=1}^{4} E_0[X_t] + \sum_{t=1}^{3}((1+r)^{4-t}-1)E_0[d_t]$$

If we return to the indefinite horizon model, and treat the four-year aggregate cum-dividend earnings as growing perpetuity, it becomes:

$$P_0 = B_0 + \{X_{cT} - (R-1)B_0\}/\{R-G\},$$

where $G=(1+g)^4$

Growth rate g is defined as an unknown variable that is annual growth rate implied by market prices, book values and four-year cum-dividends earnings. Growth rate is a bit differently defined, as annual growth rate from the date on which the forecast of earnings are made. This definition differs from the definition more frequently encountered when using the residual income model in equity valuation (Penman [2000] and Claus and Thomas 2001]).

Previous applications of the residual income model generally define g as the growth in residual income from the last year for which a forecast of earnings is available. This way defined growing perpetuity rate of four-year aggregate earnings should explain the difference between market and book value of price, as well as allow calculating the rate of return.

Calculation of r is based on book values and short term forecasting of earnings, which might have some drawbacks, considering the fact that short term forecasted earnings might include errors in predicting the long-term earnings. Simultaneously calculating growth rate and rate of

return provides adjustment for this fact, on the other hand, different accounting rules might lead to different earnings forecasts.

If we divide last equation by $B_{0,}$ we get:

$$\frac{P_0}{B_0} = \frac{X_{cT}}{B_0(R-G)} - \frac{G-1}{R-G}$$

or

$$\frac{X_{cT}}{B_0} = (G-1) + \frac{P_0}{B_0}(R-G)$$

if we denote *(G-1)* as $\gamma_0$ and *(R-G)* as $\gamma_{1,}$ we formulate the regression line:

$$\frac{X_{cT}}{B_0} = \gamma_0 + \gamma_1 \frac{P_0}{B_0}$$

or for individual firm level:

$$\frac{X_{cTj}}{B_{0j}} = \gamma_0 + \gamma_1 \frac{P_{oj}}{B_{0j}}$$

From the regression line we can calculate simultaneously rate of return and growth rate, since intercept and the slope coefficient are functions of *r* and *g*.

Therefore, by regressing $X_{ct}/B_0$ on $P_0/B_0$ we easily calculate rates of growth and return for any portfolio of j=1…….j firms. When running the regression we have to consider the error term $\varepsilon_0$, because of the firm specific random component of $\gamma_0$ and $\gamma_{1.}$

$$\frac{X_{cTj}}{B_{0j}} = \gamma_0 + \gamma_1 \frac{P_{oj}}{B_{0j}} + \varepsilon_0$$

The estimates of factors $\gamma_0$ and $\gamma_1$ are non-stochastic and they may be regarded as mean of firm specific factors. The estimates of rate of return and growth rate are calculated for portfolio of firms, not for one specific firm.

There is one assumption to be made and that is that $E_0 [d_t] = d_0$, t=1…4. This assumption leaves room for errors, since expected dividends might not equal the once at the beginning of the period. The estimates of aggregate earnings might also include errors. Price to book ratio, as independed variable contains no errors. The regression has to be set in a way that only depended variable is measured with error.

The most serious problem in this model presents the calculation of four-year aggregate earnings. In order to calculate it we need rate of return *r*, yet purpose of the model is to calculate the rate of return. This problem of circularity can be solved. One way is to assume that displacement of the future earnings due to the dividend payments is 12 %. Logic behind is that if these dividends had been retained in the company, they would at least earned the historical market return, which is approximately 12 %. For concrete case of Slovenian market, this historical market return can be calculated. At the end, the exact figure of the historical market return in his model is not important, since it will be revised, using an iterative procedure, until there is no change in the estimates of *r* and *g*. It is expected that rates will match after few iterations, while changes in growth rate vary little across samples.

Example of calculating $X_{ct}$:

What are the aggregate forecasted earnings for the four-year period?

Two components:

1. The sum of accounting earnings for each period which is

$$\sum_{t=1}^{4} E_0[X_t]$$

   Where $E_0 [X_t]$ =expectation at time o of accounting earnings for year t

2. The earnings that the investor can obtain by reinvesting dividends paid during the four-year period, which is

$$\sum_{t=1}^{3} \left((1+r)^{4-t} - 1\right) E_0[d_t]$$

**Table 3: Forecasts for Hewlett Packard at the end of 1995:**

| | $X_t$ | $d_t$ | Earnings on dividends |
|---|---|---|---|
| 1996 | 5,45 | 0,94 | $0,94 \cdot (1,12^3-1)=0,38$ |
| 1997 | 6,35 | 1,10 | $1,10 \cdot (1,12^2-1)=0,28$ |
| 1998 | 7,32 | 1,25 | $1,25 \cdot (1,12^1-1)=0,15$ |
| 1999 | 8,56 | 1,46 | $1,46 \cdot (1,12^0-1)=0,00$ |
| | **27,68** | | **=0,81** |

Source: Easton et al., 2002

Aggregate cum-dividend earnings are $28, 49.

The model was tested on the I/B/E/S sample from the period from 1981 to 1998. Their estimation of rate of return ranged from 11 to 16 %, which is much higher, compared to other studies that used forecasted data. Equity premium averaged about 5,3 %, as they used as proxy for risk-free rate yield on five year T-bonds.

Results were compared to the ones that Gebhardt, Lee, and Swaminathan (2001) had, as their risk premium was 2,5 %. Claus and Thomas (2001) estimated risk premium at 3,4 %. In both of these studies growth rate was assumed, none of them tested validity of the assumption. Growth rate was assumed by fading ROE to industry median, over forecasted horizon. This was justified by the fact that over long period ROE decreases to median as competition in particular industry increases.

They emphasize that growth assumptions are important part in valuation, since rate of return might be very sensitive to used growth assumptions. There is little evidence in accounting literature about what assumption is the most correct one. This is why these authors calculated the growth rate, implied by market, instead of assuming it

# *4. Empirical testing of the model on the sample of Slovenian capital market*

## *4.1 Introduction to Slovenian capital market*

Like in most transition countries, capital market in Slovenia was dominated by privatization process. Most important characteristic of capital markets in transition countries is that they do not reflect only the progress of financial intermediation in the financial market, but to a large

extent they reflect progress in transition. Three most important elements that influenced development of such capital markets were: privatization process, pension reform and legal environment. Privatization process represents the historical perspective of Slovenian capital market, while future perspective is its integration into EU wide capital market.

In Slovenia term privatization has a different meaning from the classical one. Since there was dominant social ownership, rather than state ownership, we should speak about elimination of social ownership; ownership transformation. Main function of the capital market was to enhance abolishment of the social ownership and consolidation of the ownership. Most shares on the securities market in Slovenia come from the ownership transformation. Ownership transformation has influenced supply of the shares on secondary market, but it has stopped development of primary securities market and collecting of fresh capital. Monetary policy is rather successful in making the domestic currency stable. Having attractive financial instruments such as bills nominated in domestic or foreign currency, it crowds out investments from the capital market. Further more, by pushing the exchange rate higher it limits entrance of foreign investors to the market. So-called two-sided internationalization of financial business is coming to its establishments, as Slovenia approaches EU. New foreign exchange Act (1999) has reduced some limitation to foreign capital. Export of capital is liberalized, while import of capital for some segments is still limited. This is specially the case for portfolio investments of foreigners into shares, short-term securities, and equity investments larger than 25 %, real states, insurance and investment funds. Fiscal politic is still not enough articulated, but yet stricter compared to other markets. Tax on interest rate would enhance balance of cost on different securities; yet, there is still unpleasant tax on capital gain from buying and selling securities. More over, time of holding the security before the tax is paid was 3 years, which is too much compared to international standard of six months. Reducing this period would improve ownership structure of securities.

Major economic and financial event that influenced development of the capital market were:

- 1988- Adoption of two laws: Securities market Act and Capital market act provided a legal basis for the development of the capital market
- 26.12.1988- LJSE was officially established
- 1990-Banking crises
- 14.03.1994-A New Securities Market Act was offered, which provided legal basis for LJSE operations
- 07.06.1994- Restrictions on the transferability of a tolar balances held by certain nonresidents were eliminated

- 1994, Dec-The introduction of Insider Trading Laws.
- 31.10.1996-LJSE was included in CESI (Central European Stock Index)
- 01.01.1997-Imposition of tax on capital gains deriving from trading in securities for domestic and foreign individuals.
- 02.04.1997-Controls on capital and money market instruments: Nonresidents are required to conduct their portfolio investments through custody accounts.
- 02.01.1997-Decree of Bank of Slovenia: Custody accounts are obligatory for all foreign portfolio investments. Furthermore these custody accounts and - foreign currency reserves to the amount of funds on the account- should appear on the balance sheet of the Slovene bank maintaining such an account.
- 15.06.1997- Provisions specific to institutional investors) The BOS adopted a new prudential regulation demanding banks to gradually limit their daily foreign exchange exposure to 20% of their capital.
- 30.06.1997-Relaxation of limitations for foreign portfolio investors that were imposed by the Slovene central bank in February 1997. From this date on, the Bank allows foreign investors to buy Slovene securities without balancing foreign exchange position for the amount invested. Foreign investors have to undertake the obligation not to sell the securities for a period of 7 years.
- 13.10.1997- LJSE was admitted as a full member to the International Association of Stock Exchanges - FIBV.
- Jan.1999- The Bank of Slovenia cut the minimum period that foreign portfolio investors were required to hold shares to four years from seven year. Another law, aimed at liberalizing foreign portfolio investment rules, proposed to consider any foreign investment representing more than 10% of a company's share capital as direct investment.
- June, 1999- the government passed the Securities Market Act, ensuring a more regulated market. The Central Clearing Corporation closed issues of dematerialized shares of joint stock companies.
- 09.07.1999- Controls on capital and money market instruments: Residents offering shares abroad were obliged to acquire the prior approval of the MOF and the ASM. The issue of bonds by nonresidents requires the permission of the MOF.
- 01.09.1999-Controls on capital and money market instruments: Conditions on the purchase of money market investments by nonresidents are set by the BOS. Commercial banks must pay a premium on the balances of custody accounts of nonresidents held for one year or more. Residents may purchase abroad only shares traded on the stock exchanges of the FIBV. Banks, investment funds, and insurance companies were allowed to purchase securities abroad freely. Other residents may

purchase securities issued by OECD member states, international finance institutions, securities with a minimum of an AA rating, or securities traded on stock exchanges of the FIBV

- 01.01.2001- Stock Exchange market segments A and B merged into a single Official market.
- Nov.2001- Foreign ownership in Slovenian-listed companies grew 30% in 2001's last two months. 14 authorized investment companies were transformed in 2001.
- 15.01.2002- new system of electronic information dissemination - SEOnet was launched.

Even though Slovenian financial sector is banking-dominated, capital market has developed itself as an important part of financial system. There are two phases of the development of the capital market. Until the summer of 1996 shares of small enterprises were mainly traded, with contributing only 5% to the turnover. Importance of the capital market was relatively small, with market capitalization at the end of 1995 of 1,8 % o GDP. In the second half of nineties things changed. Shares that were result of a process of mass privatization gave a push to the development of capital market and soon dominated the financial market. Market capitalization at the end of 1999 was 16,5 % of GDP.

Compared to EU standards Slovenian capital market is still underdeveloped. There is a number of reasons for that: domination of the privatization process, non-existence of the primary market, not enough support from the economic policy. According to market capitalization it belongs to smaller group of stock exchanges in Europe. The most important characteristic is that function of primary market is not for new issuing companies to raise money, but mostly for government to issue short-term and long-term securities. This is why non-financial companies must turn them selves to banks in order to finance their development. There are many reasons for slow development of primary market such as high supply of privatization shares, high transaction cost, not enough highly profitable companies, etc. Bond market is also not enough developed, which leaves room for unfair competition with bank deposits or government bills and bonds. Banks offer to investors a better combination of risk and return, which makes things harder for non-financial companies. At the beginning of its development secondary market was mainly used to consolidate the ownership structure. Since it is relatively small market it has inefficiencies such as low liquidity except for several most traded shares, high concentration of shares for the purpose of obtaining ownership control, relatively high amount of shares traded on the gray market, large portion of block trading.

Lack of strong domestic institutional investors is also a major factor of weak demand on Slovenian capital market. Privatization funds (PID in Slovenian language) had impact on the development of the capital market. This is a version of closed-end funds, only adjusted to the process of privatization. However, their portfolios compared to regular investment funds, are not enough diversified and concentrated on few strong issuers.

Foreign investors had restricted access to market, which also influenced small demand. In 1997 they partly entered the market, which had considerable impact on prices and trade volumes. Soon after, costly custodian accounts were introduced and reduced returns on short-term investments. Foreign portfolio investments shortly dropped until the 2000, when the restrictions were reduced. Role of foreign investors should be treated trough laws that regulate that area, especially Foreign exchange Act. Purpose of introducing this Act was to solve long lasting problem of Slovenian openness to foreign capital, as well as exporting Slovenian capital to other capital markets. Most important of that act was transferred from the European agreement of succession between EU and Slovenia, whereas numerous details were left to Bank of Slovenia and Ministry of finance. Main characteristic of this act is that it dedicates more attention to import of capital then export. Import of foreign capital has more limitation, which shows that in last few years Slovenia is worried about possibility of too large import of capital. Export of capital is almost completely liberalized, except for few minor limitations. This situation might create unbalances, which again might limit fast growth and development of capital market. For healthy development they might also need import of foreign capital, but on the other hand, by complete liberalization they might not get the quality of foreign capital that is appropriate. In the current situation qualitative capital of banks, insurances and funds is going out of the country.

Insurance houses are supposed to be one of the major institutional investor that should enhance development of capital market. This is not the case for Slovenian market. Insurance houses are still in the process of transformation, waiting to be open for foreign competition. Pension funds as institutional investors are in the early phase of development, but they are supposed to have role important in developing the Slovenian capital market. First pension fund is regulated in a way that it will solve already mentioned privatization holes, which is the term for unexploited certificate in the asset side of privatization funds. Shareholders of a such privatization funds are given the opportunity to exchange those certificates for pension coupons, which are transferable and therefore marketable, and resulting insurance policy (if they want it), whose minimal return is insured by government and it is 1 % a year. There are additional beneficiaries for those who decide to exchange their certificates for pension funds coupons and it is additional government bonds in 20 % value of the exchange value. Filling the privatization hole is an important factor of returning the confidence into capital markets.

The process of development of Slovenian market can continue when demand side is improved with investment policy of insurance houses, investment and pension funds and openness to foreign investors. Supply side will be improved by finally completing the privatization of companies, banks and others. Development of primary market is essential for companies to get to the fresh capital and make profitable investments, thus, improving the capital market.

### 4.1.1 Quantitative data

The table 4 presents some quantitative data of Slovenian capital market, order to gain some insights about the true size of the market.

**Table 4: Slovenian capital market-most important quantitative data**

| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|
| Market capitalization (bn SIT) | 178 | 399 | 628 | 795 | 967 | 1.218 | 1.930 |
| Market capitalization as % GDP | 6,9 | 13,7 | 19,3 | 21,9 | 23,7 | 26,8 | 38,1 |
| Market capitalization PID (bn SIT) | 0 | 0 | 80 | 125 | 172 | 162 | 243,8 |
| SBI20 Index | 1.183 | 1.405 | 1.706 | 1.806 | 1.808 | 2.152 | 3.340 |
| No. of securities | 82 | 129 | 173 | 237 | 267 | 270 | 265 |
| Shares | 52 | 85 | 122 | 180 | 197 | 193 | 172 |
| Bonds | 30 | 44 | 51 | 56 | 68 | 76 | 92 |
| Volume (bn SIT) | 87 | 108 | 173 | 266 | 270 | 348,6 | 481 |
| Volume as % of GDP | 3.4 | 3.7 | 5.3 | 7.3 | 6.6 | 7,7 | 9,5 |
| Liquidity (V/MC[10]) of shares | 0.54 | 0.28 | 0.28 | 0.30 | 0.21 | 0,28 | 0,23 |
| Liquidity (V/MC) of bonds | 0.25 | 0.14 | 0.15 | 0.16 | 0.22 | 0,14 | 0,16 |

Source: Securities market agency, annual report-2002

Description of the primary market: in the 2000 five-bond issues mostly by banks and one issue of shares has been publicly offered. However, in the 2002 there was only one issuance of the security papers, these were debt papers issued by a bank. The primary market did not show any improvements in the last two years. In the period from 1994 till 2002 there were 23 shares publicly offered, of which 13 are by banks. As far as bond are concerned, there were 47 bond

[10] Liquidity is calculated as ratio of volume of shares trading and market capitalization

publicly offered of which 37 are offered by banks. The major issuer is still government with 12 bond and 23 treasury bills offered in 2000. Long-term securities amounted 36 % of whole amount of issued securities. These figures confirm the story about the low and slow development of the primary market.

Market capitalization of all securities on the organized market amounted to 2.174 billion SIT in 2002, which is 57, 5% increase from a year ago. This is quote an increase since the number of securities listed on the stock exchange has decreased. Market capitalization of stocks amounted at 1.233,1 billion, while market capitalization of bonds amounted 690,7 billion SIT. The rest comes from the pension coupons. Secondary market, according the market capitalization is growing at the more than acceptable growth rate.

In 2002 the number of securities traded in the organized market decreased to 265: On the stock exchange market there were 94 securities, 40 shares and 54 bonds. On the free market part there were 157 shares (of which 43 shares of privatization funds), 14 bonds, 1 pension coupon and 8 short-term securities.10 most trades shares contributed to 54% of the total volume of share trading. 10 most traded bonds accounted for 51% of the total volume of bond trading.

Most important indices are SBI 20, Slovenian market index of 20 ordinary shares, weighted by their market capitalization (with starting value of 1000 in 1993), PIX index of privatization funds and BIO bond index. SBI 20 is showing stable growth.

## *4.2 Empiricall specification of the model*

I am going to test the model, developed by is developed by Easton et al. (2002) using database of all Slovenian companies traded on the LJSE. The model allows simultaneous calculation of cost of equity and growth rate in residual income, based on the accounting information. It is an inversion of the residual income model. As all forward-looking approaches (dividend discount model, residual income) have problem with the calculation of the terminal value, this model solves the problem by directly calculating the growth rate in residual earnings. This way is avoided to make any assumptions about the future growth, which is usually the case with other models.

The regression model formulated as follows[11]:

[11] Derivation of the model is given in Chapter 3.

$$\frac{X_{cTj}}{B_{0j}} = \gamma_0 + \gamma_1 \frac{P_{oj}}{B_{0j}} + e_{j0}$$

where

$P_{0j}$ is the market price per share at time 0,
$B_{0j}$ is the book value per share at time *0,*
$X_{cTj}$ are aggregate four-year cum-dividend earnings,
$\gamma_0$=*G-1*, where $G=(1+g)^4$, average four-year growth rate in residual income
$\gamma_1$=*R-G*, where $R=(1+r)^4$, average four-year cost of capital
$e_{j0}$ is error term

Depended variable $X_{cT}/B_o$ represents aggregate four-year earnings divided by the book value per share at the beginning of the four-year period. It is marked as XB96-XB02 in the empirical testing of the model. Usefulness of the aggregation of earnings has already been explained, but emphasis is on avoiding earnings recognition gap and improving the return-earnings relation. Depended variable is then regressed on the $P/B_0$ ratio. From the regression line we can estimate average four-year expected rate of return *(R-1)* and average four year expected growth in residual income (*G-1).* The estimates of the coefficients $\gamma_0$ and $\gamma_1$ are non-stochastic and may be regarded as the mean of the firm specific components. It follows that the *R* and *G* implied by these estimates are the estimates for the portfolio of J firms. Growth in residual earnings is defined as the excepted average annual rate of growth in residual income from the date on which the forecast of earnings are made. Most of analysts define it as the growth in residual income from the last year for which a forecast of earnings is available.

First problem that appears relates to the calculation of the aggregate earnings. They consist of regular accounting earning for the four-year subsequent period and reinvested dividends:

$$X_{ct} = \sum_{t=1}^{4} E_0[X_t] + \sum_{t=1}^{3} ((1+r)^{4-t} - 1) E_0[d_t]$$

Reinvested dividends are included because of the assumption that if they have been retained in the company they would have earned at least historical rate of return. This is why a problem of circularity appears. Aggregate earnings are input variable in the model, yet for the adjustments of dividends they need historical rate of return on equity which is an output variable. Introducing iterative procedure can solve this problem. This means that for the purpose of calculation the

aggregate four-year earnings I will use historical market return, calculated using the simple method of P/E ratio. Later, this rate will change until it equals with the rate estimated from the model. This way the accuracy of the model is not affected by the use of historical market returns.

Another problem is also connected with the calculation of the four-year aggregate return. First parts of the aggregation are subsequent four-year earnings:

$$\sum_{t=1}^{4} E_0[X_t]$$

Sample data are for the period of 1996-2002, which means that in order to calculate aggregate earnings for the period of 2002; I will need forecast of accounting earnings for the years 2003, 2004 and 2005. As a basis for forecasting I will use ex-post realization. Explanations of the forecasting procedure, as well as the calculation of the historical market return are given in the next subchapters.

Independed variable of the regression, $P_0/B_0$ does not need any adjustment, it is simply calculated by dividing the price of a share at the end of the fiscal year by the book value of equity on a share basis. It is marked as PB96-PB02 in the empirical testing of the model.

In the defined regression line one of the variables defined as $X_{cT}/B_0$ is measured with error, but the other variable $P_{jo}/B_o$ is not. For this reason, the regression line must be run with $X_{cT}/B_0$ as the depended of the regression coefficients that are unbiased.

## *4.3 Data and sample selection*

Sample includes all non-financial companies whose shares are traded on the Ljubljana Stock exchange in the period from 1996 till 2002. A criterion for dividing data into subsamples is payment of dividends. One subsample includes companies that have paid out dividends for a specific year. The other one includes companies that have paid out dividends at least ones in the observed period. From the sample are excluded financial companies and investment trusts. This is a conventional restriction as the relationship between accounting numbers and values appear to be stronger for the non-financial companies. The sample also includes companies with negative earnings, even though there are empirical evidences on different kinds of earnings-return relationship for the companies with negative earnings (Garrod and Rees, 1998). This fact might influence the analysis to some extent.

Data used in the analysis are collected from the Agency of payment of the Republic of Slovenia. This source refers to data on the book value of equity, earnings, fixed assets, total assets and sales. Price of shares, as well as the number of shares outstanding at the end of fiscal year are collected from the Archive of the listed securities on the Ljubljana Stock Exchange, starting from the 31.12.1996 until 31.12.2002. Interbank exchange rates are collected from the web site of the Bank of Slovenia. Interbank exchange rates are used as proxy for the risk-free rate because there are not appropriate financial instruments that would reflect long-term risk-free of assets.

Book value (bv) includes book value of ordinary equity plus reserves (DataStream 050 in the AOP formulary). Earnings per share ($X_t$ ) are ordinary earnings (DataStream 167) divided by the number of shares outstanding. Aggregate four-year earnings( $X_{cT}$) are calculated using the already explained method. Fixed assets ($FA_{j,t}$, DataStream 002) include materialized and dematerialized assets, as well as long-term investments. Total assets ($TA_{j,t}$, DataStream 001) include fixed assets, current asset plus accruals. Total sales ($S_{j,t}$, DataStream 090) include revenues on domestic and foreign markets.

## *4.4 Structure of sample*

Descriptive statistics for the sample are provided in Table 5. Since the sample changes there should be caution that conclusions about changes across years may partly reflect changes in sample composition. Descriptives are given for the dependent and independent variables.

**Table 5: Descriptive statistics of the sample**

| | Year | N | Mean | Median | St. dev | Min | Max |
|---|---|---|---|---|---|---|---|
| $X_{cT}/B_0$ Depended variable $X_{ct}$-four- year aggregate earnings $B_0$-book value of equity per share at the end of year | 1996 | 97 | 0,13 | 0,13 | 0,37 | -1,98 | 1,28 |
| | 1997 | 99 | 0,14 | 0,14 | 0,79 | -4,86 | 5,21 |
| | 1998 | 99 | 0,13 | 0,13 | 0,41 | -1,63 | 2,09 |
| | 1999 | 99 | 0,14 | 0,16 | 0,41 | -0,96 | 1,81 |
| | 2000 | 99 | 0,09 | 0,14 | 0,41 | -2,12 | 1,13 |
| | 2001 | 99 | 0,06 | 0,12 | 0,38 | -1,02 | 0,86 |
| | 2002 | 99 | 0,02 | 0,12 | 0,46 | -2,15 | 0,83 |
| $P_0/B_0$ Independed variable $P_0$-Price of a share at the end of year $B_0$-Book value per share at the end of year | 1996 | 17 | 0,51 | 0,48 | 0,37 | 0,07 | 1,31 |
| | 1997 | 35 | 0,45 | 0,46 | 3,27 | 0,09 | 19,80 |
| | 1998 | 47 | 0,63 | 0,53 | 0,34 | 0,12 | 1,66 |
| | 1999 | 47 | 0,96 | 0,44 | 3,01 | 0,13 | 25,48 |
| | 2000 | 99 | 0,67 | 0,41 | 1,74 | 0,07 | 16,55 |
| | 2001 | 99 | 0,84 | 0,39 | 3,20 | 0,04 | 31,35 |
| | 2002 | 99 | 0,83 | 0,49 | 1,83 | 0,04 | 18,01 |

Source: Own presentation from the SPSS results

## *4.5 Calculation of historical market return*

The simplest method of calculating the historical market return is using the *P/E* ratio. As it was already mentioned, it is the easiest one to use; yet it leaves more room for mistakes. The price-to-earnings ratio is perhaps the most widely recognized valuation indicator. Using the Gordon growth model, we can develop an expression for *P/E* in terms of the fundamentals.

We can state the expression for *P/E* in terms of the current (or trailing) *P/E* (today's market price per share divided by trailing 12 months' earnings per share) or in terms of the leading (or forward) P/E (today's market price per share divided by a forecast of the next 12 month's earnings per share, or sometimes next fiscal year's earnings per share).

Leading and trailing *P/E* expressions can be developed from the Gordon growth model. Assuming that the model can be applied for a particular company, the dividend payout ratio is considered fixed. We define b as retention rate; the fraction of earnings reinvested in the company rather than paid out as dividends. The dividend payout ratio is then by definition, (1-

b)=dividend per share/earnings per share= $D_t/E_t$ .If we divide $P_0=D_1/(r-g)$ by next years earnings per share we have:

$$\frac{P_0}{E_1} = \frac{D_1 / E_1}{r-g} = \frac{1-b}{r-g}$$

For the simplicity reasons and the availability of data, I will use formula with rather simplified assumptions in order to get to the starting point. This rate of return will be revised anyway, using the circular references method. The rate will be changed until it equals with the rate of return estimated from the model. Therefore, for the no growth case, the empirical specification of the model is:

$$\frac{P_0}{X_1} = \frac{1}{r_m}$$

where
$P_o$ is the price at the end of the year
$X_1$ are one-year earnings for the next year (leading earnings)
$r_m$ is the historical rate of return

In this example companies with negative earnings for period 1996-2002 are deleted because negative base in this case is not meaningful. The P/E coefficient is not stochastic and it may be regarded as the mean of the firm specifics ratios. It follows that historical market return can be calculated as the mean for a portfolio of stocks.

**Table 6: Statistics for the historical market return**

| $P_0/E_1=1/r_m$ | | | | | | |
|---|---|---|---|---|---|---|
| N | | Mean | Median | Std. Dev. | Minimum | Maximum |
| Valid | Missing | 0,0952 | 0,0876 | 0,05800 | 0,0101 | 0,3800 |
| 58 | 45 | | | | | |

Source: Own calculations

From the table we can see that the mean of the historical market return is 0,0952. Therefore, as a starting point for calculating the aggregated four year earnings I will use 9,5 %. This figure will change during the iterations, until it equals with the final estimation of cost of equity.

## *4.6 Forecasting of earnings*

The model requires estimation of earnings for the future three-year period that brings empirical problem of forecasting earnings. Standard economic arguments imply that in a competitive environment, profitability is mean reverting. Competitive environment makes companies mimic innovations and the ones that have low profitability will leave that market and enter other, more profitable one. This leads to impression that earnings and profitability are to some extent predictable (Fama and French, 2000). These authors showed that there is predictable variation in earnings, which traces to the mean reversion of profitability. Security analysts should exploit this characteristic; especially concerning the negative changes in earnings and extreme changes, which showed faster reverting in reality than the model predicted it.

Researches into analysts forecast (Capstaff et al., 1995) showed that they are superior only in the short-term horizon and indicate that these forecasts are usually optimistic, overreacting to new information and ignoring the value incorporated into share prices. Study of Garrod and Rees (1999) examined the explanatory and predictive power of fundamentals (equity, net income, dividends and price) for future earnings. The results were that these elements contain value relevant information for forecasting future growth and that the model outperforms financial analysts. The question of using ex-post realization rather than analysts' forecast is an open one, with pros and cons on both sides (Garrod and Valentinčič, 2004). Using the ex-post realization has its arguments in theory of rational expectations. All available information is used to forecast the future. If they are optimally used, realized earning would over a sufficiently long period approximate expected ones. If the theory of rational expectation is true, then the changes over time will follow a random walk. If the ex-post realizations are correctly recorded (not biased), then they should not affect the accuracy of the model.

The model requires forecasted earnings for the period 2003-2005. I used the extrapolative model of forecasting in order to estimate the future earnings. Extrapolative model of forecasting uses the previous to forecast the future level of earnings. That is, the forecast of the next year's income $E\ (Yt + 1)$ is a function of the past history of earnings:

$$E\ (Y_{t+1}) = f(Y_t,\ Y_{t-1},.....Y_1)$$

In order to avoid the problem of negative earnings, I used the four-year average growth rate as a function of future yearnings. This rate is calculated as the difference between the average

subsequent four-year earnings and the previous subsequent average four-year earnings, divided by the average four-year earning of the previous period:

$$g = \frac{((E_t + E_{t-1} + E_{t-2} + E_{t-3})/4) - ((E_{t-1} + E_{t-2} + E_{t-3} - E_{t-4})/4)}{(E_{t-1} + E_{t-2} + E_{t-3} + E_{t-4})/4}$$

## *4.7 Results of the regression*

After adjusting the data and calculating all the necessary inputs I ran the regression. The results are presented in the following table (table 7).

**Table 7: Estimation of the regression coefficients**

| Model $X_{cT}/B_0=\gamma_0 + \gamma_1 P_{jo}/B_o$ | | | | |
|---|---|---|---|---|
| | Regression coefficients | | Sig. | $R^2$ |
| 1996 | Constant | 0,053 | 0,630 | 0,295 |
| | Slope coefficient | 0,613 | 0,006 | |
| 1997 | Constant | 0,081 | 0,322 | 0,435 |
| | Slope coefficient | 0,616 | 0,000 | |
| 1998 | Constant | 0,133 | 0,673 | 0,284 |
| | Slope coefficient | 0,989 | 0,000 | |
| 1999 | Constant | 0,038 | 0,599 | 0,131 |
| | Slope coefficient | 0,314 | 0,002 | |
| 2000 | Constant | 0,159 | 0,066 | 0,174 |
| | Slope coefficient | 0,657 | 0,000 | |
| 2001 | Constant | 0,110 | 0,109 | 0,278 |
| | Slope coefficient | 0,485 | 0,000 | |
| 2002 | Constant | 0,240 | 0,005 | 0,393 |
| | Slope coefficient | 0,514 | 0,000 | |

Source: Own calculation with the SPSS

The annual sample size ranges from 17 in 1996 (see table 5) to 99 in 2002 From the equation line we can conclude that the regression coefficient will be positive. The intercept and the slope coefficient are indeed positive for the whole period. Slope coefficients are significant at 0,05 level in every year, which is not the case for the intercept. The intercept ranges from low 0,0386

in 1999 to 0,24 in 2002. The estimate of the slope coefficient is the lowest in 1997 (0,314) and the highest in 1998 (0,989).

The highest adjusted $R^2$is for the year 2002, which tell us that with the model we can explain 39.3 % variability of the depended variable $Xct/B_0$. The adjusted $R^2$ for similar study done in the USA market ranges from 39 % to 59%.

From the estimates of the intercept and slope coefficients I derived growth rate in residual income and the cost of equity[12]: The results are given in table 8.

**Table 8: Calculation of the growth rate and the cost of equity**

| Year | $\gamma_0$ | $\gamma_1$ | G | **g(%)** | R | **r(%)** |
|---|---|---|---|---|---|---|
| 1996 | 0,053 | 0,613 | 1,053 | **1,299** | 1,666 | **13,610** |
| 1997 | 0,081 | 0,616 | 1,081 | **1,970** | 1,697 | **14,139** |
| 1998 | 0,133 | 0,989 | 1,133 | **3,173** | 2,123 | **20,705** |
| 1999 | 0,036 | 0,518 | 1,036 | **0,898** | 1,554 | **11,658** |
| 2000 | 0,159 | 0,657 | 1,159 | **3,758** | 1,816 | **16,085** |
| 2001 | 0,110 | 0,485 | 1,110 | **2,643** | 1,595 | **12,380** |
| 2002 | 0,240 | 0,540 | 1,240 | **5,525** | 1,780 | **15,506** |
| Average r=14.87 g=2.56 | | | | | | |

Source: Own calculation

The estimates of the growth rate and rate of return vary over the period. The highest rate of return is in the year 1998 (20,7 %) and it is significantly higher than in other periods. The overall growth rates are relatively small during the period, especially for the year 1999.

Using the rate of return, estimated from the model and risk free rate I calculated the equity premium for the Slovenian market (table 9). The problem with calculating equity premium is that there is no appropriate long-term security on the Slovenian capital market that could reflect the risk-free asset. This is why as a proxy for risk-free rate I used the interbank interest rates, collected from the Bank of Slovenia annual reports.

[12] G stand for the four year growth in residual income. It is calculated from the constant figure of the regression line: $\gamma_0$=G-1. From the G can be calculated the growth rate in residual earnings, since: $G=(1+g)^4$
R is the four year rate of return on equity investment and it is calculated from the slope coefficient of the regression line $\gamma_1$=R-G. Rate of return on equity capital is calculated from the R, since: $R=(1+r)^4$

**Table 9: The equity premuim**

| Year | N | r | Interbank interest rate[13] | **Equity premium (r-i.i.r.)** |
|---|---|---|---|---|
| 1996 | 17 | 13,61 | 14 | **-0.39** |
| 1997 | 36 | 14,14 | 9,7 | **4.44** |
| 1998 | 49 | 20,70 | 7,5 | **13.20** |
| 1999 | 74 | 11,66 | 6,9 | **4.76** |
| 2000 | 93 | 16,08 | 7 | **9.08** |
| 2001 | 98 | 12,38 | 6,9 | **5.48** |
| 2002 | 101 | 15,51 | 4,9 | **10.61** |

Source: Own calculation

The highest premium was in the period of 1998, which is logical considering the high level of the cost of capital in that period. Negative equity premium on the beginning of the period is not so much of a surprise. Considering the level of inflation and relatively high bank rates fixed by the Bank of Slovenia, this level of equity premium is quite reasonable. There is not obvious time-trend in the development of the equity premium, because of the relatively volatile rates of return on equity investments.

Table 10 gives an overview of the growth rates of total assets, fixed assets, book value and sales on one side (microeconomic factors) and the growth of GDP as macroeconomic factor. The purpose of this comparison is to see the compliance of estimated growth rates in residual earnings with the elements within the companies (growth of assets, sales and book values) as well as with the global macroeconomic factors such as GDP growth.

**Table 10: Comparison of the growth rates**

| *Year* | *g* | *Gearn* | *g-fixed asset* | *g-total assets* | *g-sales* | *g-book value* | *GDP growth*[14] |
|---|---|---|---|---|---|---|---|
| 1997 | 1,97 | 8,92 | 10,40 | 11,25 | 22,72 | 11,77 | 3,5 |
| 1998 | 3,17 | 14,86 | 16,66 | 13,15 | 8,51 | 15,65 | 4,6 |
| 1999 | 0,89 | 5,94 | 15,77 | 15,65 | 6,69 | 10,10 | 3,8 |
| 2000 | 3,76 | 8,09 | 14,81 | 14,05 | 34,53 | 11,27 | 5,2 |
| 2001 | 2,64 | 7,07 | 13,08 | 9,48 | 15,41 | 7,21 | 2,9 |
| 2002 | 5,52 | 10,20 | 10,27 | 6,67 | 6,22 | 2,44 | 2,9 |

Source: Own calculations with the SPSS

[13] Bank of Slovenia annual report (www.bsi.si)
[14] Statistical Office of the Republic of Slovenia (www.sigov.si)

The comparison included estimation of the *Gearn*, which is growth in earnings but calculated from the model, using the estimated growth in residual income. Although estimation of growth in residual income is far most important element in the implementation of the residual income model, more frequent use is the growth in earnings, especially in the business circles. Analysts rather provide growth in earnings than in residual earnings. *Gearn* is a function of g and r, the ones that have been estimated from the model. The formula of the Gearn[15] is derivated from the definition of the growth in residual income and its derivation is given in the appendix 10.
Growth in residual income is the highest in the year 2002. There is a number of reasons for this. One logical explanation would be increased investments in that period, which again increased the base of growth in residual income. As we can see from the table, growth in residual income is much lower compared to other growth rates, such as growth in earnings, total assets, fixed assets, sales and book value. Since growth rate in residual income takes into account cost of capital, it is logical that it is lower than mentioned growth rates. Trend of the growth is quite similar to the growth of the GDP. This is in line with the fundamental characteristic of the residual income and the fact that it represents economic rents. This table shows that the model follows the broader set of economic factors, as well as the firm-specific factors.

## *4.8 Analysis of the subsamples*

I considered two subsamples in order to demonstrate the effectiveness of the model. Criteria for the distinction of subsamples were whether the company pays out dividends or not. One criterion is if company has paid out dividends in that particular year; other was if company has paid out dividends at least ones during the period of 1996-20002. The results were quite similar between those two samples. The statistic tests for the subsamples are much better, which shows that model fits better for the companies that pay out dividends. The estimations of the coefficients of the regression line are given in table 11.

---

[15] $(1+\text{Gearn})^4=((1+g)^4+(1+r)^4-1)+((1+g)^4-1)(\text{FVED}/\sum_{t=1}^{4}E_0(X_t))-((1+r)^4-1)[4d_0/\sum_{t=1}^{4}E_0(X_t)]+$

$((1+r)^4-1)(1-(1+g)^4[B_0/\sum_{t=1}^{4}E_0(X_t)]$

**Table 11: Statistics for the first subsample**

| Model $X_{cT}/B_0=\gamma_0 + \gamma_1 P_{jo}/B_o$ | | | | |
|---|---|---|---|---|
| | Regression coefficients | | Sig. | $R^2$ |
| 1996 | Constant<br>Slope coefficient | 0,108<br>0,596 | 0,527<br>0,028 | 0,512 |
| 1997 | Constant<br>Slope coefficient | 0,149<br>0,419 | 0,165<br>0,004 | 0,373 |
| 1998 | Constant<br>Slope coefficient | 0,181<br>0,975 | 0,145<br>0,016 | 0,227 |
| 1999 | Constant<br>Slope coefficient | 0,361<br>0,228 | 0,000<br>0,008 | 0,188 |
| 2000 | Constant<br>Slope coefficient | 0,237<br>0,316 | 0,000<br>0,000 | 0,916 |
| 2001 | Constant<br>Slope coefficient | 0,303<br>0,123 | 0,000<br>0,000 | 0,833 |
| 2002 | Constant<br>Slope coefficient | 0,153<br>0,513 | 0,00<br>0,000 | 0,847 |

Source: Own calculation and presentation from the SPSS

The annual sample size ranges from 15 in 1996 to 55 in 2002. The intercept and the slope coefficient are positive for the whole period, which is in line with the assumptions of the model. For the period from 1999- 2002 intercept and the slope coefficients are statistically significant at the 0.05 level of significance. The intercept ranges from low 0,108 in 1996 to 0,361 in 1999. The estimate of the slope coefficient is the lowest in 2001 (0,123) and the highest in 1998 (0,975). The highest adjusted $R^2$ is for the year 2002 (0.847), which tells us that with the model we can explain 84.7 % variability of the depended variable $Xct/B_0$. Adjusted $R^2$ for the period from 1999-2002 are much higher than in the previous period, which is also the case with the statistical significance of the coefficients. The sample size of this period is also higher in last period compared to 1996, which might contribute to a higher $R^2$.

From the regression line I again calculated growth rate and cost of equity capital for the first subsample. Results are given in Table 12:

**Table 12: The rate of return and growth rates in residual income for the first sample**

| Year | $\gamma_0$ | $\gamma_1$ | G | **g(%)** | R | **r(%)** |
|---|---|---|---|---|---|---|
| 1996 | 0,108 | 0,596 | 1,108 | **2,597** | 1,704 | **14,253** |
| 1997 | 0,149 | 0,616 | 1,149 | **3,533** | 1,568 | **11,901** |
| 1998 | 0,181 | 0,975 | 1,181 | **4,246** | 2,156 | **21,174** |
| 1999 | 0,361 | 0,228 | 1,361 | **8,010** | 1,589 | **12,274** |
| 2000 | 0,237 | 0,316 | 1,237 | **5,461** | 1,553 | **11,633** |
| 2001 | 0,303 | 0,123 | 1,303 | **6,840** | 1,426 | **9,277** |
| 2002 | 0,153 | 0,513 | 1,153 | **3,623** | 1,666 | **13,610** |
| Average r=13,44 g=4,9 | | | | | | |

Cost of capital is a bit higher for the subsamples compared to the whole subsample. Again, it is the highest for the year 1998 when its value was 21,17. The lowest cost of capital was in the 1997 and it was 9.27.

Since there were not significant differences between the first and the second sample, I will give the short summary of results for the second sample in the table 13:

**Table 13: Statistics for the second subsample**

| Year | $\gamma_0$ | Sig. | $\gamma_1$ | Sig. | $R^2$ | **r** | **g** |
|---|---|---|---|---|---|---|---|
| 1996 | 0,130 | 0,316 | 0,556 | 0,018 | 0,359 | **13,951** | **3,101** |
| 1997 | 0,123 | 0,150 | 0,448 | 0,001 | 0,424 | **11,953** | **2,943** |
| 1998 | 0,214 | 0,041 | 0,856 | 0,023 | 0,136 | **19,952** | **4,974** |
| 1999 | 0,244 | 0,000 | 0,327 | 0,000 | 0,938 | **11,956** | **5,615** |
| 2000 | 0,237 | 0,000 | 0,316 | 0,000 | 0,914 | **11,632** | **5,466** |
| 2001 | 0,312 | 0,000 | 0,123 | 0,000 | 0,833 | **9,445** | **7,023** |
| 2002 | 0,171 | 0,000 | 0,211 | 0,000 | 0,848 | **8,421** | **4,021** |
| Average r=12.47 g=4.73 | | | | | | | |

As we can see from the table almost all intercepts and slope coefficients are statistically significant, except for the year 1996, which might be due to the small size of a sample[16]. Adjusted $R^2$ is relatively high for the last three years of the period, especially for the year 2000-0,916.If we compare only the period from 1999-2002, in which the coefficients of regression are

[16] It includes only 15 companies.

both statistically significant, we can see that the growth rates in residual income were a bit higher, while the cost of equity was relatively lower.

In Slovenia approximately one third of net income is paid out as dividend, whilst the rest are retained earnings (Valentinčič, 2002). If we compare it with the companies of the continental Europe, situation is quite similar. It is also the same considering the number of companies that pay out dividends (Table 14), which is not the case with the US capital market where the number of companies that pay out dividends is decreasing. However, reasons for paying out dividends, or to put differently: not paying them, are different for the Slovenian capital market. Positive theory about the dividend policy says that by paying out dividends management can influence future expectations about the profitability of that company. By paying out higher dividends management is trying to increase the estimation about the future profitability of the company. In Slovenia, companies that are paying out dividends are the one that have strong earning power and that can afford it. Therefore, reasons that other companies are not paying out dividends are not in raising capital for investing it, but simply bad performance. This can be seen trough profitability of the companies that are paying out dividends, compared to ones that are not (Table 14). These companies have higher profit rates. The higher the dividends, the higher are capital gains and overall rates of return.

**Table 14: Distribution of net income**

| | Official market | | | Free market | | |
|---|---|---|---|---|---|---|
| | Mill. SIT | As % | Nb.of comp. | Mill. SIT | As % | Nb.of comp. |
| Div (pref.) | 917 | 1.5 | 2 | 0 | 0 | 0 |
| Div (reg.) | 19.05 | 30.7 | 22 | 4.48 | 40.7 | 31 |
| Retained ear. | 34.04 | 54.9 | 30 | 5.29 | 48 | |
| EBT | 62.05 | 100 | | 11.01 | 100 | 72 |
| Div as % of NI | | 34.8 | | | 41.7 | |
| Div as % mar. cap. | | 2.3 | | | 2.3 | |

Source: mag. Aljoša Valentinčič: "Pri delitvi dobička vse manj nenavadni", Finance 47, 09.03.2004, pg.23

In the following table is presented the comparison of the successfulness of the companies that are paying out dividend and the ones that are not. The difference in the indicators of success between companies that pay out dividends and the ones that are not is more than significant.

**Table 15: Comparison of the successfulness of the companies**

| Dividends | Overall return (2003) | Overall return (2002) | ROE | ROA | Growth of revenues |
|---|---|---|---|---|---|
| No | 0 | 18.4 | 0.2 | 0.1 | 28.4 |
| Yes | 13.1 | 57.4 | 7.2 | 4.3 | 46.2 |

Source: mag. Aljoša Valentinčič: "Pri delitvi dobička vse manj nenavadni", Finance 47, 09.03.2004, pg.23

## *4.9 Analysis of results*

In order for analysis to be complete I have to see what is the story behind these figures or what was going on the Slovenian capital market during that period. The estimates by themselves were not saying much. But, when I connected them with the overall events that affected the capital market the picture was complete.

I started my analysis with the 1996, which is at the same time early phase of the development of the capital market in Slovenia. Stock exchange started to work in 1990, and yet first crash was in 1993. Soon after electronic system of trading was introduced, and trading with the dematerialized securities started. Finally, in 1996 stocks from the privatization entered the official market; first ones were the shares of Kolinska. At the end of the year, number of listed shares increased to 24, which gave weight to market capitalization but not to the liquidity of the market. Early phase of the development had all the necessary institutions that were needed for the healthy development. Stock exchange with its infrastructure enabled normal trading, there were enough or even too much of brokerage houses, auditioning houses, etc. However, in spite of the strong infrastructure capital market was not developing in a proper way, most of all because the process of privatization limited it. The main condition for further development of the capital market was the conclusion of the privatization process. Primary market did not enhance the process because it did not exist, except for the shares of banks. There were not any companies that were prepared to raise money by issuing shares on the primary market. Market capitalization that included debt and equity long-term securities was around 5 % of the GDP, which was too small compared to other transition countries. Since it was early phase of development it needed the support of the state, but at time the state have not yet decide what would be the role of the capital market in Slovenia. On the other side, companies were afraid to enter the securities market most of all because they did not have any confidence in the securities market. Managers were afraid that entering the securities market would decrease the prices of

their shares. Confidence in the securities market, as a major factor of development, was lower than it should have been. The estimated growth rate for this period was 1,29, while the suitable cost of equity was 13,61 %. This is relatively high number, but considering the volatile beginning phase it is appropriate. Equity premium in this period was negative, reflecting the high interest rates and volatile capital market.

Beginning of the 1997 was optimistic, most of all because of the entrance of the foreign capital into the Slovenian market. Soon afterwards, Bank of Slovenia introduced custodian accounts with intention of limiting foreign portfolio investments. Reaction to this event was strong: limited trading, non-liquidity of the market, sensitivity of prices of shares to daily information or rumors. At that point prices of shares decreased for 10 %. Even though Bank of Slovenia soon loosed up the limitations, foreign investors did not come back on the market in a great number. The growth rate was a bit higher for this period (1, 97), as well as the cost of equity 14,14%. These numbers reflected the entrance of new companies on the market that were distinguishing from the rest with their business performance.

The most important event that influenced the development of the capital market in 1998 was the decreasing of the passive interest rates. It influenced strongly the structure of savings. As far as banks were concerned, short-term savings were decreased in favor of long-term ones. Excess cash flows of the companies were reoriented towards the capitals market and the shares. Demand side of trading was very active, which affected the overall prices of shares. At the begging of the august of 1998, SBI[17] index reached 2.026 points, which was the highest value until then.

Russian financial crises did not affect the Slovenian market in a way it did other Middle Europe capital markets. Indirectly, it did affect the cash inflows of foreign portfolio investors. At the end of August prices of shares decreased on average by 20 %. However, decreasing of the prices stopped at that point. On the Slovenian capital market at that time there were not many foreign portfolio investors, due to the introduction of custodian accounts. This also helped to protect the market from the spreading effects of the financial crisis. Furthermore, at the end of the year prices of a share were still 20 % higher than at the beginning of the year.

Important effect on the overall market capitalization was the listing of the privatization funds (PID), which were listed at the free market. They increased the market capitalization, but the liquidity of the market still remained at the same level.

[17] SBI index is composed of 21 shares: Krka, Lek, Petrol, Merkator, Luka Koper, Merkur, Intereuropa, Istrabenz, SKB Banka, Radenska, BTC, Delo, Droga Portoroz, Kolinska, Aerodrom Ljubljana, Terme Čatež, Etola, Emona Obala Koper, Zdravilišča Moravske Toplice, Kovintehna in Comet Zreče

Formal conclusion of the process of the ownership transformation was conducted during the 1998. Of course, this did not mean that it is the final conclusion of the privatization process, but it surely had effect on the capital market. Relatively large number of acquisitions of the companies took place at that time, especially in the trading industry. However, because of the underdeveloped and unclear legal basis and decretory right of the state to issue authorization, a great number of them also failed. Important event that had effect on the capital market was the sale of the state ownership in Petrol and Istrabenz. The growth rate in residual income almost doubled in this period, while the cost of equity was surprisingly high (20,7 %). It seems that this period was the bull market and brought abnormal returns on equity investments because of the events named above.

The year of 1999 wasn't so optimistic as the previous one. This can be clearly seen trough the market capitalisation. In the January of 1999 it was 9.6 %[18] higher than in December of 1998. However, in March 1999 it was only 5.9 % higher than in December of 1998. Market capitalisation of the free market was higher, but it was mainly due to the activities of the privatisation funds. Growth rate of residual income decreased to low 0.89, as well as the cost of equity 11, 66.

Year 2000 was more optimistic for the equity investments. Rate of return increased to 16.08, as well as the growth rate 3.75. The capital market recognized good financial performance of listed companies.

Beginning of the 2001 didn't bring many changes concerning the capital market. At the end of the first quarter SBI index decreased by 4,3 %. As of 1.July limitation on the foreign portfolio investments were removed. This long expecting event introduced some optimism, but not too much of it. At the end of the year, foreign portfolio investments did not significantly increased. In the second half of the year some changes occurred considering the food industry. Merging and the consolidation of that industry were noticed, which affected the market by increasing the SBI index. State has finally declared the replacement of the privatization hole in the portfolios of the privatization funds, with the appropriate financial assets. Growth rate was somewhat lower than in the previous period, which is in the line with the sluggish activity on the market. The rate of return on equity investment decreased to 12.38 %.

During the 2002, prices of share were increasing, reflected trough the SBI 20 index. The market was too optimistic. These increasing of the prices were to some degree expected, since there

[18] Securities market agency, annual report 1999

were opinions that prices of shares were under priced compared to good business results that listed companies were achieving. Some might disagree, but we should note that prices during the takeovers for some companies were increased for more than 100% starting from the day of announcement (SKB, Bank of Koper, etc.). Regulations did not support the development of the market as much as they could: introducing too high taxes on the capital gains for physical persons limited their entrance on the capital market and limited the demand side. All of this influenced the liquidity on the market. The optimism reflected in the prices is justified, as the growth rate in residual earnings was the highest in that period 5.52. Rate of return on equity investment also increased to 15.5 compared to previous period.

Comparison of the sub sample gives some interesting results. The mean of the cost of equity for the whole sample is 14,87, while for the subsamples are 13,44 and 12,47 respectively. Mean growth rate for the whole sample is 2,67, but they are much higher for the companies that are paying out dividends (4,9 for the first sample and 4,73 for the second). This reflects the fact that these companies are growing faster, even after taking into account the cost of equity capital they used. This proves that only the stronger and healthier companies can pay out dividends. If they had retained those dividends in the companies and invested them, the growth in residual income as well as the rate of return on equity would be even higher. Even after paying out dividends they are growing faster than the ones that do not pay dividends. This might indicate that these companies have also higher growth in investment, as a base for generating the residual earnings. However, proving this relation would be out of the context of my master thesis. It is obvious that these companies are still in the position of collecting the economic rents, and future prospects of those companies are optimistic.

### 4.9.1 Analysis of the P/B ratio

I included the analysis f the P/B ratio in my master thesis, in order to confirm the findings that only the stronger companies can afford to pay out dividends. Decision on retaining the dividends in companies does not depend on investment opportunities, but it is rather a consequence of bad performance.

First some words about the usefulness of the P/B ratio. In contrast to P/E ration, the measure of the value in P/B ratio is a variable coming from the balance sheet. The ratio of the market price to book value per share has a long history of use in valuation practice. The measurement of the book value per share has an accounting origin, and represents the amount of values that common investors have invested in a company on a per share basis. Most usually we use the book value of

equity, which means that any value attributable to preferred stock is subtracted from the shareholders equity, and only then divided by the number of shares.

There are several reasons in favor of using the P/B ratio in valuation (Stowe et al., 2003):

- As we all know, book value is a cumulative balance sheet value and it is generally positive, even when earnings are negative. This is way, in the case of negative earnings P/B is a very useful measure compared to P/E ratio, which is not meaningful in that case.
- If we compare the stability of these two ratios, P/B is far more stable, which makes it more meaningful in the case of highly volatile earnings per share.
- Since it is a measure of net assets value, through its history of using it has been viewed as adequate measure for companies that are mostly composed of liquid assets. These are finance, investment, insurance companies. For this kind of companies' book value is the closest to their market value.
- This ratio, as a measure of value, has been very often used in the valuation of companies that are not expected o continue as going concern.
- According to the empirical research, differences in the P/B ratios may be related to the differences in the average long-term returns[19].

There are, of course, negative sides of using P/B ratio as measure of value (Stowe et al., 2003):

- For the companies that have some assets, that might not be recognized by accounting, such as human capital, using this measure would be a problem. These kinds of companies are service companies, where the skills and knowledge possessed by workers are important elements of business.
- Sometimes it can be a misleading factor when we use different business models, especially in the case when companies under examination use different levels of assets.

- Inflation might influence this ratio, since the book value reflects the historical cist of purchasing the assets. Inflation as well as technological changes can influence the level of differences between the book value and the market value. At the end, it is questionable if the book value really reflects the investments of the shareholders in the company. In these situations, comparison of the P/B ratios across companies is not very useful; especially if those companies use assets with a different age.

[19] Bodie Zvi, Kane Alex, Marcus J. Alan: Investments, fifth edition, McGraw-Hill Irwin, 2002

- In some countries the value of a brand name is recognized in the balance sheet, in some it is not. Accounting effects of these kinds of items on the book value of shareholders equity is therefore different. This means that it might not accurately reflect the real value, especially in the case of investments in R&D. If these costs are expensed they understate the shareholders investment in equity. In general, they have positive effect on the income only after some period of time; hence they create assets.

Market values of the shares at the Slovenian capital market are, however, smaller than the book value. For the whole observed period from 1996 to 2002, P/B ratio is below one (Table 16). This is not the usual characteristic of the more developed countries, where these ratios are above one (Valentinčič, 2002). Interpretation of this is that Slovenian shareholders for one tolar invested in the company expect less then one tolar of discounted cash flows. This is a sample of non-financial companies and the structure of their assets is supposed to be more towards tangibles assets. This will make the difference between book value and market value, since there is no secondary market for those assets which will reflect the fair value. This is especially the case if there is inflation, and when historical costs are definitely not reflecting the market value.

As for a lot of other countries, accounting standards in Slovenia are also not recognizing all the assets needed in order to get to the real value of assets. The problems are, of course, intangible assets. A company cannot recognize the brand name or human capital, while recognizing the cost of research and development are subjects of a very strict regulation. A company can recognize those costs only after ensuring that they will eventually generate assets. This is a very hard thing to prove. On the other hand, market has no problem of recognizing those costs and seeing the possibility of development of a specific company. In the Slovenian market, companies with the higher then on P/B ration are the ones in the pharmaceutical companies and breweries, where those kinds of costs play important role.

Reasons for this ratio to be below one might be in nominator or denominator. Problem might be in underestimation of the companies, through prices, or in the overestimation of the assets. There are arguments for both explanations. Prices might be too low for different reasons: uncompleted process of ownership transformation, market is not developed enough to fully reflect the available information, not enough support from monetary policy for investing in capital markets-too high interest rates, not enough demand, etc.

Book value of the assets might be overestimated. In the beginning of the process of privatization companies might have estimated the values of the assets at too high level, or the estimation might be right but the accounting changes have pushed those values up. Other explanation might be that the market just cannot recognize the intangibles of the companies, or there are not enough of those kinds of intangibles. We must mention that using the debt as a financing source pushes the value of the P/B value up. Considering the capital structure of Slovenian companies (mostly debt financing), this factor is already incorporated into the P/B ratios.

Table 16 gives results of the P/B ratio for the whole sample:

**Table 16: P/B ratios from 1996-2002**

| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|
| P/B | 0,469 | 0,551 | 0,633 | 0,574 | 0,473 | 0,501 | 0,634 |

Source: Own calculation with the SPSS

The result for the subample, which includes companies that paid out dividends, is quite different. They are higher and constantly growing during the whole period. They are presented in table 17.

**Table 17: P/B ratios from the 1996-2002 for the subsamples**

| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|
| P/B | 0,714 | 0,741 | 0,7803 | 0,865 | 0,957 | 1,227 | 1,145 |

Source: Own calculation from the SPSS

As we can see from the table, these ratios are above one for the subsample in the last two years of the observed period. This shows that this sample includes stronger companies, which proves the thesis that dividends are paid out by the companies with better performance. Other companies are not retaining them for reinvesting reasons, but simply cannot afford paying out dividends. As the capital market develops, it is expected that these ratios will be even higher.

## *4.10 Comparison of results*

The focus of my master thesis is simply estimating the market's expectation of the rate of return on portfolio of stocks, rather then comment on the rationality of the market. In order to have a complete impression of the effectiveness of the model I must compared it to similar studies that have been already done for other countries. However, this is a relatively new model and the only study that I can use for the comparison is the one that has been done by the authors of the model.

It would be more appropriate to compare with some European market, considering the level of development of Slovenian capital market. In the study of the authors they compared the results with the rate of return on DJIA, S&P 500 as well as with the results of similar studies. Their estimates of the implied equity premium are higher than in other studies based on the residual income models. All those models and the estimation of the rate of return are very sensitive to the assumption about the rate of growth in residual income beyond the forecasted horizon. They avoided this problem by simultaneously estimating the rate of return and the growth rate in residual income. Their estimation of the equity premium was average of 5.3 % during the period from 1981 to 1998, which is closer to the estimates based on the historical earnings data in Fama and French (2002), 4.5%.

Study includes sample data for the period from 1981 to 1998, which is not possible to include for the Slovenian market. This is why I used only three years for the comparison. The results are given in table 18:

**Table 18: Annual estimates of r and g – comparison**

| Year | r | g | $R^2$ | Gearn | r | g | $R^2$ | Gearn |
|---|---|---|---|---|---|---|---|---|
| 1996 | 12.4 | 9.2 | 0.44 | 11.9 | 13.6 | 1.3 | 0.29 | 7,9 |
| 1997 | 12.2 | 9.1 | 0.42 | 12.1 | 14.1 | 1.9 | 0.43 | 8.9 |
| 1998 | 13.0 | 10.3 | 0.39 | 12.6 | 20.7 | 3.2 | 0.28 | 14.8 |

Source: Easton Peter, Taylor Gary, Shroff Pervin: "Using forecasts of earnings to simultaneously estimate growth and rate of return on equity investment, Journal of accounting Research, 2001, pg.665

Main characteristic of the comparison is that figures of the growth rate and the cost of equity are relatively less volatile. The growth rates in residual income are significantly higher than for the Slovenian market. This shows that companies in the USA capital market have already achieved the appropriate growth level in residual income, which is rather stable. For the Slovenian level of development of the capital market, these figures are still small which is not so bad. This means that they still have room for further growth and reaching the appropriate level of development. In my opinion, growth in residual earnings will be much higher for the Slovenian market in the future period, until it reaches some acceptable level.

# *5. Conclusion*

One of the main question that was raised during the last 30 years was the usefulness of the accounting information in the decision making process of investors and creditors. Number of proves that there is sophisticated relation between accounting data and capital market is

increasing constantly. Accounting systems are crucial in valuating the companies on the capital market. They are in a way language of forecasting. On the other hand, in order to get to the most valuable information we must investigate the issues relating to the accuracy of accounting information, which is often broadly called as quality of earning analysis. It includes balance sheet management and earnings management.

Ever since corporate finance emerged as a field of study, the cost of capital has been its nucleus. It has been said that the construction of modern corporate finance lies on three concepts: modern portfolio theory, CAPM and option pricing theory. When the CAPM arrived at the scene it was warmly welcomed as a solution to the trade-off problem of risk and return. The expected return on the equity investment was estimated as the risk free rate of an interest plus premium, which varies with the beta. The question whether the market risk is the only thing that matters, emerged soon after that. Is the market beta the only important factor in assessing the risk or the firm specific risk also matters?

As the consequence of that, one can find a number of researches, which were trying to estimate the risk on the basis of other measures. They are mostly based on the residual income model and they were trying to improve upon the estimates of the rate of return obtained by traditional approaches. Empirical results of such studies showed greater accuracy than the traditional approaches.

In the work presented above I was testing the model of calculating the cost of equity and the growth rate in residual income, using the current stock prices, book values and four-year aggregate earnings. Intention of the model was to connect the accounting fundamentals with the capital market and to calculate the implied cost of equity. Implied cost of equity refers to the rate of return on equity investment perceived by the market. Nonetheless, the model that I used does not include only the market risk, but it also incorporates the company specific factors into the rate of return on equity investment.

The model simultaneously estimates the cost of equity and the growth rate in residual income, by inverting the residual income model. This procedure enables the estimation of cost of equity using accounting and market information. The model is based on two concepts:

- The fact that earnings can be aggregated over time
- By inverting the residual income model we can express the price as a function of current book value and four-year aggregate earnings

The fact that earnings can be aggregated over time is a fundamental attribute of accounting. Another fundamental attribute of accounting is a Law of Conservation of Income, which says that accounting will eventually record true value. Overstating the earnings in one period will be corrected by understating them in next. The purpose of aggregation is that earnings are more likely to reflect value relevant event in longer period. This is how the accounting lag is avoided, inflicted by the accounting rules. These kinds of earnings are likely to have fewer measurement errors. Aggregation of earnings is a major part of the model.

The regression line of the model is formulated in a way that depended variable is the ratio of four-year aggregate earnings and book value, while the independed variable is the P/B ratio. From the regression line I estimated the average cost of equity and the average growth rate in residual income.

From the statistical point of view, I can say that the model fits well at the Slovenian capital market Statistical tests for the estimation coefficients are rather good. This is especially the case for the last years of the observed period, partly due to the fact that the size of the sample increased and partly because the quality of accounting information increases as the capital market develops.

I demonstrated the statistical value of the model, but the question is what the real-life value of the model is? A careful analysis of the capital market and its development during that observed period makes the figures about the cost of capital and the growth rates reasonable. A proper development of the companies listed on the market will enhance a proper development of the capital market itself. At the beginning of the observed period growth rates figures were relatively small and volatile. Only at the end of the observed period, these figures reached the acceptable level, which is the proper base for further growth of the companies.

Early phase of the development of the Slovenian capital market imposed some important prerequisites to be fulfilled:

- Appropriate development of the ownership transformation in conjunction with mutually depended primary and secondary market
- Supportive monetary politics, which will also allow foreign capital investment
- Larger internationalization of the Slovenian capital market
- More stimulative fiscal politics in the field of securities market

Most of these factors fulfilled only at the end of the observed period, and this is during the 2002. The most triggered question is the development of the primary capital market, which did not improve during the observed period.

Analysis of the subsamples gives two important points concerning the dividends and P/B ratio. Dividend policy of individual company was the criteria for creation of subsamples (if a company pays out dividends or not). It can clearly be seen that the companies that pay out dividends have higher growth rates and rates of return on invested equity. Companies that are paying out dividends are the ones with the better performance and the ones that can afford it. It has nothing to do with their investment policy. The same story is behind the P/B ratios. Higher then one ratios have only companies that pay out dividends and these are companies with better performance. Otherwise, P/B ratios for the overall market is bellow one during the whole period.

If we compare the Slovenian companies with the USA market we can see that the growth rates in the residual income are much smaller. This is not the case with the cost of capital, for some years it is even higher. Interpretation of these figures is that at Slovenian capital market there is more room for the growth of abnormal earnings. Considering the level of the development of the Slovenian capital market these figures are reasonable

Final conclusion is that the model of simultaneously calculating the cost of capital and the rate of growth in residual income is useful for the Slovenian market. As the market develops more importance to the accounting information will be given, which will lead to improved quality of financial reporting. All of this will make the model more accurate and useful in predicting the rates of return on equity investment and growth in residual income.

## *6. Literature*


1. Ball, R., and P. Brown, "An Empirical Evaluation of Accounting Income Numbers", *Journal of Accounting Research*, (1968): 159-178.
2. Balsam S, Bartov E. and Marquardt C., "Accruals management, Investor Sophistication and Equity valuation, evidence from10-Q filings", *Journal of Accounting Research*, (Sep. 2002), Issue 4
3. Barth, M.; W. Beaver; and W. Landsman. "The Relevance of the Value Relevance Literature for Financial Accounting Standard Setting: Another View." *Journal of Accounting and Economics* 31(2001): 77-104.
4. Botosan C., "Disclosure level and the cost of equity capital", *Accounting Review* 72 (1997), pg. 323-350
5. Beaver, W., R. Clarke, and W. Wright, "The Association between Unsystematic Security Returns and the Magnitude of Earnings Forecast Errors", *Journal of Accounting Research*, (1979): 316-340.
6. Beaver, W., R. Lambert, and D. Morse, "The Information Content of Security Prices", *Journal of Accounting and Economics*, (1980): 3-28.
7. Bernard, V., "The Feltham-Ohlson Framework: Implications for Empiricists", *Contemporary Accounting Research*, (1995): 733-747.
8. Bodie Zvi, Kane Alex, Marcus J. Alan: Investments, fifth edition, McGraw-Hill Irwin, 2002
9. Botosan, C., "Disclosure Level and the Cost of Equity Capital", *The Accounting Review*, (1997): 323-349.
10. Bowman R., "The theoretical relationship between systematic risk and financial (accounting) varables", *Journal of Finance*, (1979), pp.617-630
11. Brigham F. Eugene, Daves R. Phillip, "Intermediate financial management", Seventh edition, South-Western Thomson Learning, 2002
12. Burgstahler, D. "Discussion of 'Combining Earnings and Book Value in Equity Valuation'." *Contemporary Accounting Research* 15 (1998): 325-41.
13. Burgstahler, D.; and I. Dichev. "Earnings, Adaptation, and Equity Value." *The Accounting Review* 73 (1997): 187-215.
14. Capstaff J., Paudyal K. and Rees W., "The accuracy and the rationality of earnings forecasts by UK analysts", *The Journal of Business Finance & Accounting*, Vol.22, pp. 67-85

15. Claus, J., and J. Thomas. “Equity Premium as Low as Three Percent? Evidence From Analysts’ Earnings Forecast for Domestic and International Stock Market.” *Journal of Finance* 56, 5 (October 2001): 1629-1666.
16. Clements A., The cost of capital-the practitioners view”, *The European Journal of Finance*, (1999), Issue 5
17. Chen K., “earning aggregation and valuation”, Working paper, Fisher College of Business, 2003
18. Collins, D.; and S.P. Kothari. “An Analysis of Inter-temporal and Cross-sectional determinants of Earnings Responsive Coefficients.” *Journal of Accounting and Economics* 11 (1989): 143-181.
19. Collins, D.; E. Maydew; and I. Weiss. “Changes in the Value-relevance of Earnings and Book Values over the Past Forty Years.” *Journal of Accounting and Economics* 24 (1997): 39-67.
20. Collins, D.; M. Pincus; and H. Xie. “Equity Valuation and Negative Earnings: The Role of Book Value of Equity.” *The Accounting Review* 74 (1999): 29-61.
21. Core, J.; W. Guy; and A. VanBuskirk. “Market Valuations in the New Economy: an Investigation of What Has Changed.” *Journal of Accounting and Economics* 34 (2003): 43-67.
22. Cornell B. and Landsman W. “Accounting valuation: Is earnings quality an issue?” *Financial analysts journal*, Vol.59, Issue 6
23. Dechow, P.; A. Hutton; and R. Sloan. “An empirical assessment of the residual income valuation model.” *Journal of Accounting and Economics* 26 (1999): 1-34.
24. Dechow, P., “Accounting Earnings and Cash Flows as Measures of Firm Performance: The Role of Accounting Accruals”, *Journal of Accounting and Economics*, (1994): 3-42
25. Easton Harris, Ohlson J.” Aggregate accounting earnings can explain most of the security returns: the case of long return intervals”, *Journal of accounting and economics*, 15(2/3), pg. 119-42
26. Easton Peter, Taylor Gary, Shroff Pervin: “Using forecasts of earnings to simultaneously estimate growth and rate of return on equity investment”, *Journal of accounting Research*, (2001), pp. 645-675
27. Easton Peter, Taylor Gary, Shroff Pervin: “Permanent and Transitory Earnings, Accounting Recording Lag and the Earnings response coefficients”, *Review of Accounting Studies;* Dec 2000; 5, 4; ABI/INFORM Global pg. 281
28. Easton, P., P. Shroff, and G. Taylor. “Cost of Capital Implications of Fading Firm-specific ROE to the Industry Median.” Working paper ,(2001), the Ohio State University,
29. Easton, P., and T. Harris, “Earnings as an Explanatory Variable for Returns”, *Journal of Accounting Research*, (1991): 19-36.

30. Edwards E. and Bell P. ""The theory and measurement of business income", University of California Press, 1961
31. Ely, K.; and G. Waymire. "Accounting Standard-setting Organizations and Earnings Relevance: Longitudinal Evidence from NYSE Common Stocks, 1927-1993." *Journal of Accounting Research* 37(1999): 293-318.
32. Fama E., and K. French. "The Equity Premium." *Journal of Finance,* (2001): forthcoming.
33. Fama E., and K. French. " The Corporate Cost of Capital and the Return on Corporate investment", *Journal of Finance, Vol. Liv. No.6, December 1999*
34. Fama E., and K. French: "The CAPM is wanted dead or alive", *Journal of Finance, Vol. Liv. No.5 December 1996*
35. Fama, E., and K. French. "The Cross-Section of Expected Returns." *Journal of Finance* 47,2(June 1992):427-465.
36. Fama, E., and K. French. "Industry Costs of Equity." *Journal of Financial Economics* 43,2 (February 1997):153-193.
37. Feltham, G.; and J. Ohlson. "Valuation and Clean Surplus Accounting for Operating and Financial Activities." *Contemporary Accounting Research* 11 (1995): 689-731.
38. Francis, J.; and K. Schipper. "Have Financial Statements Lost Their Relevance?" *Journal of Accounting Research* 37(1999): 319-352.
39. Frankel, R., and C. Lee, "Accounting Valuation, Market Expectation, and Cross-sectional Stock Returns", *Journal of Accounting and Economics*, (1999): 283-319.
40. Freeman M.C., I.R. Davidson, **"**Estimating the equity premium", *The European Journal of Finance* 5, (1999), pg. 236-246
41. Garrod N. and Rees W. "Forecasting earnings growth using fundamentals", Working paper 99/6, (1996), Department of accounting and finance, University of Glasgow
42. Garrod, N. and Rees W.; "International Diversification and Firm Value", *Journal of Business Finance and Accounting,* Vol.25, Nos. 9& 10, (1998) pp.1255-1281.
43. Garrod N. and Valentinčič A., "The term structure of implicit discount rates in security valuation ", Working paper, (2004)
44. Gebhardt. W., C. Lee, and B. Swaminathan. "Towards an Ex Ante Cost-of-Capital." *Journal of Accounting Research* 39,1 (June 2001): 135-176.
45. Holthausen, R., and R. Watts, 2001. "The Relevance of the Value-relevance Literature for Financial Accounting Standard Setting." *Journal of Accounting and Economics* 31 (2001): 3-75.
46. Jagannathan Ravi, McGrattan Ellen: The CAPM debate, Federal Reserve Bank of Minneapolis. Quarterly Review - Federal Reserve Bank (1995); 19, 4; ABI/INFORM Global pg. 2

47. Kothari, S.P. "Capital Markets Research in Accounting." *Journal of Accounting and Economics* 31 (2001): 105-231.
48. Kothari S.P., Lewellen Jonathan, Warner Jarold "Stock returns, aggregate earnings surprises and behavioral finance", Sloan school of management, February 2002
49. Landsman W., " An empirical investigation on pension funds property rights", *The Accounting review*, (1986), pg. 662-691
50. Lee, C., J. Myers, and B. Swaminathan. "What is the Intrinsic Value of the Dow?" *Journal of Finance*, 54,5 (October 1999): 1693-1742
51. Lee, C., "Accounting-Based Valuation: Impact on Business Practices and Research", *Accounting Horizons*, (1999): 413-425.
52. Liu, J., and J. Thomas, "Stock Returns and Accounting Earnings", *Journal of Accounting Research*, (2000): 71-101.
53. Lev, B.; and P. Zarowin. "The Boundaries of Financial Reporting and How to Extend Them." *Journal of Accounting Research* 37 (1999): 353-385.
54. Mehra, R. and Prescott, E.C. (1985) "The equity premium: a puzzle", *Journal of Monetary Economics*, **15**, 145–61.
55. Mehra, R. and Prescott, E.C. "The equity premium: a solution?" *Journal of Monetary Economics*, (1988) **22**, 133–36.
56. Miller, M., and F. Modigliani. "Dividend Policy, Growth and the Valuation of Shares." *Journal of Business* 34 (October 1961): 411-433.
57. Mramor Dušan (editor): "Trg kapitala v Sloveniji"-prikazi, analize, mnenja; Gospodarski vestnik, Ljubljana 2000
58. Myers, J. "Implementing Residual Income Valuation with Linear Information Dynamics." *The Accounting Review* 74 (1999): 1-28
59. Ohlson J., "A synthesis of security valuation theory and the role of dividends, cash flows and earnings", *Contemporary Accounting Research*, (1990) Vol. 6, pg.648-76
60. Ohlson J.,"The theory of the value and earnings and an introduction to the Ball-Brown analysis", Contemporary Accounting Research, (1992), Vol.8, pg.1-19
61. Ohlson, J. "Earnings, Book Value, and Dividends in Equity Valuation." *Contemporary Accounting Research* 11 (1995): 661-687.
62. Ohlson, J. "On transitory earnings", Review of Accounting Studies, Dec 1999; 4, 3-4; ABI/INFORM Global pg. 145
63. Ohlson, J., and S. Penman, "Disaggregated Accounting Data as Explanatory Variables forReturns", *Journal of Accounting, Auditing & Finance*, (1992): 553-573.
64. O'Hanlon J., "The time series properties of the components of clean surplus earnings: UK evidence*", Journal of Business, Finance and Accounting*, (1996), Vol. 23, pp 159-83

65. Ryan S. and Zarowin P., “Why has the contemporaneous linear return-earnings relation declined”, *The Accounting Review*, (2003), Vol. 73, pg. 529-553
66. Rees, W., 1997; The Impact of Dividends, Debt and Investment on Valuation Models; *Journal of Business Finance and Accounting,* Vol.24, Nos. 7&8, pp.1111-1139.
67. Penman, S. “Combining Earnings and Book Value in Equity Valuation.” *Contemporary Accounting Research* 15 (1998): 291-324.
68. Penman, S., and T. Sougiannis, “A Comparison of Dividend, Cash Flow, and EarningsApproaches to Equity Valuation”, *Contemporary Accounting Research*, (1998): 343-383.
69. Penman, Stephen H., “Return to fundamentals”, *Journal of Accounting, Auditing, and Finance,(1991)*l, 465-484.
70. Roth E., Kokoszka R., “Recognizing the signs”, *International Auditor*, (April 2003), Vol. 60, Issue 2
71. Shroff Pervin, “Determinants of Return-earnings Correlation”, *Contemporary Accounting Research,(* Fall 1995)12, 1; ABI/INFORM Global pg. 41
72. Shroff Pervin, “The relation between aggregate earnings and Security Returns over long windows”, Working paper (1995), The Ohio State University
73. Sloan R., “Do stock prices fully reflect information in accruals and cash flows about future earnings?”, *The Accounting Review 71*,(1997),pg. 289-315
74. Stewart G., “The Quest for Value”, Harper business 1991.
75. Stowe J., Robinson T., Pinto J. and McLeavey D., “Analysis of equity investments: valuation” United Book Press, INC. Baltimore, August 2002
76. Veselinovič et al.: “Borzni priročnik, Gospodarski vestnik, Ljubljana 1995, pg. 13-21
77. White I. Gerald, Sondhi C. Ashwinpaul, Fried Dov., “The analysis and the use of financial statements”, Second edition, New York: John Wiley & Sons, 1997.
78. Zhang, G. “Conservative Accounting and Equity Valuation." *Journal of Accounting and Economics* 29,2 (February 2000): 125-149.
79. Zhang, G. “Accounting Information, Capital Investment Decisions, and Equity Valuation: Theory and Empirical Implications.” *Journal of Accounting Research* 38 (2000): 271-295.

## *7. Sources*


1. Database FIPO, Ljubljana: Agency for payment of the Republic of Slovenia and GV Gospodarski vestnik, 2002

2. Annual report of the Bank of Slovenia, 1996-2002 (URL www.bsi.si/html/eng/publications/annual_reports/index.html)

3. Financial data and financial ratios of the companies 4. Ljubljana, Nova Ljubljanska banka, 1996-2002,pg. 68

4. Archive of the daily price list on the stock exchange (URL *http://www.ljse.si/StrAng/Trading/Menu/tr_los.htm)*

5. List of securities, LJSE, (URL *http://www.ljse.si/StrAng/Trading/Menu/tr_los.htm)*

6. Securities market agency. Annual report 2002, www.a-tvp.si/porocilo_2002/2delang.pdf

7. Ministry of Finance: Pre-accession economic program 2002. (URL http://www.sigov.si/mf/angl/tekgib/apep.pdf) , September 2001

8. Statistical Office of the Republic of Slovenia (URL www.sigov.si)

# *8. Appendix*

### 1. Calculation of aggregate four-year earnings:

```
COMPUTE Xct02 = Xt02+(((1+0.095) ** 3-1)*div_02+((1+0.095) ** 2-
1)*div_02+(1.095-1) *div_02) .
EXECUTE .
COMPUTE Xct01 = Xt01+(((1+0.095) ** 3-1)*div_01+((1+0.095* 2-1)*div_01+(1.095
*div_01) .
EXECUTE .
COMPUTE Xct00 = Xt00+(((1+0.095* 3-1)*div_00+((1+0.095* 2-1)*div_00+(1.095
*div_00) .
EXECUTE .
COMPUTE Xct99 = Xt99+(((1+0.095* 3-1)*div_99+((1+0.095* 2-1)*div_00+(1.095
*div_01) .
EXECUTE .
COMPUTE Xct98 = Xt98+(((1+0.095* 3-1)*div_98+((1+0.095* 2-1)*div_99+(1.095
*div_00) .
EXECUTE .
COMPUTE Xct97 = Xt97+(((1+0.95** 3-1)*div_97+((1+0.095* 2-1)*div_98+(1.095
*div_99) .
EXECUTE .
COMPUTE Xct96 = Xt96+(((1+0.095* 3-1)*div_96+((1+0.095* 2-1)*div_97+(1.095
*div_98) .
EXECUTE .
```

### 2. Regression results for the whole sample

- **Year 2002**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB02 | ,0866 | ,50416 | 93 |
| PB02 | ,6345 | ,43877 | 93 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,447[a] | ,324 | ,393 | ,45339 | ,200 | 22,758 | 1 | 91 | ,000 |

a. Predictors: (Constant), PB02

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,240 | ,083 | | -2,887 | ,005 | ,075 | ,404 |
| | PB02 | ,514 | ,108 | ,447 | 4,771 | ,000 | ,300 | ,728 |

a. Dependent Variable: XB02

- **Year 2001**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB01 | ,1334 | ,43021 | 90 |
| PB01 | ,5013 | ,38394 | 90 |

**Variables Entered/Removed[b]**

| Model | Variables Entered | Variables Removed | Method |
|---|---|---|---|
| 1 | PB01[a] | , | Enter |

a. All requested variables entered.

b. Dependent Variable: XB01

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,433[a] | ,356 | ,278 | ,38999 | ,187 | 20,301 | 1 | 88 | ,000 |

a. Predictors: (Constant), PB01

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,110 | ,068 | | -1,618 | ,109 | ,025 | ,245 |
| | PB01 | ,485 | ,108 | ,433 | 4,506 | ,000 | ,271 | ,699 |

a. Dependent Variable: XB01

- **Year 2000**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB00 | ,1526 | ,46208 | 85 |
| PB00 | ,4733 | ,30160 | 85 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,429[a] | ,184 | ,174 | ,41988 | ,184 | 18,733 | 1 | 83 | ,000 |

a. Predictors: (Constant), PB00

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,159 | ,085 | | -1,863 | ,066 | ,011 | ,328 |
| | PB00 | ,657 | ,152 | ,429 | 4,328 | ,000 | ,355 | ,960 |

a. Dependent Variable: XB00

- **Year 1999**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB99 | ,2187 | ,42867 | 67 |
| PB99 | ,5744 | ,51901 | 67 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,380[a] | ,144 | ,131 | ,39961 | ,144 | 10,947 | 1 | 65 | ,002 |

a. Predictors: (Constant), PB99

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | 3,862E-02 | ,073 | | ,528 | ,599 | -,107 | ,185 |
| | PB99 | ,314 | ,095 | ,380 | 3,309 | ,002 | ,124 | ,503 |

a. Dependent Variable: XB99

- **Year 1998**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB98 | ,2916 | ,32760 | 46 |
| PB98 | ,6337 | ,34690 | 46 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,548[a] | ,300 | ,284 | ,27711 | ,300 | 18,892 | 1 | 44 | ,000 |

a. Predictors: (Constant), PB98

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,133 | ,086 | | -,424 | ,673 | ,131 | ,209 |
| | PB98 | ,989 | ,119 | ,548 | 4,347 | ,000 | ,278 | 1,013 |

a. Dependent Variable: XB98

- **Year 1997**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB97 | ,2587 | ,34016 | 33 |
| PB97 | ,5514 | ,37120 | 33 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,673[a] | ,453 | ,435 | ,25572 | ,453 | 25,625 | 1 | 31 | ,000 |

a. Predictors: (Constant), PB97

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | 8,116E-02 | ,081 | | -1,007 | ,322 | -,245 | ,083 |
| | PB97 | ,616 | ,122 | ,673 | 5,062 | ,000 | ,368 | ,865 |

a. Dependent Variable: XB97

- **Year 1996**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB96 | ,3416 | ,32522 | 16 |
| PB96 | ,4699 | ,34900 | 16 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,658[a] | ,433 | ,295 | ,25341 | ,433 | 10,706 | 1 | 14 | ,006 |

a. Predictors: (Constant), PB96

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | 5,338E-02 | ,109 | | ,492 | ,630 | -,179 | ,286 |
| | PB96 | ,613 | ,187 | ,658 | 3,272 | ,006 | ,211 | 1,016 |

a. Dependent Variable: XB96

## 3. Regression results for the first sub sample

- **Year 1996**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB96 | ,5335 | ,25391 | 8 |
| PB96 | ,7145 | ,32490 | 8 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,763[a] | ,582 | ,512 | ,17740 | ,582 | 8,339 | 1 | 6 | ,028 |

a. Predictors: (Constant), PB96

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,108 | ,160 | | ,672 | ,527 | -,284 | ,500 |
| | PB96 | ,596 | ,206 | ,763 | 2,888 | ,028 | ,091 | 1,101 |

a. Dependent Variable: XB96

- **Year 1997**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB97 | ,4627 | ,22238 | 18 |
| PB97 | ,7471 | ,33959 | 18 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,640[a] | ,410 | ,373 | ,17608 | ,410 | 11,116 | 1 | 16 | ,004 |

a. Predictors: (Constant), PB97

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,149 | ,103 | | 1,455 | ,165 | -,068 | ,367 |
| | PB97 | ,419 | ,126 | ,640 | 3,334 | ,004 | ,153 | ,686 |

a. Dependent Variable: XB97

- **Year 1998**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB98 | ,4742 | ,23218 | 25 |
| PB98 | ,7803 | ,29491 | 25 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,477[a] | ,227 | ,194 | ,20849 | ,227 | 6,763 | 1 | 23 | ,016 |

a. Predictors: (Constant), PB98

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,181 | ,120 | | 1,510 | ,145 | -,067 | ,430 |
| | PB98 | ,975 | ,144 | ,477 | 2,601 | ,016 | ,077 | ,989 |

a. Dependent Variable: XB98

- **Year 1999**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB99 | ,5580 | ,38371 | 32 |
| PB99 | ,8655 | ,77963 | 32 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,462[a] | ,214 | ,188 | ,34585 | ,214 | 8,158 | 1 | 30 | ,008 |

a. Predictors: (Constant), PB99

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,361 | ,092 | | 3,917 | ,000 | ,173 | ,549 |
| | PB99 | ,228 | ,080 | ,462 | 2,856 | ,008 | ,065 | ,390 |

a. Dependent Variable: XB99

- **Year 2000**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB00 | ,5399 | ,77326 | 48 |
| PB00 | ,9570 | 2,33975 | 48 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,957[a] | ,916 | ,914 | ,22683 | ,916 | 500,213 | 1 | 46 | ,000 |

a. Predictors: (Constant), PB00

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,237 | ,035 | | 6,697 | ,000 | ,166 | ,309 |
| | PB00 | ,316 | ,014 | ,957 | 22,365 | ,000 | ,288 | ,345 |

a. Dependent Variable: XB00

- **Year 2001**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB01 | ,4540 | ,58349 | 51 |
| PB01 | 1,2275 | 4,31931 | 51 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,913[a] | ,833 | ,830 | ,24087 | ,833 | 244,411 | 1 | 49 | ,000 |

a. Predictors: (Constant), PB01

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,303 | ,035 | | 8,625 | ,000 | ,232 | ,373 |
| | PB01 | ,123 | ,008 | ,913 | 15,634 | ,000 | ,107 | ,139 |

a. Dependent Variable: XB01

- **Year 2002**

**Descriptive Statistics**

| | Mean | Std. Deviation | N |
|---|---|---|---|
| XB02 | ,3974 | ,55890 | 53 |
| PB02 | 1,1453 | 2,41337 | 53 |

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | ,922[a] | ,850 | ,847 | ,21884 | ,850 | 288,159 | 1 | 51 | ,000 |

a. Predictors: (Constant), PB02

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95% Confidence Interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 | (Constant) | ,153 | ,033 | | 4,587 | ,000 | ,086 | ,220 |
| | PB02 | ,513 | ,013 | ,922 | 16,975 | ,000 | ,188 | ,239 |

a. Dependent Variable: XB02

## 5. Growth of fixed assets

**Statistics**

| | | F_97 | F_98 | F_99 | F_00 | F_02 | F_01 |
|---|---|---|---|---|---|---|---|
| N | Valid | 101 | 102 | 102 | 102 | 102 | 102 |
| | Missing | 2 | 1 | 1 | 1 | 1 | 1 |
| Mean | | ,1040 | ,1666 | ,1577 | ,1481 | ,1308 | ,1027 |
| Median | | ,0947 | ,0919 | ,0851 | ,1160 | ,1224 | ,0708 |
| Mode | | -,39[a] | -,08[a] | -,12[a] | -,10[a] | -,52[a] | -,24[a] |

a. Multiple modes exist. The smallest value is shown

Where F_97-F_02 stands for growth of fixed assets for the period from 1997-2002.

## 6. Growth of total assets

**Statistics**

| | | T_97 | T_98 | T_99 | T_00 | T_01 | T_02 |
|---|---|---|---|---|---|---|---|
| N | Valid | 101 | 102 | 102 | 102 | 102 | 102 |
| | Missing | 2 | 1 | 1 | 1 | 1 | 1 |
| Mean | | ,1125 | ,1315 | ,1565 | ,1405 | ,0948 | ,0667 |
| Median | | ,0991 | ,0947 | ,1299 | ,1230 | ,0836 | ,0490 |
| Mode | | -,41[a] | -,12[a] | -,30[a] | -,22[a] | -,32[a] | -,34[a] |

a. Multiple modes exist. The smallest value is shown

Where T_97-T_02 stands for growth of total assets for the period from 1997-2002

## 7. Growth of book value

**Statistics**

| | | B_97 | B_98 | B_99 | B_00 | B_01 | B_02 |
|---|---|---|---|---|---|---|---|
| N | Valid | 101 | 102 | 102 | 102 | 102 | 102 |
| | Missing | 2 | 1 | 1 | 1 | 1 | 1 |
| Mean | | ,1177 | ,1565 | ,1010 | ,1127 | ,0721 | ,0244 |
| Median | | ,1132 | ,0932 | ,1054 | ,1112 | ,0847 | ,0309 |
| Mode | | -,59[a] | -,13[a] | -,17[a] | -,55[a] | -,21[a] | -,49[a] |

a. Multiple modes exist. The smallest value is shown

Where B_97-B_02 stands for growth in book value for the period from 1997-2002

## 8. Growth of sales

**Statistics**

| | | SG_97 | SG_98 | SG_99 | SG_00 | SG_01 | SG_02 |
|---|---|---|---|---|---|---|---|
| N | Valid | 100 | 102 | 101 | 102 | 102 | 102 |
| | Missing | 3 | 1 | 2 | 1 | 1 | 1 |
| Mean | | 2,2736 | ,0851 | ,0669 | ,3453 | ,1541 | ,0622 |
| Median | | ,1220 | ,0548 | ,0427 | ,1357 | ,1142 | ,0667 |
| Mode | | -,25[a] | -1,00[a] | -,95[a] | -,63[a] | -,44[a] | -,97[a] |

a. Multiple modes exist. The smallest value is shown

Where SG_96-SG_02 stands for sales growth for the period from 1997-2002

## 9. Statistic for the historical market return

**Statistics**

R

| | | |
|---|---|---|
| N | Valid | 58 |
| | Missing | 45 |
| Mean | | ,0952 |
| Median | | ,0876 |
| Std. Deviation | | ,05881 |
| Minimum | | ,01 |
| Maximum | | ,38 |

**10. Derivation of the Gearn**

The derivation of the growth of earnings (Gearn) starts form the formula of the growth in residual earnings, and the goal is to express it as a function of the growth rate and the growth in residual income. We define g as equation (4)] as a perpetuity and we define g as the (unknown) annual growth rate such that:

$$P_0 = B_0 + \{X_{cT} - (R-1)B_0\}/\{R-G\}$$

where G = (1+g)4 is one plus the expected rate of growth in four-year residual income. The four-year growth rate of $(1+g)^4-1$ is the rate such that the present value of the growing perpetuity (Beginning with the four-year expected residual earnings explains the difference between price and current book value. In other words, g is the unique growth rate, which, if known, would permit the estimation of the internal rate of return implied by the current price, book value, and the four years of earnings forecasts.

$$(1+g)^4 = (\sum_{t=5}^{8} E[Xt] + \sum_{t=5}^{7}((1+r)^{8-1}-1)E_0[d_t] - ((1+r)^4-1)E_0[B_4])/(\sum_{t=1}^{4} E_0[Xt] + \sum_{t=1}^{3}((1+r)^{4-t}-1)E_0[d_t] - ((1+r)^4-1)B_0)$$

If we assume that $E_0(d_t)=d_0$[20], for all t, then the equation becomes:

$$\left\{\sum_{t=1}^{4} E_0[X_t] + FVED - ((1+r)^4-1)E_0[B_4]\right\}/\left\{\sum_{t=1}^{4} E_0[X_t] + FVED - ((1+r)^4-1)[B_0]\right\}$$

where

$$FVED = \sum_{t=1}^{3}((1+r)^{4-t}-1)E_0[d_t] = ((1+r)^3 + (1+r)^2 + r - 2)[d_0]$$

[20] An assumption about expected dividends is a necessary part of the derivation of a formula for growth in earnings. Note that the purpose of this Appendix is to show how growth in earnings is related to growth in residual income and to provide a formula for estimating a growth variable with which academics and investors are more familiar.

since:

$$E_0[B_4] - B_0 = \sum_{t=1}^{4} E[X_t] - \sum_{t=1}^{4} E_0[d_t] \; (clean\, surplus)$$

if we define Gearn as average annual growth in earnings from the fist four year period to the second, we have:

$$(1+Gearn)^4 \sum_{t=1}^{4} E_0\left[ X_t + FVED - ((1+r)^4 - 1)\left\{ \sum_{t=1}^{4} E_0[X_t] - \left\{ \sum_{t=1}^{4} E_0[d_t] \right\} + B_0 \right\} \right] /$$

$$\sum_{t=1}^{4} E_0[X_t] + FVED - ((1+r)^4 - 1)[B_0] = (1+g)^4$$

And finally we get the formula for the growth in earnings using the cost of capital and the growth in residual earnings:

$$(1+Gearn)^4 = ((1+g)^4 + (1+r)^4 - 1) + ((1+g)^4 - 1)\left\{ FVED / \sum_{t=1}^{4} E_0[X_t] \right\} - ((1+r)^4 - 1)\left\{ 4d_0 / \sum_{t=1}^{4} E_0[X_t] \right\}$$

$$+ ((1+r)^4 - 1)(1-(1+g)^4)\left\{ B_0 / \sum_{t=1}^{4} E_0[X_t] \right\}$$

### 10.1 Frequency table of the Gearn

**Statistics**

| | | G97 | G96 | G98 | G99 | G01 | G00 | G02 |
|---|---|---|---|---|---|---|---|---|
| N | Valid | 38 | 36 | 34 | 38 | 38 | 37 | 32 |
| | Missing | 37 | 39 | 41 | 37 | 37 | 38 | 43 |
| Mean | | ,0892 | ,0798 | ,1486 | ,0594 | ,0809 | ,0707 | ,1020 |

Where G96-02 stands for Gearn, growth in earnings for the period from 1996-2002

## 11. Summary of studies on return-earnings correlation

| Author | Problem | Features | Summary |
|---|---|---|---|
| Easton *et al*. (1992) | Accounting recognition lag | Measurement windows are extended | When both returns and earnings measurement windows are extended from 1 year to 2 years, 5 years, and 10 years,the *R*2 increases accordingly from 6% to 15%, 33%,63%. |
| Warfield and Wild (1992) | Accounting recognition lag | Future earning and past returns included | When the immediate next period's earnings are included in addition to current period's earnings to explain current period's returns, the *R*2 increases by 223, 81, 190, and 38 percent for quarterly, semi-annual, annual, and biannual reporting periods, respectively. Similar results are obtained when current and prior periods' returns are regressed on current earnings. |
| Hayan | Transitory earnings | Loses | The *R*2 of a return-earnings regression is 9.3% for the full sample. The *R*2 increases to 16.9% when only profit cases are considered, and drops to almost 0% when only loss cases are considered |
| Amir and Lev (1996) | Transitory earnings | Intangibles | When wireless communications (mobile) firms are used as the sample, the *R*2 of the return model is close to 0%.These firms are characterized by heavy investment in intangibles, such as R&D and franchise development. |
| Eliott and Hanna (1996) | Transitory earning | One-time items | The market-adjusted excess returns are regressed on unexpected earnings before special items (a permanent component) and special items (a transitory component). The coefficient on special items is small and statistically insignificant. |
| Basu (1997) | Accounting recognition lag & transitory earnings | Conservatism | A reverse regression of earnings on returns is run. The *R*2 is 7.99% for the full sample, 2.09% for 'good news' positive returns) sample, and 6.64% for 'bad news' (negative returns) sample. |
| Liu and Thomas (2000) | Accounting recognition lag | Analysts forecast of earnings | Unexpected returns are regressed on unexpected earnings. When revisions of future earnings forecasts are included, the *R*2 increases from 5.26% to 30.67%. |
| Ota (2001) | Accounting recognition lag | Management forecast of earning | When management forecasts of next period's earnings are included in the return model, the *R*2 increases from 5.9% to 14.9%. |

Source: Ota (2001)