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ACCOUNTING EARNINGS PROPERTIES AND DETERMINANTS OF EARNINGS RESPONSE COEFFICIENT IN BRAZIL

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ABSTRACT

A fundamental issue at the interface of economics, finance, and accounting involves the relation between a firm's reported earnings and its stock returns. The lack of research in this field using Brazilian data and the limitations of previous research in terms of time-series data (small length available) motivates the present research. In addition, the practical justification of this research is that time-series properties of accounting earnings and the determinants of Earnings Response Coefficient (ERC) have a direct application in earnings forecasting and the valuation process. Based on this, the general objectives of this dissertation are to analyse the earnings time-series properties and to find the economic determinants of ERC in Brazil. Consequently, this dissertation is divided into three main sections/studies: (1) An analysis of the time-series properties of accounting earnings and the long-term relationship among price, return and earnings; (2) An analysis of the relevance and significance of ERC for individual companies and pooled data; and, (3) Elucidation of the economic determinants of ERC in Brazil. In order to achieve these objectives, quarterly and annual data were gathered and analysed. The quarterly sample is composed by 71 firms with quarterly data from the first quarter of 1995 until first quarter of 2009 (57 time-observations), and the annual sample is composed by 61 firms and annual observations from 1995 to 2008 (14 time-observations). Two measures of accounting earnings (SEPS and UNEPS) and two measures of stock returns (RET and ARET) were used. Additionally, proxies of systematic risk (BETA), expected economic growth opportunity (GRO), leverage (LEV), risk-free interest rate (INTER) and size (SIZE) were used as measures of the economic determinant of ERC. In each study, the two different measures of earnings and returns resulted in a combination of four functional models (regressions), in an annual and a quarterly basis. These models were estimated into firm-specific level and pooled data by using different methods (OLS and GLS); these varieties of designs, periodicity and estimations provide a robust analysis. The results of the first study show that earnings present, for most firms, stationarity series and seasonal fluctuation. The evidence also suggests that the accounting earnings in Brazil follow an auto-regressive model AR(1). Test results indicate long-term relationships between earnings and prices/returns, although, it is not possible to robustly infer about the Granger causality direction since a general behaviour was not identified. The second study indicates that for annual and quarterly firm-specific regressions between earnings and stock returns, only a few companies presented a significant relationship. However, the annual pooled analysis presents positive and significant coefficients, and contemporaneous observations (at *t* level) seem to fit better in the models than the lagged variable of return. Cross-sectional weight in the panel aggregates some refinement to the models in terms of significance and explanatory power. In the quarterly pooled regressions, coefficients with statistical significances were found; nevertheless, these regressions report an extremely low or nonexistent explanatory power, suggesting a slight relationship between the variables. The results of the third study show that systematic risk, interest rates and size significantly explain cross-sections and intertemporal variations of ERC according to previous hypothesis. On the other hand, differently from what has been hypothesized, expected economic growth and leverage do not significant explain cross-section variations of ERC in Brazil. Since the interest rate level in Brazil is higher than those in developed countries and given that interest rate levels affect both earnings and discount rate, the regressions presented different signals according to the proxy for return used. Finally, it is possible to conclude that, by including the significant factors noted above, the empirical specification of the earnings-returns relation is significantly improved, however, given some contrasting results presented here, this dissertation advocates for further research in this field.

RESUMO

Um desafio fundamental que interliga economia, finanças e contabilidade envolve a relação entre lucros contábeis divulgados e o retorno das ações. A falta de pesquisa nesta área utilizando dados brasileiros e a limitação das pesquisas anteriores devido à falta de séries temporais adequadas (as séries disponíveis são curtas) motivam a presente pesquisa. Adicionado a isso, uma justificativa pragmática é que a propriedade temporal dos lucros contábeis e os determinantes do Coeficiente de Resposta ao Lucro (ERC) têm aplicação direta na previsão de lucros e em processos de valuation. Baseado nisso, o objetivo geral desta tese é analisar as propriedades estocásticas do lucro contábil e encontrar os determinantes econômicos do ERC no Brasil. Para isso, a tese está dividida em três seções/estudos: (1) Análise as propriedades dos lucros contábeis e a relação de longo prazo entre preço das ações, retorno e lucros; (2) Análise a relevância e significância do ERC por empresa e em dados agrupados (*pooling*); e, (3) Teste dos determinantes econômicos do ERC. Para atingir tais objetivos, dados trimestrais e anuais foram coletados e analisados. A amostra trimestral é composta por 71 empresas entre o 1º trimestre de 1995 e o 1º trimestre de 2009 (57 observações trimestrais) e a amostra anual é composta por 61 empresas com observações anuais entre 1995 a 2008 (14 observações anuais). Duas medidas para lucro contábil (SEPS e UNEPS) e duas medidas de retorno das ações (RET e ARET) foram utilizadas. Adicionalmente, *proxies* para risco sistemático (BETA), oportunidades de crescimento econômico esperado (GRO), alavancagem (LEV), taxa de juros livre de risco (INTER) e tamanho (SIZE) foram utilizadas como medidas de determinantes econômicos do ERC. Em cada estudo, as duas medidas de lucro e de retorno resultaram em uma combinação de quatro modelos funcionais (regressões), em uma base anual e uma trimestral. Tais modelos são estimados individualmente nas empresas e por agrupamento de dados (*pooling*) por meio de diferentes métodos (OLS e GLS); essa variedade de modelagem, periodicidade e estimação proporcionam uma análise mais robusta. Os resultados do primeiro estudo mostram que os lucros apresentam, para a maioria das empresas, séries estacionárias e com flutuações sazonais. As evidências também sugerem que os lucros no Brasil seguem um modelo autoregressivo de ordem um - AR(1). Os resultados dos testes indicam a existência de relacionamento de longo prazo entre lucro e retorno, no entanto, não é possível inferir de forma robusta sobre a direção da causalidade de Granger visto que não foi encontrada uma tendência geral para os dados. O segundo estudo indica que poucas empresas apresentaram regressões com coeficientes significantes. No entanto, a análise com dados agrupados apresenta coeficientes positivos e significantes, sendo que as observações em períodos similares (no nível *t*) aparentam melhor adequação do que variável de retorno defasada. Atribuição de peso em variação transversal (cross-sectional) no painel de dados agrega maior refinamento nos modelos em termos de significância e poder explicativo. Nas regressões trimestrais agrupadas, coeficientes com significância estatística foram encontrados; entretanto, essas regressões indicam um poder explicativo extremamente baixo ou inexistente, sugerindo um pequeno relacionamento entre as variáveis. Os resultados do terceiro estudo mostram que risco sistemático, taxa de juros e tamanho explicam com significância estatística as variações temporais e transversais do ERC de acordo com hipóteses prévias. Por outro lado, diferentemente do hipotetizado por estudos anteriores, oportunidades de crescimento econômico esperado e alavancagem não explicam com significância as variações transversais do ERC no Brasil. Visto que a taxa de juros no mercado brasileiro é significativamente maior do que em países desenvolvidos e que a taxa de juros afeta tanto a geração de lucros quanto a taxa de desconto, a regressões apresentaram sinais diferentes de acordo com a *proxy* de retorno utilizada (RET ou ARET). Finalmente é possível concluir que, ao incluir os fatores estatisticamente significantes, apresentados acima, a especificação empírica da relação lucro/retorno é significativamente melhorada, entretanto, considerando que alguns resultados contraditórios foram verificados, esta tese advoga por maiores pesquisas neste campo.

CONTENTS

LIST OF ABBREVIATIONS

ADF – Augmented Dickey-Fuller
ARET – Proxy for unexpected return; adjusted return for firm-specific (without market effects)
CAPM – Capital Asset Pricing Model
CDI – Certificado de Depósito Interbancário
CVM – Comissão de Valores Mobiliários
EMH – Efficient Market Hypothesis
EPS – Earnings Per Share
ERC – Earnings Response Coefficient
GLS – Generalized Least Squares
GRO – Proxy for expected economic growth
INTER – Proxy for risk-free interest rate
LEV – Proxy for leverage
OLS – Ordinary Least Squares
P – Price
P/E – Price/earnings ratio
PIH – Permanent Income Hypothesis
R – Return
RET – Nominal return including dividends
SEPS – Earnings per share variation scaled by price
UNEPS – Proxy for unexpected earnings per share
X – Accounting earnings (earnings variation or unexpected earnings)

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1 INTRODUCTION

A fundamental issue at the interface of economics, finance, and accounting involves the relation between a firm's reported earnings and its stock returns (KORMENDI; LIPE, 1987). Standard valuation models assume that price is the discount present value of future expected dividends or future cash flows. It is commonly assumed that, over long periods, reported accounting earnings are directly related to futures dividends and cash flows. Since Ball and Brown (1968), numerous studies have been trying to identify whether reported earnings contain information used by the market in assessing the value of a firm's common stock.

Early accounting studies regarding the relationship between earnings and stock returns[1] grouped firms into good news and bad news portfolio according to the sign and/or the magnitude of the earnings forecast error. White, Sondhi and Fried (2003, p. 172) consider that "there was no explicit theoretical consideration or measurement of the relationship between earnings and return"; however Garman and Ohlson (1980), Ohlson (1983) and Easton (1985) present theoretical models that may be used to derive response coefficients for accounting earnings and the future benefits accruing to equity holders. Thus, later studies explicitly related the response of stock returns to earnings by the introduction of the earnings response coefficient (ERC). Earnings response coefficient studies test for differential reactions across firms and for differential reactions to various components of earnings (permanent or transitory earnings). Moreover, the Earnings response coefficient permitted testing the explicit relationship between prices and earnings as implied by finance valuation models.

In general, empirical studies concluded that information provided by accounting earnings is relevant to valuation. However, the relation between earnings and firm value (the earnings response coefficient) is affected by several aspects; for example, the transitory components of earnings do not affect future benefits to equity holders; the differences in risk levels affect the firm's discount rates; the economic growth expectations imply in higher future earnings and then,

[1] For instance, see Ball and Brown (1968), Beaver (1979), Beaver, Clarke and Wright (1979), and Beaver, Lamber and Morse (1980)

cash flows and dividends. Earnings-return models demonstrate that stock price is a function of all information variables that predict dividends.

Therefore, given that earnings contain useful information, it is important to know (and investigate) what is the economic nature of the information in reported earnings, and how does it relate to firm valuation.

According to Ball, Kothari and Watts (1993), changes in earnings have systematic economic determinants that are likely to be associated with variation in securities' expected returns, particularly since earnings are the accounting return on equity. Identifying the economic determinants of earnings variation should improve our understanding the earning-return relation.

Hence, considering the study of accounting earnings properties and the economic determinants of its association with securities returns, the general objective of this study is to analyse the earnings properties and to find the economic determinants of earnings response coefficients in Brazil. In order to achieve this objective, this dissertation is divided into three main goals/sections: (1) An analysis of the time-series properties of accounting earnings and the long-term relationship between price, return and earnings; (2) An analysis of the relevance and significance of earnings response coefficient for individual companies and pooled data; and, (3) An analysis of economic determinants of earnings response coefficient in Brazil.

According to Lopes and Bezerra (2004, p.135), studies relating accounting earnings and stock prices in Brazilian capital markets are almost non-existent. Based on this, this dissertation is justified by the lack of research in this field and especially by the absence of studies with a quantitative approach in the intertemporal behaviour of accounting earnings and economic determinants of earnings response coefficient.

The practical justification of this research is that time-series properties of accounting earnings and the determinants of earnings response coefficient have a direct application in earnings forecasting and valuation process. According to Kothari (2001) "further refinements in the valuation models and more accurate estimates of discount rates are likely to be only incrementally fruitful in furthering our understanding of the return–earnings relation or the earnings response coefficients". The author also advocates that the academic motivation for research on earnings response coefficients is to facilitate the design of more powerful tests of the contracting and political cost hypotheses or voluntary disclosure or signalling hypotheses in accounting.

1.1 Structure of the Research

The research is structured in order to provide different approaches for the same subject (or at least related subjects) the "relation between accounting earnings and stock prices/returns". Therefore, the study is divided into three parts:

Study 1 – Time-series properties of accounting earnings and the long-term relationship between earnings and return. Based on and extending the studies of Foster (1977), Kormedi and Lipe (1987), Brown (1993) and Galdi and Lopes (2008), this study intends to analyse the stochastic behaviour of accounting earnings by studying the time-series process in accounting information and the long-term relationship between earnings and return. The aim of this study is to analyse empirically, in an exploratory way, the time series model of quarterly accounting earnings for the Brazilian listed companies covering the period from 1995 to 2008. The questions that motivate this study are: "What are the time-series properties of accounting earnings?" and "Is there a long-term relationship between price and earnings and/or returns/earnings variation?"

Study 2 – Accounting earnings and stock returns the role of earnings response coefficient (ERC). The aim of this study consists of finding and analyzing the significance of firm-specific and pooled earnings response coefficient. The lag structure of earnings-return relation is also analysed. The question that motivates this study is: "Is there statistical significance in the earnings response coefficient in Brazil for company-based regressions and/or pooled data?". The theoretical platform is based on the previous studies of Easton and Zmijewski (1989), Kormedi and Lipe (1987) and Collins, Kothari, Raybum (1987).

Study 3 – Economic determinants of earnings response coefficient (ERC). Given the findings of the first two parts, this study investigates the possible economic explanations for the intertemporal and cross-sectional differences in earnings response coefficient for the same sample in terms of quarterly and annual data. The economic variables are composed of interest and inflation ratios, risk, capital structure, growth opportunities, economic sector and size. Seminal researches explaining the time-series nature and magnitude of the relationship between earnings and stock prices include Kormendi and Lipe (1987), Collins and Kothary (1989), Easton and Zmijewski (1989), Easton, Harris and Ohlson (1992), Kothari and Sloan (1992), Ball, Kothari and Watts (1993), Dhaliwal and Reynolds (1994). However, the present study strongly rests on Collins and Kothary's (1989) and Ball, Kothar and Watts' (1993) methodology. The question that motivates this study is: "What are the determinants of earnings response coefficient in Brazil?"

1.2 Theoretical Support and Ontological Assumptions

Schroeder, Clark and Cathey (2001, p. 37) claim that the development of accounting theory and practice will not solve all the needs of the users of accounting information. Theories must also be developed that predict market reactions to accounting information and how users react to accounting data. This kind of research had its beginning with Ball and Brown (1968) and Beaver (1968). After these seminal papers a large body of research has been analyzing the market reaction to accounting data, and a formal theory regarding this relation was first developed by Ohlson (1995)[2].

Kormendi and Lipe (1987), for instance, estimate the magnitude of the relation between stock returns and earnings by resting their tests on the macroeconomic literature on the rational expectations version of the permanent income hypothesis (RE-PIH). In a seminal paper, Hall (1978) discusses the close conformity of the RE-PIH to models of firm valuation.

[2] For detailed literature review about this topic in English language see Kothary (2001), in Portuguese Language see Lopes (2001) and/or Iudícibus and Lopes (2004).

Neoclassical consumption theory posits that consumers are forward-looking and base their consumption decisions not on current income but on the expected discounted value of lifetime resources which is known as the permanent income. In its simplest form, the permanent income hypothesis (PIH) states that the choices made by consumers regarding their consumption patterns are determined not by current income but by their longer-term income expectations. Then, the theory suggests that consumers try to determine consumer spending based on their estimates of permanent income. Only if there has been a change in permanent income will there be a change in consumption.

Measured income and measured consumption contain a permanent (anticipated and planned) element and a transitory (windfall gain/unexpected) element. PIH states that the individual (person or company) will consume a constant proportion of their permanent income. Consequently, individuals who have low levels of income are more likely to consume a higher part of their income. On the other hand, individuals with high incomes have a higher transitory element to their income and a lower than average propensity to consume. Because of this, consumers would spend a proportional amount of what they perceived to be their permanent income, meaning that, windfall gains tend to be saved. Therefore, the key conclusion of this theory is that transitory changes in income do not affect long-run consumer spending behaviour .

Beaver and Morse (1978) analyse the transitory components in accounting earnings and conclude that only current earnings are affected by transitory components. Then, future earnings are affected only by permanent components. The traditional example is the results derived from sales of permanent assets. In addition, Beaver (1968) justifies the weak explanatory power of earnings on returns for the market identification of transitory earnings.

Based on this, a key implication of this rational expectations version of the permanent income hypothesis is that the size of the revision in consumption due to an income innovation is equal to the size of the revision in permanent income due to the same income innovation. Rational expectation is an assumption used in many macroeconomic models and supposes that the expectations of individuals (person or firms) about future economic conditions are an essential part of the model. Quantitative models of expectations have been controversial because macroeconomic predictions of the models may differ depending on the assumptions that are made about expectations. The most common way to model rational expectations is to consider that agents' expectations are correct on average. This means that, since the future is not fully predictable, agents' expectations are assumed to use all relevant information in forming economic variables expectations. Modeling expectations is crucial when it is studied the dynamics of the economy over time, and it has an important consequences in contemporary accounting and finance.

Similar to the idea of rational expectations and consensus in the market place, the efficient market hypothesis (EMH) is commonly used to base accounting studies regarding earnings prices associations. The economics literature argues, in a simplified way, that, in a free market economy with perfect competition, price is determined by (1) the availability of the product (supply) and (2) the desire to possess this product (demand); then, the price of a product/asset is determined by a market equilibrium or consensus based on the purchasers' knowledge of relevant information about a product/asset. However, in the security markets, two issues are involved: the information about a company that is valuable to an investor and the form of corporate disclosure and its understandability. Based on these two issues, three separate forms of the efficient market hypotheses were developed: the weak form, the semi-strong form and the strong form.

Consequently, the efficient market hypothesis has implications for the development of accounting theory and practice. Some critics of accounting have argued that the lack of uniformity in accounting principles has allowed corporate managers to manipulate earnings and mislead investors [see Ball and Brown (1968) for instance]. This argument is based on the assumption that accounting reports are the only sources of information on a business organization. The results of efficient market hypothesis research suggest that stock prices are not determined solely by accounting reports. This conclusion has led researches to investigate how accounting earnings are related to stock prices.

The results of these investigations imply that accounting earnings are correlated with securities returns. Other accounting research relies on research findings that support the efficient market hypothesis to test market perceptions of accounting numbers and financial disclosures. This research is rested on the premise that an efficient market implies that the market price of a firm reflects the consensus of investors regarding the value of the firm. Thus, if accounting information and/or other financial disclosure reflect items that affect firm value, then they should be reflected in firms' security prices.[3]

1.3 Sample choice

The analysis is based on Brazilian firms and the sample construction criteria was to analyse the quarterly and annual accounting and market information of all public companies from the first quarter of 1995 to the first quarter of 2009 (this period includes the Real Plan and the beginning of relative monetary stability). Hence, the study also involves the full available period since the Securities and Exchange Commission of Brazil's (CVM) Instructions nº 202/1993 and nº 274/1998 determined the obligation of quarterly information. Although that represents a short period of time compared to international studies, this is the complete official time-series available.

This period provides 57 quarterly earnings as well as price information (or 14 years of quarterly earnings and price information). Therefore, given the availability of data, the companies' lengths vary from 22 to 57 quarterly time-series observations. According to these criteria, 71 companies were included in the sample for quarterly analysis. Table 1 shows a brief description of the companies, the economic sectors and size:

[3] Since the efficient market hypothesis is well covered in financial, economical and accounting literature, a detailed literature review is easily found in a finance book. For implications of EMH in accounting research in Portuguese language, see Lopes (2001) and/or Iudícibus and Lopes (2004, chapter 2)

Table 1 – Sample descriptions

Code	Company's name	Economic Sector	Size (by market capitalization)	Size (by total assets)	Classification by total assets
ALLL11	All - America Latina Logistica S.A.	Transporte Serviç	6,576,122	11,471,285	MEDIUM
AMBV4	Companhia de Bebidas Das Americas-Ambev	Alimentos e Beb	61,414,391	41,670,570	LARGE
ARCZ6	Aracruz Celulose Sa	Papel e Celulose	7,364,437	11,579,944	MEDIUM
BBAS3	Banco do Brasil S.A.	Finanças e Seguros	43,305,820	591,925,233	LARGE
BBDC4	Banco Bradesco S.A.	Finanças e Seguros	65,154,338	482,140,944	LARGE
BRAP4	Bradespar S.A.	Outros	7,579,546	6,663,581	MEDIUM
BRKM5	Braskem S.A.	Química	2,382,045	22,409,372	LARGE
BRSR6	Banco do Estado do Rio Grande do Sul S/A	Finanças e Seguros	2,953,086	26,501,518	LARGE
BRTO4	Brasil Telecom S.A.	Telecomunicações	18,659,355	17,709,094	MEDIUM
BRTP3	Brasil Telecom Participacoes S.A.	Telecomunicações	11,986,102	19,506,681	LARGE
CCRO3	Companhia de Concessoes Rodoviarias	Transporte Serviç	8,404,673	6,677,860	MEDIUM
CESP6	Cesp - Companhia Energetica de Sao Paulo	Energia Elétrica	4,104,929	17,018,719	MEDIUM
CGAS5	Companhia de Gas de Sao Paulo - Comgas	Petróleo e Gas	3,311,661	3,891,502	SMALL
CLSC6	Centrais Eletricas de Santa Catarina S.A.	Energia Elétrica	1,466,804	4,450,261	SMALL
CMIG4	Cia Energ Minas Gerais - Cemig	Energia Elétrica	15,264,095	25,126,887	LARGE
CNFB4	Confab Industrial Sa	Siderur & Metalur	1,430,776	2,077,382	SMALL
CPFE3	CPFL Energia S.A.	Energia Elétrica	15,117,195	16,483,490	MEDIUM
CPLE6	Cia. Paranaense de Energia - Copel	Energia Elétrica	6,087,486	13,188,444	MEDIUM
CRUZ3	Souza Cruz S.A.	Outros	13,373,938	3,471,983	SMALL
CSMG3	Cia. de Saneamento de Minas Gerais	Outros	2,229,824	6,531,736	MEDIUM
CSNA3	Companhia Siderurgica Nacional	Siderur & Metalur	26,098,248	31,735,764	LARGE
CYRE3	Cyrela Brazil Realty Sa Emprs e Parts	Construção	3,265,794	7,766,726	MEDIUM
DASA3	Diagnosticos da America S.A.	Outros	1,423,594	1,844,030	SMALL
DURA4	Duratex Sa	Outros	1,776,711	3,239,646	SMALL
ELET3	Centrais Elet Brasileiras Sa	Energia Elétrica	29,160,413	137,281,991	LARGE
ELPL6	Eletropaulo Metropolitana El.S.Paulo S.A.	Energia Elétrica	4,976,986	12,327,025	MEDIUM
EMBR3	Embraer - Emp Brasileira Aeronautica Sa.	Veiculos e peças	5,622,877	20,502,468	LARGE
ETER3	Eternit S. A.	Minerais não Met	418,690	417,127	SMALL
FFTL4	Fertilizantes Fosfatados S.A. -Fosfertil	Química	5,740,738	3,502,645	SMALL
GETI4	AES Tiete S.A.	Energia Elétrica	6,382,268	2,489,395	SMALL
GFSA3	Gafisa S/A	Construção	1,514,069	5,725,838	SMALL
GGBR4	Gerdau S.A.	Siderur & Metalur	17,012,558	56,104,181	LARGE
GOAU4	Metalurgica Gerdau S.A.	Siderur & Metalur	6,400,661	57,070,075	LARGE
GOLL4	Gol Linhas	Transporte Serviç	1,334,835	6,629,555	MEDIUM
IDNT3	Ideiasnet S/A	Outros	191,824	392,826	SMALL
ITSA4	Itausa - Investimentos Itau S.A.	Outros	33,962,367	625,646,394	LARGE
ITUB4	Banco Itau Holding Financeira S.A.	Finanças e Seguros	96,576,644	618,943,348	LARGE
KEPL3	Kepler Weber Sa	Siderur & Metalur	182,168	382,344	SMALL
KLBN4	Klabin S.A.	Papel e Celulose	3,089,973	8,140,421	MEDIUM
LAME4	Lojas Americanas S.A.	Comércio	4,510,032	6,011,012	SMALL
LIGT3	Light S.A.	Energia Elétrica	4,523,251	9,530,895	MEDIUM
LREN3	Lojas Renner Sa	Comércio	1,732,957	1,382,198	SMALL
NATU3	Natura Cosmeticos S/A	Comércio	9,724,551	2,182,045	SMALL
NETC4	Net Servicos de Comunicacao S.A.	Outros	5,861,255	6,003,998	SMALL
PCAR5	Companhia Brasileira de Distribuicao	Comércio	7,288,513	13,370,249	MEDIUM
PETR4	Petroleo Brasileiro	Petróleo e Gas	285,150,830	304,426,305	LARGE
PLAS3	Plascar Participacoes Industriais S.A.	Veiculos e peças	153,116	635,031	SMALL
POMO4	Marcopolo Sa	Veiculos e peças	739,819	2,234,676	SMALL
PRGA3	Perdigao S.A.	Alimentos e Beb	5,937,669	10,892,799	MEDIUM
PSSA3	Porto Seguro S.A.	Finanças e Seguros	2,731,547	8,112,729	MEDIUM
RAPT4	Randon S/A Implementos e Participacoes	Veiculos e peças	829,809	2,219,766	SMALL
RSID3	Rossi Residencial S/A	Construção	705,494	2,976,516	SMALL
SBSP3	Cia Saneamento Basico Estado Sao Paulo	Outros	5,878,169	20,762,026	LARGE
SDIA4	Sadia S.A.	Alimentos e Beb	2,521,792	11,377,790	MEDIUM
SUZB5	Suzano Papel e Celulose S.A.	Papel e Celulose	3,218,418	12,874,096	MEDIUM
TAMM4	Tam S.A.	Transporte Serviç	1,976,091	13,001,190	MEDIUM
TBLE3	Tractebel Energia S.A.	Energia Elétrica	11,227,166	8,459,349	MEDIUM
TCSL4	Tim Participacoes S.A.	Telecomunicações	9,176,697	14,260,713	MEDIUM
TELB4	Telecom Brasileiras Sa	Telecomunicações	393,745	428,645	SMALL
TLPP4	Telecomunicacoes de Sao Paulo S/A-Telesp	Telecomunicações	22,708,935	19,822,300	LARGE
TMAR5	Telemar Norte Leste S/A	Telecomunicações	13,078,108	56,301,593	LARGE
TMCP4	Telemig Celular Participacoes S.A.	Telecomunicações	1,549,811	2,629,521	SMALL
TNLP4	Tele Norte Leste Participações S/A	Telecomunicações	13,125,868	56,855,714	LARGE
TRPL4	Cteep-Cia Transm Energia Eletr. Paulista	Energia Elétrica	7,454,317	5,820,284	SMALL
UGPA4	Ultrapar Participacoes S.A.	Química	7,449,528	10,080,489	MEDIUM
UNIP6	Unipar- Uniao de Inds. Petroquimicas S/A	Química	603,583	11,835,488	MEDIUM
USIM5	Usinas Siderurgicas de Minas Gerais S.A.	Siderur & Metalur	13,807,087	26,939,066	LARGE
VALE5	Cia Vale do Rio Doce	Mineração	152,961,526	187,954,278	LARGE
VCPA4	Votorantim Celulose e Papel Sa	Papel e Celulose	2,174,699	29,398,254	LARGE
VIVO4	Vivo Participacoes S/A	Telecomunicações	11,245,033	22,434,252	LARGE
WEGE3	Weg Sa	Máquinas Indust	7,213,880	5,589,565	SMALL

Since some companies do not present completely annual information for the full 15-year period in the analysis, 10 companies were excluded from the annual analysis because of the lack of annual observations. The exclusion criteria were defined based on companies that do not present the minimum of nine annual observations. Based on this, BRAP4, CCRO3, CSMG3, CPFE3, DASA3, GFISA3, GOLL4, KEPL3, NATU3 and PSSA3 were eliminated from the annual sample, decreasing the annual sample to 61 companies.

1.4 General Methodology

White, Sondhi and Fried (2003) identify three major approaches to accounting theory and research:

1) The classical approach that attempts to develop an optimal or most correct accounting representation of some true (but unobservable) reality.

2) The market-based accounting research that takes a more empirical perspective and also assumes a user-oriented focus. Market-based research uses observable relations between reported accounting earnings (or other accounting performance measures) and market returns to draw conclusions about the role of accounting information.

3) The positive accounting theory approach that also focuses on observable reactions to accounting numbers; but, this is not its primary focus because, in addition to financial markets, positive research includes other environments influenced by financial statements, including management compensation plans, debt agreements with creditors and the host of regulatory bodies interacting with the firm. This approach recognises that, since financial statements impact these other environments, there are incentives for accounting systems to be used not only to measure the results of decisions, but in turn, to influence these decisions in the first place.

According to White, Sondhi and Fried (2003), these three approaches view the underlying economic reality of a firm in different ways. In the classical approach, an underlying reality exists, and it is the role of accounting to best describe it. Market-based research, on the other hand, views reality as determined by market value, and accounting alternatives do not make any difference. The positive research adds a new twist: accounting alternatives define and determine reality.

Advances in finance theory in the mid- and late 1960s were the primary catalyst for the shift in market-based accounting research. The two major advances in the finance literature that influenced accounting research in this period were the efficient market hypothesis (EMH) and the modern portfolio theory (MPT). Hence, the accounting academic research moved from the classical deductive approach to an empirical approach that focused primarily on three issues: (1) what are users' reactions to financial statements? (2) Do alternative methods affect users' reactions? (3) Given users' needs, could accounting methods be set to maximise the utility of financial statements for various user-groups?

According to Schroeder, Clark and Cathey (2001, p. 37), the more commonly methodologies in accounting research are (1) the deductive approach that requires the establishment of objectives and then proceeding to specific practices; (2) the inductive approach that involves making observations and drawing conclusions from those observations; (3) the pragmatic approach that identifies problems and researches utilitarian solutions; (4) the scientific approach, which involves testing hypothesis and proposed solutions; (5) the ethical approach that approach emphasizes the concepts of truth, justice and fairness; and (6) the behaviour al approach which studies how individuals are influenced by accounting functions and reports.

1.4.1 General Quantitative Procedures

This dissertation is divided into three related topics with distinct methods and quantitative approaches. The specific quantitative orientation is presented individually in each specific study. In general terms, next paragraphs summarise the quantitative procedures and technical data treatment.

All regressions and analysis are estimated by using the statistical package EViews 6 from Quantitative Micro Software (1994-2007), registered to USP; Serial Number 60Z00299. The Economática data base, registered to USP, served as the data basis for collection of financial information data; Microsoft Excel was used to organize data and elaborate tables and formatted reports.

In the first study, when analyzing the time-series properties of accounting earnings and the long-term relationship between earnings and returns, a time-series approach is used. In order to do that, the first step is to define the stationarity of the series, applying the Augmented Dickey-Fuller (ADF) test for a unit root. For the non-stationarity firm-series the cointegration test (Johansen Cointegration test) was applied to test for the long-term relationship. For those companies with cointegration vector, the test for Granger Causality with correction was used. For series with no unity root, the Granger Causality was tested. The autocorrelations of historical earnings are analysed in order to verify the dependence of current earnings to its previous time-series observations. The results of autocorrelation analysis might give some important insights to seasonality and smoothing behaviour of earnings; hence, these are important points for earnings forecasting.

In order to investigate the relationship between earnings and returns and to evaluate the role and significance of Earnings Response Coefficient (ERC) in Brazil, linear regressions for each firm are estimated. However, the estimation of separate time-series regressions for each of firms is likely to be sub-optimal way to proceed since this approach would not take into account any common structure present in the series of interest. In addition, pooled analysis can efficiently deal with more complex problems then pure time-series or pure cross-sections data alone. Pooled analysis can also examine how variables change dynamically over time; moreover, with additional variation introduced by combining the data in this way can also help to mitigate problems of multicolinearity that may arise if time series are modelled individually.

Wooldridge (2004), assumes that the basic class of model that can be estimated using a pool object may be written as:

$$Y_{it} = \alpha + \beta_1 X_{it1} + \beta_2 X_{it2} + ...\beta_k X_{itk} + u_{it}$$

where Y_{it} is the dependent variable, α is the intercept term (or overall constant), β_k are parameters to be estimated on the explanatory variables, X_{itk} regressors representing observations on the explanatory variables, and u_{it} is the idiosyncratic error and it represents the cross-sectional and temporal unobserved factors that affect Y_{it}. t = 1, 2, … , T and i = 1, 2, … , N.

According to Wooldridge (2004, p.430), if this equation satisfies the classical linear model assumptions, then pooled OLS gives unbiased estimators, and the usual t and F statistics are valid for hypothesis. The important requirement for OLS to be consistent is that u_{it} is uncorrelated with X_{it} for all independent variable.

According to Wooldridge (2004, p 434), non-observer effects can be included in the model by decompose the disturbance term, u_{it}, into an individual cross-sectional specific effect, ε_i, and the remain disturbance. When these non-observed terms vary for each cross-section but keeps fixed over time, it is known as fixed effects model. However, if non-observed term vary cross-sectionaly and over time, it is referred as random effect model.

Gujarati (2004, p. 648) infers that in fixed effect model each cross-sectional unit has its own (fixed) intercept value, in all N such values for N cross-sectional units. In random effect model, on the other hand, the intercept α represents the mean value of all the (cross-sectional) intercepts and the error component ε_i represents the (random) deviation of individual intercept from this mean value. However, keep in mind that ε_i is not directly observable; it is what is known as an unobservable, or latent, variable.

Wooldridge (2004, p 452) suggests that in empirical work, authors decide between fixed and random effects based on whether the α_i are best viewed as parameters to be estimated or as outcomes of a random variable. “When we cannot consider the observations to be random draws from a large population it often makes sense to think of the α_i as parameters to estimate, in which case we use fixed effects methods". Gujarati (2004, p. 650) the assumptions underlying random effect model is that the ε_i are a random drawing from a much larger population.

Given that the sample analysed in this dissertation is not a random sample from a larger population, the random effect model seems not to be adequate. Additionally, intercept and slope coefficients varying in cross-section observations can be observed in the firm-specific regressions.

Therefore, since firm-specific regressions were estimated, this dissertation just estimate the usual (and simplest) the pooled specification. The idea is to capture the effect of a "macro earnings response coefficient", that considers an aggregate (mean) earnings and an aggregate return. The specification is bases on OLS and additionally analysis were developed by weighted generalized least square (GLS) specification.

Specifications by Generalized Least Squares (GLS): Wooldridge (2004, p. 273) states that "OLS is no longer the best linear unbiased estimator in the presence of heteroskedasticity. When the form of heteroskedasticity is known, generalized least squares (GLS) estimation can be used". According to the author (p.263), the GLS estimators for correcting heteroskedasticity are also called weighted least squares (WLS) estimators. This name comes from the fact that the coefficient β_j estimated by GLS minimizes the weighted sum of squared residuals. The idea is that less weight is given to observations with a higher error variance; OLS gives each observation the same weight because it is best when the error variance is identical for all partitions of the population.

Wooldridge (2004) concludes that "the test statistics from the WLS estimation are either exactly valid when the error term is normally distributed or asymptotically valid under nonnormality". Thus, the GLS estimators, because they are the best linear unbiased estimators of the β_j, are necessarily more efficient than the OLS estimators obtained from the untransformed equation. Essentially, after the variables transformation, it is possible to simply use standard OLS analysis.

According to Eviews (2007, p.499), it is possible to estimate GLS specifications that account for various patterns of correlation between the residuals. The GLS specifications may be estimated in one-step form, where coefficients are estimated computing a GLS weighting transformation, and then reestimate on the weighted data, or in iterative form, where to repeat this process until the coefficients and weights converge. Two basic variance structures were specified in this dissertation: the cross-section specific heteroskedasticity and the period specific heteroskedasticity.

The cross-section Heteroskedasticity allows for a different residual variance for each cross section. Residuals between different cross-sections and different periods are assumed to be 0. Thus, it must be assumed that $E(\varepsilon_{it}\varepsilon_{it}|X_i^*) = \sigma_i^2$ and $E(\varepsilon_{is}\varepsilon_{jt}|X_i^*) = 0$ for all *i, j, s* and *t* with $i \neq j$ and $s \neq t$. First, it is performed the preliminary estimation to obtain cross-section specific residual vectors, then these residuals are used to form estimates of the cross-specific variances. The estimates of the variances are then used in a weighted least squares procedure to form the feasible GLS estimates.

The period Heteroskedasticity allows for a different residual variance for each period. Residuals between different cross-sections and different periods are still assumed to be 0 so that: $E(\varepsilon_{it}\varepsilon_{jt}|X_i^*) = \sigma_i^2$ and $E(\varepsilon_{is}\varepsilon_{jt}|X_i^*) = 0$ for all *i, j, s* and *t* with $i \neq j$ and $s \neq t$. It is performed preliminary estimation to obtain period specific residual vectors, then these residuals are used to form estimates of the period variances, reweight the data, and then form the feasible GLS estimates.

The investigation of economic determinants of earnings response coefficient is also conducted by using pooled data (or combined data or panel data structure) and partial correlations. The panel data is unbalanced, since the number of observations differs among panel members. The estimations are the simple pooling structure; besides the justifications for that practice as justified above, formal fixed effects tests and random effects test were developed and, with exception of one model, also suggest the simple pooled estimation. The results are available under request.

1.5 Intuitive Explanation of the Concept of Earnings Response Coefficient

According to White, Sondhi and Fried (2003), studies of the earnings/return relationship are by far the most prevalent form of market-based research. Until the middle of 1980s, most studies on market-based accounting research grouped firms into “good news” and “bad news” portfolios by using the earnings forecast error; however, there was no explicit theoretical consideration about the relation between earnings and returns. In the late 1980s, studies explicitly related the response of stock returns to earnings by introducing the earnings response coefficient (ERC).

Two questions thus emerge: How is the earnings response coefficient related to the valuation model? and Why is the earnings response coefficient relevant for valuation models?

To answer the first question, we need to consider the most simple earnings-based valuation model (derived from the dividend-based model). Considering a dividend at time t (D_t) represented by a payout ratio (k) multiplied by the earnings at time t (E_t), we have $D_t = kE_t$, and, for the growth case we have the following equation:

$$P_i = \frac{kE_i(1+g)}{r-g} = \frac{kE_i}{r-g}$$

where r is the discount rate and g is the growth rate (both considered constant over time). Imagining a firm without growth in dividends and earnings, this firm would not make new investments, and all earnings would be paid out as dividends. In this case, the payout ratio (k) equals one, and the valuation becomes:

$$P = \frac{E}{r}$$

Given these relationships, it is possible to represent the valuation model in terms of price and earnings; more specifically, it is possible to relate the earnings valuation model with the Price/Earnings ratio (P/E), since the following is true:

$$\frac{P}{E} = \frac{1}{r}$$

in the no-growth case, where price and earnings will be constant, and

$$\frac{P_i}{E_i} = \frac{k(1+g)}{r-g}$$

According to the concepts presented above, it is possible to infer that the relation between price and earnings is a function of the firm's growth rate and risk (as captured by *r*). Beaver and Morse (1978), for instance, found that differences in the P/E ratio between firms could be explained by growth in the first three years; however, they could not explain long-run variations in the P/E ratio by using growth rate or risk.

Subsequent studies re-examined Beaver and Morse's (1978) findings and concluded that high or low P/E ratios indicate that the reported earnings, during the time period when P/E ratios were calculated, were abnormally low or high, but the following years, earnings returned to their normal levels. This indicates that the market ignored the transitory component of earnings, and, thus, firms whose earnings were unusually low appeared to have abnormally high P/E ratios, and firms with unusually high earnings had abnormally low P/E ratios.

These findings initiated a detailed discussion about the effects of permanent and transitory earnings and their effects were analysed under the idea of "**earnings persistence**". That is, prices will not react very much to changes in earnings caused by transitory components. Kothari (2001) states that transitory earnings components increase value on a dollar-for-dollar basis, whereas permanent changes increase value by a multiplier, so that the present value of a $1 permanent innovation is [1 + 1/*r*] (the P/E ratio).

In order to relate the time-series properties of earnings (then the persistence of earnings) to the macroeconomic literature on the permanent income hypothesis (which relates the time-series of consumption and income), the idea of the earnings response coefficient (ERC) was developed. Thus, the earnings response coefficient provides, in a feasible way, mapping earnings time-series properties and the discount rate into changes in equity market values. If the system of time-series processes for the information variables that predict dividends is linear, then price may be expressed as a linear function of these information variables (EASTON; ZMIJEWSKI, 1989).

In other words, the earnings response coefficient minimises or solves two problems in using the P/E ratio: (1) the earnings response coefficient considers the difference between the permanent and transitory earnings by considering the time-series properties of earnings, and (2) the earnings response coefficient minimises the problems of measurement error of the earnings-return relationship on the valuation models. For further descriptions of the effects of transitory components and the measurement error on valuation, see White, Sondhi and Fried (2003, p.1058). See also Attachment 1 at the end of this dissertation.

1.6 Variables Involved

This dissertation takes into accounting two different measures for accounting earnings (earnings variation and e additional earnings over risk-free interest rate) and two measures for return (nominal realized returns and returns adjusted to the market), and five economic variables that might explain the cross-sectional and intertemporal behaviour of earnings response coefficient. In addition, time-series behaviour of stock prices and earnings per share are analysed. All of the variables are analysed on an annual and quarterly basis and can be described as follows:

Earnings per share (EPS or *X*): it represents the accounting earnings per share in a given period. Since this study analyses the earnings-returns relationship in terms of annual and quarterly data, two periods of earnings accumulation were used. Quarterly data consists of accounting earnings accumulated in one specific quarter (e.g. first quarter’s earnings are obtained during January, February and March) and annual data consists of accounting earnings accumulated on an annual basis until December 31 fiscal year-end of year t (all companies have earnings year-accumulations that are equivalent to the civil calendar). Historical EPS for each company is adjusted for subsequent changes in equity structures (e.g., stock splits, mergers and acquisitions, etc.), and this adjusted figure then becomes the default EPS. The effect of accounting methods changes was ignored because they are relatively infrequent.

Earnings per share variation scaled by price (SEPS or $\Delta X/P_{t-1}$): the variation of EPS scaled by price is commonly verified in accounting and financial literature and can be used as a proxy for unexpected earnings (*UX*). This measure of unexpected earnings is used by Collins and Kothari (1989), Ball, Kothari and Watts (1993), for instance, used variation of EPS scaled by price as a proxy for (*UX*) and they argued that, given the random walk characteristic, the short data history and the usage of reverse regression and different holding period, earnings change is the appropriate proxy for unexpected earnings. the variation of EPS scaled by price is commonly verified in the accounting and financial literature and can be used as a proxy for unexpected earnings (*UX*); for instance, this measure is used by Kormendi and Lipe (1987), Collins and Kothari (1989) and Ball, Kothari and Watts (1993). These authors argue that, given the random walk characteristic of earnings and the short data history, the scaled earnings change can be consider an appropriate proxy for unexpected earnings. Collins and Kothari (1989) present three reasons to use this variable:

> (1) Many annual earnings/returns association studies use a random walk model as a proxy for the market's earnings expectation as of the beginning of the year. Thus, annual earnings change is the appropriate proxy for unexpected earnings.
> (2) Unexpected earnings, using more sophisticated ARIMA models, require a relatively long data history (20-30 years) to estimate parameter values. This would restrict our sample severely and reduce the range of size and risk profiles which are determinants of the ERCs. We do, however, use an IMA (l,1) model to estimate earnings persistence for a subset of our sample firms with the requisite data, and these results are reported below.
> (3) The two empirical procedures described above (i.e., reverse regression and expanding the return holding period) reduce the potential measurement error that results from using annual earnings changes as a proxy for UX_{it}.

Unexpected EPS (UNEPS): This variable represents the additional earnings over an interest rate in a specific period. According to Lopes (2001, p.156), the abnormal accounting earnings are calculated by the product of the risk free interest rate and the book value of equity in the beginning of the period minus the accounting earnings obtained in the same period. Hence, the variable is calculated by:

$$UNEPS_{it} = EPS_{it} - (BV_{it-1} * RF_{t_t}^{N})$$

where BV_{it-1} is the book value at *t*-1 and $RF_{t_t}^{L}$ is the proxy for the nominal risk free rate and is net of tax (N indicates net of tax). This methodology is inspired by the residual income framework; however, the residual income framework implies the use of and risk-adjusted discount rate rather than a risk-free rate. In Brazil, Lopes (2001) uses the same methodology of abnormal earnings over risk-free rate considering the bank savings interest rate and the CDI (*Certificado de Depósitos Bancários* or Interbank Deposits Certificate) rate as the risk-free proxy. The author does not find differences in his results by using different interest rates. In the present study, I assume the CDI rate as the risk-free proxy, since it represents the standard rate for the biggest Brazilian financial institutions and has similar time-series behaviour as the basic interest rate fixed/droved by Brazilian Government bonds. The usage of the interest rate net of tax is motivated by the possibility of comparisons among the returns to investors, since EPS is already net of tax.

Price (P): it represents the official closing price in local currency adjusted to declared dividends, in nominal terms (not adjusted to inflation). The stock prices are adjusted for subsequent stock splits and stock dividends, and this adjusted figure then becomes the default price. Prices are based on ‘last trade’ or an official price fixing.

Return (RET or *R*): was calculated on an annual and quarterly basis by continuous capitalization as follows:

$$RET = \ln\left(\frac{P_t}{P_{t-1}}\right)$$

where P_t is the price adjusted to dividends at the end of period *t*.

The annual returns are cumulated from April of year *t* to March of *t* + 1 to capture any return reaction associated with the announcement of earnings for year *t*. Therefore, according suggested by Lopes and Bezzera (2004, p.143), return is the continuous capitalization of market price changes adjusted to dividends distributed in each period as suggested by.

In the same way, the quarterly returns are accumulated into quarter periods considering the period of March-May; June-August; September-November and December-February, for the first, second, third and fourth quarters, respectively. Hence, any return reaction associated with the announcement of earnings for quarter *t* might be captured.

Regarding return measures, Collins and Kothari (1989) suggest that, in earnings-returns studies, the appropriate return metric is given by abnormal return, then, $R_{it} - E_{t-1}(R_{it})$. However, they also use nominal return inclusive of dividends (R_{it}) for three reasons: (1) $E_{t-1}(R_{it})$ is an *ex ante* measure of expected return, but *ex ante* measures of riskless rates and risk premia are not readily available. Most studies use an *ex post* measure of $E_{t-1}(R_{it})$ conditional on the realized market return for period *t* which introduces error into the return metric. (2) Relative to the temporal and cross-sectional variability in R_{it}, the variability in $E_{t-1}(R_{it})$ is small. Hence, the use of $R_{it} - E_{t-1}(R_{it})$ essentially amounts to using R_{it}. (3). Beaver, Lambert and Morse (1980) and Beaver, Lambert, and Ryan (1987) report that the earnings/returns relation is essentially the same whether one uses R_{it}, inclusive or exclusive of dividends or market model prediction errors.

In addition to Collins and Kothari's (1989) proxy, this dissertation also uses an *ex post* measure of $E_{t-1}(R_{it})$ conditional on the realized market return for period *t*, (ARET) defined in the following paragraph.

Adjusted Return (ARET): This variable was created to allow a deeper analysis considering and abnormal return conditional to market return. The idea is to pull out the market effects from a specific firm time-series return, so that, the adjusted return (ARET) of a particular firm might represent the return derived exclusively from the firm's operations and its specific risks. In order to calculate the variable, the expected returns for each specific firm were found by regressing firm-specific return on market returns (similar to the market model). Once the firms' expected return conditioned to the market is found, the abnormal return is the difference between historical returns and their expected conditional returns. Thus,

$$ARET_{it} = RET_{it} - (\lambda_{1i} + \lambda_2 RET_{Mt})$$

where, λ_1 and λ_2 are the coefficients of regression between return of firm *i* and the market return and RET_{Mt} is the market return in the year/quarter *t*. In the annual sample, the regressions of firm-specific returns and the market returns were estimated considering the 14 annual returns (returns calculated from April to March). Therefore, only one coefficient was considered for the whole estimation.

In quarterly data, the last 24 monthly firm-returns were regressed on market return (ibovespa) developed considering; and returns were accumulated into quarter periods considering the periods of March-May, June-August, September-November and December-February, for the first, second, third and fourth quarters, respectively.

The analysis with two measures of return (RET and ARET) is justified in Brazil, since stock prices (and returns) present high volatility caused by huge amounts of foreign capital that comes and leaves the country in period short periods (speculative capital). These movements of capital are intensified in period of crises or expansions derived from international excess or absence of monetary liquidity. Additionally, until 2008 the Brazilian market was considered a speculative market; them, many systematic, political and economical risks use to drive the investor's decisions in a higher level than aspects related to firm-specific economic and/or financial performance.

In short, given the high market (systematic) volatility, this study uses R_{it}, in the same way as Collins and Kothari (1989), and an *ex post* measure of $E_{t-1}(R_{it})$ conditional on the realized market return for period *t*.

Beta as a Systematic Risk proxy (BETA): Similarly to Kormendi and Lipe (1987), Easton and Zmijewski (1989) and Collins and Kothari (1989), stock betas were estimated from monthly returns as a proxy for the systematic risk, according to the market model. The market model, in accordance with Sharpe-Lintner CAPM, tries to capture cross-sectional variation in the expected annual/quarterly rates of returns as function of the systematic risk as:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}$$

where R_{it} is the continuous compounded rate of return on the common stock of security j for quarter *t*, R_{mt} is the continuously compounded rate of return on a diversified portfolio, representing the market for quarter *t*, α_i = intercept coefficient, β_i = slope coefficient (and estimated of systematic risk) for firm *j*, and e_{it} is the normally distributed disturbance term.

The regression period consists of the last 24 monthly returns before the end of each quarter/year *t* (e.g., the beta in March 2009 is found by regressing the last 24 monthly firm-specif returns from March 2007 to March 2009 on market proxy). The general stock index proxy for market return (and the risk and its variation) is the Bovespa Index (Ibovespa). Ibovespa is considered the oldest official stock index in Brazil and it is the main indicator of the Brazilian stock market's average performance. This index's importance comes from two facts: it reflects the variation of Bovespa stock exchange most traded stocks and it has maintained the integrity of its historical series without any methodological change since its inception in 1968. In Brazil, the use of Ibovespa has been criticized because it does not reflect all companies (stocks) but just the more tradable assets and the biggest market capitalizations, which includes just a few number of companies.

Growth Expectation (Market Value to Book Value) (GRO): Similarly to Collins and Kothari (1989), this study uses as a proxy for Expected Growth Opportunity, the market value to book of equity relative to the median market value to book value ratio of all the sample firms in each year of equity. The data were collected from Economatica data base and consists of the stock price divided by the book value per share (it can also be considered as the total market capitalization divided by the total equity). The implicit idea is that the difference between the market general ratio ‘market to book’ and the ratio of a specific firm approximately represent the value of investment opportunities facing the firm. Since future earnings are affected by growth opportunities, the higher the ratio is, the higher the expected earnings growth is. Thus, as the proxy tries to capture the expected economic growth, this study uses the ratio of the beginning of each quarter/year *t*.

Leverage as a Risk proxy (LEV): Ball, Kothari and Watts (1993) suggest that the presence of corporate debt complicates the analysis of economic determinants of earnings response coefficient because leverage seems to affect the relationship between changes in investment risk and unexpected earnings. For this reason, the variable LEV is included in the present research to control the risk for leverage and to act as an economic determinant of earnings response coefficient. Here, leverage is calculated considering the total liabilities (financial debt and functional liabilities) divided by the total assets. The variable was not applied to financial institutions (banks and insurance companies) because their debt-equity structure is completely different from non-financial companies.

Interest Rate (INTER): Collins and Kothari (1989) state that the rate at which earnings are capitalized into prices is inversely related to the risk-free interest rate. From an empirical standpoint the capitalization rate would be a function of current as well as expected future interest rates or the term structure of interest rates. However, in Brazil the risk free interest rate for the local market is a controversial subject. I assume the CDI (*Certificado de Depósitos Bancários*) rate as the risk-free proxy since it represents the interbank market and has similar time-series behaviour as the basic interest rate that is fixed/driven by Brazilian government bonds. The rate is calculated net of tax (net return for long-term investor) and is assumed that the term structure is flat.

Firm Size (SIZE): In this dissertation, the measure for firm size is based on the total market capitalization logarithm, divided by 100. The market capitalization is calculated in the last trade day of the respective year or quarter. The logarithm and the division by 100 is explained by giving a relative similar scale without any lose in variance. This measure is consistent with

Kormendi and Lipe (1987), Easton and Zmijewski (1989), Collins and Kothari (1989) and other studies that consider the accounting and market values.

2 TIME-SERIES PROPERTIES OF ACCOUNTING EARNINGS

2.1 Initial Ideas about Time-Series Properties of Accounting Earnings

The main motivations for studies about time-series properties of earnings are: developing models that can forecast, with robustness, future values of the earnings time-series and testing the ability to approximate the capital market's expectation model when examining the market's reaction to accounting data.

Kothari (2001) identifies at least four reasons for researching the time-series properties of earnings: first, almost all models of valuation either directly or indirectly use earnings forecasts[4]; second, capital markets research that correlates financial statement information with security returns frequently uses a model of expected earnings to isolate the surprise component of earnings from the anticipated component. The degree of return–earnings association depends on the accuracy of the unexpected earnings proxy used by a researcher, which naturally creates a demand for the time-series properties of earnings; third, the efficient markets hypothesis is being increasingly questioned.[5] Accounting-based capital market research has produced evidence that is apparently inconsistent with market efficiency. A common feature of this research is to show that security returns are predictable and that their predictability is associated with the time-series properties of earnings, and, fourth, positive accounting theory research hypothesizes efficient or opportunistic earnings management and/or seeks to explain managers' accounting procedure choices. In this research there is often a need for 'normal' earnings that are calculated using a time-series model of earnings.

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[4] In example the discounted cash flow valuation models often use forecasted earnings, with some adjustments, as proxies for future cash flows (see Fama and Miller 1972, Chapter 2) and the analytically equivalent residual-income valuation models discount forecasted earnings net of ''normal'' earnings (see Edwards and Bell, 1961; Ohlson, 1995; Feltham and Ohlson, 1995)

[5] Efficient markets hypothesis is questioned empirically and theoretically. See behavioral finance models of inefficient markets: Daniel et al., 1998; Barberis et al., 1998; Hong and Stein, 1999)

Foster (1977) also argues that “time-series research is important to several areas of accounting and finance. One such area is the ‘smoothing literature’”. The importance of management knowing the stochastic process generating the reported accounting series when making smoothing decisions is documented in Gonedes (1972).

In Brazil, Lopes (2002, p.58) infers that accounting data and evidences of Latin America in the international accounting literature is almost nonexistent. Brazilian local literature has contributed poorly to empirical market-based accounting research regarding the Brazilian capital market. Lopes (2003), for instance, analyses the causality between earnings and stock returns and finds evidence that, for small lags (one to three periods), there is causality relation in earnings to return direction. However, the conclusions cannot be extended since just two companies were analysed. Galdi and Lopes (2008) extended the sample and considered stock prices rather than stock returns for Brazilian and Latin American countries.

Kothari (2001, p. 124) states that “time series properties or earnings play a role in parsimoniously describing the revisions in earnings forecasts based on current earnings but a rigorous theory for time-series properties does not exist”. The author also believes that the literature on time-series properties might become extinct. The main reason is the easy availability of a better substitute: analysts’ forecasts are available at a low cost in a machine-readable form for a large fraction of publicly traded firms. However, in the recent credit crunch and the banking crises the volatility presented by stock markets might signalize that analyst’s forecasts can be excessively optimists in moments of growth and stability and excessively pessimist in moments of stress. Because of that and due to other evidences, the efficient market hypothesis has been heavily criticized by behaviour finance studies. In this context, accounting conservatism could get a relevant status in future economic benefits forecasting.

The objectives of this study are: (1) to examine the time-series properties of quarterly accounting earnings series of 71 Brazilian companies over the 1995-2009 period; (2) to examine the predictive ability of the same series, and (3) to examine the ability to approximate the markets´ expectation of quarterly earnings when examining the security market reaction to accounting data in a long term relationship sense.

2.2 Time-series Properties of Accounting Earnings

2.2.1 Time-series properties of quarterly earnings

Kothari (2001, p. 148) states that the interest in the time-series properties of quarterly earnings arises for at least four reasons: (1) quarterly earnings are seasonal in many industries because of the seasonal nature of their main business activity; (2) quarterly earnings are more timely, so the use of a quarterly earnings forecast as a proxy for the market's expectation is likely to be more accurate than using a stale annual earnings forecast; (3) GAAP requires that the quarterly reporting period is viewed as an integral part of the annual reporting period. As a result, firms are required to estimate annual operating expenses and allocate these costs to quarterly periods. More importantly, quarterly earnings are potentially a more powerful setting to test positive accounting theory based and capital markets research hypothesis; (4) there are four times more quarterly earnings than annual earnings observations. That means that less stringent data availability requirements are necessary using quarterly than annual earnings to achieve the same degree of precision of the forecasts.

Evidence in Kinney, Burgstahler and Martin (2002) show that the odds of the same sign of stock returns and earnings surprise are no greater than 60–40% even when using composite earnings forecasts. The lack of a strong association should not be interpreted mechanically as an indication of noise in the earnings expectation proxy. The modest association is likely to be an indication of prices responding to information about future income that are unrelated to the current earnings information. That is, the forward-looking nature of prices with respect to earnings becomes an important consideration. In addition, increased incidence of transitory items in earnings in recent years further weakens the relation between current earnings surprise and revisions in expectations about future periods' earnings as captured in the announcement period price change.

According to Kothari (2001, p. 149), well-developed Box–Jenkins autoregressive integrated moving average (ARIMA) models of quarterly earnings exist (for instance, see Foster, 1977;

Griffin, 1977; Watts, 1975; Brown and Rozeff, 1979). Research comparing the models shows that the Brown and Rozeff (1979) model is slightly superior in forecast accuracy at least over short horizons (see Brown et al., 1987a). However, this advantage does not necessarily show up as a stronger association with short-window returns around quarterly earnings announcements (see Brown et al., 1987b). Simpler models like Foster (1977) do just as well as the more complicated models. The main advantage of the Foster (1977) model is that it can be estimated without the Box–Jenkins ARIMA software.

Foster (1977) indicates some issues regarding quarterly accounting reports. The first concerns seasonal operations that, according to him, require a variety of adjustment techniques to reduce the effect of seasonality. Then, time-series analysis should provide important information for evaluating these techniques for seasonally adjusting quarterly earnings. This statement is based on the assumption that it is necessary to know something about the unadjusted series before deciding on the set of techniques to produce the seasonally adjusted series. Another interim issue examined is whether the aggregate market, when interpreting an interim report, adjusts for seasonality in the earnings series. The argument that industry officials have advanced against extensive interim disclosure rules states that investors would be "confused" or "misled" by the interim results of seasonal firms.

Brown and Kennelly (1972) using four periods lagged models is to find seasonality in accounting earnings based on:

Model 1: $E(Q_t) = Q_{t-4}$

Model 2: $E(Q_t) = Q_{t-4} + \delta$

where Q_t = earnings in quarter *t* of a given year and δ is a drift (disturbance) term. The drift term is the average change in that quarter which has occurred over the available history. Models 1 and 2 assume a seasonal pattern in quarterly earnings. A set of models which ignore any such seasonality are used in studies on the information con-tent of annual earnings. Two such non-seasonal models are:

Model 3: $E(Q_t) = Q_{t-1}$

Model 4: $E(Q_t) = Q_{t-1} + \delta$

Whether any seasonality exists in quarterly accounting data is obviously an empirical question. Models 3 and 4 provide some insight into the consequences of suppressing any seasonality in quarterly data.

Rested on the conclusions of Beaver (1979), Brown and Kennelly (1972), Watts (1975) and Griffin (1976) that the above models (one through four) could generate a misspecification problem, Foster (1977) proposes a model under the strong assumption that an AR(1) process describes the time-series behaviour of the fourth difference in a quarterly data of all firms. Therefore, the model becomes:

Model 5: $E(Q_t) = Q_{t-4} + \phi_1(Q_{t-1} - Q_{t-5}) + \delta$

Foster (1977) also proposes an alternative approach to Model 5 by using the Box-Jenkins (1970) methodology for identifying the process generated in each individual firm's data. The Box-Jenkins' model consists of a four-step approach. The first step is model identification. This involves, among other things, a comparison of the sample autocorrelations and partial autocorrelations with theoretical patterns of particular autoregressive-moving average models. The second step is the model estimation of partial autocorrelations with theoretical patterns of particular autoregressive-moving average models. The third step is diagnostic checking, which tests for the serial noncorrelation of residuals. Based on these steps, Foster (1977) identifies, for each firm, the appropriate Box-Jenkins model for the accounting earnings.

2.2.2 Time-series properties of annual earnings

Random Walk Properties: Unlike the random walk property of security prices, which is a theoretical prediction of the efficient capital markets hypothesis, economic theory does not predict a random walk in earnings. However, a large body of evidence suggests that a random walk or a random walk with drift is a reasonable description of the time-series properties of annual earnings (LITTLE, 1962; LITTLE & RAYNER, 1966; LINTNER & GLAUBER (1978); BALL & WATTS, 1972).

A random walk phenomenon means that the best prediction of a time-series observation tomorrow is equal to its value today plus a purely random shock (or error term). Commonly, two types of random walks are distinguished: (1) random walk without drift (i.e., no constant or intercept term) and (2) random walk with drift (i.e., a constant term is present). A random walk without drift can be expressed as:

$$Y_t = Y_{t-1} + u_t$$

where u_t is a white noise error term with a mean of zero and variance σ^2.

In the random walk model, the value of Y at time t is equal to its value at time $(t - 1)$ plus a random shock; thus this is an AR(1) model. The model represents as a regression of Y at time t on its value lagged one period (GUJARATI, 2004).

A random walk with drift includes a drift parameter δ as follows:

$$Y_t = \delta + Y_{t-1} + u_t$$

In random walk models the mean as well as the variance increases over time, violating the conditions of (weak) stationarity. This means that random walk models, with or without drift, are a nonstationary stochastic process.

According to Kothari (2001 p.145), the random walk property of annual earnings is puzzling: accounting earnings do not represent the capitalization of expected future cash flows like prices. Therefore, there is no economic reason to expect annual earnings to follow a random walk. Ball and Watts (1972) conducted the first systematic study and failed to reject the random walk time-series property for annual earnings. Subsequent research confirmed their conclusion[6] by testing against the predictive ability of Box–Jenkins models of annual earnings vis-à-vis the random walk model.

Mean Reversion Properties: Kothari (2001 p. 146) suggests several economic and statistical reasons to expect mean reversion[7] in earnings: (1) competition in product markets implies that above-normal profitability is not sustainable; (2) accounting conservatism and litigation risk motivate managers to recognize economic bad news more quickly than good news, making losses less permanent and thus inducing negative autocorrelation in earnings; (3) firms´ incurring losses have the option to liquidate the firm if the management does not anticipate recovery, meaning that surviving firms are expected to reverse the poor performance. Thus, the abandonment option and survivor bias together imply that time series of earnings will exhibit reversals. (4) The incidence of transitory special items and losses has increased dramatically over time, which means earnings changes are predictable. The increase in transitory items might be due in part to a shift in standard setting by the SEC and FASB toward mark-to-market accounting for some assets and liabilities.

A number of empirical studies have documented evidence of mild mean reversion in annual earnings (BROOKS & BUCKMASTER, 1976, RAMAKRISHNAN, 1992; LIPE & KORMENDI, 1994; FAMA & FRENCH, 2000). However, interpreting evidence of mean reversion from in-sample estimates of the time-series parameter values requires caution.

2.3 The Data and Empirical Test Results

The data are composed by quarterly and annual accounting earnings from 71 Brazilian companies that are listed on the Sao Paulo Stock Exchange. The annual data ranges from December 1994 to December 2008 and the quarterly data ranges from March 1994 to March 2009. The length and

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[6] See Watts, 1970; Watts and Leftwich, 1977 and Albrecht et al., 1977

[7] If a time series is stationary, its mean, variance, and autocovariance (at various lags) remain the same no matter at what point we measure them; that is, they are time invariant. Such a time series will tend to return to its mean (called mean reversion) and fluctuations around this mean (measured by its variance) will have a broadly constant amplitude (Gujarati, 2004 p.798)

range of data are dictated by their availability. Despite the short period, the study involves the full time series of annual reports since the relative economic stabilization promoted by the Real Plan in mid 1994. These periods provide 15 annual observations and 58 quarterly observations off accounting earnings, which is a short period as compared with international studies, however, is full period data available for the public financial statements in Brazil.

Foster (1977 p.3) use a similar number of time-series observations varying from 18 to 50 observations. Regarding the sample size in Box-Jenkins analysis he states

> in the absence of structural change, the more observations one has the greater is one's ability to identify the underlying model. However, a key issue when using finite samples is the small sample properties of the estimators of B-J models. The statistical literature has not examined this issue extensively for many specific B-J models. The A.R.(1) and M.A.(l) models have been examined in most detail. Nelson [1974], for in-stance, examined via simulation the identification and estimation of M.A.(1) models with sample sizes of 30 and 100. His results suggest that the problem of identifying M.A'(1) models with θ_1 in the .1 to .5 range are much more severe with severe with samples of 30 than with samples of 100 observations. Nelson’s result relate to nonseasonal models. There is even less evidence on the small sample properties of the estimators of seasonal Box-Jenkins models.

Brown and Kennelly (1972) also use a relatively small sample of quarterly earnings from 94 companies during the period from 1958 to 1967.

Time series models are usually non-theoretical, implying that their construction and usage is not based upon any underlying theoretical model of the behaviour of a variable. Instead, time-series models are an attempt to capture empirically relevant features of the observed data that may have arisen from a variety of different (but unspecified) structural models (BROOKS, 2008 p. 206).

In Brazil, Galdi and Lopes (2008) studied the long-term causality between accounting earnings and stock prices in Latin America countries. They investigated the relevance of accounting information for capital markets in Argentina, Brazil, Chile, Peru and Mexico. They used cointegration tests in the same approach and their findings attested that the variables are cointegrated (they have a long-term relationship) and some evidences indicate that Argentine’s accounting earnings are typically stationary and have a higher degree of causality relation with stock prices than other Latin American countries accounting earnings.

2.3.1 Test for stationary behaviour

A stationary series can be defined as one with a constant mean, constant covariance and constant autocovariance for each given lag. Given the nature of quarterly earnings and their tendency to grow or undergo cyclic behaviour, they are not expected to follow a stationary process. According to Brooks (2008), there are several reasons why the concept of non-stationarity is important and why it is essential that variables that are non-stationary be treated differently from those that are stationary: the stationarity or otherwise of a series can strongly influence its behaviour and properties; the use of non-stationary data can lead to spurious regressions and if the variables employed in a regression model are not stationary, then it can be proved that the standard assumptions for asymptotic analysis will not be valid.

In order to test for stationary conditions the Augmented Dickey–Fuller (ADF) unit root test was used. The test was applied to the accounting earnings and stock prices.

According to Brooks (2008), the augmented Dickey–Fuller (ADF) test consists in identifying any unity root which can be done by estimating the following regression:

$$\Delta y_t = \psi y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + u_t$$

where u_t is a pure white noise error term, p is the number of lags of the dependent variable and where $\Delta y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta y_{t-2} = (Y_{t-2} - Y_{t-3})$, etc. The number of lagged difference terms to include is often determined empirically. The idea is to include enough terms so that the error term is serially uncorrelated. The ADF test for the null of the non stationarity in level verifies whether $\psi = 0$ and if the ADF test follows the same asymptotic distribution as the DF statistic, so the same critical values can be used. Although several ways of choosing the numbers of lags (p) have been proposed, they are all somewhat arbitrary. Brooks (2008 p.329) suggested a rule to define the numbers of lags (p) according to the frequency of the data. For instance, “if the data are monthly, use 12 lags, if the data are quarterly, use 4 lags, and so on”.

To define the inclusion or not of intercepts and trends in the unit root test equations, a graphical analysis can be conducted. Figure 1 shows four graphs reporting the time-series behaviour of EPS values of some companies from different economic sectors. It is possible to observe that, in all of the companies analysed, there is an increasing trend behaviour in quarterly EPS, thus, these evidence suggest the use of a trend in the unit root test regressions.

This graphical analysis is also conducted for remaining variables and, as expected, only the variables EPS and price can be assumed to have an increasing trend. Given that SEPS and returns are "first differencing" of EPS and price, these variables do not seem to have any trend. Considering this, trend and intercept were used to verify all of the companies' EPS and price series and the remaining variables are tested by using only intercept in the unit root test equations. Additionally, tests were also performed by simulating regressions with and without trend and similar results were found.

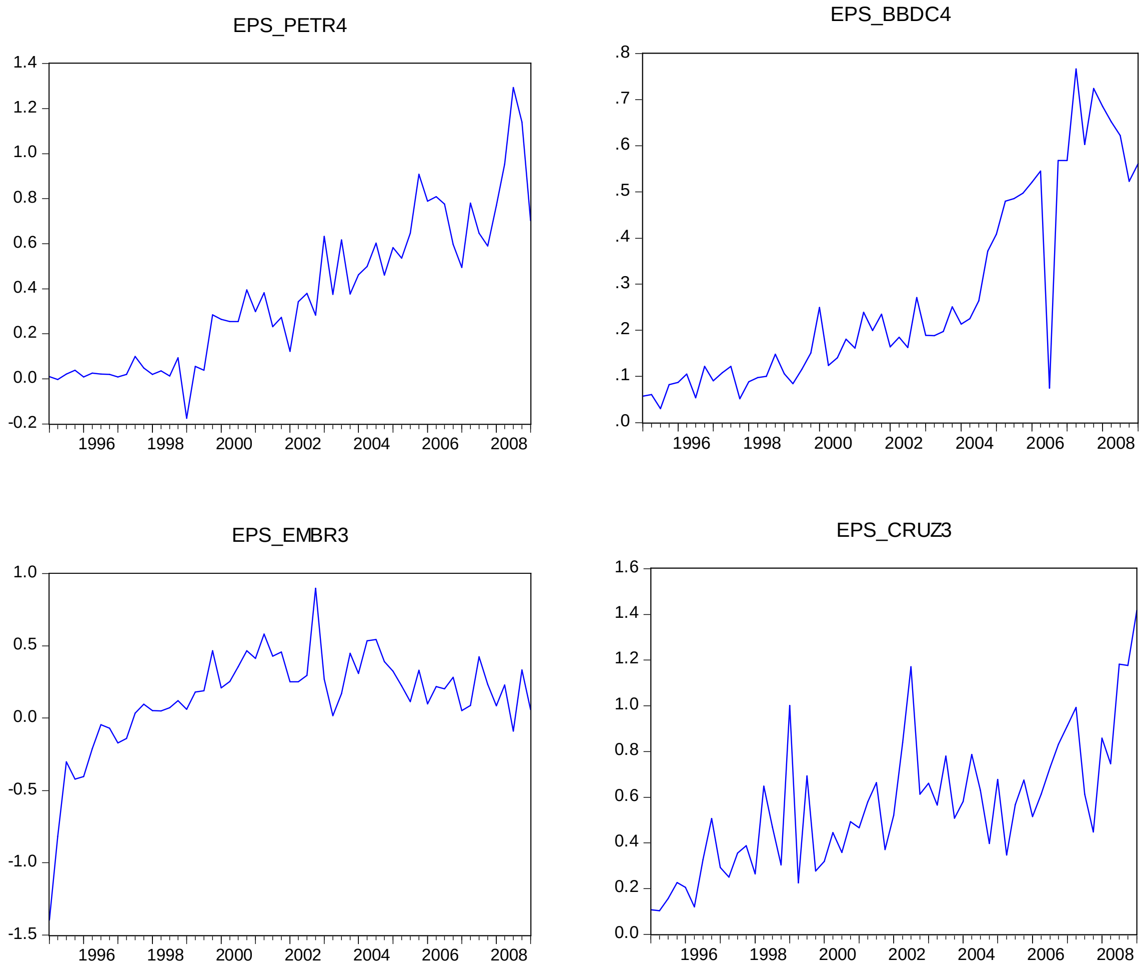

Figure 1 – Time behaviour for EPS in some companies

Table 2 shows the Augmented Dickey-Fuller unit root test results for the quarterly variables of each firm. The quarterly firm-observations contain a maximum of 56 observations and a minimal of 11 observations.

Table 2 - Augmented Dickey-Fuller Unit Root Test for the quarterly variables

	Earning per Share (EPS)			Variation EPS (EPSVAR)			Scaled EPS (SEPS)			Price (P)			Return (RET)		
Series	t-Stat	Prob.	Obs	t-Stat	Prob.	Obs	t-Stat	Prob.	Obs	t-Stat	Prob.	Obs	t-Stat	Prob.	Obs
ALLL11	-5.627	0.000	39	-7.549	0.000	37	-5.404	0.003	15	-0.275	0.983	16	-2.816	0.217	13
AMBV4	-5.515	0.000	56	-9.012	0.000	54	-9.795	0.000	54	-1.957	0.611	56	-6.379	0.000	55
ARCZ6	-0.691	0.969	54	-13.284	0.000	54	-5.444	0.000	54	0.070	0.996	56	-4.741	0.002	55
BBAS3	-4.435	0.004	56	-11.803	0.000	54	-16.844	0.000	50	-1.865	0.660	56	-8.736	0.000	55
BBDC4	-4.631	0.002	56	-12.584	0.000	55	-6.698	0.000	52	-5.356	0.000	47	-6.809	0.000	55
BRAP4	-7.056	0.000	33	-7.917	0.000	26	0.531	0.999	22	-1.269	0.876	29	-5.395	0.001	33
BRKM5	-7.448	0.000	56	-8.550	0.000	54	-8.575	0.000	51	-2.165	0.499	53	-5.040	0.001	55
BRSR6	-3.361	0.068	50	-5.546	0.000	50	-6.191	0.000	38	-2.670	0.253	56	-8.826	0.000	55
BRTO4	-4.681	0.002	56	-10.411	0.000	55	-10.046	0.000	55	-3.612	0.038	54	-6.727	0.000	55
BRTP3	-4.169	0.010	44	-9.108	0.000	43	-9.986	0.000	40	-0.916	0.944	41	-6.258	0.000	40
CCRO3	-6.835	0.000	33	-9.048	0.000	31	-4.524	0.008	22	-1.645	0.749	28	-4.607	0.005	27
CESP6	-6.347	0.000	56	-8.329	0.000	53	-2.792	0.209	37	-2.951	0.155	54	-7.266	0.000	55
CGAS5	-4.433	0.005	52	-7.369	0.000	49	-3.717	0.033	40	-2.202	0.477	45	-6.022	0.000	45
CLSC6	-6.096	0.000	56	-11.142	0.000	55	-6.586	0.000	48	-1.529	0.808	56	-7.031	0.000	55
CMIG4	-5.623	0.000	56	-9.981	0.000	54	-9.647	0.000	54	-0.990	0.937	54	-8.263	0.000	55
CNFB4	-4.406	0.005	56	-8.655	0.000	55	-9.159	0.000	55	-2.137	0.515	56	-6.931	0.000	55
CPFE3	-1.112	0.911	31	-2.995	0.151	29	-9.898	0.000	17	-1.963	0.581	18	-4.342	0.016	17
CPLE6	-5.051	0.001	56	-6.472	0.000	52	-6.559	0.000	51	-2.234	0.462	56	-7.295	0.000	55
CRUZ3	-5.824	0.000	56	-12.856	0.000	55	-10.716	0.000	54	-1.698	0.739	55	-7.112	0.000	55
CSMG3	-5.637	0.001	24	-6.693	0.000	22	-5.378	0.009	10	-1.245	0.850	12	-4.449	0.029	10
CSNA3	-9.236	0.000	56	-10.010	0.000	54	-7.899	0.000	50	2.759	1.000	46	-8.111	0.000	55
CYRE3	-5.721	0.000	50	-4.638	0.003	42	-11.275	0.000	48	-2.709	0.238	46	-6.348	0.000	48
DASA3	-3.990	0.027	20	-5.846	0.001	19	-3.482	0.076	16	-1.918	0.602	17	-5.322	0.004	15
DURA4	-3.824	0.022	56	-10.519	0.000	55	-8.793	0.000	54	-2.706	0.239	55	-7.471	0.000	55
ELET3	-7.858	0.000	56	-7.045	0.000	53	-12.059	0.000	55	-3.430	0.058	56	-8.763	0.000	55
ELPL6	-5.379	0.000	44	-6.079	0.000	40	-6.685	0.000	41	-2.149	0.505	44	-4.962	0.001	43
EMBR3	-5.153	0.001	56	-7.654	0.000	53	-3.641	0.036	53	-1.253	0.889	56	-8.648	0.000	55
ETER3	-4.386	0.005	56	-11.576	0.000	55	-2.779	0.214	36	-2.111	0.529	56	-6.805	0.000	55
FFTL4	-4.727	0.002	48	-11.182	0.000	54	-3.437	0.058	52	1.660	1.000	47	-6.965	0.000	55
GETI4	-6.041	0.000	38	-5.058	0.001	34	-4.052	0.018	29	-1.644	0.756	37	-8.026	0.000	37
GFSA3	-5.303	0.001	41	-9.274	0.000	40	-3.515	0.089	11	-1.078	0.888	12	-4.709	0.017	11
GGBR4	-2.047	0.563	54	-9.241	0.000	54	-5.140	0.001	45	-2.170	0.496	52	-6.760	0.000	55
GOAU4	-1.700	0.738	54	-8.414	0.000	54	-11.068	0.000	55	-2.419	0.366	52	-6.017	0.000	55
GOLL4	-2.831	0.204	19	-2.758	0.228	18	-4.733	0.008	17	-1.131	0.896	19	-5.758	0.001	18
IDNT3	-5.549	0.000	35	-10.422	0.000	34	-5.182	0.001	31	-3.986	0.019	34	-5.155	0.001	34
ITSA4	-7.497	0.000	56	-7.739	0.000	48	-7.013	0.000	53	-1.504	0.817	56	-7.533	0.000	55
ITUB4	-7.977	0.000	56	-15.243	0.000	55	-10.198	0.000	55	-1.622	0.772	56	-8.336	0.000	55
KEPL3	-5.199	0.000	56	-12.363	0.000	55	-5.976	0.000	24	-1.694	0.724	25	-4.941	0.003	24
KLBN4	-7.367	0.000	56	-13.961	0.000	55	-12.462	0.000	53	-2.738	0.226	53	-5.715	0.000	55
LAME4	-8.140	0.000	56	-9.246	0.000	53	-10.743	0.000	52	-2.473	0.340	55	-5.843	0.000	55
LIGT3	-3.755	0.027	56	-9.040	0.000	55	-5.605	0.000	47	-2.302	0.426	56	-6.366	0.000	55
LREN3	-2.463	0.345	53	-8.627	0.000	53	-7.791	0.000	42	-3.294	0.082	40	-5.371	0.000	44
NATU3	-5.481	0.001	20	-6.935	0.000	17	-6.017	0.001	16	-1.928	0.601	19	-4.562	0.010	18
NETC4	-3.868	0.021	51	-7.057	0.000	49	-9.048	0.000	41	-5.572	0.000	32	-5.420	0.000	45
PCAR5	-5.707	0.000	56	-7.974	0.000	53	-6.979	0.000	50	-3.480	0.052	53	-8.108	0.000	52
PETR4	-5.082	0.001	56	-9.771	0.000	55	-14.209	0.000	55	0.377	0.999	46	-7.084	0.000	55
PLAS3	-4.382	0.005	56	-8.334	0.000	54	-2.523	0.316	40	-2.912	0.168	48	-7.358	0.000	55
POMO4	-5.991	0.000	55	-8.282	0.000	53	-6.477	0.000	52	3.611	1.000	46	-3.854	0.022	50
PRGA3	-1.888	0.648	56	-7.829	0.000	55	-10.988	0.000	55	-1.764	0.709	56	-6.933	0.000	55
PSSA3	-4.918	0.001	45	-7.548	0.000	43	-4.836	0.008	15	-0.324	0.982	17	-3.724	0.051	16
RAPT4	-3.136	0.108	56	-8.878	0.000	55	-8.983	0.000	55	0.602	0.999	47	-6.269	0.000	55
RSID3	-4.233	0.008	48	-9.162	0.000	47	-7.624	0.000	43	-2.181	0.488	42	-5.756	0.000	42
SBSP3	-6.542	0.000	52	-7.979	0.000	49	-6.897	0.000	46	-3.341	0.072	46	-6.328	0.000	48
SDIA4	-9.082	0.000	55	-1.498	0.816	45	-8.855	0.000	53	-2.402	0.375	55	-5.742	0.000	55
SUZB5	-5.267	0.000	56	-8.489	0.000	54	-12.712	0.000	55	-3.942	0.017	53	-5.328	0.000	55
TAMM4	-5.697	0.000	44	-10.261	0.000	43	-4.751	0.004	27	-0.698	0.964	30	-3.658	0.043	28
TBLE3	-6.548	0.000	44	-7.884	0.000	41	-5.220	0.001	34	-1.888	0.643	43	-8.224	0.000	42
TCSL4	-4.560	0.004	44	-7.185	0.000	42	-7.119	0.000	40	-1.960	0.606	42	-5.922	0.000	41
TELB4	-13.862	0.000	42	-8.571	0.000	40	-0.952	0.931	22	-4.310	0.007	42	-6.640	0.000	40
TLPP4	-5.784	0.000	56	-8.839	0.000	53	-8.346	0.000	53	-1.909	0.637	56	-8.262	0.000	54
TMAR5	-5.455	0.000	56	-8.661	0.000	54	-10.752	0.000	49	-2.016	0.580	56	-7.342	0.000	55
TMCP4	-7.491	0.000	44	-5.818	0.000	40	-6.538	0.000	39	-3.226	0.093	42	-6.103	0.000	41
TNLP4	-4.981	0.001	44	-10.947	0.000	43	-6.294	0.000	39	-3.489	0.054	42	-7.860	0.000	41
TRPL4	-7.075	0.000	40	-8.172	0.000	38	-6.761	0.000	36	0.559	0.999	33	-6.018	0.000	37
UGPA4	-3.725	0.032	40	-7.406	0.000	39	-5.750	0.000	33	-3.888	0.024	34	-5.582	0.000	36
UNIP6	-3.294	0.078	56	-7.501	0.000	54	-2.476	0.338	42	-1.339	0.868	56	-6.059	0.000	55
USIM5	-4.228	0.008	56	-10.302	0.000	55	-4.323	0.007	45	0.203	0.997	46	-7.003	0.000	55
VALE5	-0.550	0.978	52	-8.976	0.000	52	-7.557	0.000	54	4.120	1.000	47	-6.372	0.000	55
VCPA4	-5.823	0.000	55	-9.403	0.000	54	-7.288	0.000	54	-3.242	0.088	53	-4.459	0.004	55
VIVO4	-1.939	0.617	43	-14.189	0.000	43	-17.205	0.000	41	-2.950	0.159	40	-6.478	0.000	41
WEGE3	-4.202	0.008	56	-3.412	0.061	52	-7.589	0.000	53	4.276	1.000	46	-6.894	0.000	55

According to the results of the unit root test presented in Table 2, it is possible to assume that, in general analysis, EPSVAR, SEPS and RET for all companies do not have a unit root at level since the null hypothesis of a unit root was rejected at 5% level. Hence, it is possible to assume that these two variables are *I(0)*, meaning that they are stationary at level for all companies.

On the other hand, it is not possible to reject the null hypothesis of a unit root for the variables EPS and P. In these cases the variables have a unit root at level which suggests that the variables are *I(1)* or, non-stationary at level. However, these variables present firm-observations that are considered stationary. This means that for some companies the variables are stationary and must be treated statistically different.

2.3.2 Firm-specific, Box-Jenkins identified models

According to Collins and Kothari (1989) earnings persistence is typically measured by estimating an ARIMA time-series earnings process [e.g., Kormendi and Lipe (1987)]. If earnings follow an IMA(l,1) process, earnings expectations for all future periods will be revised by $(1-\theta)a_t$, where $a_t = X_t - E_{t-1}(X)$ and θ is the moving average process parameter. Thus, revisions in earnings expectations are an increasing function of (1 - θ), the persistence of an IMA(l, 1) process. Because dividends are assumed to be expressed as a positive fraction of earnings, greater persistence will lead to larger revisions in dividend expectations and the earnings response coefficient will be larger.

In order to analyse the time-series behaviour of accounting earnings, Table 3 presents the individual and cross-sectional autocorrelation (means and standard deviations) of the earnings per share up to a lag of 12.

By analysing the autocorrelation, it is possible to infer about the dependence of a specific EPS and its previous values. In this context, this analysis can provide some evidence of seasonal behaviour. Seasonal differences involve four periods (quarters) per seasonal cycle. If the time series process implicit in Fosters' (1977) Model 1 ($E(Q_t) = Q_{t-4}$) or Model 3 ($E(Q_t) = Q_{t-1}$) are valid in Brazil, autocorrelations would be significant in four and one lag, respectively.

Table 3 – Earnings time-series properties: autocorrelations by firm and cross-sectional sample

Firm	Lags											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Cross-sectional sample Autocorrelation (ALL FIRMS)												
MEAN	0.426	0.322	0.255	0.269	0.202	0.170	0.151	0.160	0.082	0.071	0.058	0.066
MAXIMUM	0.927	0.890	0.847	0.795	0.734	0.684	0.632	0.575	0.522	0.489	0.468	0.394
MINIMUM	-0.137	-0.212	-0.211	-0.105	-0.168	-0.253	-0.254	-0.246	-0.292	-0.256	-0.204	-0.399
STD. DEVIATION	0.269	0.265	0.268	0.242	0.225	0.223	0.201	0.185	0.190	0.164	0.153	0.164
LARGE COMPANIES												
MEAN	0.470	0.369	0.320	0.320	0.256	0.229	0.219	0.207	0.151	0.118	0.099	0.115
MAXIMUM	0.870	0.813	0.714	0.693	0.608	0.557	0.525	0.512	0.522	0.489	0.468	0.394
MINIMUM	-0.074	-0.040	-0.143	-0.102	-0.066	-0.033	-0.036	-0.054	-0.225	-0.223	-0.179	-0.399
STD. DEVIATION	0.267	0.257	0.254	0.243	0.231	0.211	0.191	0.192	0.200	0.169	0.165	0.174
MIDIUM COMPANIES												
MEAN	0.364	0.209	0.160	0.169	0.123	0.079	0.063	0.091	0.007	-0.025	-0.023	-0.020
MAXIMUM	0.919	0.869	0.773	0.703	0.610	0.522	0.424	0.318	0.213	0.180	0.152	0.170
MINIMUM	-0.137	-0.212	-0.211	-0.105	-0.128	-0.253	-0.254	-0.246	-0.278	-0.256	-0.204	-0.352
STD. DEVIATION	0.241	0.257	0.246	0.217	0.180	0.197	0.169	0.154	0.135	0.117	0.112	0.136
SMALL COMPANIES												
MEAN	0.448	0.390	0.289	0.320	0.230	0.205	0.174	0.185	0.091	0.123	0.099	0.106
MAXIMUM	0.927	0.890	0.847	0.795	0.734	0.684	0.632	0.575	0.520	0.472	0.421	0.377
MINIMUM	-0.072	-0.040	-0.131	-0.066	-0.168	-0.133	-0.112	-0.126	-0.292	-0.104	-0.107	-0.166
STD. DEVIATION	0.295	0.252	0.285	0.242	0.245	0.238	0.216	0.193	0.206	0.163	0.150	0.150

Quarterly time-series autocorrelation in earnings per share (EPS) variable. All Firms includes the 71 cross-sectional companies. Large, Medium and Small companies is classified according to total assets in December 2008.

As expected, Table 3 shows that the levels of quarterly earnings are highly correlated over time (r_1 = 0.426 for the general mean). Evidences of high autocorrelations suggest non-stationary behaviour while low autocorrelations suggest the stationary condition in level. An important point to be highlighted is that, with the application of Foster’s model, strong evidence of seasonality in quarter-earnings in fourth and eighth lags for the cross-sectional sample (r_4 = 2,69 and r_8 = 1,16) was found. This seasonality suggests that Foster’s models 3 and 4 may be misspecified for many firms.

Table 3, also reports important insights regarding earnings persistence and seasonality when controlled by size; the first evidence is that larger companies seem to have higher autocorrelation then medium and small companies. However, this tendency is not corroborate when medium and small companies are compared: maybe for some bias in the sample, but medium firms are significantly less autocorrelated then small (or large) companies. The second evidence is that large firms seem to present lower seasonal changes then medium and small companies (see mean correlation changes from third and fourth lags). On the other hand, small companies present higher seasonal changes in earnings, since the fourth and eighth lags autocorrelation values increase significantly more than medium and large firms.

Appendix 2 reports autocorrelations for individual companies where it is possible to see, besides other things, that some companies report autocorrelation higher than 0.9 in the first lag (CPFE3, RAPT4 and WEGE3) and some companies show negative autocorrelations in the first lags what is puzzling and demand and detailed analysis.

In a user-friendly presentation, Figures 2 and 3 show the mean autocorrelation and the mean partial autocorrelation, respectively for each of the 12 period lags.

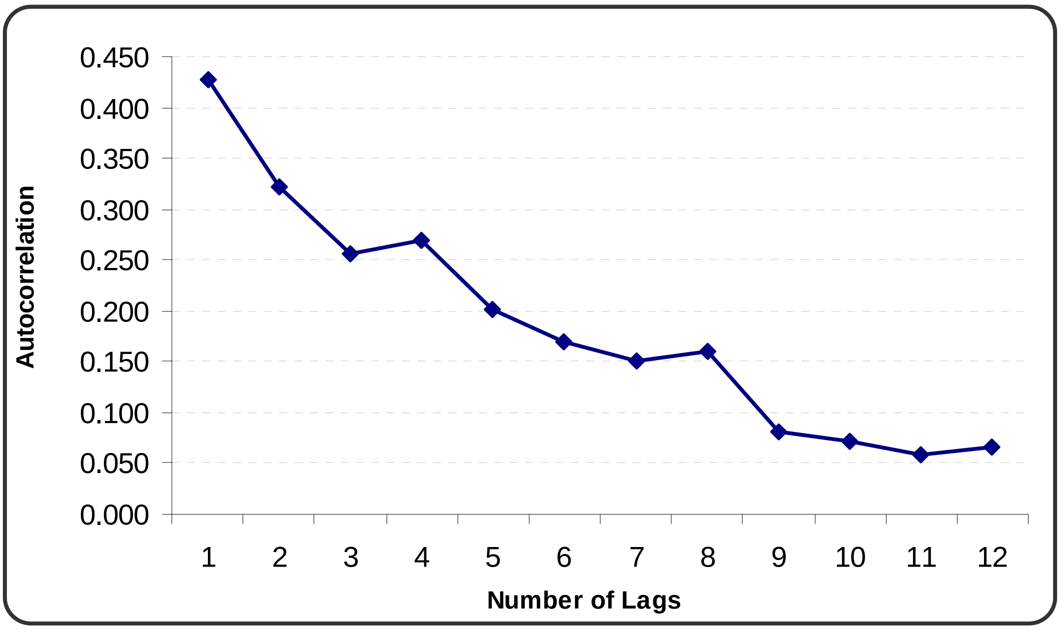

Figure 2 - Cross-sectional sample autocorrelation for 1 to 12 lags

Figure 2 easily shows the two high points in lags four and eight, it is evident the tendency of seasonal behaviour of accounting earnings in Brazil. Also in the 12th lag it is possible to see a small increase in the autocorrelation. It is important to clarify that this is a cross-sectional sample, and, undoubtedly, seasonality is higher for some companies than for others.

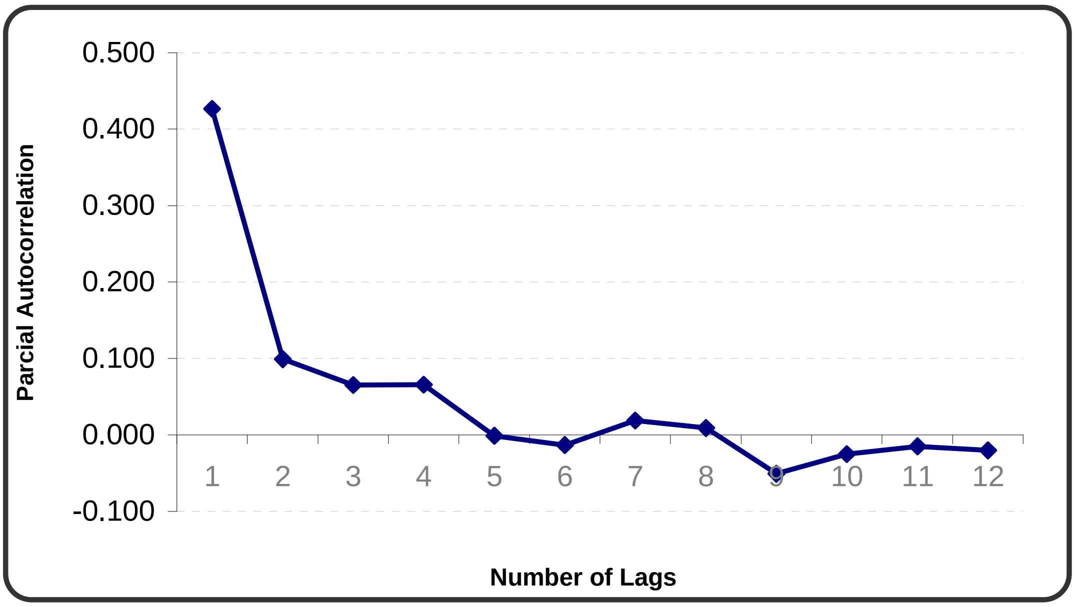

Figure 3 - Cross-sectional sample partial autocorrelation for one to 12 lags

In Figure 3, it is possible to verify that the first lag presents a high value of partial autocorrelation that decrease abruptly in the second lag, which suggests once again the usage of an autoregressive model (AR). It is also possible to verify that the fourth lag also presents a small increase in comparison to the third lag. In the ninth lag another sudden decrease is presented and, after this, a stable behaviour after the tenth lag is shown.

2.3.3 Test for cointegration: accounting earnings x stock prices

In most cases, if two variables are I(1) (non-stationary), they are linearly combined. Therefore, the combination will also be I(1). If variables with differing orders of integration are combined, the combination will have an order of integration that is equal to the largest variable.

According to Engle and Granger (1987), if we let w_t be a k x 1 vector of variables, then the components of w_t are integrated of order (d,b) if:

(1) all components of w_t are I(d), and

(2) There is at least one vector of coefficients α such that:

$$\alpha' w_t \sim I(d-b)$$

According to Brooks (2008 p. 336), "in practice, many financial variables contain one unit root, and are thus I(1) […]. In this context, a set of variable is defined as cointegrated if their linear combination is stationary". Many times series are non-stationary but 'move together' over time – that is, there is some influence on the series, which implies that the two series are bound by some relationship in the long run.

A cointegrating relationship may also be seen as long-term or equilibrium phenomenon, since it is possible that cointegrating variables may deviate from their relationship in short run, but their association would return in the long run.

In this dissertation, the Johansen (1991; 1995) technique for testing and estimating cointegrating system is applied. There are two test statistics, the trace λ_{trace} and the maximum eigenvalue $\lambda_{\max}$, for cointegration under the Johansen approach, which are formulated as

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{g} \ln(1-\hat{\lambda}_i)$$

and

$$\lambda_{\max}(r, r+1) = -T\ln(1-\hat{\lambda}_{r+1})$$

where r is the number of cointegration vectors under null hypothesis, and $\hat{\lambda}_i$ is the estimated value for the *i*th ordered eigenvalue from the Π matrix and *T* is the number of observations in the series. Intuitively, the larger is $\hat{\lambda}_i$, the more large and negative will be $\ln(1-\hat{\lambda}_i)$ and hence the larger will be the test statistic. Each eigenvalue will be associated with a different cointegrating vector, which will be eingenvectors. A significantly non-zero eigenvalue indicates a significant cointegration vector (BROOKS, 2008, p.351)

The trace test (λ_{trace}) is a joint test where the hypothesis test is defined as follow:

> Ho — The number of cointegrating vectors is less than or equal to *r*
> H_1 — There are more than *r*

The maximum eigenvalue test ($\lambda_{\max}$) conducts separate tests on each eigenvalue in which the hypothesis test is defined as follows:

> Ho — The number of cointegrating vectors is iqual to *r*
> H_1 — The number of cointegrating vectors is more than *r*+1.

The cointegration test was applied to 9 companies that presented both variables (earnings per share and stock prices) as non-stationary, in order to identify the long memory relationship between accounting earnings and stock prices in the Brazilian market. Table 4 shows the cointegration results for the companies:

Table 4 - Cointegration test for the non-stationary company variables (earnings per share and stock prices)

COINTEGRATION TEST (*)											
		Trace Statistic (1)		**Maximun Eigenvalue (1)**				**Trace Statistic (1)**		**Maximun Eigenvalue (1)**	
Company		**r = 0**	**r < 1**	**r = 0**	**r < 1**	**Company**		**r = 0**	**r < 1**	**r = 0**	**r < 1**
ARCZ6	Statistic	61.278	1.427	59.850	1.427	GOLL4	Statistic	16.617	2.033	14.585	2.033
	Prob.	0.000	0.232	0.000	0.232		Prob.	0.034	0.154	0.045	0.154
BRSR6	Statistic	22.076	1.701	20.376	1.701	LREN3	Statistic	11.513	1.212	10.301	1.212
	Prob.	0.004	0.192	0.005	0.192		Prob. (3)	0.182	0.271	0.193	0.271
CPFE3	Statistic	15.594	5.531	10.063	5.531	VALE5	Statistic	38.203	1.119	37.085	1.119
	Prob.	0.048	0.019	0.208	0.019		Prob.	0.000	0.290	0.000	0.290
GGBR4 (2)	Statistic	21.134	2.544	18.590	2.544	VIVO4 (2)	Statistic	23.657	6.216	17.442	6.216
	Prob.	0.020	0.111	0.031	0.111		Prob.	0.008	0.013	0.045	0.013
GOAU4 (2)	Statistic	18.522	2.151	16.372	2.151						
	Prob.	0.048	0.143	0.065	0.143						

** Johansen Cointegration Test*

(1) Considering Linear Deterministic Trend Assumption except when mentioned. Critical values: 15,495 and 14,265 for trace and maximum eigenvalue statistics respectively

(2) Considering Quadratic Deterministic Trend Assumption. Critical values: 18,398 and 17,148 for trace and maximum eigenvalue statistics respectively

(3) Cointegration vectors were not find at 0,05 or 0,10 significance level

In order to illustrate the results obtained in Table 4, the series of graphics in Figure 4 shows the intertemporal behaviour of EPS and P for companies VALE5 and GGBR4 that present cointegration vectors and for LREN3 that does not evidence a long-term relationship.

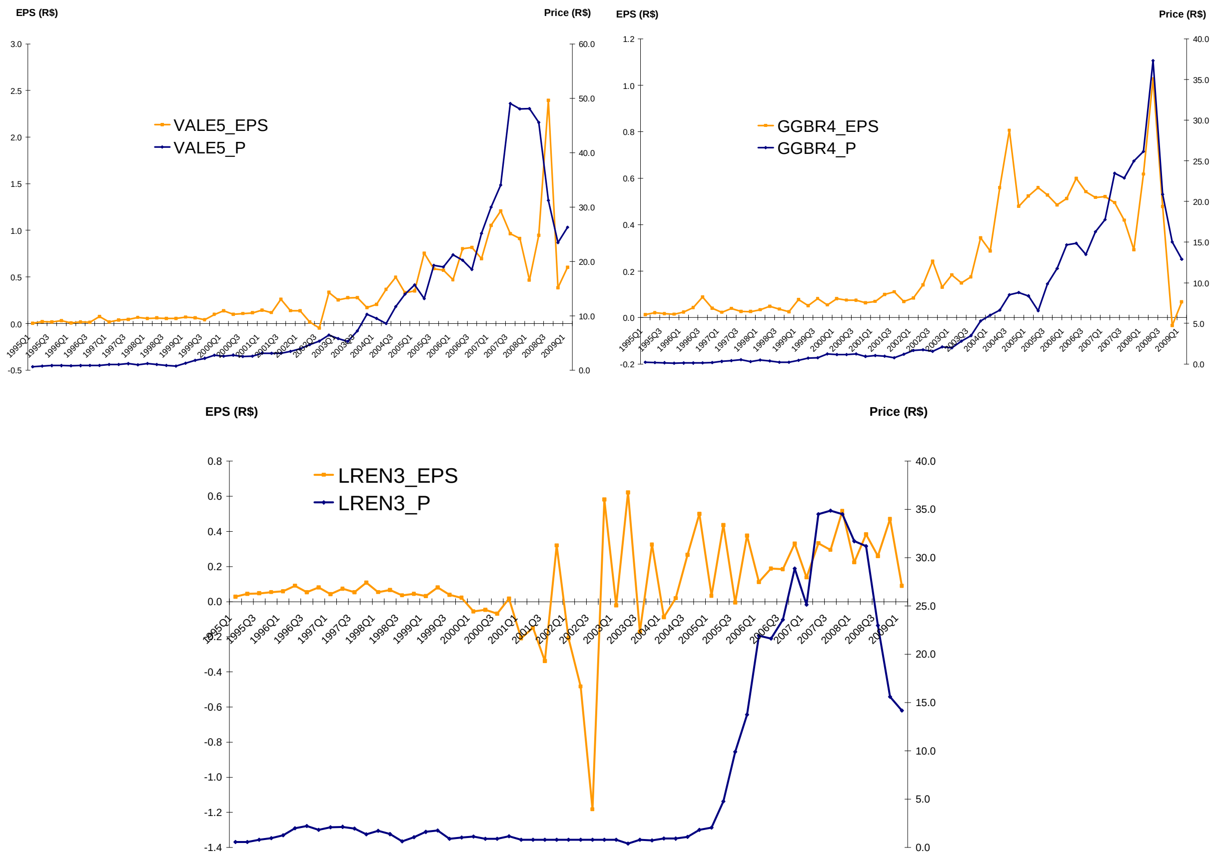

Figure 4 - EPS and Price time-series for some companies with cointegration and for LREN3

2.3.4 Test for causality

According to Gujarati (2004), “although regression analysis deals with the dependence of one variable on other variables, it does not necessarily imply causation. In other words, the existence of a relationship between variables does not prove causality or the direction of influence”. This means that a correlation does not necessarily imply causation in any meaningful sense of the word.

Granger's (1969) approach to the question of whether *x* causes *y* is to see how much of the current *y* can be explained by past values of *y* and then to see whether adding lagged values can improve the explanation. *y* is said to be Granger-caused by *x* if *x* helps in the prediction of *y*, or equivalently if the coefficients on the lagged *x*'s are statistically significant. Two-way causation is frequently the case such that, *x* Granger causes *y* and *y* Granger causes *x*.

It is important to note that the statement "*x* Granger causes *y*" does not imply that *y* is the effect or the result of *x*. Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term.

The basic approach (for stationary variables) for the Granger causality test is based on the run of the following bivariate regressions of the form:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_l y_{t-l} + \beta_1 x_{t-1} + \ldots + \beta_l x_{t-l} + \varepsilon_t$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \ldots + \alpha_l x_{t-l} + \beta_1 y_{t-1} + \ldots + y_l x_{t-l} + u_t$$

for all possible pairs of (*x*,*y*) series in the group. The reported F-statistics are the Wald statistics for the joint hypothesis:

$$\beta_1 = \beta_1 = \ldots = \beta_l = 0$$

for each equation. The null hypothesis is that *x* does not Granger-cause *y* in the first regression and that *y* does not Granger-cause *x* in the second regression.

According to Gujarti (2004 p. 698), since the Granger Causality Test tests for the lagged relations between two variables, it must be assumed that the variables are stationary. However, in the case of non-stationarity conditions but cointegration between the variables, the tests can also be used with a correction term and, in case of non-stationarity and absence of cointegration, the test can be applied using the first difference of the variables. In this study, the first difference of EPS is the variation between *t* and *t–1* that is already defined as EPSVAR and the first difference of stock price can be expressed here as the stock return.

Base on this consideration, the causality between accounting earnings and stock returns was tested using two different, but complementary, functional forms. The first analysis was of the Granger Causation between price and earnings per share for the group of variables considered non-stationary but cointegrated. The second analysis was of the Granger Causation for the variation of EPS and the stock returns for all companies, since stationary conditions were verified in both.

2.3.4.1 Accounting earnings and stock prices causality

The Granger Causality test applied in this analysis used two lags. However three and four lags were also applied randomly for some companies and the results were consistent for two, three and four lags. Table 5 shows the results of the Granger Causality test between earnings per share and stock prices. It is possible to observe that there is no conclusive empirical evidence regarding the causality between the variables for all of companies; however, the number of companies with Granger Causes in the direction of price to earnings is greater than the number of companies with earnings to price relations.

One can suggests that the stock prices anticipate EPS values with two lags (or two quarters). Therefore, it is possible to say that prices and EPS are Granger Caused, meaning that an increase in prices reflects a future increase in nominal EPS. Other information that can be extracted from the test is that, in most cases, companies with Granger Causation relations are those with the greatest market capitalization. That suggests that, the bigger the company is in terms of market capitalization, the higher the capacity to anticipate variation in accounting earnings (it is implicit that the bigger the company is, the higher is the annalists coverage). However, the present study is not properly built to provide a robust conclusion to that question.

Table 5 - Pairwise Granger Causality Test for EPS and Stock Price

Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.	TEST RESULT
ARCZ6_EPS does not Granger Cause ARCZ6_P	**54**	**5.745**	**0.006**	**Granger Causality****
ARCZ6_P does not Granger Cause ARCZ6_EPS		**2.535**	**0.090**	**Granger Causality***
BRSR6_EPS does not Granger Cause BRSR6_P	52	0.115	0.892	No Causality
BRSR6_P does not Granger Cause BRSR6_EPS		0.537	0.588	No Causality
CPFE3_EPS does not Granger Cause CPFE3_P	16	1.942	0.190	No Causality
CPFE3_P does not Granger Cause CPFE3_EPS		0.297	0.749	No Causality
GGBR4_EPS does not Granger Cause GGBR4_P	54	0.333	0.719	No Causality
GGBR4_P does not Granger Cause GGBR4_EPS		0.623	0.541	No Causality
GOAU4_EPS does not Granger Cause GOAU4_P	54	1.471	0.240	No Causality
GOAU4_P does not Granger Cause GOAU4_EPS		0.046	0.955	No Causality
GOLL4_EPS does not Granger Cause GOLL4_P	17	1.477	0.267	No Causality
GOLL4_P does not Granger Cause GOLL4_EPS		**3.727**	**0.055**	**Granger Causality***
LREN3_EPS does not Granger Cause LREN3_P	43	0.028	0.972	No Causality
LREN3_P does not Granger Cause LREN3_EPS		**2.990**	**0.062**	**Granger Causality***
VALE5_EPS does not Granger Cause VALE5_P	**54**	**13.152**	**0.000**	**Granger Causality****
VALE5_P does not Granger Cause VALE5_EPS		**21.689**	**0.000**	**Granger Causality****
VIVO4_EPS does not Granger Cause VIVO4_P	40	0.818	0.449	No Causality
VIVO4_P does not Granger Cause VIVO4_EPS		**4.087**	**0.025**	**Granger Causality****

Results presented for two lags. Similar results were found for three and four lags.
*** Granger Causality significant at 0,05 level.*
**Granger Causality significant at 0,10 level.*

2.3.4.2 Accounting earnings variation and stock returns causality

Table 6 shows the results for the Granger Causality test between earns per share variation and stock returns. Few companies show Granger Causality between EPS variation and stock returns, which can suggest that returns are defined by other variables rather than accounting information. Differently from prices and EPS cointegrated causality (where an increase in prices reflects a future increase in EPS), it is not possible to infer that increases in EPS are anticipated by an abnormal returns (abnormal returns here means unexpected returns given a accounting earnings variation).

In addition, any relation between companies' results and companies' size can not be clearly verified. Although, TMAR5, TLPP4, TBLE3, ITUB4, GGBR4, CMIG4 and BBAS3 are considered big companies in terms of market capitalization, many other big companies did not present any relations. On top of that, ARCZ6, CYRE3, ELPL6, GETI4 and LIGT3 are considered to be medium companies and BRSR6 , DURA4, IDNT3, SDIA4 and ETER3 are considered to be small companies presented Granger Causality.

Table 6 - Pairwise Granger Causality Test for EPS Variation and Stock Returns

Pairwise Granger Causality Tests

Null Hypothesis:	Lag	Obs	F-Statistic	Prob.	TEST RESULT
ALLL11_RET does not Granger Cause ALLL11_LPAVAR	2	14	2,1828	0,1687	No Causality
ALLL11_LPAVAR does not Granger Cause ALLL11_RET			1,1369	0,3629	No Causality
AMBV4_RET does not Granger Cause AMBV4_LPAVAR	5	51	3,9164	0,0055	Causa Granger***
AMBV4_LPAVAR does not Granger Cause AMBV4_RET			0,8303	0,5359	No Causality
ARCZ6_RET does not Granger Cause ARCZ6_LPAVAR	2	54	4,1701	0,0213	Causa Granger**
ARCZ6_LPAVAR does not Granger Cause ARCZ6_RET			0,4326	0,6513	No Causality
BBAS3_RET does not Granger Cause BBAS3_LPAVAR	2	54	2,3783	0,1033	No Causality
BBAS3_LPAVAR does not Granger Cause BBAS3_RET			0,6709	0,5159	No Causality
BBDC4_RET does not Granger Cause BBDC4_LPAVAR	2	54	0,7618	0,4723	No Causality
BBDC4_LPAVAR does not Granger Cause BBDC4_RET			0,8162	0,4480	No Causality
BRAP4_RET does not Granger Cause BRAP4_LPAVAR	8	26	6,0815	0,0070	Causa Granger***
BRAP4_LPAVAR does not Granger Cause BRAP4_RET			0,3428	0,9267	No Causality
BRKM5_RET does not Granger Cause BRKM5_LPAVAR	4	52	1,9285	0,1230	No Causality
BRKM5_LPAVAR does not Granger Cause BRKM5_RET			3,9936	0,0077	Causa Granger***
BRSR6_RET does not Granger Cause BRSR6_LPAVAR	3	51	0,4753	0,7011	No Causality
BRSR6_LPAVAR does not Granger Cause BRSR6_RET			1,4566	0,0000	Causa Granger***
BRTO4_RET does not Granger Cause BRTO4_LPAVAR	4	52	0,6995	0,5965	No Causality
BRTO4_LPAVAR does not Granger Cause BRTO4_RET			0,3989	0,8083	No Causality
BRTP3_RET does not Granger Cause BRTP3_LPAVAR	2	39	2,2986	0,1158	No Causality
BRTP3_LPAVAR does not Granger Cause BRTP3_RET			3,3630	0,0465	Causa Granger**
CCRO3_RET does not Granger Cause CCRO3_LPAVAR	2	26	9,7322	0,0010	Causa Granger***
CCRO3_LPAVAR does not Granger Cause CCRO3_RET			0,1759	0,8400	No Causality
CESP6_RET does not Granger Cause CESP6_LPAVAR	2	54	3,2832	0,0459	Causa Granger**
CESP6_LPAVAR does not Granger Cause CESP6_RET			0,5245	0,5951	No Causality
CGAS5_RET does not Granger Cause CGAS5_LPAVAR	6	40	0,3378	0,9108	No Causality
CGAS5_LPAVAR does not Granger Cause CGAS5_RET			2,5075	0,0465	Causa Granger**
CLSC6_RET does not Granger Cause CLSC6_LPAVAR	2	52	1,0956	0,3709	No Causality
CLSC6_LPAVAR does not Granger Cause CLSC6_RET			1,2073	0,3216	No Causality
CMIG4_RET does not Granger Cause CMIG4_LPAVAR	4	52	0,1115	0,9778	No Causality
CMIG4_LPAVAR does not Granger Cause CMIG4_RET			2,4734	0,0585	Causa Granger*
CNFB4_RET does not Granger Cause CNFB4_LPAVAR	3	53	4,0857	0,0118	Causa Granger**
CNFB4_LPAVAR does not Granger Cause CNFB4_RET			5,1446	0,0038	Causa Granger***
CPFE3_RET does not Granger Cause CPFE3_LPAVAR	4	14	0,8929	0,5306	No Causality
CPFE3_LPAVAR does not Granger Cause CPFE3_RET			5,3670	0,0470	Causa Granger**
CPLE6_RET does not Granger Cause CPLE6_LPAVAR	2	54	0,5108	0,6032	No Causality
CPLE6_LPAVAR does not Granger Cause CPLE6_RET			2,8546	0,0672	Causa Granger*
CRUZ3_RET does not Granger Cause CRUZ3_LPAVAR	3	53	1,4573	0,2386	No Causality
CRUZ3_LPAVAR does not Granger Cause CRUZ3_RET			1,0113	0,0000	Causa Granger***
CSMG3_RET does not Granger Cause CSMG3_LPAVAR	3	9	0,1792	0,9025	No Causality
CSMG3_LPAVAR does not Granger Cause CSMG3_RET			1,2111	0,0772	Causa Granger*
CSNA3_RET does not Granger Cause CSNA3_LPAVAR	4	52	1,2570	0,3016	No Causality
CSNA3_LPAVAR does not Granger Cause CSNA3_RET			0,8112	0,5250	No Causality
CYRE3_RET does not Granger Cause CYRE3_LPAVAR	2	47	0,1326	0,8761	No Causality
CYRE3_LPAVAR does not Granger Cause CYRE3_RET			2,7310	0,0767	Causa Granger*
DASA3_RET does not Granger Cause DASA3_LPAVAR	2	15	1,9178	0,1972	No Causality
DASA3_LPAVAR does not Granger Cause DASA3_RET			0,0083	0,9918	No Causality
DURA4_RET does not Granger Cause DURA4_LPAVAR	2	54	6,3439	0,0035	Causa Granger***
DURA4_LPAVAR does not Granger Cause DURA4_RET			0,2374	0,7896	No Causality
ELET3_RET does not Granger Cause ELET3_LPAVAR	2	54	5,9197	0,0050	Causa Granger***
ELET3_LPAVAR does not Granger Cause ELET3_RET			3,3779	0,0422	Causa Granger**
ELPL6_RET does not Granger Cause ELPL6_LPAVAR	3	41	3,4578	0,0270	Causa Granger**
ELPL6_LPAVAR does not Granger Cause ELPL6_RET			1,9344	0,1426	No Causality
EMBR3_RET does not Granger Cause EMBR3_LPAVAR	3	53	4,3233	0,0091	Causa Granger***
EMBR3_LPAVAR does not Granger Cause EMBR3_RET			1,1475	0,3400	No Causality
ETER3_RET does not Granger Cause ETER3_LPAVAR	2	54	4,5099	0,0159	Causa Granger**
ETER3_LPAVAR does not Granger Cause ETER3_RET			0,6577	0,5226	No Causality
FFTL4_RET does not Granger Cause FFTL4_LPAVAR	2	54	0,9658	0,3878	No Causality
FFTL4_LPAVAR does not Granger Cause FFTL4_RET			1,2743	0,2887	No Causality
GETI4_RET does not Granger Cause GETI4_LPAVAR	2	36	4,7443	0,0159	Causa Granger**
GETI4_LPAVAR does not Granger Cause GETI4_RET			0,1289	0,8795	No Causality
GFSA3_RET does not Granger Cause GFSA3_LPAVAR	2	10	2,2560	0,2003	No Causality
GFSA3_LPAVAR does not Granger Cause GFSA3_RET			0,6011	0,5835	No Causality
GGBR4_RET does not Granger Cause GGBR4_LPAVAR	2	54	0,5561	0,5770	No Causality
GGBR4_LPAVAR does not Granger Cause GGBR4_RET			0,0337	0,9669	No Causality
GOAU4_RET does not Granger Cause GOAU4_LPAVAR	2	54	2,5316	0,0899	Causa Granger*
GOAU4_LPAVAR does not Granger Cause GOAU4_RET			4,8724	0,0118	Causa Granger**
GOLL4_RET does not Granger Cause GOLL4_LPAVAR	3	16	4,3289	0,0379	Causa Granger**
GOLL4_LPAVAR does not Granger Cause GOLL4_RET			0,1974	0,8956	No Causality
IDNT3_RET does not Granger Cause IDNT3_LPAVAR	2	33	3,8850	0,0324	Causa Granger**
IDNT3_LPAVAR does not Granger Cause IDNT3_RET			5,7702	0,0080	Causa Granger***
ITSA4_RET does not Granger Cause ITSA4_LPAVAR	3	53	1,0719	0,3703	No Causality
ITSA4_LPAVAR does not Granger Cause ITSA4_RET			3,1671	0,0331	Causa Granger**

Pairwise Granger Causality Tests

Null Hypothesis:	Lag	Obs	F-Statistic	Prob.	TEST RESULT
ITUB4_RET does not Granger Cause ITUB4_LPAVAR	4	52	1,0363	0,3996	No Causality
ITUB4_LPAVAR does not Granger Cause ITUB4_RET			2,5566	0,0522	Causa Granger*
KEPL3_RET does not Granger Cause KEPL3_LPAVAR	6	20	0,5958	0,7276	No Causality
KEPL3_LPAVAR does not Granger Cause KEPL3_RET			4,6874	0,0313	Causa Granger**
KLBN4_RET does not Granger Cause KLBN4_LPAVAR	2	54	0,8255	0,4440	No Causality
KLBN4_LPAVAR does not Granger Cause KLBN4_RET			0,3835	0,6835	No Causality
LAME4_RET does not Granger Cause LAME4_LPAVAR	3	53	4,2760	0,0096	Causa Granger***
LAME4_LPAVAR does not Granger Cause LAME4_RET			0,6177	0,6071	No Causality
LIGT3_RET does not Granger Cause LIGT3_LPAVAR	2	54	1,5521	0,2220	No Causality
LIGT3_LPAVAR does not Granger Cause LIGT3_RET			0,7342	0,4851	No Causality
LREN3_RET does not Granger Cause LREN3_LPAVAR	2	42	0,1417	0,8683	No Causality
LREN3_LPAVAR does not Granger Cause LREN3_RET			0,2669	0,7672	No Causality
NATU3_RET does not Granger Cause NATU3_LPAVAR	2	17	0,0484	0,9529	No Causality
NATU3_LPAVAR does not Granger Cause NATU3_RET			0,5615	0,5847	No Causality
NETC4_RET does not Granger Cause NETC4_LPAVAR	2	43	8,7613	0,0007	Causa Granger***
NETC4_LPAVAR does not Granger Cause NETC4_RET			1,9532	0,1558	No Causality
PCAR5_RET does not Granger Cause PCAR5_LPAVAR	2	51	2,4713	0,0956	Causa Granger*
PCAR5_LPAVAR does not Granger Cause PCAR5_RET			0,1004	0,9046	No Causality
PETR4_RET does not Granger Cause PETR4_LPAVAR	2	54	3,3917	0,0417	Causa Granger**
PETR4_LPAVAR does not Granger Cause PETR4_RET			2,1413	0,1284	No Causality
PLAS3_RET does not Granger Cause PLAS3_LPAVAR	2	50	0,3932	0,6772	No Causality
PLAS3_LPAVAR does not Granger Cause PLAS3_RET			1,1451	0,0001	Causa Granger***
POMO4_RET does not Granger Cause POMO4_LPAVAR	2	54	0,2039	0,8162	No Causality
POMO4_LPAVAR does not Granger Cause POMO4_RET			0,3604	0,6993	No Causality
PRGA3_RET does not Granger Cause PRGA3_LPAVAR	2	54	0,1700	0,8441	No Causality
PRGA3_LPAVAR does not Granger Cause PRGA3_RET			1,5103	0,2310	No Causality
PSSA3_RET does not Granger Cause PSSA3_LPAVAR	2	15	0,0964	0,9090	No Causality
PSSA3_LPAVAR does not Granger Cause PSSA3_RET			0,2446	0,7876	No Causality
RAPT4_RET does not Granger Cause RAPT4_LPAVAR	5	51	3,1519	0,0172	Causa Granger**
RAPT4_LPAVAR does not Granger Cause RAPT4_RET			1,3816	0,2517	No Causality
RSID3_RET does not Granger Cause RSID3_LPAVAR	2	40	1,2674	0,2942	No Causality
RSID3_LPAVAR does not Granger Cause RSID3_RET			1,5087	0,2352	No Causality
SBSP3_RET does not Granger Cause SBSP3_LPAVAR	4	45	0,8876	0,4812	No Causality
SBSP3_LPAVAR does not Granger Cause SBSP3_RET			3,2762	0,0217	Causa Granger**
SDIA4_RET does not Granger Cause SDIA4_LPAVAR	5	51	2,6469	0,0370	Causa Granger**
SDIA4_LPAVAR does not Granger Cause SDIA4_RET			0,8861	0,4994	No Causality
SUZB5_RET does not Granger Cause SUZB5_LPAVAR	3	53	1,2423	0,3053	No Causality
SUZB5_LPAVAR does not Granger Cause SUZB5_RET			2,9544	0,0422	Causa Granger**
TAMM4_RET does not Granger Cause TAMM4_LPAVAR	2	26	0,4903	0,6193	No Causality
TAMM4_LPAVAR does not Granger Cause TAMM4_RET			4,1997	0,0292	Causa Granger**
TBLE3_RET does not Granger Cause TBLE3_LPAVAR	2	41	4,8282	0,0139	Causa Granger**
TBLE3_LPAVAR does not Granger Cause TBLE3_RET			3,2688	0,0496	Causa Granger**
TCSL4_RET does not Granger Cause TCSL4_LPAVAR	2	40	2,1457	0,1321	No Causality
TCSL4_LPAVAR does not Granger Cause TCSL4_RET			0,5507	0,5815	No Causality
TELB4_RET does not Granger Cause TELB4_LPAVAR	5	37	0,0809	0,9946	No Causality
TELB4_LPAVAR does not Granger Cause TELB4_RET			3,8051	0,0102	Causa Granger**
TLPP4_RET does not Granger Cause TLPP4_LPAVAR	2	54	2,1181	0,1311	No Causality
TLPP4_LPAVAR does not Granger Cause TLPP4_RET			4,3704	0,0179	Causa Granger**
TMAR5_RET does not Granger Cause TMAR5_LPAVAR	2	54	5,7429	0,0057	Causa Granger***
TMAR5_LPAVAR does not Granger Cause TMAR5_RET			0,8254	0,4441	No Causality
TMCP4_RET does not Granger Cause TMCP4_LPAVAR	4	38	0,4323	0,7842	No Causality
TMCP4_LPAVAR does not Granger Cause TMCP4_RET			2,5773	0,0584	Causa Granger*
TNLP4_RET does not Granger Cause TNLP4_LPAVAR	3	39	2,6642	0,0646	Causa Granger*
TNLP4_LPAVAR does not Granger Cause TNLP4_RET			0,1601	0,9224	No Causality
TRPL4_RET does not Granger Cause TRPL4_LPAVAR	2	36	0,4496	0,6420	No Causality
TRPL4_LPAVAR does not Granger Cause TRPL4_RET			1,2087	0,3123	No Causality
UGPA4_RET does not Granger Cause UGPA4_LPAVAR	2	35	0,5293	0,5944	No Causality
UGPA4_LPAVAR does not Granger Cause UGPA4_RET			1,4201	0,2575	No Causality
UNIP6_RET does not Granger Cause UNIP6_LPAVAR	8	48	2,7755	0,0194	Causa Granger**
UNIP6_LPAVAR does not Granger Cause UNIP6_RET			0,6469	0,7325	No Causality
USIM5_RET does not Granger Cause USIM5_LPAVAR	2	54	3,0373	0,0571	Causa Granger*
USIM5_LPAVAR does not Granger Cause USIM5_RET			1,3669	0,2645	No Causality
VALE5_RET does not Granger Cause VALE5_LPAVAR	2	54	0,2795	0,7573	No Causality
VALE5_LPAVAR does not Granger Cause VALE5_RET			0,3157	0,7307	No Causality
VCPA4_RET does not Granger Cause VCPA4_LPAVAR	5	51	0,8022	0,5548	No Causality
VCPA4_LPAVAR does not Granger Cause VCPA4_RET			2,0026	0,0991	Causa Granger*
VIVO4_RET does not Granger Cause VIVO4_LPAVAR	2	40	5,7502	0,0069	Causa Granger***
VIVO4_LPAVAR does not Granger Cause VIVO4_RET			0,1176	0,8894	No Causality
WEGE3_RET does not Granger Cause WEGE3_LPAVAR	2	54	0,2365	0,7903	No Causality
WEGE3_LPAVAR does not Granger Cause WEGE3_RET			0,3829	0,6839	No Causality

Results presented for two lags. Similar results were found for three and four lags.
**** Granger Causality significant at 0,01 level.*
*** Granger Causality significant at 0,05 level.*
**Granger Causality significant at 0,10 level.*

Hence, in terms of Granger Causality, a part of the companies presented causality between earnings variation and returns, especially in the stock – earnings direction, meaning that mean stock prices anticipate changes in earnings. However, this evidence was not general for the sample. It is not possible robustly to infer about causality between the variables since a general behaviour was not identified.

Additional tests must be developed in order to test conditional Grager Causality in relation to some firm-specific characteristics. However, the finds of the present study extend, since it test for earnings change and returns, and corroborate the finds of Galdi and Lopes (2008). However, differently from Galdi and Lopes (2008) the non-robust conclusion is justified by the different nature of the relation between price-earnings and return-earnings.

3. ACCOUNTING EARNINGS AND STOCK RETURNS

3.1 Initial Ideas about Accounting Earnings and Stock Returns

Association studies over relatively long periods (fiscal quarters or years) are regressed on unexpected earnings or other performance measures such as cash flows or replacement cost earnings, estimated over a forecast horizon that corresponds roughly with the fiscal period of interest. Association studies recognise that market agents learn about earnings and valuation-relevant events from many non-accounting information sources throughout the period. The focus is on whether the earnings determination process captures, in a meaningful and in a timely fashion, the valuation-relevant events.

Easton, Harris and Ohlson (1992) showed (by aggregating earnings and investment outcomes over periods of up to ten years) that, over long intervals, the contemporary relation between aggregated earnings and stock prices grows stronger. The return-earnings association over shorter intervals is low because some economic events that cause revisions in the market's expectation about earnings are not captured in current earnings, or some past economic events are reflected in current earnings. Over longer intervals, however, the impact of a greater fraction of economic events is captured by the earnings, thereby yielding a stronger contemporaneous correspondence between longer interval returns and earnings.

Considering the findings of Easton, Harris and Ohlson (1992), and Collins and Kothari (1989), since longer intervals capture a greater fraction of economic events, for financial analysis, the most relevant duration is long-term. According to Ball and Kothari (1994, p.5), "to the financial analyst, the implication is that long-term earnings essentially is the game; earnings essentially is the ultimate source of value created in the firm".

According to Collins and Kothari (1989 p.143), "inferences regarding the information content of earnings are bases on the significance of the slope coefficient (b) and explanatory power (R^2) of the following linear model estimated cross-sectionally and/or over time:

$$CAR_{it} = a + bUX_{it} + e_{it} \qquad (3.1)$$

where CAR_{it} is some measure of risk-adjusted return for security *i* cumulated over period *t*, UX_{it} is a measure of unexpected earnings (appropriately scaled) and e_{it} is a random disturbance assumed to be distributed by N(0, σ_e^2).”

The slope coefficient is the Earning Response Coefficient, where the term “response” does not imply causality, but in a generic sense to measure the degree of co-movement between securities returns shocks to an earnings series, without necessarily implying that the latter causes the former.

Given that, the objectives of this study are: (1) to examine the significance of annual earnings response coefficient accounting earnings series of 61 Brazilian companies over the 1995-2009 period in terms of individual firms and pooled data; (2) to examine the significance of quarterly earnings response coefficient accounting earnings series of 71 Brazilian companies over the March/1995 to Mach/2009 period in terms of individual firms and pooled data; and (3) to test for lags significance in earnings response coefficient relations.

Seminal research studies showing the existence and nature of a relation between earnings and stock prices include: Kormendi and Lipe (1987), Collins and Kothari (1989), Easton, Zmijewski (1989), Easton, Harris and Ohlson (1992), Kothari and Sloan (1992), and Ball, Kothari and Watts (1993).

3.2 Conceptual Framework

The following sections present the conceptual framework relating accounting earnings, returns and valuation models.

3.2.1 A System Representing the Relation between Firm’s Stock Returns and Earnings

Kormendi and Lipe’s (1987) is an early paper on earnings response coefficient. Their study focus explicitly on the link between the time-series properties of earnings (the *b* coefficient in [3.3]) and the magnitude of the return reaction to an earnings innovation a_0 in [3.2]). The authors modelled the study as follows:

Given firm’s stock returns, R_t

$$R_t = \frac{P_1 - P_{t-1} + D_t}{P_{t-1}} \qquad (3.1)$$

where

P_1 is the common stock price at the end of period *t*, and D_t represents the declared dividends per share adjusted for stock splits and stock dividends.

The model of the time-series relation between a given firm's stock returns, R_t, and its earnings, X_t, can be expressed with the following two-equation system, according to Kormendi and Lipe (1987):

Given firm’s earnings X_t

$$R_t = k_1 + a_0 . \frac{UX_t}{P_{t-1}} + UR_t \qquad (3.2)$$

$$\Delta X_t = k_2 + \sum_{i=1}^{N} b_i \Delta X_{t-1} + UX_t \qquad (3.3)$$

where

X_t is the dollar earnings per share announced in period t before extraordinary items and is adjusted for stock splits and stock dividends.

R_t is a given firm's stock returns, and

UR_t and UX_t, are the residuals, that is, the portion of R, and X, respectively, unexplained by the system.

It is assumed that UR_t and UX_t, are independent white-noise processes.

Equation (3.2) represents the effect of an earnings innovation on stock returns and can be interpreted as a univariate earnings forecasting equation written in first-differenced autoregressive form. The term UX_t, is the new information contained in current-period earnings, and hence we refer to UX_t, as the earnings innovation.

In Equation (3.3) the information available to the market in forecasting future earnings is reasonably approximated by a univariate time-series model. If significant information is excluded from (8), then UX_t, will contain not only the true earnings innovation but some "old information" as well. Kormendi and Lipe (1987) residuals measure, UX_t, will then be an errors-in-variables measure of the true earnings innovation in period *t*. The term UX_t was divided by the beginning-of-period stock price to render its units comparable to those of R_t.

Kormendi and Lipe (1987) interpreted the a_0 coefficient as the effect of a $1.00 earnings innovation on a dollar stock return: the magnitude of a_0 should equal the present value of the revisions in expected current and future equity benefits induced by a $1.00 earnings innovation. As long as a positive earnings innovation causes generally non-negative (and some strictly positive) revisions in expected current and future equity benefits, $a_0 > 0$ should hold.

3.2.2 Valuation Model, Earnings Forecast and Discount Rate

Kothari (2001, p.124) believes further refinements in the valuation models and more accurate estimates of discount rates are likely to be only incrementally fruitful in furthering our understanding of the return–earnings relation or the earnings response coefficients. To predict earnings response coefficient magnitudes, a researcher thus requires (1) a valuation model (e.g., dividend-discounting model), (2) revisions in forecasts of future earnings based on current earnings information and (3) a discount rate.

3.2.2.1 Equity Valuation Model and Earnings Response Coefficient

Collins and Kothari (1989), for example, defined the value of a firm as a function of expectation, at time *t*, of dividends to be received at the end of period t + k, discounted by an expected rate of return on the security, which is shown below.

The price is the discount present value of future expected dividends:

$$p_{it} = \sum_{k=1}^{\infty} E_t(D_{it+k}) \prod_{\tau=1}^{k} \left\{ \frac{1}{[1+E(R_{it+\tau})} \right\}$$

where

$E_t(D_{it+k})$ = expectation at time t of dividends to be received at the end of period $t + k$

$E_t(R_{it+\tau})$ = expectation rate of return on the security from the end of $t+\tau-1$ to the end of $t+\tau$.

Under this valuation model, Collins and Kothari (1989), assume the following:

- accounting earnings are related to future dividends,.

- unexpected earnings cause investors to revise their expectations of future dividends changing (leading to) the security price,

- constant discount rates,

- isomorphic relation between future earnings and future dividend expectations,

- and the Capital Asset Pricing Model can express, in a fair way, the risk and return relation.

Considering the dividend expectation, $E_t(D_{it+k})$, as a function of the earnings at period *t* - X_{it}, we have defined the following parameters:

$$E_t(D_{it+k}) = \lambda_{it+k} X_{it} , \qquad \lambda_{it+k} > 0, \qquad k = 1,2,...,\infty$$

where X_{it} is a firm's reported accounting earnings for time period *t*.
Substituting equations yields the equation below:

$$P_{it} = \left[\sum_{k=1}^{\infty} \lambda_{it+k} \prod_{\tau=1}^{k} \left\{ \frac{1}{[1 + E(R_{it+\tau})} \right\} \right] X_{it}$$

According to Collins and Kothari's (1989) model, the unexpected return associated with unexpected earnings is derived using eq. (3.6) as follows:

$$R_{it} - E_{t-1}(R_{it}) = \frac{[P_{it} - E_{t-1}(P_{it}) + D_{it} - E_{t-1}(D_{it})]}{P_{it-1}}$$

or

$$UR_{it} = \left[\lambda_{it} \sum_{k=1}^{\infty} \lambda_{it+k} \prod_{\tau=1}^{k} \left\{ \frac{1}{[1 + E(R_{it+\tau})} \right\} \right] UX_{it} / P_{it-1}$$

where $UX_{it} = X_{t-1} - (X_{it})$ is the unexpected earnings in period *t*, and the equation relates unexpected earnings to unexpected returns, and the coefficient is the earnings response coefficient (the bracketed term).

3.2.2.2 Forecasts of future earnings based on current earnings

According to White, Sondhi and Fried (2003), the quality of valuation process strongly depends on the ability to forecast earnings and filter out transitory and permanent components.

The forecast models using the previous time-series of earnings to forecast the future level of earnings is commonly referred as extrapolative models. This method of forecast simply considers that the expected future earnings, E(X_{t+1}), is a function of the past history of earnings:

$$E(X_{t+1}) = f(X_t, X_{t-1}, X_{t-2}, \ldots, X_{t-\tau})$$

However, earnings are composed by permanent and transitory components; thus, the challenge for time-series analysis is to identify (or segregate) the firm's permanent earnings component. The permanent component is expected to persist into the future; however, it can be altered by random events affecting the firm (or its environment), these events will change permanently the firm earnings.

Assume that a company in a no-growth environment[8] had expected earnings of $10 for a given period; however, for this period the company reported earnings of $11 (a positive earning surprise of $1).

Considering the $1 deviation as a one-time transitory event that will not recur in the future, expectations of future earnings should not be affected by this reported earnings surprise. Therefore, in the future the company's earnings will revert from its present level of $11 to the previous expectation of $10. Such a process is referred to as mean reverting, as the earnings revert to a constant level. The mean-reverting process imply that the earnings forecast of next period is a constant *u*. The estimate of *u* is the mean of all prior period earnings:

$$E(X_{t+1}) = u\,,$$

where u is the mean of previous earnings ($u = (X_t + X_{t-1} + X_{t-2} + \ldots + X_{t-\tau})/(\tau + 1)$.

Considering now that the $1 deviation is a permanent change, then the expected period earning will be $11. Such process is referred to as random walk. For such model, the only information needed to generate the next period forecast is the prior period result. All of the earlier information relevant is:

[8] Example adapted from White, Sondhi and Fried (1997, p1073)

$$E(X_{t+1}) = X_t$$

In random walk process, expectations change from period to period based on reported earnings.

Assuming now that a company's earnings is expected to growth by $2 each year. This company had an expected earnings of $12 for this year and the company's report a earning is $11.50.

Considering the negative earnings surprise of $0.50 as a transitory component, then the underlying earnings is assumed to be $12 and the forecast for next period would be $12 + $2 = $14:

$$E(X_{t+1}) = E(X_t) + d$$

where d represents the growth term.

Considering now that the $0.50 deviation is viewed as permanent, then the starting point for the next period forecast is the reported $11.50 and the next period forecast is $11.50 + $2 = $13.50. This is an example of a random walk with drift, and can be expressed as

$$E(X_{t+1}) = X_t + d$$

The empirical evidence show that earnings surprise has both transitory and permanent components. According to White, Sondhi and Fried (2003, p. 1074) "the forecast does not depend solely on current period results, but also on all previous reported earnings. At the same time, the weights are not the same for all previous result, as is the case for mean-reverting models. Typically, the forecast should be a weighted average of previous reported earnings".

Attachment 2, at the end of this dissertation, report additional material extracted from White, Sondhi and Fried (2003, p. 1075) which presents the description of an earning time-series process having transitory and permanent components.

3.2.2.2.1 Quarterly forecasting models

According to White, Sondhi and Fried (2003, p. 1077), quarterly forecasting models are considered to perform better than annual forecast, however quarterly earnings are better described by more complex models. The seasonality of many businesses makes the task of designing quarterly data models more challenging.

Generally, the forecast models for quarterly series find that a quarter's earning Q_t is related to the immediately preceding quarter Q_{t-1} and the same quarter of the preceding year Q_{t-4}. Three competing models have been put forward to represent the average firm; individually fitted models were not able to improve on these models in a meaningful way.

Model 1 based on Watts (1975) and Griffin (1977)

$$E(Q_t) = Q_{t-4} + (Q_{t-1} - Q_{t-5}) - be_{t-1} - ce_{t-4} + bce_{t-5}$$

Model 2 based on Foster (1977)

$$E(Q_t) = Q_{t-4} + a(Q_{t-1} - Q_{t-5}) + d$$

Model 3 based on Brown and Rozeff (1979)

$$E(Q_t) = Q_{t-4} + a(Q_{t-1} - Q_{t-5}) - ce_{t-4}$$

where a, b, and c are estimated parameters; d is the drift term (the average seasonal change); and e_t (times the respective parameter) represents the transitory portion of period' Q_t.

3.2.3.3 Discount Rate

The discount rate, or the interest rate, is a relevant point in studies relating accounting earnings and stock prices, as is the capital point in valuation studies. The discount rate is a controversial point in the finance literature. Nevertheless, one point is consensually accepted: the rate must reflect the risk involved in the asset to be evaluated. In this way, one of the main subjects of studies in finance is the measure of risk.

Should the rate of interest for discounted expected future cash flow be assumed to be linear and constant over time? Should the discount rates follow the Capital Asset Pricing Model (CAPM) premises or the Arbitrage Pricing Theory (APT) premises, or other asset pricing models?

Kormendi and Lipe (1987), for instance, to model their research, assumed the appropriate rate of interest for discounting expected future cash flows to be constant over time for simplicity.

Easton and Zmijewski (1989) used the market model to capture cross-sectional variation in expected quarterly rates of returns as function of systematic risk as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it} \qquad (3.8)$$

where

R_{it} = continuous compounded rate of return on the common stock of security j for quarter *t*,

R_{mt} = continuously compounded rate of return on the CRSP Equally Weighted Index for quarter *t*,

α_i = intercept coefficient,

β_i = slope coefficient (and estimated of systematic risk) for firm *j*, and

e_{it} = normally distributed disturbance term.

As far as Collins and Kothari (1989) are concerned, current earnings may not necessarily reveal growth opportunities because, in these models (classical valuation), only future investments are assumed to earn above normal rates of return. However, the current rate is the result of investments in growth and no-growth projects. In this case, current earnings are likely to signal useful information about the changing spread between normal and profit rates.

Current earnings and current dividends may jointly signal management's private information about growth opportunities on future investments (negative relation between current dividends and future dividends). Since (*r*) is the normal rate of return that is commensurable with the riskiness of investments in a competitive industry, (π) is the profit rate of return that represents the return in existing projects and new projects.

3.3 Empirical Studies in Brazil

An effort to find Brazilian studies in this field was done, and the finds are summarised as follows:

Leão (2001) analyses the relation between earnings and stock prices through a literature review approach and uses one "case study" of only one Brazilian company; there was no statistical treatment or methodological approach in this paper. The study is base on visual graphic inspection analysis and public announcements (accounting and non-accounting announcements), and the author concludes that, "the market reacts quickly and intelligently to accounting information about company's management". However, by critically analysing the paper, no empirical evidence was found supporting the author's conclusion.

Some studies test for the valuation models based the accounting numbers, the seminal Brazilian study of which is Lopes (2001). After this, a number of studies tested specifically the relevance of the residual income valuation in Brazil and compared its efficiency with other traditional valuation model (LOPES, 2002; OHLSON & LOPES, 2007; LOPES, SANT´ANNA & COSTA, 2007; GALDI et al, 2008; FERREIRA *et al*, 2008).

Lopes (2006), testing prices in level regressions, finds evidence that accounting earnings seem to be reasonably value-relevant. However, after controlling for scale effects, the R2 is significantly reduced. The author also finds a week earnings-return relationship and the results of the study also show that book values concentrate most of the value relevance on preferred stocks.

Aguiar, Lopes and Coelho (2007) tested the earnings persistence and the relation between industry structure and market share in Brazilian public firms, also using Ohson's valuation model (or residual income valuation). They concluded that the industry contains other information that can impact abnormal earnings for a following period and market share does not imply differentiated impacts on firms' abnormal earnings for a following period; they do not reflect, therefore, the presence of "other information" in the Ohlson's model.

3.4 The Data and Empirical Tests Results

In order to analyse and estimate the basic earnings-returns system, four different approaches (estimations) were used for both annual and quarterly data. In addition, the estimation process considers the firm-individual regression and the pooled (diagonal) approach. According to the international literature, the analysis is developed based on linear regressions and partial correlations.

The following section and technical approach rely heavily on Kormedi and Lipe (1987), Collins and Kothari (1989) and Easton and Zmijewski (1989) in describing the relationship between accounting earnings and stock returns.

3.4.1 Specification of the Basic Earnings-Returns System

To analyse the earning-returns relation, the general specification follows this model:

$$UR_{it} = a + b_1 UX_{it} + \varepsilon_{it}$$

where UR_{it} and UX_{it} are the measures of unexpected return and unexpected accounting earnings for company *i* at time *t*, respectively.

The systems are estimated for firm-specific observations and the pooled data by using linear Ordinary Least Squares approach. To estimate the parameters of the systems, the two measures of unexpected returns (RET and ARET) and the two measures of unexpected accounting earnings (SEPS and UNEPS). Then, the four models can be expressed as follows:

$$RET_{it} = a_i + b_i SEPS_{it} + \varepsilon_{it}$$

$$RET_{it} = a_i + b_i UNEPS_{it} + \varepsilon_{it}$$

$$ARET_{it} = a_i + b_i SEPS_{it} + \varepsilon_{it}$$

$$ARET_{it} = a_i + b_i UNEPS_{it} + \varepsilon_{it}$$

Note that the intercept a_i is restrict to firm-specific regressions; pooled data analysis supposes a common intercept a.

These functional models can also be tested by using lagged structures of return or earnings; the most common structure is the usage of lagged return rather than lagged earnings. In this case, reverse regression must be used, and according Collins and Kothari (1989), in case of reverse regressions, the analysis focuses on the return response coefficient (RRC) rather than the earnings response coefficient (ERC) and follows the annual model shown below:

$$UX_{it} = a + b_1 R_{it-1} + b_2 R_{it} + \varepsilon_{it}$$

Since the annual time-series is limited to 14 year-observations, and the lack of observation in the annual analysis, the estimation is based only on the level regressions (without lag structure). In quarterly analysis, the lagged model is applied for one and four quarter lags; this is justified by the seasonality in the quarter earnings found in the Brazilian earnings time-series. Also, this is proposed by Foster (1977) for quarterly accounting data analysis.

Including the fourth lag in the quarterly equation, the model assumes the following functional model:

$$UX_{it} = a + b_1 R_{it-4} + b_2 R_{it-2} + b_3 R_{it} + \varepsilon_{it}$$

3.4.2 Annual Regressions

The annual regressions are applied to the 61 firm-specifics that compose the annual sample; earnings from the 1995 to 2008 returns period are calculated from April of year *t* to March of year *t*+1. Tests are also developed for the pooled data. The following sections present the descriptive statistics and correlation matrix for the pooled data, the annual regression analysis and the quarterly analysis.

3.4.2.1 Annual descriptive statistics

Table 7 reports descriptive statistics for the sample.

Table 7 - Annual Descriptive Statistics

	SEPS	RET	UNEPS	ARET
Mean	0.0252	0.0646	-0.1045	-0.0204
Median	0.0170	0.0514	-0.0167	-0.0275
Maximum	0.9485	1.5398	0.9215	2.1497
Minimum	-0.9747	-1.9241	-0.9918	-2.5586
Std. Dev.	0.2232	0.3231	0.3001	0.4598
Skewness	0.1253	0.1907	-0.6868	-0.0725
Kurtosis	7.30	6.34	3.95	7.18
Jarque-Bera	556.57	369.19	78.57	557.97
Probability	0.0000	0.0000	0.0000	0.0000
Sum	18.17	50.76	-70.84	-15.64
Sum Sq. Dev.	35.86	81.95	60.98	161.52
Observations	721	786	678	765

Since the sample selection criteria result only in firms with at least eight years of listings, the sample of 61 firms gives a number of 721 and 678 firm-year observations for the unexpected earnings measured by SEPS and UNEPS, respectively. The unexpected returns measure gives a number of firm-year observations of 786 and 765, for RET and ARET, respectively.

The Jarque-Bera test statistic tests whether the series is normally distributed by measures of the skewness and kurtosis under the null hypothesis of a normal distribution. The statistic is computed as follows:

$$Jarque-Bera = \frac{N}{6}\left(S^2 + \frac{(K-3)^2}{4}\right)$$

where S is the skewness (a measure of the asymmetry of the distribution of the series around its mean), and K (measuring the peak or flatness of the distribution of the series) is the kurtosis. A small probability value leads to the rejection of the null hypothesis of a normal distribution. For all of the series displayed (SEPS, RET, UNEPS and ARET), it is possible to reject the hypothesis of normal distribution at the one percent significance level.

The mean and median SEPS and RET (observed earnings variation and observed return) have positive values, while UNEPS and ARET have negative values. A negative UNEPS mean and median indicate that, in general, companies' accounting returns (based on earnings and initial equity per share, or ROE) are historically smaller than the interest rates paid by Brazilian government bonds, used as a reference in the Brazilian market. Negative mean and median values of ARET indicate that the realised return for a specific firm is, in general, smaller than its expected return conditioned to the market (Ibovespa) returns.

Following and complementing the data description, Figure 5 presents the histograms for each variable of accounting earnings and returns for a graphical inspection.

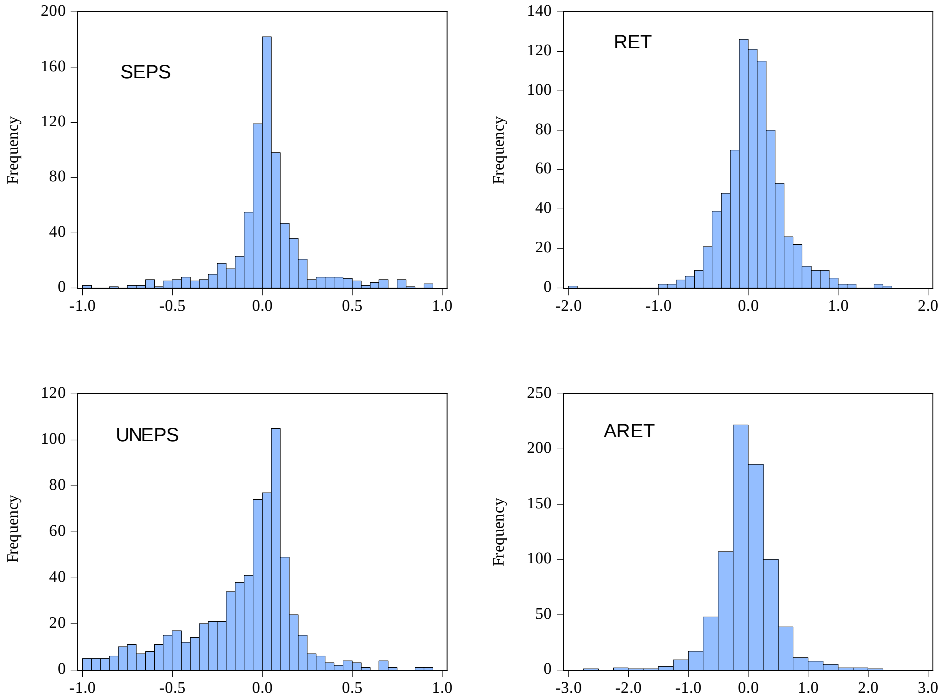

Figure 5 – Annual histogram with SEPS, RET, UNEPS and ARET variables for a number of firm-year observations of 721, 786, 678 and 765, respectively from a sample of 61 pooled firms from Dec. 1995 to Dec. 2008

Since the pooled variables are not normally distributed, Table 8 presents the Spearman rank-order correlation in order to verify the non-parametrical relationship between the measures of accounting earnings and stock returns.

The correlations of interest are encircled, and it is possible to highlight that the correlations are all higher than 0.10. The lowest correlation is 0.1188 (between UNEPS and RET), and the highest is 0.2671 (between SEPS and ARET). All correlations are significant at the one percent level.

Table 8 - Annual Spearman rank-order correlation

Spearman Correlation	SEPS	RET	UNEPS	ARET
SEPS	1.0000			
RET	0.2113	1.0000		
UNEPS	0.2671	0.1228	1.0000	
ARET	0.2787	0.4472	0.2528	1.0000

Spearman rank-order correlation: balanced sample (listwise missing value deletion) – 643 included observations from 1995 to 2008. All correlations are significant at the one percent level.

3.4.2.2 Annual regressions by firm

Table 9 shows the distributional characteristics (summary) of the coefficients of the firm-specific time-series regression parameters for individual firm-regressions for the annual earnings and returns. Each firm contains, in general, 12 year-observations; however, given the availability of the data, the length varies from five to 14 annual observations.

The regressions for each firm follow the functional model below, where *t* is a specific year from 1995 to 2009:

$$UR_t = a + b_1 UX_t + \varepsilon_t$$

UR is a measure of the unexpected return that can assume the proxies RET and ARET, and *UX* is a measure of unexpected earnings that can assume the proxies SEPS and UNEPS. Despite the fact that evidence in firm-regressions is not significant for all firms—suggesting that there is no statistical significance in the earnings-return relationship in a short time-series period—for the main part of sample, the most puzzling fact is that some firms, with significant regressions, present a negative coefficient, indicating a negative relationship between the variables. The complete firm-regressions report is presented in Appendixes 5 to 8.

Table 9 – Summary of annual regressions by firm for the four different models [a,b]

Summary of firm-regressions - Ordinary Least Squares

Panel A: $RET_{it} = a_i + b_i SEPS_{it} + \varepsilon_{it}$

	n	**Correlation**	**Rsquare**	**Linear Coefic. (*a* *i*)**	**Slope (*b* *i*)**	**Number of significant regressions**	
Mean	12	0.1227	0.1612	0.0502	0.2025	at 0.10	21
Maximum	14	0.9443	0.8918	0.2652	2.1478	at 0.05	16
Minimum	6	-0.8239	0.0005	-0.1714	-2.7991	at 0.01	6
Std. Deviation		0.3854	0.2035	0.0868	0.8906		

Panel B: $RET_{it} = a_i + b_i UNEPS_{it} + \varepsilon_{it}$

	n	**Correlation**	**Rsquare**	**Linear Coefic. (*a* *i*)**	**Slope (*b* *i*)**	**Number of significant regressions**	
Mean	11	0.0582	0.1381	0.0437	0.4764	at 0.10	17
Maximum	14	0.7603	0.7584	0.2802	17.9140	at 0.05	10
Minimum	5	-0.8709	0.0001	-0.5050	-2.5858	at 0.01	5
Std. Deviation		0.3700	0.1541	0.1198	2.4619		

Panel C: $ARET_{it} = a_i + b_i SEPS_{it} + \varepsilon_{it}$

	n	**Correlation**	**Rsquare**	**Linear Coefic. (*a* *i*)**	**Slope (*b* *i*)**	**Number of significant regressions**	
Mean	12	0.1844	0.1420	-0.0144	0.4578	at 0.10	17
Maximum	14	0.8420	0.7090	0.3805	3.4219	at 0.05	8
Minimum	5	-0.5650	0.0001	-0.2466	-2.2196	at 0.01	4
Std. Deviation		0.3314	0.1465	0.0833	0.9989		

Panel D: $ARET_{it} = a_i + b_i UNEPS_{it} + \varepsilon_{it}$

	n	**Correlation**	**Rsquare**	**Linear Coefic. (*a* *i*)**	**Slope (*b* *i*)**	**Number of significant regressions**	
Mean	11	0.0273	0.1635	-0.0087	0.1341	at 0.10	19
Maximum	14	0.7559	0.6929	0.5157	13.2738	at 0.05	13
Minimum	5	-0.8324	0.0000	-1.6038	-4.8180	at 0.01	6
Std. Deviation		0.4067	0.1772	0.2467	2.2371		

[a] Detailed regressions by firm for each proposed model are presented in Appendixes 5 to 8. Parameters estimated by Ordinary Least Squares (OLS) for the 61 year-firm sample, where RET and ARET are proxies for unexpected return with a holding period return from April in *t* to March *t+1* and SEPS and UNEPS are proxies for unexpected annual accounting earnings.

[b] RET is the return inclusive dividends, given by the natural logarithm of P/P_{t-1} adjusted for dividends and capital actions. ARET is the abnormal return or adjusted return for market influence, and is the residual of specific firm-return and predicted market model return for company *i*. SEPS is the scaled EPS variation given by the annual earnings change scaled by price from the previous year ($\Delta EPS/P_{t-1}$). UNEPS is the excess of earnings on expected growth given by the risk-free interest rate, which is then the realised EPS minus the accounting equity value per share times the risk-free interest rate.

The firm-specific time-series regressions show an average explanatory power of around 16% in Panel A with variables RET and SEPS, and Panel D, for the models including ARET and UNEPS. These two models (in Panels A and D) are also the models with highest number of significant regressions at 1%, 5% and 10% levels.

The mean slope *b* for all models is positive as expected; however, as can be seen in Appendixes 5 to 8, some negative and significant coefficients can be verified. This is an intriguing finding, and, in some aspects, it is hard to explain because it means that, in general, years that presented an increase in accounting earnings, a reduction on stock returns was found, and the opposite is also true. This can be explained by bias in the measured earnings and returns because few companies presented recurrent negative slopes in all of the four models that were analysed; only Light S.A (LIGH3) and Tim Participações S.A. (TCSL4) presented negative slopes in three out of four models.

Figure 6 illustrates the annual behaviour of firm LIGH3 for the four possible proxies' combinations. It is visually noted that, for some years, the measures of accounting earnings and price returns show opposite behaviours, especially in the last four years. The explanation for this inverse relation demands a specific analysis of these two firms, and this is beyond the scope of this study.

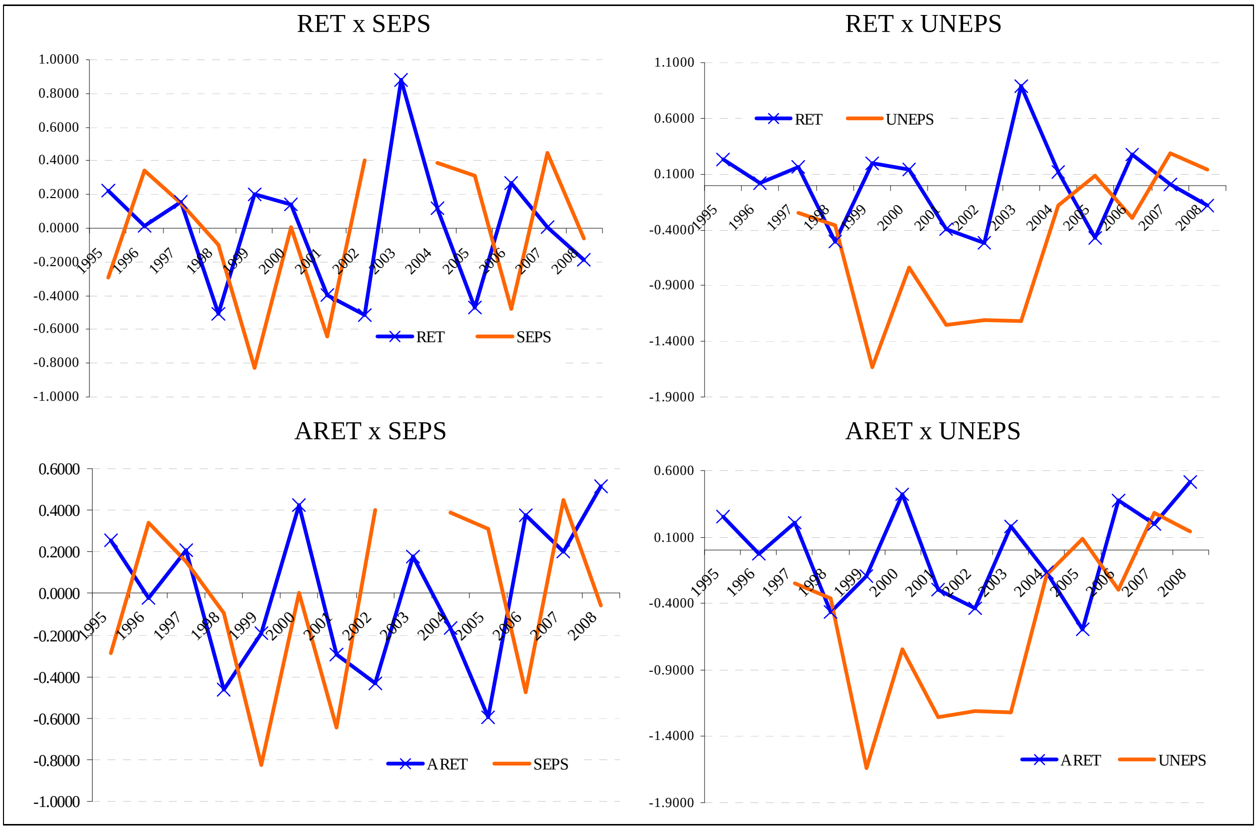

Figure 6 – Graphical illustration of negative correlation between earnings and returns in Light S.A. (LIGH3)

The estimation of separate time-series regressions for each of firms is likely to be sub-optimal way to proceed since this approach would not take into account any common structure present in the series of interest. Thus, in order to optimise the analysis, the pooled regressions were estimated presented in next section.

3.4.2.3 Pooled annual regressions

Table 10 is divided into four panels (A through D) and shows the annual pooled regressions for the four functional models that consider proxies for unexpected returns (RET and ARET) as dependent variables, while the independent variables are the proxies for the unexpected accounting earnings (SEPS and UNEPS) at the level structure.

Each panel (A, B, C and D) shows the test of each functional model with three different specifications of regression; the first is the ordinary specification (Panel Ordinary Least Squares), the second attributes weights to cross-sectional observation (Panel EGLS – Cross-section weights) and the third attributes weights to period observation (Panel EGLS – Period weights). The second and third models are estimated by a Generalized Least Squared (GLS) technique.

The cross-sectional weights allow for hetero-skedasticity between cross-sections, which means that a different residual variance for each cross section is admitted. The GLS specification performs preliminary estimation to obtain cross-section specific residual vectors, and then the specification uses these residuals to form estimates of the cross-specific variances. The estimates of the variances are then used in a weighted least squares procedure to form the feasible GLS estimates (EVIEWS, 2007, p.499).

Exactly analogous to the cross-section case, period-specific hetero-skedasticity allows for a different residual variance for each period. Then, preliminary estimation in order to obtain period-specific residual vectors is performed, and these residuals are used to form estimates of the period variances, reweighting the data, and then forming the GLS estimates. The functional models for the three panels are indicated in the respective panels.

Table 10 – Pooled annual regressions: Scaled EPS x Return [a,b]

Panel A: $RET_{it} = a + b_1 SEPS_{it} + \varepsilon_{it}$

Dependent Variable: RET

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	0.0629	5.5350	0.0000	0.0155	1.8816
SEPS	0.1701	3.3620	0.0008		
Method: Panel EGLS (Cross-section weights)					
C	0.0555	6.0186	0.0000	0.0381	1.9069
SEPS	0.2372	5.3383	0.0000		
Method: Panel EGLS (Period weights)					
C	0.0662	6.6516	0.0000	0.0153	1.8053
SEPS	0.1613	3.3412	0.0009		

Panel B: $RET_{it} = a + b_1 UNEPS_{it} + \varepsilon_{it}$

Dependent Variable: RET

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	0.0732	5.9837	0.0000	0.0085	1.7058
UNEPS	0.0925	2.3941	0.0169		
Method: Panel EGLS (Cross-section weights)					
C	0.0679	6.7399	0.0000	0.0081	1.7597
UNEPS	0.0769	2.3406	0.0195		
Method: Panel EGLS (Period weights)					
C	0.0806	7.8323	0.0000	0.0169	1.7158
UNEPS	0.1166	3.3850	0.0008		

Panel C: $ARET_{it} = a + b_1 SEPS_{it} + \varepsilon_{it}$

Dependent Variable: ARET

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	-0.0261	-1.6072	0.1085	0.0228	1.5694
SEPS	0.2959	4.0969	0.0000		
Method: Panel EGLS (Cross-section weights)					
C	-0.0321	-3.0685	0.0022	0.0612	1.5797
SEPS	0.3850	6.8428	0.0000		
Method: Panel EGLS (Period weights)					
C	-0.0201	-1.3259	0.1853	0.0312	1.6898
SEPS	0.3325	4.8081	0.0000		

Panel D: $ARET_{it} = a + b_1 UNEPS_{it} + \varepsilon_{it}$

Dependent Variable: ARET

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	0.0221	1.3003	0.1940	0.0527	1.6484
UNEPS	0.3290	6.0789	0.0000		
Method: Panel EGLS (Cross-section weights)					
C	0.0144	1.2964	0.1953	0.0640	1.7670
UNEPS	0.2530	6.7360	0.0000		
Method: Panel EGLS (Period weights)					
C	0.0246	1.5514	0.1213	0.0536	1.7304
UNEPS	0.3088	6.1319	0.0000		

[a] Pooled annual regressions for each proposed model. Parameters for each model are estimated by Ordinary Least Squares (OLS) and orthogonalisated in cross-sections and periods by the Generalized Least Squares (GLS) for the 61 year-firm samples, where RET and ARET are proxies for unexpected return with holding period return from April in *t* to March in *t+1*, and SEPS and UNEPS are proxies for the unexpected annual accounting earnings.

[b] RET is the return-inclusive dividends, given by the natural logarithm of P/P_{t-1} adjusted for dividends and capital actions. ARET is the abnormal return or adjusted return for market influence, and the residuals of specific firm-return and predicted market model return for company *i*. SEPS is the scaled EPS variation given by annual earnings change scaled by the price from the previous year ($\Delta EPS/P_{t-1}$). UNEPS is the excess of earnings on expected growth given by the risk-free interest rate, which is the realised EPS minus the accounting equity value per share times the risk-free interest rate. C, indicated as an independent variable, is the linear/constant coefficient represented as *a* in the functional models.

Analysing Table 10, it is possible to verify that all of the regressions are significant at the five percent level, and almost all are significant at the one percent level. Since the measures of earnings and returns try to capture the unexpected effects, the constant coefficient might be assumed to be equal to zero (Prob. higher than five percent) because, in this case, an unexpected variations in earnings would directly affect the returns in the exactly magnitude of the earnings response coefficient, thus, without a non-observed effect (the constant coefficient). On the other hand, a constant coefficient with statistical significance (different from zero) indicates that returns are affected by variables other than accounting earnings.

Non-zero constant coefficients were verified in the first two panels that have RET as the dependent variable. Panels C and D report that the constant coefficients are statistically equal to zero in the regressions of ARET on SEPS and of ARET on UNEPS. This means that panels C and D are easily justified and theoretically consistent, since the variable ARET is the return adjusted to the systematic market variation. This variable focuses on the firm-specific stock returns without market effects.

The explanatory power (R-square) is considerably low for all of the models, but R-square seems to increase in the GLS models, especially when the weight is given to cross-sectional variation. This suggests that variance in cross-section observation is more relevant in explaining the earnings-return relation than the time-series variance. No estimated regression has shown a serial correlation problem, since the Durbin-Watson statistic is in the acceptable interval (accepted the null hypothesis of no serial correlation at the five percent level) according to the critical values presented in Appendix 3.

3.4.2.4 Pooled lagged annual regressions

In order to complement the analysis, one-period lagged regressions were estimated. Collins and Kothari (1989), a contemporaneous regression of annual returns on earnings changes (variable SEPS) understates the earnings response coefficient. However, since the stock price (and its return) is assumed to anticipate part of the earnings news, the ideal form of modelling the lagged relation between earnings changes and stock returns is by assuming a lagged return as the explanation for earnings changes. In the literature, this practice is known as reverse regression. About the application of reverse regression in earnings-return studies, Collins and Kothari (1989) infer the following points:

> To address the measurement error problem, we employ reverse regression [see Maddala (1977) Learner (1978), Klepper and Learner (1984), and Beaver, Lambert, and Ryan (1987)]. Specifically, we regress earnings changes on returns and a series of terms representing interactions between returns and risk, growth and/or persistence, and interest rates. We adopt this approach over various grouping procedures in direct regression for several reasons.
>
> First, using a UX_{it} proxy as the dependent variable reduces the attenuation bias that exists when ERCs are estimated at the individual security level using eq. (1). Second, having returns on the RHS allows us to conveniently test for differences across firm size in the lead-lag relation by incorporating both contemporaneous and earlier period's returns as explanatory variables. Finally, with returns on the RHS, we can vary the length of the return holding period for different firms (i.e., combine varying portions of contemporaneous and leading returns into one metric). As noted earlier, by varying the length of the return window we control for cross-sectional differences in information environment because the return period is expanded until the market's expectation of current period's earnings is approximated by the prior year's earnings (i.e., earnings change is now unexpected). One consequence of using reverse regression is that we estimate the return response coefficient (RRC) rather than the ERC. The reciprocal of RRC is an estimate of the ERC in the simple regression context. This interpretation is based largely on the evidence in Beaver, Lambert, and Ryan (1987). […]. The inverse of the estimated RRC is the upper bound for ERC. Therefore, attempts to infer the earnings process or to place other economic interpretations on the inverse of the estimated RRC must be approached with caution. Accordingly, we interpret the RRCs conservatively and use significance tests only to judge whether its determinants have the predicted signs.

Based on Collins and KotharI's (1989) argument, Table 11 shows, in each of its panels, the coefficients estimated by reverse regressions for the four lagged models, considering the estimation in OLS and GLS with weight on the cross-sections and the period, in order to allow for hetero-skedasticity in the relevant dimension. The signal (-1) in the independent variable represents the lagged parameter and, since a lagged structure is constructed, one year of observation is lost.

Table 11 – Pooled annual reverse regressions with one year lag for the independent variable [a,b]

Panel A: $SEPS_{it} = a + b_1 RET_{it} + \varepsilon_{it}$

Dependent Variable: SEPS

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	0.0232	2.5757	0.0102	0.0110	1.8296
RET(-1)	0.0772	2.7522	0.0061		
Method: Panel EGLS (Cross-section weights)					
C	0.0241	6.2186	0.0000	0.0124	2.0086
RET(-1)	0.0403	2.9302	0.0035		
Method: Panel EGLS (Period weights)					
C	0.0129	1.8047	0.0716	0.0147	1.8490
RET(-1)	0.0768	3.1848	0.0015		

Panel B: $UNEPS_{it} = a + b_1 RET_{it} + \varepsilon_{it}$

Dependent Variable: UNEPS

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	-0.1127	-9.4318	0.0000	0.0264	0.7112
RET(-1)	0.1564	4.1915	0.0000		
Method: Panel EGLS (Cross-section weights)					
C	-0.0728	-9.9751	0.0000	0.0529	0.7751
RET(-1)	0.1415	6.0229	0.0000		
Method: Panel EGLS (Period weights)					
C	-0.0537	-5.5541	0.0000	0.0349	0.7457
RET(-1)	0.1559	4.8416	0.0000		

Panel C: $SEPS_{it} = a + b_1 ARET_{it} + \varepsilon_{it}$

Dependent Variable: SEPS

Independent Variable	**Coefficient**	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
		Method: Pooled Ordinary Least Squares			
C	0.0287	3.3703	0.0008	0.0066	1.8442
ARET(-1)	0.0430	2.0995	0.0362		
		Method: Panel EGLS (Cross-section weights)			
C	0.0275	7.5532	0.0000	0.0046	2.0355
ARET(-1)	0.0206	1.7438	0.0817		
		Method: Panel EGLS (Period weights)			
C	0.0204	3.2675	0.0011	0.0158	1.8381
ARET(-1)	0.0499	3.2614	0.0012		

Panel D: $UNEPS_{it} = a + b_1 ARET_{it} + \varepsilon_{it}$

Dependent Variable: UNEPS

Independent Variable	**Coefficient**	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
		Method: Pooled Ordinary Least Squares			
C	-0.0973	-8.7493	0.0000	0.0639	0.7739
ARET(-1)	0.1724	6.5686	0.0000		
		Method: Panel EGLS (Cross-section weights)			
C	-0.0583	-7.9732	0.0000	0.0726	0.8490
ARET(-1)	0.1342	7.0325	0.0000		
		Method: Panel EGLS (Period weights)			
C	-0.0414	-4.5560	0.0000	0.0447	0.7505
ARET(-1)	0.1181	5.4366	0.0000		

[a] Pooled annual regressions for each proposed model. Parameters for each model are estimated by Ordinary Least Squares (OLS) and orthogonalisated in cross-sections and periods by the Generalized Least Squares (GLE) for the 61 year-firm samples, where RET and ARET are proxies for unexpected return with holding period return from April in *t* to March in *t+1*, and SEPS and UNEPS are proxies for unexpected annual accounting earnings.

[b] RET is the return inclusive dividends, given by the natural logarithm of P/P_{t-1} adjusted for dividends and capital actions. ARET is the abnormal return or adjusted return for market influence, and is the residual of specific firm-return and predicted market model return for company *i*. SEPS is the scaled EPS variation given by an annual earnings change scaled by the price from the previous year ($\Delta EPS/P_{t-1}$). UNEPS is the excess of earnings on expected growth given by the risk-free interest rate, which is the realised EPS minus the accounting equity value per share times the risk-free interest rate.

By analysing Table 11 and its annual regressions, it is possible to verify that (1) except for Panel A with period weight and Panel C with cross-sectional weight, the four models are statistically significant at five percent in lagged regressions; (2) the explanatory power in some lagged regressions is slightly higher than that found in level regressions, and, in lagged regressions, the period weight seems to be more effective in increasing the explanatory power, except on regressions between UNEPS and ARET (Panel D); and, (3) Serial correlation is not a problem on these regressions, as indicated by Durbin-Watson statistics.

Complementing the lagged analysis, Table 12 presents regression results for a combined regression on current and lagged values of return. In the same way as the previous tables, four panels are displayed for each functional model and each panel shows three different estimation methods (ordinary, cross-sectional and period-weighted).

Table 12 – Pooled annual combined lagged and at level regressions [a,b]

Panel A: $SEPS_{it} = a + b_1 RET_{it} + b_2 RET_{it-1} + \varepsilon_{it}$

Dependent Variable: SEPS

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	0.0167	1.8213	0.0690	0.0261	1.8429
RET	0.0954	3.4706	0.0006		
RET(-1)	0.0767	2.7530	0.0061		
Method: Panel EGLS (Cross-section weights)					
C	0.0213	5.2294	0.0000	0.0275	2.0042
RET	0.0497	3.4652	0.0006		
RET(-1)	0.0440	2.9625	0.0032		
Method: Panel EGLS (Period weights)					
C	0.008566	1.1992	0.2309	0.0383	1.8347
RET	0.094332	4.2861	0.0000		
RET(-1)	0.068772	2.8905	0.0040		

Panel B: $UNEPS_{it} = a + b_1 RET_{it} + b_2 RET_{it-1} + \varepsilon_{it}$

Dependent Variable: UNEPS

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	-0.1139	-9.3741	0.0000	0.0267	0.7074
RET	0.0550	1.4713	0.1417		
RET(-1)	0.1530	4.1103	0.0000		
Method: Panel EGLS (Cross-section weights)					
C	-0.0732	-9.9903	0.0000	0.0600	0.7716
RET	0.0491	2.1093	0.0353		
RET(-1)	0.1415	6.1239	0.0000		
Method: Panel EGLS (Period weights)					
C	-0.053823	-5.5140	0.0000	0.0330	0.7527
RET	0.02226	0.7111	0.4773		
RET(-1)	0.153606	4.7602	0.0000		

$$\textit{Panel C: } SEPS_{it} = a + b_1 ARET_{it} + b_2 ARET_{it-1} + \varepsilon_{it}$$

Dependent Variable: SEPS

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	0.0300	3.5497	0.0004	0.0210	1.8684
ARET	0.0708	3.4396	0.0006		
ARET(-1)	0.0336	1.6208	0.1055		
Method: Panel EGLS (Cross-section weights)					
C	0.0292	8.2178	0.0000	0.0472	2.0804
ARET	0.0626	5.7303	0.0000		
ARET(-1)	0.0151	1.3741	0.1699		
Method: Panel EGLS (Period weights)					
C	0.020451	3.2728	0.0011	0.0297	1.8687
ARET	0.053265	3.5090	0.0005		
ARET(-1)	0.045025	2.9503	0.0033		

$$\textit{Panel D: } UNEPS_{it} = a + b_1 ARET_{it} + b_2 ARET_{it-1} + \varepsilon_{it}$$

Dependent Variable: UNEPS

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	-0.0953	-8.7166	0.0000	0.0905	0.7285
ARET	0.1196	4.3787	0.0000		
ARET(-1)	0.1600	6.0717	0.0000		
Method: Panel EGLS (Cross-section weights)					
C	-0.0553	-7.6633	0.0000	0.1254	0.8048
ARET	0.1163	5.9745	0.0000		
ARET(-1)	0.1303	6.9878	0.0000		
Method: Panel EGLS (Period weights)					
C	-0.044048	-4.7915	0.0000	0.0516	0.7211
ARET	0.060347	2.7185	0.0067		
ARET(-1)	0.11527	5.2080	0.0000		

[a] Pooled annual regressions for each proposed model. Parameters for each model are estimated by Ordinary Least Squares (OLS) and orthogonalisated in cross-sections and periods by the Generalized Least Squares (GLE) for the 61 year-firm samples, where RET and ARET are proxies for unexpected return with holding period return from April in *t* to March in *t+1*, and SEPS and UNEPS are proxies for unexpected annual accounting earnings.

[b] RET is the return inclusive dividends, given by the natural logarithm of P/P_{t-1} adjusted for dividends and capital actions. ARET is the abnormal return or adjusted return for market influence, and is the residual of specific firm-return and predicted market model return for company *i*. SEPS is the scaled EPS variation given by an annual earnings change scaled by the price from the previous year ($\Delta EPS/P_{t-1}$). UNEPS is the excess of earnings on expected growth given by the risk-free interest rate, which is the realised EPS minus the accounting equity value per share times the risk-free interest rate.

Table 12 shows that explanatory power increases with the addition of two variables in the models. However, for some regressions, both of the independent variables are not simultaneously significant. This can be verified in Panels B and C. The results reveal that coefficients on both the current and lagged years' returns are of comparable magnitude and, in general, significant. However, in Panel B (regressions of UNEPS on RET), the level variable fits better in the model than the lagged variable, suggesting that the current return is closely related to the current accounting earnings over the general interest rate. Panel C's (regressions of SEPS on ARET) lagged variable fits better in the model, suggesting that the return for a specific firm (without systematic market effects) anticipates, in one year, the increasing or decreasing in accounting earnings. Similar findings are reported in Collins and Kothari (1989) that infer that "a non-trivial portion of the events contributing to accounting earnings changes in the current period are captured in security returns from an earlier period".

Collins and Kothari (1989) also test the same model, controlling for firm size by dividing their sample into three categories: small, medium, and large firms. The authors verify that lagged years' returns possess significant explanatory power for all three size groups. However, the magnitude and significance of the coefficient for contemporaneous return in relation to the lagged return suggest that the lagged return is more important in explaining earnings changes for large versus small firms.

According to Collins and Kothari (1989), while their analysis suggests that the earnings/returns association is enhanced by including returns from an earlier time frame, the results do not identify exactly how far back one should go. About this challenge, the authors complement that "this is difficult to specify a priori and will vary as a function of the timing of valuation relevant economic events, the nature of a firm's information environment, and how quickly economic events are captured in the accounting earnings numbers."

3.4.3 Quarterly Regressions

The quarterly regressions are applied in the 71 firm-specific figures that compose the quarterly sample and the pooled data. The period of analysis includes 56 quarters, from the first quarter in 1995 to the first quarter in 2009. The following section presents the descriptive statistics and correlation matrix for the pooled data.

3.4.3.1 Quarterly descriptive statistics

Table 13 - Quarterly Descriptive Statistics

	SEPS	RET	UNEPS	ARET
Mean	0.0011	0.0427	-0.0436	-0.0067
Median	0.0006	0.0592	-0.0007	-0.0079
Maximum	0.9364	2.2246	0.9332	2.1080
Minimum	-0.9651	-2.0149	-0.9950	-1.6431
Std. Dev.	0.1276	0.2683	0.1555	0.2052
Skewness	-0.1671	-0.3781	-1.6011	0.4202
Kurtosis	21.75	8.71	13.22	11.87
Jarque-Bera	47719.40	4611.83	15882.92	11035.03
Probability	0.0000	0.0000	0.0000	0.0000
Sum	3.62	142.73	-145.12	-22.39
Sum Sq. Dev.	53.04	240.24	80.40	140.31
Observations	3258	3339	3325	3333

The descriptive statistics report for the 71 pooled firms indicates a number of 3,258 and 3,339 firm-year observations for unexpected earnings measured by SEPS and UNEPS, respectively. The unexpected returns measurement gives the number of firm-year observations at 3,325 and 3,333, for RET and ARET, respectively. The Jarque-Bera normally test indicates that it is possible to reject the hypothesis of normal distribution at the one percent significance level.

Similar to the annual analysis, SEPS and RET (observed earnings variation and observed return) present positive means and medians, while UNEPS and ARET's means and medians are negative values. Negative UNEPS means and medians indicate that, in general, companies' accounting returns (based on earnings and initial equity per share, or ROE) are historically smaller than the interest rates paid by Brazilian government bonds, used as references in the Brazilian market. Negative mean and median values for ARET indicate that the realised return for a specific firm is, in general, smaller than its expected return conditioned to the market (Ibovespa) returns.

Following and complementing the data description, Figure 7 presents the histograms for each variable of accounting earnings and return for a graphical inspection.

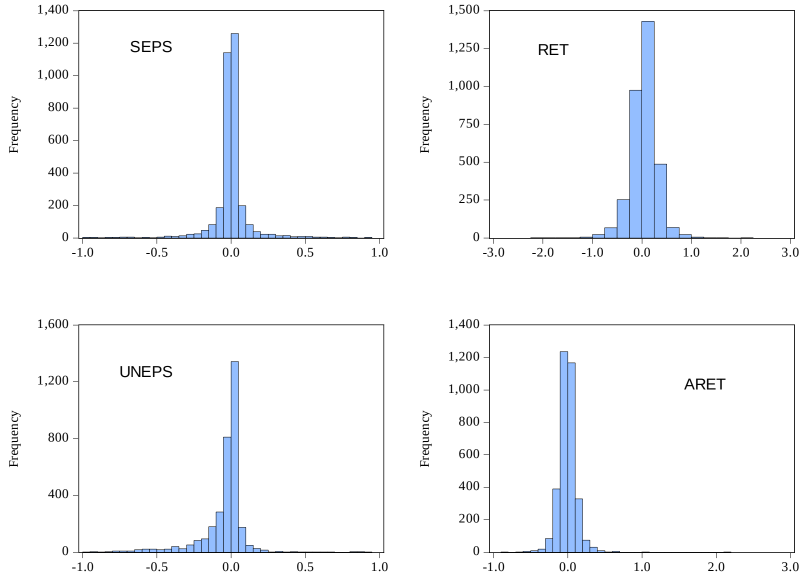

Figure 7 - Histogram with SEPS, RET, UNEPS and ARET variables for a number of firm-quarter observation of 3258, 3339, 3325 and 3333, respectively. Sample of 71 pooled firms.

Since the pooled variables are not normal distributed, Table 14 presents the Spearman rank-order correlation in order to verify the non-parametrical relationship between the measures of accounting earnings and stock returns.

The correlations of interest are encircled, and it is possible to highlight that the quarterly correlations are around 0.05, except for the correlation between UNEPS and RET. It is interesting to observe that the correlations are significantly lower than what was observed in annual correlations; in annual correlations, the lowest correlation was between UNEPS and RET (and now the highest quarterly correlation). Besides the low magnitudes, all of the correlations can be considered significant at the five percent level.

Table 14 - Quarterly Spearman rank-order correlation

Spearman Correlation	SEPS	RET	UNEPS	ARET
SEPS	1.0000			
RET	0.0441	1.0000		
UNEPS	0.3451	0.1161	1.0000	
ARET	0.0580	0.6725	0.0385	1.0000

Spearman rank-order correlation: balanced sample (listwise missing value deletion) – 643 included observations from 1995 to 2008.

3.4.2.2 Quarterly regressions by firm

Table 15 shows the distributional characteristics (summary) of the coefficients of the firm-specific time-series regression parameters for individual firm-regressions for the quarterly earnings and return in level. Each firm contains, in general, 47 quarterly-observations with firm-specific length varying from 12 to 57 quarterly observations.

The regressions for each firm follow the functional model below, where *t* is a specific quarter, ranging from the first quarter in1995 to the first quarter in 2009:

$$UR_t = a + b_1 UX_t + \varepsilon_t$$

where *UR* is a measure of unexpected return which can be represented by the proxies RET and ARET. *UX* is a measure of the unexpected earnings that can also be represented by the proxies SEPS and UNEPS. Despite the fact that the evidence in the firm-regressions is not significant for all of the firms—suggesting that there is no statistical significance in earnings-return relationship in short time-series periods for the main part of sample—the most puzzling fact is that, some regressions present a negative and significant coefficient, indicating a negative relationship between the variables. The complete quarterly firm-regressions report is presented in Appendixes 10-13.

Table 15 – Summary of quarterly regressions by firm for the four different models at level [a,b]

Summary of firm-regressions - Ordinary Least Squares

Panel A: $RET_{it} = a_i + b_i SEPS_{it} + \varepsilon_{it}$

	n	Correlation	Rsquare	Linear Coefic. (a_i)	Slope (b_i)	Number of significant regressions	
Mean	46	0.0468	0.0399	0.0390	1.0025	at 0.10	18
Maximum	56	0.5267	0.2774	0.0902	39.1956	at 0.05	12
Minimum	12	-0.4243	0.0000	-0.0670	-2.6344	at 0.01	5
Std. Deviation		0.1955	0.0536	0.0354	4.9202		

Panel B: $RET_{it} = a_i + b_i UNEPS_{it} + \varepsilon_{it}$

	n	Correlation	Rsquare	Linear Coefic. (a_i)	Slope (b_i)	Number of significant regressions	
Mean	47	0.0556	0.0357	0.0356	0.6496	at 0.10	12
Maximum	56	0.5968	0.3562	0.0968	14.6081	at 0.05	6
Minimum	13	-0.3962	0.0000	-0.1655	-4.3769	at 0.01	2
Std. Deviation		0.1819	0.0555	0.0463	2.9068		

Panel C: $ARET_{it} = a_i + b_i SEPS_{it} + \varepsilon_{it}$

	n	Correlation	Rsquare	Linear Coefic. (a_i)	Slope (b_i)	Number of significant regressions	
Mean	46	0.0307	0.0343	-0.0064	0.2258	at 0.10	17
Maximum	56	0.4696	0.2464	0.0743	5.0437	at 0.05	12
Minimum	12	-0.4964	0.0000	-0.0805	-1.9981	at 0.01	3
Std. Deviation		0.1840	0.0483	0.0228	0.9583		

Panel D: $ARET_{it} = a_i + b_i UNEPS_{it} + \varepsilon_{it}$

	n	Correlation	Rsquare	Linear Coefic. (a_i)	Slope (b_i)	Number of significant regressions	
Mean	48	0.0501	0.0421	-0.0134	0.2800	at 0.10	15
Maximum	57	0.4713	0.2221	0.0450	13.7698	at 0.05	8
Minimum	13	-0.4538	0.0000	-0.1993	-4.0461	at 0.01	3
Std. Deviation		0.2004	0.0556	0.0370	2.0147		

[a] Detailed regressions by firm for each proposed model are presented in Appendixes 10 to 13. Parameters estimated by Ordinary Least Squares (OLS) for the 71 quarterly-firm sample, where RET and ARET are proxies of unexpected return with holding period return from month *k* to *k+2* for each quarter *t* and SEPS and UNEPS are proxies for unexpected annual accounting earnings.

[b] RET is the return inclusive dividends, given by the natural logarithm of P/P_{t-1} adjusted for dividends and capital actions. ARET is the abnormal return or adjusted return for market influence, and is the residual of specific firm-return and predicted market model return for company *i*. SEPS is the scaled EPS variation given by an annual earnings change scaled by the price from the previous year ($\Delta EPS/P_{t-1}$). UNEPS is the excess of earnings on expected growth given by the risk-free interest rate, which is the realised EPS minus the accounting equity value per share times the risk-free interest rate.

The quarterly firm-specific time-series regressions show an average explanatory power of around four percent in Panel A with variables RET and SEPS, and in Panel D, for the models including ARET and UNEPS. These two models (in Panels A and D) are also the models with the highest number of significant regressions at the one percent, five percent and ten percent levels. As compared to the annual regressions, the quarterly regressions have a smaller explanatory power and relatively smaller number or firm-specific regressions with statistical significance. However, similar to the annual regressions, Panels A and D present the highest explanatory power and significant regressions, suggesting that, for both the annual and quarterly periods, the variables RET and SEPS represent the realised return and earnings, and ARET and UNESP represent abnormal or surprising returns and earnings, which seem to fit better with each other.

The mean slope *b* (the earnings response coefficient) for all models is positive as expected; however, similar to annual data, some negative and significant slopes can be verified.

The estimation of separate time-series regressions for each of firms is likely to be sub-optimal way to proceed since this approach would not take into account any common structure present in the series of interest. Thus, in order to optimise the analysis, the pooled regressions were estimated presented in next section.

3.4.2.3 Pooled quarterly regressions

Table 16 is divided into four panels (A through D) and shows the annual pooled regressions, for the four functional models that consider proxies for unexpected returns (RET and ARET) as dependent variables, and the independent variables are the proxies for the unexpected accounting earnings (SEPS and UNEPS) at the level structure.

Each panel (A, B, C and D) shows the test of each functional model with three different specifications of regression; the first is the ordinary specification (Panel Ordinary Least Squares), the second attributes weights to cross-sectional observations (Panel EGLS – Cross-section weights), and the third attributes weights to period observations (Panel EGLS – Period weights). The second and third models are estimated by a Generalized Least Squared (GLS).

The cross-sectional weights allow for heteroskedasticity between cross-sections, which means that a different residual variance for each cross section is admitted. The GLS specification performs preliminary estimation to obtain cross-sectional specific residual vectors, and then the specification uses these residuals to form estimates of the cross-specific variances. The estimates of the variances are then used in a weighted least squares procedure to form the feasible GLS estimates (EVIEWS, 2007, p.499).

Exactly analogous to the cross-section case, period-specific heteroskedasticity allows for a different residual variance for each period. Then, preliminary estimation in order to obtain period-specific residual vectors is performed, and these residuals are used to form estimates of the period variances, reweighting the data, and then forming the GLS estimates. The functional models for the three panels are indicated in the respective panels.

Table 16 – Pooled quarterly regressions [a,b]

Panel A: $RET_{it} = a + b_1 SEPS_{it} + \varepsilon_{it}$

Dependent Variable: RET

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	0.0434	9.3286	0.0000	0.0017	1.8478
SEPS	0.0866	2.3561	0.0185		
Method: Panel EGLS (Cross-section weights)					
C	0.0504	12.9120	0.0000	0.0014	2.0139
SEPS	0.0773	2.0977	0.0360		
Method: Panel EGLS (Period weights)					
C	0.0577	15.2374	0.0000	0.0015	1.8865
SEPS	0.0700	2.1969	0.0281		

Panel B: $RET_{it} = a + b_1 UNEPS_{it} + \varepsilon_{it}$

Dependent Variable: RET

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	0.0502	10.5890	0.0000	0.0069	1.8577
SEPS	0.1414	4.7858	0.0000		
Method: Panel EGLS (Cross-section weights)					
C	0.0553	13.9858	0.0000	0.0058	2.0077
SEPS	0.1266	4.3792	0.0000		
Method: Panel EGLS (Period weights)					
C	0.0664	17.3806	0.0000	0.0161	1.9216
SEPS	0.1776	7.3196	0.0000		

Panel C: $ARET_{it} = a + b_1 SEPS_{it} + \varepsilon_{it}$					
Dependent Variable: ARET					
Independent Variable	**Coefficient**	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
Method: Pooled Ordinary Least Squares					
C	-0.0043	-1.2164	0.2239	0.0013	1.9384
SEPS	0.0571	2.0748	0.0381		
Method: Panel EGLS (Cross-section weights)					
C	-0.0048	-1.7263	0.0844	0.0004	2.0979
SEPS	0.0316	1.1729	0.2409		
Method: Panel EGLS (Period weights)					
C	-0.0013	-0.4207	0.6740	0.0014	1.9088
SEPS	0.0533	2.0976	0.0360		

Panel D: $ARET_{it} = a + b_1 UNEPS_{it} + \varepsilon_{it}$					
Dependent Variable: ARET					
Independent Variable	**Coefficient**	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
Method: Pooled Ordinary Least Squares					
C	-0.0031	-0.8747	0.3818	0.0039	1.9205
SEPS	0.0799	3.5670	0.0004		
Method: Panel EGLS (Cross-section weights)					
C	-0.0037	-1.3235	0.1858	0.0049	2.0819
SEPS	0.0840	4.0073	0.0001		
Method: Panel EGLS (Period weights)					
C	0.0016	0.4999	0.6172	0.0060	1.9104
SEPS	0.0956	4.4460	0.0000		

[a] Pooled quarterly regressions for each proposed model. Parameters for each model are estimated by Ordinary Least Squares (OLS) and orthogonalisated in cross-sections and periods by the Generalized Least Squares (GLE) for the 61 year-firm samples, where RET and ARET are proxies for unexpected return with holding period return from a monthly basis, and SEPS and UNEPS are proxies for unexpected annual accounting earnings.

[b] RET is the return inclusive dividends, given by the natural logarithm of P/P_{t-1} adjusted for dividends and capital actions. ARET is the abnormal return or adjusted return for market influence, and is the residual of specific firm-return and predicted market model return for company *i*. SEPS is the scaled EPS variation given by an annual earnings change scaled by the price from the previous year ($\Delta EPS/P_{t-1}$). UNEPS is the excess of earnings on expected growth given by the risk-free interest rate, which is the realised EPS minus the accounting equity value per share times the risk-free interest rate.

By analysing Table 16, it is possible to verify that all regressions are significant at the five percent level. Non-zero constant coefficients were verified in the first two models that regress RET on SEPS and RET on UNEPS (Panels A and B). On the other hand, the findings in Panels C and D indicate that the constant coefficients are equal to zero, which can be easily justified with theoretical consistency. Since the variable ARET is the return adjusted to the systematic market variation, this variable focuses on the firm-specific stock returns without market effects.

Besides the significant relation, the explanatory power (R-square) for all models is almost nonexistent. The only model that presents explanatory power higher than one percent is the model which shows regressing RET on UNEPS when weight is attributed to the period dimension. Besides the very low R-squares, a tendency of period-weighted regressions performing "better" was observed. R-squares seem to increase poorly in GLS models when weight is given to period variation. This suggests that variance in short intervals (quarters) becomes more relevant than cross-sectional variations. The period dimension might be a better explanation when the interval of return accumulation is reduced and the frequency of the earnings report increases.

No estimated regression presents serial correlation problem: the Durbin-Watson statistic is in the acceptable interval (accepted the null hypothesis of the no serial correlation at the five percent level) according to the critical values presented in Appendix 3.

3.4.2.4 Pooled lagged quarterly regressions

Since quarter periods seem to show seasonality, the model testing a lagged structure for the earnings-returns relationship considers the regression of unexpected earnings (SEPS and UNEPS) on return measures (RET and ARET) by analysing the contemporaneous variables, one-period lag and four-period lags.

The only model with significance in the lagged structure is presented in Panel B relating UNEPS and RET; this model also presents a higher explanatory power (almost five percent in the level regression). The other regressions indicate that the current return is more significant for explaining changes in the quarterly earnings. Considering the results and the methodology of this study, it is possible to infer that returns do not seem to anticipate changes in the quarterly earnings.

Table 17 – Pooled quarterly reverse regressions with one and four quarters lags for the independent variable [a,b]

Panel A: $SEPS_{it} = a + b_1 RET_{it} + b_1 RET_{it-1} + b_1 RET_{it-4} + \varepsilon_{it}$

Dependent Variable: SEPS

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	0.0007	0.2816	0.7782	0.0015	2.2623
RET	0.0229	2.6769	0.0075		
RET(-1)	0.0008	0.0915	0.9271		
RET(-4)	-0.0049	-0.5513	0.5815		
Method: Panel EGLS (Cross-section weights)					
C	0.0006	0.9409	0.3468	0.0012	2.4544
RET	0.0061	2.2318	0.0257		
RET(-1)	0.0019	0.6652	0.5060		
RET(-4)	0.0023	0.7239	0.4692		
Method: Panel EGLS (Period weights)					
C	0.0000163	0.0165	0.9868	0.0015	2.4866
RET	0.007279	1.9520	0.0510		
RET(-1)	0.007169	1.7205	0.0854		
RET(-4)	0.001233	0.2879	0.7734		

Panel B: $UNEPS_{it} = a + b_1 RET_{it} + b_1 RET_{it-1} + b_1 RET_{it-4} + \varepsilon_{it}$

Dependent Variable: UNEPS

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	-0.0398	-15.7210	0.0000	0.0483	0.9895
RET	0.0361	3.8904	0.0001		
RET(-1)	0.0728	7.6879	0.0000		
RET(-4)	0.0823	8.6612	0.0000		
Method: Panel EGLS (Cross-section weights)					
C	-0.0141	-11.3120	0.0000	0.0371	0.8806
RET	0.0174	3.3109	0.0009		
RET(-1)	0.0314	5.8761	0.0000		
RET(-4)	0.0454	8.1854	0.0000		
Method: Panel EGLS (Period weights)					
C	-0.010558	-7.3573	0.0000	0.0392	0.8776
RET	0.018823	3.6369	0.0003		
RET(-1)	0.038645	6.6347	0.0000		
RET(-4)	0.045758	8.0376	0.0000		

Panel C: $SEPS_{it} = a + b_1 ARET_{it} + b_1 ARET_{it-1} + b_1 ARET_{it-4} + \varepsilon_{it}$

Dependent Variable: SEPS

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	0.0013	0.5663	0.5713	0.0041	2.2276
ARET	0.0288	2.5335	0.0113		
ARET(-1)	-0.0226	-2.0070	0.0448		
ARET(-4)	-0.0233	-2.1725	0.0299		
Method: Panel EGLS (Cross-section weights)					
C	0.0011	1.8440	0.0653	0.0018	2.4587
ARET	0.0108	2.6007	0.0093		
ARET(-1)	-0.0028	-0.6766	0.4987		
ARET(-4)	-0.0032	-0.7843	0.4329		
Method: Panel EGLS (Period weights)					
C	0.000365	0.3974	0.6911	0.0012	2.4452
ARET	0.009141	1.8207	0.0688		
ARET(-1)	-0.007302	-1.6798	0.0931		
ARET(-4)	-0.004018	-0.8216	0.4113		

Panel D: $UNEPS_{it} = a + b_1 ARET_{it} + b_1 ARET_{it-1} + b_1 ARET_{it-4} + \varepsilon_{it}$

Dependent Variable: UNEPS

Independent Variable	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
Method: Pooled Ordinary Least Squares					
C	-0.0312	-12.4709	0.0000	0.0018	0.9237
ARET	0.0002	0.0177	0.9859		
ARET(-1)	0.0155	1.2349	0.2170		
ARET(-4)	0.0316	2.6206	0.0088		
Method: Panel EGLS (Cross-section weights)					
C	-0.0093	-8.4307	0.0000	0.0009	0.8295
ARET	-0.0022	-0.3181	0.7505		
ARET(-1)	0.0102	1.5185	0.1290		
ARET(-4)	0.0115	1.7507	0.0801		
Method: Panel EGLS (Period weights)					
C	-0.00348	-2.6867	0.0073	0.0005	0.8459
ARET	-0.009385	-1.3719	0.1702		
ARET(-1)	0.004694	0.6941	0.4877		
ARET(-4)	0.009721	1.4129	0.1578		

[a] Pooled Quarterly regressions for each proposed model. Parameters for each model are estimated by Ordinary Least Squares (OLS) and orthogonalisated in cross-sections and periods by the Generalized Least Squares (GLE) for the 61 year-firm samples, where RET and ARET are proxies for unexpected return with holding period return from a monthly basis, and SEPS and UNEPS are proxies for unexpected annual accounting earnings.

[b] RET is the return inclusive dividends, given by the natural logarithm of P/P_{t-1} adjusted for dividends and capital actions. ARET is the abnormal return or adjusted return for market influence, and is the residual of specific firm-return and predicted market model return for company *i*. SEPS is the scaled EPS variation given by an annual earnings change scaled by the price from the previous year ($\Delta EPS/P_{t-1}$). UNEPS is the excess of earnings on expected growth given by the risk-free interest rate, which is the realised EPS minus the accounting equity value per share times the risk-free interest rate.

In resume to the finds of the second study, it is possible to summarise that, for annual firm-regressions, few companies presented a significant relationship between earnings and stock returns and—what is even more puzzling in the analysis is—for some significant firm-relations, the coefficient is negative, suggesting that earnings variation and stock returns show an opposite relation for some companies. In terms of the annual pooled data, regressions show that the relations are statistically significant and positive; however, the explanatory power (R-square) is considerable low for all of the models, but R-square seems to increase in the GLS models, especially when weight is given to cross-sectional variation. This suggests that variance in cross-sectional observation has more relevant power for explaining the earnings-return relation than the time-series variance. The low explanatory power was commonly found in related research and, specifically, Collins and Kothari (1989) have found similar results.

In quarterly regressions, the statistically significant regressions were found, but the explanatory power is extremely low or nonexistent, suggesting a slight relationship between the variables. Besides the very low R-squares, a tendency for period-weighted regressions performing “better” was observed. R-squares seem to increase poorly in the GLS models when weight is given to period variation. This suggests that variance in short intervals (quarters) becomes more relevant than cross-sectional variations. The period dimension might be a better explanation when the interval of return accumulations is reduced (quarterly) and the frequency of data is bigger.

4 ECONOMIC DETERMINANTS OF EARNINGS RESPONSE COEFFICIENT

4.1 Background Concepts of Economic Determinants of the earnings response coefficient

Earnings response coefficient studies, e.g. Easton and Zmijewski (1989), Collins and Kothari (1989), Ball, Kothari and Watts (1993), present theoretical models that may be used to derive response coefficients for information variables. These models demonstrate that stock price is a function of all information variables that predict dividends. If the system of time-series processes for the information variables that predict dividends is linear, then price may be expressed as a linear function of these information variables.

4.2. Economic determinants of earnings response coefficient

According to Kothari (2001, p.124),

> The most promising area of research in the earnings response coefficient literature is to relate time-series properties of earnings to economic determinants like competition, technology, innovation, effectiveness of corporate governance, incentive compensation policies, etc.

According to Collins and Kothari (1989), in the perspective of association studies, most of the empirical literature assumes the earnings-returns relation to be homogeneous across firms; hence, the earnings response coefficients were treated as cross-sectional and temporal constants. However, the studies of Beaver, Lambert and Morse (1980), Ohlson (1983), Miller and Rock (1985), Kormendi and Lipe (1987) and Easton and Zmijewski (1989) show that relaxing the cross-firms homogeneity assumption, the specification and explanatory power are improved. These studies provided important insights into cross-sectional factors that explain variation in earnings response coefficients. Additionally, theses studies provided evidences of intertemporal differences in the earnings response coefficient by combining alternative valuation models with different earnings process assumptions.

Collins and Kothari's (1989) study provides further insights into factors contributing to differential earnings response coefficients in an annual association study context by combining temporal as well as cross-sectional determinants of earnings response coefficients. According to the authors,

> the temporal variation in ERCs is hypothesized to be negatively related to the risk-free interest rate. We expect cross-sectional variation in ERCs to be positively related to earnings persistence and negatively related to firm's systematic risk. In addition, we hypothesize that ERCs are positively related to growth opportunities that are not likely to be fully captured by persistence estimated using time series models.

Collins and Kothari (1989) also demonstrate empirically that the earnings/returns relation varies with firm size, where size is a proxy for environment-based information differences. Differences in environmental information affect the extent to which price changes anticipate earnings changes.

Collins and Kothari (1989) related the earnings response coefficient to a number of commonly assumed ARIMA time-series properties of earnings, including the random walk, moving average, and autoregressive properties.

According to Kothari (2001) all of the studies relating the earnings response coefficient to economic variable, began with the discounted net cash flow valuation model that is standard in the finance and economics literature. To link earnings to security returns, a one-to-one link between revisions in the market's expectations of earnings and net cash flows was assumed.

The price change in response to a $1 earnings innovation was the $1 innovation plus the discounted present value of the revision in expectations of all future periods' earnings. The four determinants of this price change or the earnings response coefficient were persistence, risk, growth, and interest rate.

Kormendi and Lipe (1987) and Easton and Zmijewski (1989) showed that the greater the impact of earnings innovation is on market participants' expectations of future earnings (persistence of time-series property of earnings), the larger is the price change or the earnings response coefficients.

In the same way, Easton and Zmijewski (1989), using a single and multi-beta versions of the CAPM, explained why systematic risk negatively affects the earnings response coefficient since it is implied that the equity discount rate increases in the equity cash flows' systematic risk. Thus, greater risk implies a larger discount rate, which reduces the discounted present value of the revisions in expected future earnings (the earnings response coefficient).

Collins and Kothari (1989) predicted a positive marginal effect of a firm's growth opportunities on the earnings response coefficient. Growth refers either to existing projects or to opportunities to invest in new projects that are expected to yield rates of return that exceed the risk-adjusted rate of return (*r*) measured with the systematic risk of the project's cash flows. A firm's ability to earn above-normal rates of return on its current or future investments does not contradict capital market efficiency. It only means that the firm has monopoly power over the product's markets and is able to earn (quasi) rents for a finite period. On the contrary, entry or exit into or out of the product's market often does not instantaneously eliminate firms' ability to earn super-normal rates of return. To the extent that current earnings are informative about the firm's growth opportunities, the price change is expected to be large. Collins and Kothari (1989, pp. 149–150) argue that the price reaction would be greater than that implied by the time-series persistence of earnings partly because persistence estimates from historical data are likely to be 'deficient in accurately reflecting current growth opportunities'.

In addition to the three cross-sectional determinants (persistence, risk and growth) of the earnings response coefficient, the interest rate was hypothesised as a temporal determinant of the earnings response coefficient since the expected rates of returns in the future periods vary over time. That is, $E(R_{it+\tau})$ can vary over time. Collins and Kothari (1989) assumed that the current risk-free interest rate is highly and positively auto-correlated with the future risk-free interest rates. Because the risk-free interest rates are a component of $E(R_{it+\tau})$, higher risk-free interest rates lead to higher expected rates of return on the security in the future periods. Therefore, the authors predict a negative relation between interest rates and the earnings response coefficient over time.

Collins and Kothari (1989) use a partial equilibrium analysis to examine the interest rate effect on the earning response coefficient.

> Interest rate changes affect, among other things, the saving/investment decisions of individuals and corporations which, in turn, affect the firms' future cash flows. Incorporating these effects on cash flows and their present values to derive a relation between interest rates and the ERCs requires a complete equilibrium analysis that is beyond the scope of this paper. We essentially ignore the saving/investment and associated cash flow implications of interest rate changes in making our predictions.

When hypothesising the negative temporal association between interest rates and the earnings response coefficient, Collins and Kothari (1989) deviated from the assumption underlying the discounted cash flow model and the multi-period CAPM that all of the future $E(R_{it+\tau})$ are known at time *t* and, thus, cannot vary with *t*. However, relaxing this assumption generates an interesting empirical prediction and is consistent with the evidence that both nominal and real interest rates change over time.

Kothari (2001) summarises that the discount rate *r*, at any point in time, is the sum of the risk-free rate of return at that time added to a risk premium. If the risk-free rate of interest rises, then *ceteris paribus* the discounted present value of the revisions in expectations of future earnings innovations falls, inducing a negative temporal association between interest rate levels and earnings response coefficients.

To summarise, the hypotheses of Collins and Kothari's (1989) study, it is possible to say that they identified four factors contributing to cross-sectional and temporal differences in the earnings response coefficients:

- The earnings response coefficient is positively related to earnings persistence (this variable will not be tested).

- The earnings response coefficient is positively related to economic growth opportunities.

- The earnings response coefficient is negatively related to the securities' future expected discount rates. The discount rate is made up of (i) the risk-free interest rate, R_f, and the market risk premium, and (ii) the firms' CAPM beta risk. Because R_f and the market risk premium are the same for all of the firms, they obviously are not a source of cross-sectional variation in the earnings response coefficients.

- The earnings response coefficients are negatively related to the interest rate levels over time and the CAPM beta risk in the cross-section.

Thus, assuming that current risk-free interest rate is highly positively autocorrelated with the future risk-free interest rate, if the risk-free interest rate raises, then ceteris paribus the discounted present value of expected future earnings falls, inducing a negative temporal association.

4.3 Previous Empirical Studies

Kormendi and Lipe (1987) estimated the time-series properties of firms' earning series and the relation between earnings innovation and stock returns for 145 firms using 32 years of annual data (from 1947 to 1980). The annual earnings were from the Compustat database, and the data consisted of all of the firms' reports on a calendar-year basis that had a complete time-series for earnings and returns for the analysed period. They found that the present value of the revisions in the expected future earnings induced by innovation and earnings innovation are positively related across firms. The results strongly support such a positive relation, with some evidence suggesting that the relation is approximately one-to-one, as implied by classical valuation models. They also found no evidence that stock returns are excessively sensitive to earnings innovations. This was consistent with the previous literature that found no evidence of excess volatility after (1) dispensing with the assumption that aggregate dividends and stock prices are stationary and (2) assessing volatility with respect to a (relatively) unsmoothed series, such as earnings instead of with respect to a smoothed series such as dividends.

Collins and Kothari (1989) used a sample of firms from the Compustat Industrial Annual and the Compustat Research Annual tapes with a December 31 fiscal year-end and a minimum of three years of earnings data for each year *t* from 1968 to 1982 (a total of 15 years). The December 31 fiscal year-end criterion was imposed in order to facilitate data analysis and enhance comparisons with previous studies. From the Compustat sample, only firms listed on the NYSE were included for further analysis. They limited the sample to NYSE firms because they used monthly return data to estimate systematic risk and also use monthly returns to obtain buy-and-hold returns over varying holding periods. These criteria yielded a sample of 9,776 firm-year observations. The number of observations in each year varied from 519 in 1968 to 730 in 1978. Their empirical evidence was consistent with the predictions that the earnings response coefficient increases in growth and/or persistence and decreases in interest rates and risk. Because the proxies used for growth and persistence could potentially reflect the effect of both variables, they could not conclude unambiguously that growth and persistence affect earnings response coefficient individually. To reduce the errors-in-variables problem, we use reverse regression to document the effect of differences in persistence and/or growth, risk, and interest rates on the response coefficient.

Easton and Zmijewski (1989) used a subsample of the data in Brown et al. (1987a). Value Line forecasts for the six-year period 1975-1980 were collected. All of the firms included in the Brown et al. sample satisfied some criteria. The number of companies was 212, and for a firm to be included in the sample for this study, it had to present complete data for 20 quarters. The results indicated predictable cross-sectional variation in the earnings response coefficients. Evidence indicated a positive association between the earnings response coefficient and the revision coefficient, a negative association between the earnings response coefficient and systematic risk, and a positive association between the earnings response coefficient and firm size. However, the results for systematic risk and size were not consistently and significantly different from zero. Cross-sectional variation in the earnings response coefficients has important implications for other researchers who constrain this coefficient to be the same for all firms when conducting cross-sectional regressions of abnormal returns on unexpected earnings and other non-earnings variables. In such research designs, these other explanatory variables may have significant explanatory power only because they are correlated with the cross-sectional variation in the earnings response coefficients.

Ball, Kothari and Watts (1993) also used firms' information from Compustat with December fiscal year-ends. Firms were ranked on their unexpected earnings in each of the 37 years during the 1951-1987 period, and were assigned to portfolios in equal numbers. The first portfolio therefore was rebalanced annually to contain each years' ten percent worst (best) earnings performers. The earnings-performance year was designed as year zero in event time and contained those earnings that were used to sort firms into portfolios. According to this, the sample was formed by firms with earnings data of at least six years during 1950 and 1988. The resulting sample consisted of 28.294 firm-years, an average of 764 firms per year. The authors used the CAPM model to determine the expected return of assets and portfolio. The author concluded that changes in earnings have systematic economic determinants that are likely to be associated with variation in securities' expected returns, particularly since earnings are the accounting return on equity. According to them (p.636), "identifying the economic determinants of earnings variation should improve our understanding of the earnings-price level relation". Ball, Kothari and Watts (1993, p. 622) also found an interesting observation that, "the presence of corporate debt complicates the analysis because leverage effects seem likely to affect the relation between changes in investment risk and expected earnings".

Ahmed (1994) re-examined the competition, the cost structure, and growth opportunities' effects on earnings response coefficients and extended this literature. He presented a more refined theoretical motivation for investigating competition and cost structure effects, and introduced new economic factor proxies that confirm prior findings with respect to competition, but differ from prior findings with respect to cost structure and growth opportunities. The author tested the hypothesis that "the higher the competition in the firm's product market, the lower is its ERC" and "the higher the ratio of fixed costs to total costs, the higher is the ERC." Overall, the evidence suggests that accounting earnings reflect information about future economic rents generated by firms' assets-in-place. The evidence also suggests, contrary to prior studies, that accounting earnings are not very informative about firms' growth opportunities. The empirical study was developed using a sample of 682 manufacturing firms (covering 179 different fourdigit industries) from the Compustat Quarterly Industrial file that had at least 20 quarters of earnings, prices, and return data from 1980 to 1985. Non-manufacturing firms were excluded because firms in these sectors are subject to additional regulatory requirements that likely affect the relations hypothesised in his study. Ahmed (1994) used quarterly data rather than annual data because the cross-sectional tests assume constancy of the ERCs and economic factors over time.

Dhaliwal and Reynolds (1994) examined the effect of the default risk of debt on the relation between accounting earnings and stock returns. Some previous researches had suggested that measurements of equity beta do not capture all dimensions of riskiness equity. According to the authors, the default risk of debt may help explain how accounting earnings are likely to affect stock returns because the default risk of debt may capture some elements of the riskiness of equity that are not captured by the equity beta. A sample of firms from the Compustat and CRSP was used which had the following characteristics: (1) Annual EPS over the 1969-1988 period; (2) sufficient return data for estimation of market model parameters; (3) each firm had a fiscal year ending in December, and (4) a bond rating available in quarterly database on Compustat. Consequently, the sample was composed by 3.587 firm-year observations over the 11-year observation from 1978-1988. They documented empirically that the coefficient relating unexpected changes in earnings to abnormal returns (the earning response coefficient) is negatively related to the default risk of debt as measured by bond ratings.

Teets and Wasley (1996) studied the use of firm-specific versus pooled cross-sectional regression estimation procedures in short-window accounting capital market studies. While they focused on estimating earnings response coefficients, their results do apply more generally. They constructed random samples of 75 firms, each using Compustat quarterly data files covering the 1971-1990 period. This 20-year period is broken down into four five-year sub-periods (i.e., 1971-75, 1976-80, 1981-85, and 1986-90). Firms with quarterly earnings announcement dates and earnings per share data available from Compustat for at least 15 of the sub-periods’ 20 quarters, and continuous security return data available on the CRSP daily returns file, were included in a sample in a sub-period. Using random samples of firms, they found that the mean of the firm-specific coefficients was, on average, 13 times larger than the corresponding coefficient estimated with a pooled cross-sectional regression methodology (CSRM). In fact, the average of the firm-specific coefficients is always larger than the corresponding CSRM ERC. The difference is due to the variation in the coefficients and unexpected earnings (UE) variances across firms, combined with a negative relation between firm-specific unexpected earnings variances and earnings response coefficients. These results document the necessity to consider possible heterogeneity in the response coefficients and UE variances from a research design perspective, especially if there is reason to suspect a correlation between the response coefficients and the characteristics of the independent variables. Failure to do so may lead to incorrect inferences about the magnitude of the estimated coefficients and/or incorrect inferences about differences in coefficient behaviour between groups of firms.

4.4 The Data, Methodological Considerations and Empirical Tests

According to Collins and Kothari (1989, p. 151), the covariance between unexpected returns (UR_{it}) and unexpected earnings (UX_{it}) can be summarised as follows:

$$\operatorname{cov}(UR_{it}, UX_{it}) = f(\underbrace{\overset{(+)}{\text{persistence}}, \overset{(-)}{\text{risk}}, \overset{(+)}{\text{growth}}}_{\substack{\text{cross-sectional}\\ \text{variation}}}, \underbrace{\overset{(-)}{\text{interest rates}}}_{\substack{\text{temporal}\\ \text{variation}}})$$

The authors also claim that in their model, at least two other empirical factors affect the estimated $\operatorname{cov}(UR_{it}, UX_{it})$ and, therefore, the estimated earnings response coefficient. The first is a noise in reported accounting earnings as an indicator of future dividends, and the second is the firm's information environment.

The functional model to be tested in this dissertation is based on one by Collins and Kothari (1989):

$$SEPS = b_0 + b_1 RET_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 INTER_{it} + b_5 SIZE_{it} + \varepsilon_{it}$$

4.4.1 Annual regressions

The empirical procedure for determination of economic determinants of earnings response coefficient follows the tests used by Collins and Kothari (1989), Easton and Zmijewski (1989) and Ball, Kothari and Watts (1993). The analysis of this dissertation considers annual and quarterly data. Regarding annual data, Table 11 summarises the descriptive statistic for the five variables considered in this study, where SEPS is the scaled variation of earnings per share, RET is the annual return calculated by quarterly returns accumulation; BETA is the risk proxy calculated by a market model; GRO is the proxy for investment growth opportunities measured by relative market-to-book index; INTER is the annual nominal interest rate given by the interbank rate (assumed to be free of risk); and SIZE is measured by the total assets logarithm divided by 100.

Table 18 – Annual pooled descriptive statistics

	SEPS	RET	UNEPS	ARET	BETA	GRO	INTER	LEV	SIZE
Mean	0.0252	0.0646	-0.1045	-0.0204	0.7828	1.2527	0.2213	0.6101	0.0636
Median	0.0170	0.0514	-0.0167	-0.0275	0.7758	0.9842	0.1904	0.6009	0.0646
Maximum	0.9485	1.5398	0.9215	2.1497	2.8107	8.6986	0.5309	1.7114	0.0863
Minimum	-0.9747	-1.9241	-0.9918	-2.5586	-1.1658	-6.3828	0.1181	0.0306	0.0380
Std. Dev.	0.2232	0.3231	0.3001	0.4598	0.4713	1.1272	0.0999	0.1985	0.0080
Skewness	0.1253	0.1907	-0.6868	-0.0725	0.1245	1.8308	1.9572	0.3399	-0.3863
Kurtosis	7.30	6.34	3.95	7.18	4.64	13.79	6.82	4.29	3.13
Jarque-Bera	556.57	369.19	78.57	557.97	90.07	4126.71	1063.86	67.06	20.20
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sum	18.17	50.76	-70.84	-15.64	612.95	955.85	188.97	461.87	50.19
Sum Sq. Dev.	35.86	81.95	60.98	161.52	173.71	968.23	8.51	29.80	0.05
Observations	721	786	678	765	783	763	854	757	789

Table 18 shows that all pooled variables have no normal distribution, as the Jarque-Bera statistics reject the null hypothesis of normal distributions. The number of observation varies from 678 to 854, and the first four variables were already analysed, as they are the same variables used in the previous study of this dissertation.

Each security's systematic risk (BETA) is estimated by regressing monthly returns over 24 months on the market return index given by Ibovespa. The sample mean beta is 0.7828, which suggests that the sample is slightly less risky than the average security listed on the Sao Paulo Stock Exchange (Bovespa). This is expected because the sample selection criteria are biased towards including larger Bovespa firms (which also have a longer listed period). Previous evidence suggests that firm size and beta are inversely related [see, for example, Banz (1981) and/or Collins and Kothari (1989)].

The variable INTER is the yearly nominal interest rate for interbank market (CDI), which is similar to the interest paid by Brazilian government bonds and is a proxy for the risk-free interest rate. Evidently, interest rate varies over time but is common for all cross-sections. The yearly mean during the period is 22.13%, but this value had reached 53.09% in 1995, with the following year marking the beginning of relative monetary stability with Real Plan. Recently, the yearly nominal interest rate has been around 11%.

The leverage measure used in this study (LEV) compares the total accounting liabilities to total assets (liabilities/assets), and the average is 61.01%, which represents the mean percentage of assets financed by non-equity holders. To obtain the ratio of total liabilities to equity (liabilities/equity), it is necessary to transform LEV, as Liabilities/Equity = LEV / (1-LEV). In this case, the mean liability/equity ratio will be 0.6101/(1-0.6101) = 1.564. This variable is restricted to non-financial firms; this measure cannot be applied to financial institutions.

Figure 8 presents the histograms for all variables.

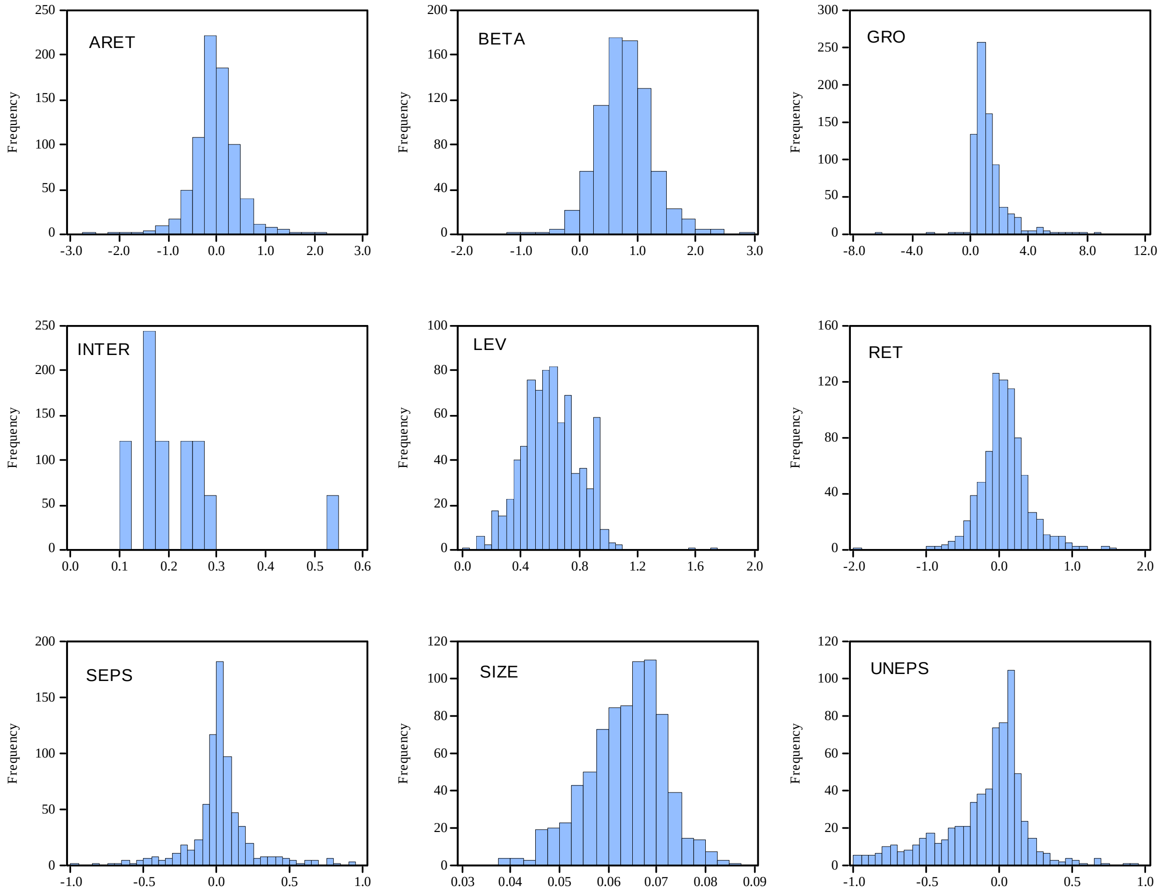

Figure 8 - Histogram of annual pooled observations of earnings, returns and economic variables

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Based on the non-normality of the variables and previous attempts to analyse the relationships between the earnings response coefficients and their determinants, Table 19 presents a Spearman Rank-Order correlation matrix (non-parametric correlations) between the variables, where it is possible to visualise some statistically significant correlations. Some relevant correlations may suggest adequacy of the models: positive correlation between earnings proxies and stock return proxies, and all correlations highlighted in the dotted-line rectangle, which relate earnings and returns measurements with economic variables.

Table 19 also shows that there are statistically significant correlations between independent variables; however, these correlations do not suggest a multicolinearity problem because the correlations are, in general, bellow 0.20. The highest correlation is between interest and firm size.

This is a completely spurious correlation because interest is common to all firms, independently of firm-size.

Table 19 – Annually Spearman Rank-Order Correlation Matrix [a]

Spearman Correlation	SEPS	RET	ARET	UNEPS	BETA	GRO	LEV	INTER	SIZE
SEPS	1.0000								
RET	0.2056	1.0000							
ARET	0.2710	0.4481	1.0000						
UNEPS	0.2855	0.1390	0.2597	1.0000					
BETA	-0.0294 [b]	-0.1464	-0.1081	-0.1000	1.0000				
GRO	0.0079 [b]	-0.0217 [b]	-0.2224	0.2220	-0.0569	1.0000			
LEV	0.0214 [b]	-0.0091 [b]	0.0795	0.2396	0.1036	0.1578	1.0000		
INTER	0.0972	0.1462	-0.0622 [b]	-0.4151	-0.1183	0.1730	-0.0792	1.0000	
SIZE	-0.0169 [b]	0.0216 [b]	0.0489 [b]	0.3017	0.2195	0.1272	0.1251	-0.3667	1.0000

[a] Spearman Rank-Order Correlation. Balanced sample (listwise missing value deletion) with 643 included observations. All correlations are statistically significant at the 5% level, except where indicated by [b].
[b] Spearman Correlation not significant at the 5% level.

Following the model by Collins and Kothari (1989) relating the earnings response coefficient and its determinants and aggregating the studies of Easton and Zmijewski (1989), Ball, Kothari and Wats (1993) and Collins et al. (1994), in order to estimate the equations of return proxies on earnings proxies, controlled by the economic determinants, four functional models were used by combining different proxies of earnings and returns:

$$RET_{it} = a + b_1 SEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

$$RET_{it} = a + b_1 UNEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

$$ARET_{it} = a + b_1 SEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

$$ARET_{it} = a + b_1 UNEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

Table 20 is composted of four panels (A to D), which report the annual pooled regressions for the four functional models that consider proxies for unexpected returns (RET and ARET) as dependent variables, with the independent variables being the proxies for unexpected accounting earnings (SEPS and UNEPS). The economic variables are hypothesised to be determinants of earnings response coefficient.

Each Panel (A, B, C and D) shows the test of each functional model specified by Panel Ordinary Least Squares (OLS). For additional analysis, Appendixes 14 to 17 show the four functional models specified by the Generalised Least Squared (GLS) method. GLS specification includes regressions with weights attributed to cross-section observation (Panel EGLS – Cross-section weights) and with weights attributed to period observation (Panel EGLS – Period weights). The cross-section weights allow for heteroskedasticity between cross-sections. In other words, a different residual variance for each cross-section is admitted. Analogously, period weights allow for a different residual variance for each period.

All variables are analysed at level structure; however, the variable expected growth (GRO) is the relative market-to-book-value of equity ratio from the beginning of year *t*. According to Collins and Kothari (1989), this proxy for growth is likely to be affected by earnings persistence; that is, high market-to-book-value ratio is likely to be associated with high persistence. Therefore, "a relation between market-to-book ratio and earnings response coefficient will suggest that growth *and/or* persistence affect ERC".

Table 20 – Pooled annual regressions – estimation for the determinants of ERC [a,b,c]

Panel A: Dependent variable RET in the equation:

$$RET_{it} = a + b_1 SEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
C	-0.2395	-2.0324	0.0425	0.0521	1.8170
SEPS	0.1608	3.1809	0.0015		
BETA	-0.1273	-4.8921	0.0000		
GRO	-0.0094	-0.9213	0.3572		
LEV	0.0201	0.3292	0.7421		
INTER	0.3028	2.0487	0.0409		
SIZE	5.2233	3.2259	0.0013		

Panel B: Dependent variable RET in the equation:

$$RET_{it} = a + b_1 UNEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
C	-0.2531	-2.1055	0.0356	0.0514	1.7049
UNEPS	0.1248	2.7276	0.0066		
BETA	-0.1119	-4.2892	0.0000		
GRO	-0.0162	-1.5916	0.1120		
LEV	0.0135	0.2143	0.8304		
INTER	0.6014	3.2771	0.0011		
SIZE	4.7921	2.9371	0.0034		

Panel C: Dependent variable ARET in the equation: $ARET_{it} = a + b_1SEPS_{it} + b_2BETA_{it} + b_3GRO_{it} + b_4LEV + b_5INTER_{it} + b_6SIZE_{it} + \varepsilon_{it}$					
	Coefficient	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
C	-0.0508	-0.3079	0.7582	0.0907	1.5250
SEPS	0.2820	3.9992	0.0001		
BETA	-0.1540	-4.2509	0.0000		
GRO	-0.0514	-3.6104	0.0003		
LEV	0.1104	1.3001	0.1940		
INTER	-0.7904	-3.8357	0.0001		
SIZE	4.7705	2.1064	0.0355		
Panel D: Dependent variable ARET in the equation: $ARET_{it} = a + b_1UNEPS_{it} + b_2BETA_{it} + b_3GRO_{it} + b_4LEV + b_5INTER_{it} + b_6SIZE_{it} + \varepsilon_{it}$					
	Coefficient	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
C	0.0004	0.0024	0.9981	0.1128	1.5832
UNEPS	0.3042	4.8708	0.0000		
BETA	-0.1340	-3.7658	0.0002		
GRO	-0.0714	-5.1378	0.0000		
LEV	0.0383	0.4437	0.6574		
INTER	-0.2404	-0.9589	0.3380		
SIZE	3.7277	1.6692	0.0956		

[a] Pooled annual regressions for each proposed model estimated by Ordinary Least Squares (OLS) for the 61-firm sample from 1995 to 2008, where RET and ARET are proxies of unexpected return with holding period return from April (*t*) to March (*t+1*) and SEPS and UNEPS are proxies for unexpected annual accounting earnings.

[b] RET is the return inclusive dividends, given by natural logarithm of P/P_{t-1} adjusted for dividends and capital actions. ARET is the abnormal return or adjusted return for market influence, which is the sum of the residuals of specific firm-return and predicted market model return for company *i*. SEPS is the scaled EPS variation given by annual earnings change scaled by the price of the previous year ($\Delta EPS/P_{t-1}$). UNEPS is the excess of earnings on expected growth given by risk-free interest rate, which is thus the realised EPS minus the accounting equity value per share times risk-free interest rate.

[c] The coefficients and explanatory power for GLS estimations with cross-section and period weights can be found in Appendixes 14 to 17

Results in Table 20 reveal that coefficients, in general, assume equivalent signs for every independent variable, an exception being the risk-free interest rate (INTER). In the first two panels, when the dependent variable is realised return (RET), interest rate is positively and significantly related to earnings response coefficient; in contrast, the last two panels (Panels C and D) report a negative relationship of interest rate; however, for the results in Panel D, no statistical significance was found.

These finds are puzzling because interest rate affects both the discount rate and the expected earnings, as discussed above. Some explanations can be given for these conflicting findings: (1) Because the variable RET is calculated as a nominal stock return, an increase in general interest rates generates an increase in expected nominal stocks returns (firm-specific discount rate/expected returns is the sum of the risk-free rate and the risk premium); therefore, a positive relation is expected. On the other hand, because ARET is a measure of adjusted return vis-à-vis market effects, the impact of a change in general market interest rates is (in theory) eliminated from the return calculation. Thus, ARET might capture only firm-specific risk premium; therefore, ceteris paribus, the discounted present value of expected future earnings falls, inducing a negative temporal association. (2) The sample contains financial institutions; therefore, a high level of interest rates might imply higher earnings for these institutions; thus, the sample can be biased by financial institutions.

Panel A is the most direct comparison to results found by Collins and Kothari (1989) in terms of empirical measurements, proxy definition and statistical estimation. Comparing the results reported in Panel A to those found by the aforementioned authors: (1) a significant negative relationship in systematic risk proxy (BETA) was found, confirming the hypothesis of negative relation; this find also supports the study by Ball, Kothari and Watts (1993); (2) in contrast to Collins and Kothari's study, the proxy for growth opportunities (GRO) is not significant; thus, it is possible to conclude that, for these variable specifications, growth does not affect earnings response coefficient; (3) Collins and Kothari conclude that there is "no theoretical justification for incremental explanatory power of the firm size variable on including risk and growth (and/or persistence) variables to explain cross-sectional variation in the relation between earnings and returns"; however, in the Brazilian market, firm size appears to explain some of the cross-sectional variations of earnings response coefficient, as it is significant and as the explanatory power would be reduced by 0.7% without this variable (several regressions were estimated, simulating different specification models; these regressions are available under request). The explanatory power (adjusted R-squared) was 5.21% and no problems of serial autocorrelations, multicolinearity or heteroskedasticity that may have compromised the conclusions were identified.

The evidence obtained by the leverage variable (LEV) in Panel A does not support the findings of Ball, Kothari and Watts (1993). According to these authors, "leverage effects seem likely to affect the relation between changes in investment risk and expected earnings". However, the construction of the variable does not intend to capture the same effect as the one tested by the authors: Ball, Kothari and Watt (1993) estimated the leverage change as a proxy for firm-specific risk change. This effect of risk change is more likely to evidence time-series variances of earnings response coefficient, given the way I present the variable leverage in the present study in order to capture the cross-sectional explanation of earnings response coefficient variation (the same idea is valid for BETA, GRO and SIZE).[9]

Panels B, C and D generally report results similar to Panel A in relation to the risk variable: BETA is negative and significant for all regressions, as hypothesised, and LEV is not significant in any regression. These findings suggest that relative systematic risk is far more relevant in explaining cross-sectional variation of earnings response coefficient than firm-specific leverage is. An additional explanation for this lack of significance in the leverage variable is that Brazilian firms generally tend not to be highly/excessively indebted; therefore, the leverage level may not strongly segregate the firms in relation to their earnings response coefficient s.

In contrast to the conclusions of the first two panels, Panels C and D report that expected growth opportunities (GRO) are statistically significant at a level of 5%. However, the signs of the coefficients are negative, suggesting that firms with higher growth opportunities have lower earnings response coefficient; this evidence is contrary to empirical finds of Beaver and Morse (1978) and Collins and Kothari (1989). A possible explanation is that, in Brazil, the ratio of market value to book value of equity is not a consistent proxy for economic growth opportunities. According to Smith and Watts (1992), the difference between the market value and book value of equity, when measured relative to the market average, roughly represents the value of investment opportunities present for the firm. The market-to-book-value ratio depends on the extent to which the firm's return on its existing assets and on expected future investments exceeds its required rate of return on equity. Therefore, given that future earnings are affected by the growth opportunities, the higher the market to book value of equity ratio, the higher the expected earnings growth. However, as the correlation matrix reports (Table 19), the ratio of market to book value of equity at the beginning of a period is not significantly correlated with observed return or observed earnings variation. This evidence can suggest that the market-to-book ratio reflects variables other than expected growth or expected earnings increase in one year.

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[9] I also tested for the first difference in leverage (representing the risk change) and the coefficients were significant at the 5% level; however, a deep analysis is beyond the scope of the present study.

The negative correlation between GRO and ARET may be explained because GRO and ARET are calculated/deflated by the market average; however, GRO is an average obtained from the sample in this study (61 firms) and is thus the relative average represents growth opportunities for the 61-firm sample. On the other hand, ARET is obtained by adjusting the 61 firms' returns to the Ibovespa; thus, the relative average includes firms that can present higher (or lower) growth opportunities than the 61 firms in the sample.

The two models presented in Panels A and B have similar explanatory power (5.21% and 5.14%, respectively), and no problems of serial correlation or multicolinearity were detected. Panels C and D report a higher explanatory power, accounting for 9.07% and 11.28%, respectively. This increase in explanatory power can be explained by the higher correlations between UNEPS and ARET and the economic variables. It can suggest that abnormal earnings and returns, calculated in relation to risk-free and market index, respectively, are more likely to be explained by economic variables. Despite the increase in explanatory power in regressions on Panels C and D, a large decrease in Durbin-Watson test statistics was reported. This indicates that the regressions may not be free of serial autocorrelation problem; however, it is not possible to infer that the regressions have autocorrelated residuals because the statistic is in an inconclusive area.

Appendixes 14 to 17 presents the four functional models (combining the four measures or earnings and return) with estimations by generalised least squares (GLS), and no significant evidence can be extracted because most of the coefficients present the same behaviour as the estimations by OLS. The explanatory power seems to slightly increase when the weight for cross-sections is attributed;, consequently, cross-sectional heteroskedasticity is allowed in this dimension.

In order to verify the results, especially with a view of preventing an incorrect analysis derived from any multicolinearity and autocorrelation problems and with the intention of providing a robust analysis of earnings and return variable correlations conditioned to economic determinants, a series of partial correlations were estimated by controlling for the hypothesised economic determinants of earnings response coefficient.

According to Gujarati (2004), partial correlation coefficient analysis indicates the "true" degree of (linear) association between two variables (Y and X_2) when a third variable X_3 may be associated with both of them. Therefore, to an adequate estimation, the coefficients will be unlikely to give a false impression of the nature of association between Y and X_2. Thus, it is necessary that a correlation coefficient between X_2 and Y is independent of the influence, if any, of X_3. Such a correlation coefficient can be obtained and is appropriately known as the partial correlation coefficient.

Table 21 – Partial Annual Correlations – Earnings and Returns Correlations Controlled for Economic Variables

Spearman Correlation	Ordinary Coefficient	BETA	GRO	LEV	INTER	SIZE	Controlled by All Variables
SEPS x RET	0.2113	0.2145	0.2099	0.2032	0.2006	0.2106	0.1911
SEPS x ARET	0.2787	0.2828	0.2861	0.2688	0.2890	0.2777	0.2808
UNEPS x RET	0.1228	0.1096	0.1324	0.1427	0.2058	0.1248	0.2211
UNEPS x ARET	0.2528	0.2455	0.3198	0.2405	0.2416	0.2527	0.3153

As can be observed from Table 21, all variables present constant correlation when controlled for each economic variable, which suggests that the correlation is not spurious. The most interesting find, however, is that by controlling the variable, the correlation between earnings and return proxies increases, especially when compared to the correlation coefficient simultaneously controlled for all variables. These findings corroborate the idea of aggregating explanatory power by introducing the economic variables. Again, the variable that seems to contribute less to improving explanatory power, in general terms, is the variable LEV.

In order to complement the analysis or determinants of earnings response coefficient, quarterly data were collected and analysed in the next section.

4.4.2 Quarterly regressions

To describe the variables involved in the quarterly analysis for economic determination of earnings response coefficient, Tables 22 present the quarterly descriptive statistics and the quarterly correlation analysis. Quarterly variables do not follow a normal distribution, and the number of observations varies from 3258 to 4047.

Table 22 – Quarterly cross-sectional descriptive statistics

	SEPS	RET	UNEPS	ARET	BETA	GRO	LEV	INTER	SIZE
Mean	0.0011	0.0427	-0.0436	-0.0067	0.7749	1.2540	0.6007	0.0503	0.0636
Median	0.0006	0.0592	-0.0007	-0.0079	0.7729	0.9983	0.5961	0.0438	0.0645
Maximum	0.9364	2.2246	0.9332	2.1080	3.8193	5.9874	1.8315	0.1307	0.0866
Minimum	-0.9651	-2.0149	-0.9950	-1.6431	-3.2539	-4.0627	0.0188	0.0257	0.0161
Std. Dev.	0.1276	0.2683	0.1555	0.2052	0.4799	0.9730	0.2051	0.0219	0.0078
Skewness	-0.1671	-0.3781	-1.6011	0.4202	-0.2868	1.6886	0.4478	1.8448	-0.4602
Kurtosis	21.75	8.71	13.22	11.87	7.18	7.54	4.68	6.50	3.55
Jarque-Bera	47719.40	4611.83	15882.92	11035.03	2491.03	4350.43	526.82	4365.19	162.32
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sum	3.62	142.73	-145.12	-22.39	2601.17	4089.32	2090.47	203.49	214.74
Sum Sq. Dev.	53.04	240.24	80.40	140.31	772.77	3086.17	146.37	1.93	0.21
Observations	3258	3339	3325	3333	3357	3261	3480	4047	3375

Table 22 shows that all variables are not considered normally distributed because the Jarque-Bera statistics reject the null hypothesis of normal distributions. Each security's systematic risk (BETA) is estimated by regressing monthly returns over 24 months of the market return index given by Ibovespa. The quarterly sample mean BETA is 0.7749, suggesting that the sample is slightly less risky than the average security listed on the Sao Paulo Stock Exchange (Bovespa). This is expected because the sample selection criteria are biased towards including larger Bovespa firms (which also have longer listed periods). Previous evidence suggests that firm size and beta are inversely related (BANZ, 1981; COLLINS & KOTHARI, 1989).

The variable INTER is the quarterly nominal interest rate for interbank market (CDI), which is similar to the interest paid by Brazilian government bonds and is a proxy for the risk-free interest rate. This variable shows a relevant decrease in recent periods. The quarterly interest rate was 13.07% in early 1995, and, recently, the quarterly rate has been around 2.57%.

To illustrate the distributional characteristics of the earnings, returns and economic variables, Figure 9 presents the histograms for all variables.

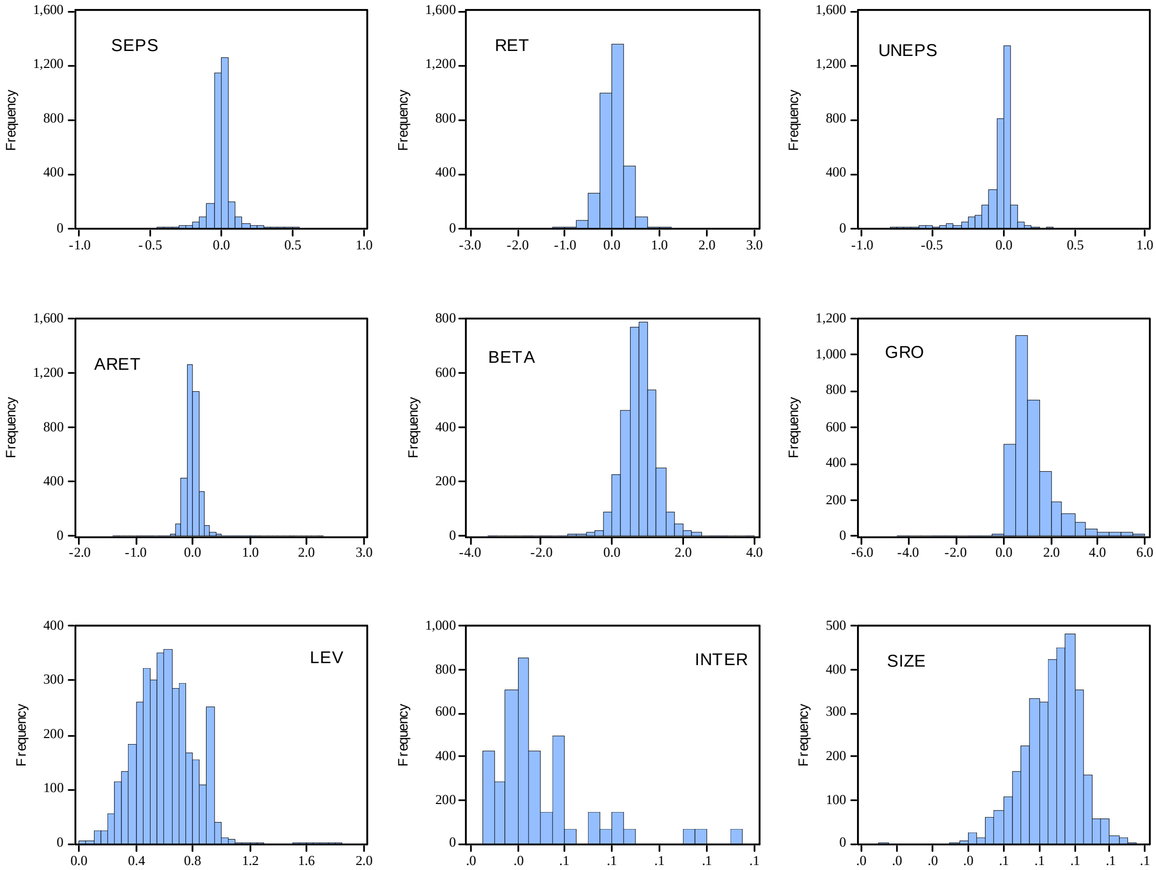

Figure 9 – Histogram for quarterly pooled observations of earnings, returns and economic variable

Based on non-normality of the variables and previous attempts to analyse the quarterly relationships between earnings response coefficients and their determinants, Table 23 presents a Spearman Rank-Order correlation matrix (non-parametric correlations) between the variables, where it is possible to visualise some statistically significant correlations. Some relevant correlations may suggest adequacy of the models: positive correlation between earnings proxies and stock return proxies, and all correlations highlighted in the dotted-line rectangle, which relate earnings and returns measurements with economic variables.

Statistically significant correlations between independent variables can be observed; however, these correlations do not suggest a multicolinearity problem because the correlations are strong. The highest correlation is between interest and firm size; this is a completely spurious correlation because interest is common to all firms, independent of firm size.

Table 23 – Quarterly Spearman Rank-Order Correlation Matrix [a]

Spearman Correlation	SEPS	RET	UNEPS	ARET	BETA	GRO	INTER	LEV	SIZE
SEPS	1.0000								
RET	0.0438*	1.0000							
UNEPS	0.3545**	0.1128**	1.0000						
ARET	0.0610**	0.6729**	0.0273	1.0000					
BETA	-0.0202	-0.0436*	-0.1017*	-0.0310	1.0000				
GRO	-0.0124	0.0225	0.2772**	-0.1076**	-0.1197**	1.0000			
INTER	0.0138	0.1137**	-0.3382**	0.0113	-0.0765**	0.0158	1.0000		
LEV	-0.0078	0.0258	0.2547**	0.0262	0.0660**	0.1869**	-0.1181**	1.0000	
SIZE	-0.0065	-0.0314	0.2376**	-0.0691**	0.2442**	0.2129**	-0.3833**	0.0876**	1.0000

[a] Spearman Rank-Order Correlation. Balanced sample (listwise missing value deletion) with 2976 included observations.
** Correlations statistically significant at 1% level
* Correlations statistically significant at 5% level

Similar to the annual analysis, Table 24 shows pooled regressions, where the dependent variables are the measures of return and the independent variables are the earnings change (and unexpected earning) controlled for economic proxies. Each Panel (A, B, C and D) shows the test of each functional model specified by Panel Ordinary Least Squares (OLS). For additional analysis, Appendixes 18 to 21, show the four functional models specified by the Generalised Least Squared (GLS) method. GLS specification includes regressions with weights attributed to cross-sectional observation (Panel EGLS – Cross-section weights) and with weights attributed to period observation (Panel EGLS – Period weights). The cross-section weights allow for heteroskedasticity between cross-sections; this means that a different residual variance for each cross-section is admitted. Analogously, period weights, allows for a different residual variance for each period.

All variables are analysed at level structure; however, the variable expected growth (GRO) is the relative ratio of market to book value of equity from the beginning of quarter *t*. According to Collins and Kothari (1989), this proxy for growth is likely to be affected by earnings persistence; that is, high market-to-book-value ratio is likely to be associated with high persistence. Hence, “a relation between market to book ratio and ERC will suggest that growth *and/or* persistence affect ERC”.

Table 24 Pooled Quarterly regressions – estimation for the determinants of ERC [a,b,c]

Panel A: Dependent variable RET in the equation:

$$RET_{it} = a + b_1 SEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
C	-0.0955	-1.8683	0.0618	0.0181	1.8335
SEPS	0.1064	2.7444	0.0061		
BETA	-0.0525	-4.9042	0.0000		
GRO	-0.0030	-0.5999	0.5486		
LEV	0.0598	2.4057	0.0162		
INTER	1.6549	5.3987	0.0000		
SIZE	1.1081	1.5951	0.1108		

Panel B: Dependent variable RET in the equation:

$$RET_{it} = a + b_1 UNEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
C	-0.0828	-1.6568	0.0977	0.0239	1.8640
UNEPS	0.2032	5.8429	0.0000		
BETA	-0.0411	-3.9181	0.0001		
GRO	-0.0063	-1.2512	0.2110		
LEV	0.0454	1.8526	0.0640		
INTER	2.1171	6.9238	0.0000		
SIZE	0.7578	1.1056	0.2690		

Panel C: Dependent variable ARET in the equation:

$$ARET_{it} = a + b_1 SEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
C	0.1634	4.3227	0.0000	0.0243	1.9354
SEPS	0.0736	2.5612	0.0105		
BETA	-0.0198	-2.4640	0.0138		
GRO	-0.0216	-5.6469	0.0000		
LEV	0.0528	2.8610	0.0043		
INTER	-0.3211	-1.4011	0.1613		
SIZE	-2.1676	-4.2481	0.0000		

Panel D: Dependent variable ARET in the equation:

$$ARET_{it} = a + b_1 UNEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
C	0.1667	4.4976	0.0000	0.0205	1.9406
UNEPS	0.0678	2.5874	0.0097		
BETA	-0.0133	-1.6663	0.0958		
GRO	-0.0203	-5.3206	0.0000		
LEV	0.0421	2.3098	0.0210		
INTER	-0.3857	-1.6835	0.0924		
SIZE	-2.1583	-4.2668	0.0000		

[a] Pooled quarterly regressions for each proposed model estimated by Ordinary Least Squares (OLS) for the 61-firm sample from 1995 to 2008, where RET and ARET are proxies of unexpected return with holding period return from April (*t*) to March (*t+1*) and SEPS and UNEPS are proxies for unexpected annual accounting earnings.

[b] RET is the return inclusive dividends, given by natural logarithm of P/P_{t-1} adjusted for dividends and capital actions. ARET is the abnormal return or adjusted return for market influence, which is the sum of the residuals of specific firm-return and predicted market model return for company *i*. SEPS is the scaled EPS variation given by annual earnings change scaled by the price of the previous year ($\Delta EPS/P_{t-1}$). UNEPS is the excess of earnings on expected growth given by risk-free interest rate, which is thus the realised EPS minus the accounting equity value per share times risk-free interest rate.

[c] The coefficients and explanatory power for GLS estimations with cross-section and period weights can be found in. Appendixes 18 to 21.

In Panel A, it is possible to see that, similar to annual analysis, SEPS, BETA and INTER have significant coefficients with positive, negative and positive signals, respectively, and growth expectation (GRO) has a negative but not significant signal. In contrast to the annual regression, SIZE is not statistically significant, suggesting by this model that size does not help explain earnings response coefficient. Similar results were found by Collins and Kothari (1989). The quarterly result to variable LEV is also different from the annual estimation: in quarterly data, leverage seems to be statistically significant at the 5% level, not only in Panel A but in other regressions, as well.

Similarly, Panel B reports that GRO and SIZE are not significant at the 5% level; in contrast to Panel A, LEV is not significant at 5% (however, it is almost so). In the last two panels (Panels C and D), INTER is not significant, and in the last panel, BETA is not significant.

Compared to annual results, quarterly regressions have significantly smaller explanatory power. In quarterly regressions, in general, the R-squared is around 2%, while annual regressions presented an R-squared of 11% in ordinary regressions.

Appendixes 18 to 21 report the functional models combining the four measures of earnings and return using generalised least squares (GLS) to estimate the coefficients. However, because most of the coefficients present the same behaviour as do the estimations by OLS, no different evidence can be extracted. The explanatory power seems to remain constant in the three estimation method, and all the regression (pooling) assumptions are attended. Based on this, it is possible to infer that the pooled regressions do not serve as evidence of problems than could invalidate the analysis.

However, similar to annual analysis, in order to verify the results, especially with a view towards preventing problems regarding multicolinearity and autocorrelation, as well as to provide a robust analysis of earnings and return variable correlations conditioned to economic determinants, a series of partial correlations were estimated by controlling for the hypothesised economic determinants of earnings response coefficient.

Table 25 – Partial Quarterly Correlations – Earnings and Returns Correlations Controlled for Economic Variables

Spearman Correlation	Ordinary Coefficient	BETA	GRO	LEV	INTER	SIZE	Controlled for All Variables
SEPS x RET	0.0441	0.0435	0.0432	0.0450	0.0426	0.0438	0.0421
UNEPS x RET	0.1161	0.1122	0.1146	0.1105	0.1577	0.1226	0.1549
SEPS x ARET	0.0580	0.0573	0.0582	0.0585	0.0580	0.0603	0.0595
UNEPS x ARET	0.0385	0.0345	0.0731	0.0229	0.0414	0.0560	0.0593

According to quarterly partial correlation, Table 25, all variables present relatively constant correlation when controlled for each economic variable, what suggests that the correlation is not spurious. Similarly to annual results, correlation between earnings and return slightly increases when simultaneously controlled for all variables. Thus, in quarterly data as well, these finds corroborate the idea of aggregating explanatory power by introducing the economic variables, albeit in a softer way.

Given the finds of the third, it is possible to summarise that, the four different earnings response coefficient analysed (by combining the four variables of earnings and return) suggest that the annual results strongly support the hypothesis of negative relation between earnings response coefficient and risk (BETA). All of the regressions reported a significant negative coefficient; therefore, the coefficient was similar to that in the previous studies.

The variable growth (GRO) was not significant when the dependent variable was RET; however, when the dependent variable was ARET, the variable was significant but negative (opposite signal was expected). This evidence is contrary to empirical findings of Beaver and Morse (1978) and Collins and Kothari (1989), for which, there are be two possible explanations: in Brazil, the ratio of market value to book value of equity is not a consistent proxy for economic growth opportunities; there may be noise in the correlation between market-to-book ratio and return and earnings variation. The second explanation for negative correlation is that, because the variables are calculated/deflated by the market averages, some companies outside the sample can present higher (or lower) growth opportunities than the 61 firms in the sample.

The evidence regarding LEV does not support the initial hypothesis of negative relationship in annual regressions, given that no significance was found. These findings suggest that relative systematic risk is far more relevant for explaining cross-sectional variation of earnings response coefficient than firm-specific leverage is. An additional explanation for this lack of significance in leverage variable is that Brazilian firms generally tend to not be highly/excessively indebted; therefore, the leverage level might not strongly segregate the firms in relation to their earnings response coefficients.

The interest rate variable (INTER) was reported to have significant negative and positive signals. When the dependent variable was RET, the relationship was positive, while when the dependent variable was ARET, a negative relationship was found. Because the variable RET is calculated as a nominal stock return, an increase in general interest rates generates an increasing expected nominal stock returns. On the other hand, because ARET is a measure of adjusted return vis-à-vis market effects, the impact of a change in general market interest rates are (in theory) eliminated from the return calculation.

In Brazil, the variable SIZE, contrary to evidenced by Collins and Kothari (1989), seems to explain part of cross-sectional variations of earnings response coefficient because SIZE presented a significant positive relationship to earnings response coefficient. The finds in quarterly data and regressions are similar to annual regressions and play an important role in corroborating the discovered relationships.

The conclusions are assumed to be robust with respect to a variety of changes in the research design, as different variables were used without significant differences in their interpretation, and partial correlation analyses tried to capture any inconsistence in the results and their interpretation. Similarly to previous studies, the explanatory power of earnings and returns relationship is low, around 5% to 11% in annual data and around 2% in quarterly data. Regarding this, Collins *et al* (1994) suggest that, because the market’s expectations are conditioned on a richer information set than simply on past earnings, time-series models no doubt measure the market’s expectations and revisions with considerable error. This adversely affects the ability to explain return variation.

Ball and Shivakumar (2008), also suggest that ‘even though earnings announcements undoubtedly contain an element of “surprise,” there are valid reasons not to expect them to provide substantial new information to the share market’. The following are some valid reasons: (1) Earnings announcements are low-frequency, occurring quarterly; (2) earnings announcements are not discretionary - many disclosures are selected as a function of their informativeness; (3) accounting income is based primarily on backward-looking information, such as past product sales and past production costs. According to the authors, these reasons lead us to the expectation that earnings announcements are unlikely to be a major source of timely new information.

5 CONCLUSIONS

The rich empirical and theoretical literature relating earnings to enterprise value suggest that accounting earnings play an important role in valuation process. However, Ball and Shivakumar (2008), claim that earnings announcements are unlikely to be a major source of timely new information. Additionally, annalists, investor or managers deal with several challenges in aggregate accounting information and all of the economic information available in a feasible valuation model.

In order to bring to light some evidence regarding the interaction between earnings and stock returns, and specially to examine some predicted determinants of this relationship, the general objective of this dissertation was to analyse the earnings properties and to find the economic determinants of earnings response coefficients in Brazil.

In order to achieve theses objectives, this dissertation was divided into three main goals/sections: (1) An analysis of the time-series properties of accounting earnings and the long-term relationship between price, return and earnings; (2) An analysis of the relevance and significance of earnings response coefficient for individual companies and pooled data; and, (3) An analysis of economic determinants of earnings response coefficient in Brazil.

Given the division into three studies the conclusion for each one can summarised as follows:

Study 1: The objectives of the first of study were: (1) to examine the time-series properties of quarterly accounting earnings series of 71 Brazilian companies during the 1995-2009 period; (2) examine the predictive ability of the same series; and (3) to examine the ability to approximate the markets' expectation of quarterly earnings when examining the securities market reaction to accounting data in a long term relationship sense.

Empirical evidences suggest that accounting numbers, represented by earnings per share (EPS), earnings per share variation (EPSVAR or ΔX) and earnings per share variation scaled by the initial price (SEPS or $\Delta X/P_{t-1}$), presented, for most firms stationary and seasonal behaviour. A strong autocorrelation was found in the first lag with exponential decreasing until the 12^{th} lag. The partial autocorrelation abruptly decreased from the first to the second lag, and underwent non-significant partial autocorrelation after that. Analysing the evidence together suggests that the accounting earnings in Brazil follow an autoregressive model AR(1).

Companies with non-stochastic variables presented long term-relationship as shown in the cointegration test, the exception being LREN3. In terms of Granger Causality, a part of the companies presented causality between earnings variation and returns, especially in the stock – earnings direction, meaning that mean stock prices anticipate changes in earnings. However, this evidence was not general for the sample. It is not possible robustly to infer about causality between the variables since a general behaviour was not identified.

Study 2: The objectives of the second study were as follows: (1) to review the literature about the earnings response coefficient (ERC) and its determinants vis-à-vis the market-based accounting literature, (2) to examine the significance of annual earnings response coefficient accounting earnings series of 61 Brazilian companies over the 1995-2009 period in terms of individual firms and pooled data; (3) to examine the significance of quarterly earnings response coefficient accounting earning series of 71 Brazilian companies over the March/1995 to the March/2009 period in terms of individual firms and pooled data; and, (4) to test for lag significance in the earnings response coefficient relations.

It was possible to infer that, for annual firm-regressions, few companies presented a significant relationship between earnings and stock returns and — what is even more puzzling in the analysis is — for some significant firm-relations, the coefficient is negative, suggesting that earnings variation and stock returns show an opposite relation for some companies. In terms of the annual pooled data, regressions show that the relations are statistically significant and positive; however, the explanatory power (R-square) is considerable low for all of the models, but R-square seems to increase in the GLS models, especially when weight is given to cross-sectional variation. This suggests that variance in cross-sectional observation has more relevant power for explaining the earnings-return relation than the time-series variance. The low explanatory power was commonly found in related research and, specifically, Collins and Kothari (1989) have found similar results. Additionally, Collins et al (1994) infer that earnings-return studies typically find very low explanatory power.

In quarterly regressions, the statistically significant regressions were found, but the explanatory power is extremely low or nonexistent, suggesting a slight relationship between the variables. Besides the very low R-squares, a tendency for period-weighted regressions performing “better” was observed. R-squares seem to increase poorly in the GLS models when weight is given to period variation. This suggests that variance in short intervals (quarters) becomes more relevant than cross-sectional variations. The period dimension might be a better explanation when the interval of return accumulations is reduced (quarterly) and the frequency of data is bigger.

These finds of low explanatory power corroborates the claims of Ball and Shivakumar (2008) that there are valid reasons not to expect accounting earnings to provide substantial new information to the stock market.

Study 3: The objective of the third study was to investigate the possible economic explanations for the intertemporal and cross-section differences in earnings response coefficient for the same sample in terms of annual and quarterly data. To find the earnings response coefficient, two proxies of earnings (SEPS and UNEPS) and two proxies of return (RET and ARET) were used, resulting in a combination of four functional models. The economic variables are composed of systematic risk (BETA), expected economic growth opportunity (GRO), leverage (LEV), risk-free interest rate (INTER) and size (SIZE). According to previous studies, these variable are hypothesised to be determinants of earnings response coefficient; thus, a positive relationship was expected with GRO and SIZE, and a negative relationship with BETA, INTER and LEV.

Given that four different earnings response coefficient were analysed (by combining the four variables of earnings and return), the results were analysed under the specificity and characteristics of each variable. In a generic way, the annual results strongly support the hypothesis of negative relation between earnings response coefficient and risk (BETA). All of the regressions reported a significant negative coefficient for the systematic risk proxy; therefore, the coefficient was similar to that in the previous studies.

The variable growth (GRO) was not significant when the dependent variable was RET; however, when the dependent variable was ARET, the variable was significant but negative (opposite signal was expected). This evidence is contrary to empirical findings of Beaver and Morse (1978) and Collins and Kothari (1989), for which, there are be two possible explanations: in Brazil, the ratio of market value to book value of equity is not a consistent proxy for economic growth opportunities; there may be noise in the correlation between market-to-book ratio and return and earnings variation. The second explanation for negative correlation is that, because the variables are calculated/deflated by the market averages, some companies outside the sample can present higher (or lower) growth opportunities than the 61 firms in the sample.

The evidence regarding LEV does not support the initial hypothesis of negative relationship in annual regressions, given that no significance was found. These findings suggest that relative systematic risk is far more relevant for explaining cross-sectional variation of earnings response coefficient than firm-specific leverage is. An additional explanation for this lack of significance in leverage variable is that Brazilian firms generally tend to not be highly/excessively indebted; therefore, the leverage level might not strongly segregate the firms in relation to their earnings response coefficients.

Some intriguing evidence was obtained by analysing the interest rate variable (INTER) because this variable affects both the discount rate and the expected earnings. Significant negative and positive signals were found: when the dependent variable was RET, the relationship was positive, while when the dependent variable was ARET, a negative relationship was found. Because the variable RET is calculated as a nominal stock return, an increase in general interest rates generates an increasing expected nominal stock returns. On the other hand, because ARET is a measure of adjusted return vis-à-vis market effects, the impact of a change in general market interest rates are (in theory) eliminated from the return calculation. Thus, ARET might capture only firm-specific risk premium; therefore, ceteris paribus, the discounted present value of expected future earnings falls, inducing a negative temporal association.

Contrary to evidence provided by Collins and Kothari (1989), in Brazil, firm size seems to explain part of cross-sectional variations of earnings response coefficient because SIZE presented a significant positive relationship to earnings response coefficient. The finds in quarterly data and regressions are similar to annual regressions and play an important role in corroborating the discovered relationships.

The conclusions are robust with respect to a variety of changes in the research design, as different variables were used without significant differences in their interpretation, and partial correlation analyses tried to capture any inconsistence in the results and their interpretation.

Similarly to previous studies, the explanatory power of earnings and returns relationship is low, around 5% to 11% in annual data and around 2% in quarterly data. Regarding this, Collins *et al* (1994) suggest that, because the market's expectations are conditioned on a richer information set than simply on past earnings, time-series models no doubt measure the market's expectations and revisions with considerable error. This adversely affects the ability to explain return variation.

Ball and Shivakumar (2008), also suggest that 'even though earnings announcements undoubtedly contain an element of "surprise," there are valid reasons not to expect them to provide substantial new information to the share market'. The following are some valid reasons: (1) Earnings announcements are low-frequency, occurring quarterly; (2) earnings announcements are not discretionary - many disclosures are selected as a function of their informativeness; (3) accounting income is based primarily on backward-looking information, such as past product sales and past production costs. According to the authors, these reasons lead us to the expectation that earnings announcements are unlikely to be a major source of timely new information.

The generic conclusion covering the three studies can be summarised as: in Brazil, similar to other countries, accounting earnings is associated with stock returns with statistical significance in both quarterly and annual period. However, similar to other countries, given the frequency and the lack of timeliness of earnings, they are not expected to provide substantial new information to the stock market. Despite the lack of explanatory power of earnings, evidence of this dissertation indicate that ignoring the cross-sectional and temporal variation in earnings response coefficient can result in statistically less precise parameter estimates and downward biased test statistics on the explanatory power of the model would be reduced. Thus, controlling the earnings-return relationship by economical factors optimize the analysis of nature and magnitude of earnings in financial analysis and valuation process.

Similar to all of the empirical academic studies, there are some limitations in the analysis and results of this dissertation. First, these conclusions are limited to the sample, since the nature of study does not allow for extrapolations. However, since the study uses the complete sample available and is robust in terms of different methodologies, it is slightly possible to suggest that these finds might reflect a general really in Brazil, at least for the period analysed.

A second limitation is regarding the measurement of economic observations and events by using proxies: biased proxies can completely invalidate a study. In order to deal with this challenge all of the proxies used were validated by international studies and also, different proxies were used in this dissertation, however, these procedures do not exempt risk regarding the non-adequacy of the variable to the Brazilian market context.

This dissertation suggests a number of extensions, the first is to give a second look at earnings time-series properties test and, specially focusing on the effectiveness of earnings forecast based on current earnings. It would be also an interesting empirical effort to test for structural breaks in the earnings series and, also, to analyse the more effective return accumulation in relation to earnings change, because in the academic literature, it is commonly assumed that a twelve moth period accumulation from April of year t to March of year $t + 1$ reflects the “surprise” of new information caused by earnings report, however a longer period or a different interval would give a more effective measure (see Collins and Kothari, 1989).

Another extension would be to test and to get more insights about seasonality in quarterly earnings: “might the fourth quarter be more ‘informative’ than others?” and “is the earnings seasonality linked to economic sector or size?”; this dissertation gives some evidences of a relationship between size and seasonality, however, this association must be more explored.

Additionally, would be interest to compare, in the Brazilian market, annalists forecasts of earnings and forecasts based on current earnings.

Maybe, the more important future extension would be to test additional economical variables as determinants of earnings response coefficient. Kothati (2001) suggests, for example, competition, technology innovation, effectiveness of corporate governance, incentive compensation policies, live cycle and others.

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APPENDIXES

Appendix 1 - Augmented Dickey-Fuller Unit Root Test for the quarterly variables

	SEPS		UNEPS		RET		ARET		BETA		GRO		LEV		SIZE	
	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.
GETI4	-6.324	0.000	-6.808	0.000	-4.920	0.000	-3.077	0.037	-1.425	0.559	-0.960	0.757	-3.722	0.008	-0.968	0.755
ALLL11	-3.225	0.040	-3.022	0.057	-2.190	0.218	-2.250	0.199	-0.925	0.748	-1.695	0.412	-2.506	0.122	-1.905	0.323
AMBV4	-9.892	0.000	-8.941	0.000	-5.121	0.000	-4.741	0.000	-2.210	0.205	-0.898	0.780	-1.320	0.614	-1.368	0.592
ARCZ6	-3.492	0.012	-5.297	0.000	-6.546	0.000	-5.390	0.000	-2.031	0.273	-2.288	0.179	-1.861	0.348	-1.360	0.595
BRSR6	-7.697	0.000	-7.700	0.000	-5.543	0.000	-4.812	0.000	-2.157	0.224	-2.390	0.149	-2.226	0.200	-0.564	0.869
BBDC4	-7.980	0.000	-5.200	0.000	-5.531	0.000	-4.532	0.001	-2.151	0.226	-1.609	0.472	-3.637	0.008	-1.047	0.730
BRAP4	-6.615	0.000	-9.627	0.000	-2.862	0.062	-3.513	0.014	-1.460	0.541	-2.347	0.164	-1.217	0.655	-0.803	0.805
BBAS3	-7.814	0.000	-9.279	0.000	-5.394	0.000	-5.262	0.000	-1.118	0.703	-3.266	0.021	-2.318	0.170	-1.821	0.367
BRTP3	-6.754	0.000	-5.027	0.000	-5.673	0.000	-5.407	0.000	-2.350	0.162	2.371	1.000	-1.841	0.356	-1.601	0.475
BRTO4	-6.560	0.000	-5.603	0.000	-5.800	0.000	-5.727	0.000	-2.493	0.123	-1.607	0.472	-2.119	0.239	-1.411	0.571
BRKM5	-5.706	0.000	-6.220	0.000	-4.672	0.000	-4.275	0.001	-1.480	0.536	-1.925	0.319	-1.358	0.596	-1.307	0.620
PRGA3	-6.528	0.000	-6.121	0.000	-4.713	0.000	-5.339	0.000	-2.351	0.160	-2.133	0.233	-2.437	0.137	-0.259	0.924
CCRO3	-6.090	0.000	-14.453	0.000	-4.023	0.005	-3.326	0.024	-3.623	0.012	-0.098	0.939	-1.207	0.661	-1.041	0.723
CLSC6	-8.289	0.000	-6.983	0.000	-5.248	0.000	-8.222	0.000	-1.700	0.426	-2.246	0.193	-2.165	0.221	-1.303	0.622
CMIG4	-9.724	0.000	-8.384	0.000	-4.341	0.001	-4.527	0.001	-2.235	0.197	-1.751	0.400	-0.934	0.770	-1.393	0.579
CESP6	-8.115	0.000	-8.420	0.000	-4.927	0.000	-5.431	0.000	-2.010	0.282	-1.883	0.338	-1.804	0.375	-1.561	0.495
CGAS5	-9.067	0.000	-8.666	0.000	-4.179	0.002	-4.683	0.000	-2.259	0.189	-2.165	0.222	-1.188	0.673	-1.068	0.720
CNFB4	-4.893	0.000	-6.136	0.000	-5.330	0.000	-5.619	0.000	-2.492	0.123	-2.226	0.200	-1.962	0.302	-1.064	0.724
CSMG3	-5.501	0.002	-5.983	0.001	-2.599	0.122	-2.360	0.174	-1.441	0.520	-1.456	0.513	-1.683	0.427	-1.524	0.485
CPLE6	-8.689	0.000	-5.804	0.000	-4.573	0.001	-6.980	0.000	-1.074	0.720	-1.255	0.644	-2.583	0.103	-2.037	0.271
CPFE3	-3.202	0.039	-3.925	0.010	-2.249	0.198	-4.312	0.005	-1.317	0.595	1.159	0.996	-2.942	0.050	-2.046	0.266
CYRE3	-7.224	0.000	-7.463	0.000	-5.517	0.000	-4.596	0.001	-0.158	0.937	-2.231	0.199	-1.242	0.648	-0.773	0.817
DASA3	-3.154	0.044	-3.903	0.011	-5.075	0.001	-2.579	0.119	-1.170	0.658	-0.899	0.759	-1.117	0.688	-1.701	0.412
DURA4	-8.882	0.000	-6.169	0.000	-5.405	0.000	-5.116	0.000	-1.713	0.419	-1.815	0.370	-3.227	0.024	-0.946	0.766
ELET3	-6.403	0.000	-5.657	0.000	-5.711	0.000	-6.317	0.000	-1.306	0.621	-1.204	0.667	-1.564	0.494	-2.471	0.128
ELPL6	-5.327	0.000	-5.262	0.000	-3.961	0.004	-6.464	0.000	-1.152	0.686	-4.407	0.001	-1.735	0.407	-2.310	0.174
EMBR3	-8.854	0.000	-8.406	0.000	-4.614	0.000	-3.758	0.006	-2.538	0.112	-0.916	0.774	-2.163	0.222	-2.095	0.247
ETER3	-6.821	0.000	-6.793	0.000	-6.471	0.000	-4.798	0.000	-1.031	0.736	-3.874	0.004	-0.919	0.773	-1.388	0.582
FFTL4	-12.679	0.000	-11.237	0.000	-5.661	0.000	-4.552	0.001	-2.126	0.235	-2.564	0.107	-1.295	0.626	-0.764	0.821
GFSA3	-3.589	0.029	-2.422	0.160	-2.823	0.087	-1.615	0.440	-1.266	0.600	-1.270	0.599	-2.075	0.256	-1.196	0.635
GGBR4	-7.024	0.000	-13.659	0.000	-5.034	0.000	-4.380	0.001	-1.732	0.410	-2.188	0.213	-2.225	0.200	-1.402	0.575
GOAU4	-6.748	0.000	-7.067	0.000	-5.354	0.000	-4.692	0.000	-1.071	0.721	-2.551	0.109	-2.010	0.282	-1.073	0.720
GOLL4	-5.542	0.000	-6.526	0.000	-1.772	0.380	-2.504	0.132	-1.362	0.575	-0.475	0.874	-0.703	0.824	0.533	0.983
IDNT3	-5.386	0.000	-7.965	0.000	-3.589	0.012	-3.946	0.005	-0.192	0.930	-2.995	0.046	-1.118	0.698	-1.035	0.729
ITSA4	-7.307	0.000	-6.773	0.000	-5.896	0.000	-4.620	0.000	-2.020	0.278	-2.224	0.201	0.052	0.959	-0.767	0.820
ITUB4	-7.354	0.000	-6.774	0.000	-5.620	0.000	-5.398	0.000	-2.311	0.172	-1.225	0.657	-3.094	0.033	-1.021	0.740
KEPL3	-6.123	0.000	-5.838	0.000	-2.338	0.170	-3.621	0.013	-1.706	0.416	-1.356	0.584	-2.652	0.091	-1.757	0.392
KLBN4	-6.236	0.000	-6.722	0.000	-4.746	0.000	-4.105	0.002	-2.985	0.043	-2.079	0.254	-1.913	0.324	-1.188	0.674
LIGT3	-4.263	0.001	-6.249	0.000	-4.372	0.001	-6.765	0.000	-2.626	0.094	-2.551	0.109	-2.306	0.174	-2.438	0.136
LAME4	-5.156	0.000	-6.441	0.000	-4.806	0.000	-4.448	0.001	-2.079	0.254	-1.036	0.730	-1.694	0.429	-0.610	0.860
LREN3	-7.821	0.000	-8.867	0.000	-4.086	0.003	-4.340	0.001	-2.340	0.165	-3.207	0.030	-1.520	0.516	-0.949	0.761
POMO4	-7.926	0.000	-7.549	0.000	-5.574	0.000	-5.879	0.000	-2.715	0.078	-2.668	0.086	-1.790	0.381	-1.092	0.713
NATU3	-4.773	0.002	-3.769	0.013	-2.125	0.238	-2.570	0.118	-0.608	0.844	-3.581	0.056	-2.089	0.251	-2.359	0.166
NETC4	-9.164	0.000	-3.384	0.018	-3.437	0.014	-4.174	0.002	-1.998	0.287	-0.946	0.755	-1.299	0.623	-1.393	0.578
PCAR5	-6.978	0.000	-7.398	0.000	-6.511	0.000	-5.104	0.000	-3.506	0.012	-1.212	0.663	-3.085	0.034	-2.205	0.207
PETR4	-6.932	0.000	-4.511	0.001	-5.022	0.000	-5.985	0.000	-1.802	0.376	-1.476	0.538	-2.054	0.264	-1.331	0.609
PLAS3	-6.827	0.000	-8.088	0.000	-4.272	0.001	-3.723	0.006	-2.124	0.236	-1.961	0.303	-1.687	0.432	-1.223	0.658
PSSA3	-3.378	0.029	-4.396	0.005	-2.143	0.232	-2.961	0.062	-1.543	0.485	-1.704	0.409	-1.870	0.343	-1.339	0.585
RAPT4	-5.670	0.000	-6.934	0.000	-4.906	0.000	-4.944	0.000	-2.214	0.204	-1.361	0.595	-2.794	0.066	-0.671	0.845
RSID3	-6.047	0.000	-6.980	0.000	-4.942	0.000	-4.322	0.002	-1.932	0.315	-2.628	0.095	-2.082	0.253	-0.852	0.794
SBSP3	-6.744	0.000	-6.404	0.000	-5.053	0.000	-5.787	0.000	-1.400	0.574	-2.067	0.258	-2.192	0.212	-2.402	0.147
SDIA4	-8.656	0.000	-8.163	0.000	-5.724	0.000	-4.457	0.001	-2.407	0.145	-3.258	0.022	-1.914	0.324	-1.170	0.681
CSNA3	-7.968	0.000	-9.083	0.000	-5.455	0.000	-6.332	0.000	-1.852	0.352	-0.143	0.939	-2.044	0.268	-0.725	0.832
CRUZ3	-10.500	0.000	-7.264	0.000	-6.670	0.000	-4.891	0.000	-2.069	0.258	-3.359	0.017	-4.083	0.002	-0.710	0.836
SUZB5	-7.220	0.000	-5.723	0.000	-4.701	0.000	-6.038	0.000	-1.890	0.334	-2.318	0.170	-2.050	0.265	-1.209	0.664
TAMM4	-4.719	0.001	-4.880	0.001	-2.526	0.121	-3.238	0.029	-2.144	0.230	-1.824	0.361	-1.725	0.412	-1.631	0.449
TELB4	-3.294	0.025	-7.413	0.000	-5.668	0.001	-4.596	0.001	-2.379	0.155	-9.644	0.000	-1.329	0.607	-0.963	0.758
TNLP4	-6.510	0.000	-5.998	0.000	-5.077	0.000	-5.092	0.000	-0.719	0.830	-1.152	0.685	-0.629	0.853	-4.163	0.002
TMAR5	-10.090	0.000	-5.349	0.000	-5.228	0.000	-4.400	0.001	-1.005	0.746	-2.290	0.179	-0.425	0.897	-1.706	0.423
TMCP4	-6.633	0.000	-6.467	0.000	-4.528	0.001	-4.073	0.003	-1.993	0.289	-1.070	0.718	-2.772	0.071	-4.233	0.002
TLPP4	-7.746	0.000	-5.018	0.000	-7.942	0.000	-4.370	0.001	-0.270	0.922	-2.165	0.221	-0.744	0.826	-2.692	0.082
TCSL4	-7.289	0.000	-7.500	0.000	-4.484	0.001	-5.551	0.000	-1.482	0.532	-1.419	0.564	-2.433	0.139	-1.202	0.664
TBLE3	-6.024	0.000	-5.500	0.000	-5.699	0.000	-4.205	0.002	-2.449	0.135	0.546	0.986	-2.233	0.198	-1.556	0.496
TRPL4	-6.814	0.000	-7.431	0.000	-5.585	0.000	-6.498	0.000	-2.124	0.237	1.149	0.997	-1.439	0.554	-0.656	0.845
UGPA4	-6.516	0.000	-6.373	0.000	-4.700	0.001	-4.344	0.002	-0.954	0.759	-1.617	0.464	-2.599	0.102	-0.172	0.933
UNIP6	-6.268	0.000	-6.056	0.000	-3.768	0.006	-4.503	0.001	-3.169	0.027	-1.694	0.429	1.135	0.997	-1.019	0.741
USIM5	-4.660	0.000	-6.670	0.000	-4.632	0.000	-6.117	0.000	-1.783	0.385	-2.775	0.069	-0.312	0.915	-0.693	0.840
VCPA4	-7.500	0.000	-7.238	0.000	-4.801	0.000	-5.308	0.000	-2.527	0.115	-1.773	0.390	-0.845	0.798	-2.376	0.155
VALE5	-7.545	0.000	-6.402	0.000	-5.802	0.000	-6.074	0.000	-1.567	0.492	-1.962	0.303	-2.673	0.086	-0.353	0.910
VIVO4	-6.075	0.000	-6.139	0.000	-3.556	0.011	-4.671	0.001	-1.331	0.606	-3.128	0.033	-1.910	0.325	-2.233	0.198
WEGE3	-6.539	0.000	-5.671	0.000	-5.259	0.000	-4.781	0.000	-2.205	0.207	-2.821	0.062	-4.667	0.000	-0.647	0.851

Appendix 2 - Earnings time-series properties: autocorrelations by firm

Firm	Lags											
	1	2	3	4	5	6	7	8	9	10	11	12
ALLL11	0.226	-0.145	0.047	0.314	0.077	-0.253	0.050	0.318	0.101	-0.113	0.012	0.170
AMBV4	0.493	0.386	0.421	0.427	0.366	0.236	0.240	0.261	0.241	0.055	0.083	0.137
ARCZ6	0.416	0.007	0.023	0.006	-0.020	-0.029	-0.026	-0.031	-0.032	-0.037	-0.048	-0.028
BBAS3	0.639	0.489	0.474	0.368	0.148	0.055	0.050	0.050	0.040	0.041	0.031	0.023
BBDC4	0.836	0.813	0.714	0.693	0.608	0.551	0.503	0.453	0.415	0.356	0.342	0.284
BRAP4	0.093	-0.166	0.273	0.187	0.089	0.025	0.085	0.216	-0.025	-0.008	0.058	-0.048
BRKM5	-0.016	-0.040	-0.065	-0.102	0.033	-0.033	0.105	-0.035	-0.120	-0.048	-0.097	-0.020
BRSR6	0.247	-0.024	-0.009	0.015	0.010	0.000	-0.036	-0.028	-0.031	-0.041	-0.014	-0.004
BRTO4	0.389	0.264	0.080	-0.024	-0.004	-0.006	-0.022	-0.087	-0.187	-0.201	-0.204	-0.352
BRTP3	0.384	0.246	0.116	-0.007	0.003	0.017	0.015	-0.012	-0.225	-0.223	-0.139	-0.399
CCRO3	0.105	0.089	0.390	-0.046	0.104	0.061	-0.069	0.172	0.100	-0.009	0.100	0.148
CESP6	0.138	-0.212	-0.207	0.113	0.071	0.088	0.011	0.095	-0.110	-0.164	-0.162	0.025
CGAS5	0.855	0.801	0.775	0.744	0.662	0.628	0.593	0.526	0.477	0.441	0.382	0.290
CLSC6	0.298	0.168	0.076	0.011	0.177	0.157	0.087	0.077	0.147	0.101	0.031	-0.038
CMIG4	0.475	0.208	0.379	0.342	0.314	0.323	0.283	0.266	0.180	0.134	0.022	0.114
CNFB4	0.657	0.410	0.292	0.283	0.147	0.065	0.048	0.085	0.079	0.124	0.165	0.238
CPFE3	0.919	0.869	0.773	0.703	0.610	0.522	0.424	0.305	0.182	0.069	-0.007	-0.092
CPLE6	0.506	0.338	0.285	0.312	0.375	0.358	0.171	0.181	0.144	0.027	0.014	0.017
CRUZ3	0.512	0.463	0.331	0.267	0.259	0.244	0.279	0.228	0.167	0.108	0.038	0.098
CSMG3	-0.137	0.147	0.092	-0.105	0.018	-0.243	0.074	-0.134	-0.278	0.092	-0.040	0.099
CSNA3	0.115	0.282	0.301	0.175	0.141	0.202	0.161	0.038	0.113	0.088	0.078	0.104
CYRE3	0.514	0.556	0.525	0.521	0.371	0.205	0.323	0.245	0.213	0.087	0.099	0.076
DASA3	-0.032	-0.040	-0.053	0.088	-0.168	-0.119	-0.112	0.296	-0.292	0.042	-0.047	-0.017
DURA4	0.835	0.781	0.708	0.632	0.529	0.492	0.433	0.395	0.317	0.254	0.217	0.182
ELET3	-0.074	0.025	-0.143	0.000	-0.066	-0.029	-0.014	0.021	-0.032	-0.027	-0.083	0.110
ELPL6	0.266	0.169	-0.146	-0.032	0.101	0.133	0.054	0.067	0.054	-0.059	-0.021	-0.163
EMBR3	0.616	0.449	0.439	0.424	0.330	0.299	0.271	0.276	0.189	0.127	0.087	0.170
ETER3	0.441	0.339	0.239	0.247	0.077	0.125	0.042	0.037	-0.011	-0.099	-0.107	-0.135
FFTL4	0.670	0.331	0.394	0.438	0.231	0.099	0.169	0.218	0.059	0.025	0.202	0.246
GETI4	0.663	0.522	0.485	0.451	0.467	0.466	0.452	0.262	0.247	0.194	0.152	0.213
GFSA3	0.281	0.214	0.132	0.093	0.111	-0.069	0.068	-0.126	-0.163	-0.104	0.080	-0.166
GGBR4	0.809	0.603	0.597	0.616	0.588	0.537	0.515	0.482	0.397	0.332	0.295	0.258
GOAU4	0.834	0.647	0.619	0.629	0.597	0.550	0.525	0.484	0.412	0.334	0.287	0.239
GOLL4	0.702	0.388	0.233	0.086	-0.056	-0.124	-0.155	-0.246	-0.194	-0.151	-0.197	-0.156
IDNT3	0.201	0.284	0.061	0.165	0.085	0.066	-0.007	-0.096	-0.024	0.006	-0.021	0.008
ITSA4	0.372	0.307	0.229	0.263	0.267	0.239	0.263	0.279	0.391	0.174	0.118	0.057
ITUB4	0.224	0.195	0.183	0.174	0.202	0.166	0.148	0.134	0.121	0.112	0.139	0.088
KEPL3	0.455	0.373	0.110	0.042	-0.012	-0.133	-0.047	-0.087	-0.026	-0.093	0.013	-0.101
KLBN4	0.009	0.156	-0.211	0.041	0.062	0.148	-0.054	0.041	-0.017	-0.058	0.038	0.040
LAME4	0.059	0.079	-0.016	0.350	0.088	0.114	0.029	0.182	0.022	0.150	0.002	0.121
LIGT3	0.577	0.342	0.279	0.263	0.231	0.168	0.208	0.291	0.143	-0.067	-0.188	-0.234
LREN3	0.096	0.370	-0.131	0.436	0.049	0.344	0.007	0.280	-0.148	0.178	-0.091	0.164
NATU3	0.257	0.277	0.112	0.398	-0.070	-0.042	-0.091	0.203	-0.156	-0.018	0.000	0.056
NETC4	0.665	0.568	0.513	0.393	0.380	0.331	0.315	0.285	0.155	0.188	0.152	0.135
PCAR5	0.248	0.007	-0.053	0.190	-0.128	-0.152	-0.254	-0.076	-0.113	-0.018	-0.105	0.126
PETR4	0.870	0.784	0.671	0.622	0.587	0.557	0.520	0.512	0.522	0.489	0.468	0.394
PLAS3	0.494	0.434	0.441	0.375	0.287	0.149	0.158	0.114	0.004	-0.080	-0.070	0.045
POMO4	0.615	0.336	0.300	0.449	0.458	0.398	0.294	0.333	0.265	0.207	0.185	0.256
PRGA3	0.454	0.291	0.085	0.163	-0.027	0.033	0.030	0.129	-0.009	0.148	0.152	0.135
PSSA3	0.640	0.661	0.619	0.535	0.437	0.417	0.348	0.245	0.205	0.089	0.119	0.033
RAPT4	0.913	0.855	0.757	0.712	0.635	0.587	0.523	0.478	0.434	0.408	0.382	0.360
RSID3	0.453	0.261	-0.047	-0.066	-0.013	-0.014	0.098	0.003	0.012	0.063	0.151	0.128
SBSP3	0.181	-0.019	-0.096	0.193	0.053	0.132	0.109	0.215	0.037	0.072	-0.119	0.033
SDIA4	0.476	0.025	-0.076	-0.092	-0.049	-0.014	-0.030	-0.044	0.015	0.029	-0.018	-0.075
SUZB5	0.330	0.043	0.096	0.106	0.028	0.026	0.057	0.106	0.084	0.072	0.071	0.061
TAMM4	0.118	0.031	-0.042	0.005	0.025	0.068	-0.040	-0.092	-0.086	-0.056	-0.034	-0.055
TBLE3	0.409	0.340	0.183	0.470	0.322	0.317	0.250	0.248	0.145	0.180	0.132	0.135
TCSL4	0.306	0.231	0.232	0.261	0.095	-0.115	-0.168	0.051	-0.154	-0.256	-0.139	-0.137
TELB4	-0.072	-0.010	-0.015	-0.040	-0.015	-0.007	0.037	-0.032	-0.027	-0.011	-0.074	-0.009
TLPP4	0.656	0.567	0.510	0.606	0.436	0.366	0.378	0.428	0.270	0.245	0.205	0.355
TMAR5	0.402	0.232	0.303	0.196	0.047	0.113	0.093	0.090	0.094	0.041	0.138	0.145
TMCP4	0.169	0.191	0.222	0.222	0.187	0.196	0.073	0.077	0.093	0.203	0.091	-0.037
TNLP4	0.407	0.410	0.230	0.332	0.083	0.013	0.097	0.100	-0.038	0.110	0.126	0.187
TRPL4	0.331	0.465	0.403	0.184	0.234	0.165	0.107	0.118	0.031	0.183	0.123	0.132
UGPA4	0.509	0.256	0.206	0.086	0.170	0.242	0.248	0.168	-0.035	-0.238	-0.192	-0.206
UNIP6	0.525	0.340	0.143	-0.005	0.042	0.011	-0.002	0.022	0.011	0.039	0.005	-0.007
USIM5	0.661	0.608	0.540	0.599	0.487	0.460	0.413	0.389	0.254	0.253	0.233	0.293
VALE5	0.619	0.546	0.565	0.539	0.556	0.469	0.390	0.382	0.312	0.232	0.214	0.195
VCPA4	0.567	0.157	0.093	0.030	-0.005	0.011	0.018	0.031	0.022	0.008	0.035	0.074
VIVO4	0.483	0.625	0.287	0.232	0.099	0.025	-0.021	-0.054	-0.098	-0.141	-0.179	-0.198
WEGE3	0.927	0.890	0.847	0.795	0.734	0.684	0.632	0.575	0.520	0.472	0.421	0.377

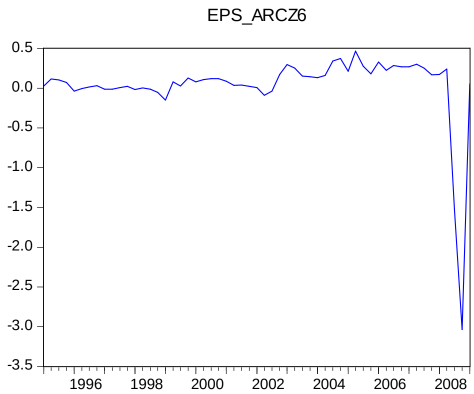
Appendix 3 – Durbin-Watson Statistics: lower and upper 5% critical values

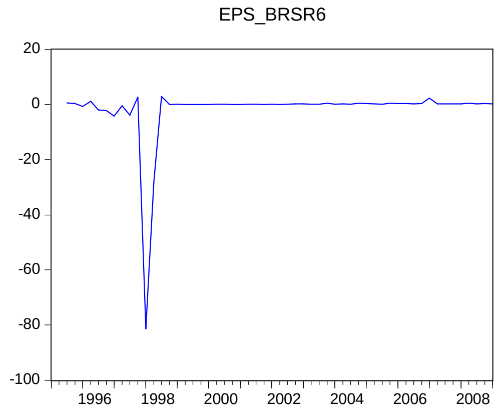
	0	dL	dU	2	4-dU	4-dL	4
N = 14 and K=1	0	1.045	1.350	2	2.650	2.955	4
N = 14 and K=5	0	0.505	1.704	2	2.296	3.495	4
N = 55 and K=1	0	1.528	1.601	2	3.399	2.472	4
N = 55 and K=5	0	1.374	1.768	2	2.232	2.626	4

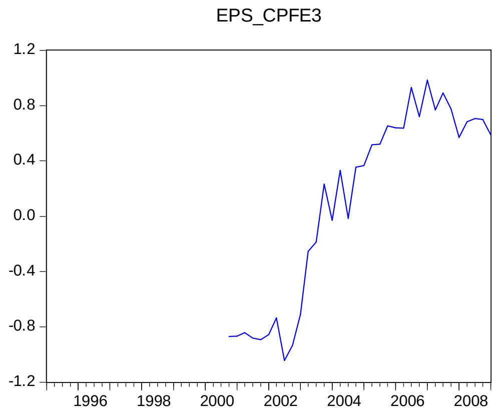
Were N = number of observations and K = number or independent variables, excluded the constant term.

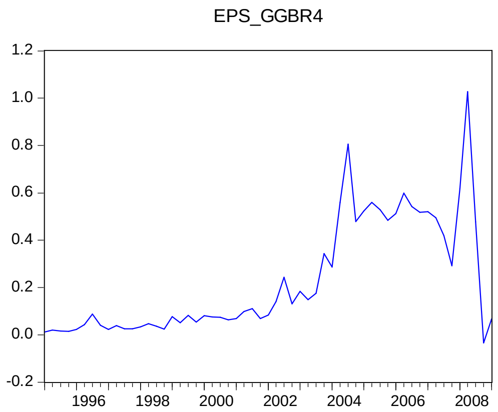
Source: Gujarati (2004, p.786)

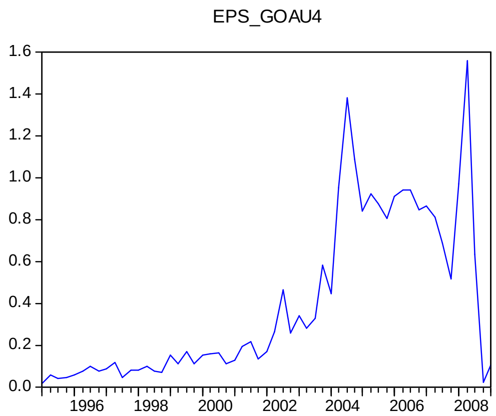
Appendix 4 - Graphical movement in EPS for non-stationary companies

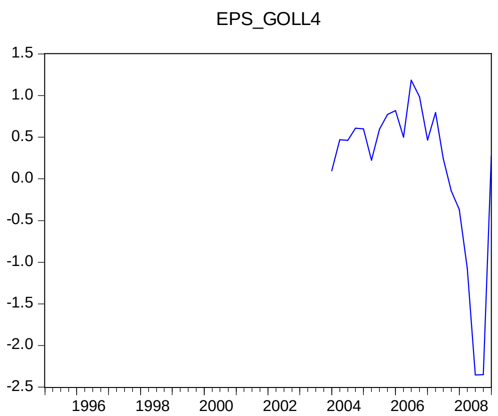


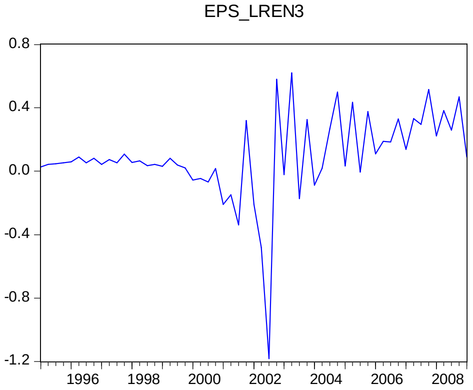











EPS_LREN3
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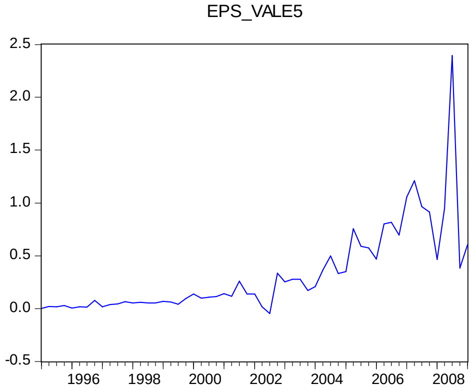
0.4
0.0
-0.4
-0.8
-1.2
1996
1998
2000
2002
2004
2006
2008


EPS_VALE5
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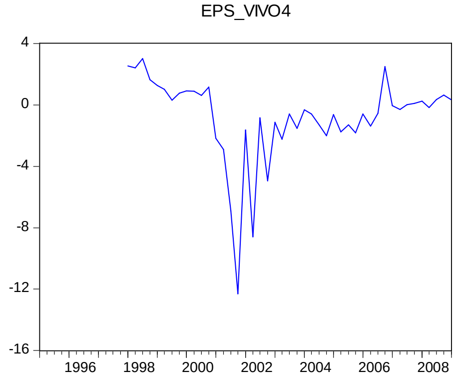
2.0
1.5
1.0
0.5
0.0
-0.5
1996
1998
2000
2002
2004
2006
2008


EPS_VIVO4
4
0
-4
-8
-12
-16
1996
1998
2000
2002
2004
2006
2008

Appendix 5 - Annual regressions by firm for RET x SEPS

Firm	n	Correl	Rsquare	Coeficient	Slope	F Value	F Sig
GETI4	9	0.3565	0.1271	0.0413	0.4614	0.4359	0.5277
ALLL11	9	0.0812	0.0066	0.0284	1.7191	0.0133	0.9156
AMBV4	14	-0.2739	0.0750	0.1306	-0.7750	0.9735	0.3418
ARCZ6	14	0.5941	0.3529	0.0395	0.8215	6.5449	0.0238
BRSR6	9	0.3257	0.1061	0.0248	0.4140	21.4110	0.0017
BBDC4	14	-0.0375	0.0014	0.1961	-0.3973	0.0169	0.8984
BBAS3	11	-0.6165	0.3801	0.1286	-2.7991	12.3534	0.0056
BRTP3	10	0.0559	0.0031	0.1696	0.3013	0.0251	0.8780
BRTO4	14	-0.0843	0.0071	0.0971	-0.1655	0.0858	0.7742
BRKM5	12	0.5025	0.2525	0.0276	0.3806	8.1517	0.0157
PRGA3	14	0.2054	0.0422	0.0699	0.3456	0.5288	0.4800
CLSC6	12	0.0645	0.0042	0.0992	0.0893	0.0418	0.8422
CMIG4	14	0.2073	0.0430	0.0667	0.1072	0.5386	0.4761
CESP6	12	0.2989	0.0893	0.0861	0.2234	1.1310	0.3104
CGAS5	11	0.3755	0.1410	-0.0344	0.8033	0.5258	0.4850
CNFB4	11	-0.4684	0.2194	0.1064	-0.3408	9.1028	0.0130
CPLE6	14	0.5045	0.2545	0.0480	1.5400	4.0961	0.0640
CYRE3	12	0.2322	0.0539	0.1038	2.1478	0.5698	0.4662
DURA4	14	0.3059	0.0936	0.0542	1.1372	1.2389	0.2858
ELET3	14	0.3585	0.1286	0.0955	0.8414	1.7703	0.2062
ELPL6	9	0.8727	0.7616	0.0321	0.8150	32.8939	0.0004
EMBR3	13	0.1701	0.0289	0.1014	0.3171	0.3277	0.5785
ETER3	11	0.0616	0.0038	0.0873	0.0304	0.0343	0.8572
FFTL4	14	-0.1367	0.0187	0.2081	-0.1237	0.2287	0.6405
GGBR4	13	-0.0886	0.0078	0.0277	-0.1021	2.8982	0.1144
GOAU4	13	0.4185	0.1751	0.0268	0.3701	2.1478	0.1685
IDNT3	8	-0.5052	0.2552	0.1976	-0.6960	1.6873	0.2351
ITSA4	14	0.4490	0.2016	0.0224	1.2298	3.0306	0.1053
ITUB4	14	0.3037	0.0923	0.0890	1.2207	1.2196	0.2895
KLBN4	13	-0.5398	0.2914	-0.0421	-0.7929	3.6787	0.0792
LIGT3	13	-0.2250	0.0506	-0.0756	-0.1599	8.0044	0.0152
LAME4	13	-0.0412	0.0017	0.1671	-0.0869	0.0187	0.8937
LREN3	13	0.1036	0.0107	0.0333	0.2173	0.0993	0.7586
POMO4	14	-0.0791	0.0063	0.0688	-0.0956	0.0756	0.7877
NETC4	11	-0.6601	0.4357	-0.0976	-1.9898	4.6095	0.0574
PCAR5	13	0.1595	0.0254	-0.0190	1.1602	0.2871	0.6027
PETR4	14	0.0328	0.0011	0.1716	0.0667	0.0129	0.9113
PLAS3	11	0.7933	0.6294	-0.0247	1.0546	12.3223	0.0056
RAPT4	13	0.6805	0.4630	-0.0331	0.8493	7.9137	0.0157
RSID3	11	0.0731	0.0053	0.0469	0.2975	0.0429	0.8410
SBSP3	12	0.0228	0.0005	-0.0217	0.0206	0.2871	0.6028
SDIA4	14	0.3761	0.1415	0.0524	0.4135	1.9775	0.1831
CSNA3	12	0.0903	0.0082	0.2286	0.0910	0.0823	0.7801
CRUZ3	14	0.4997	0.2497	0.0648	0.4063	3.9946	0.0670
SUZB5	13	0.2849	0.0812	-0.0107	0.3097	2.1166	0.1714
TAMM4	7	0.9443	0.8918	-0.0466	1.0884	30.2723	0.0015
TELB4	6	-0.8239	0.6788	0.0384	-1.2012	8.0127	0.0366
TNLP4	10	0.0627	0.0039	-0.0175	0.1281	0.0316	0.8633
TMAR5	14	0.6479	0.4198	-0.1247	0.8667	8.6828	0.0113
TMCP4	9	-0.2100	0.0441	-0.0845	-0.5092	2.5737	0.1473
TLPP4	14	0.2515	0.0633	0.0012	0.5858	0.8103	0.3844
TCSL4	10	-0.6480	0.4198	0.0007	-2.3824	5.5220	0.0433
TBLE3	10	0.2655	0.0705	0.2652	0.1751	1.6664	0.2289
TRPL4	9	-0.5066	0.2567	0.1518	-0.9962	3.6595	0.0921
UGPA4	9	-0.2365	0.0559	0.1019	-0.8324	0.5269	0.4886
UNIP6	11	0.2107	0.0444	-0.0375	0.1930	6.5848	0.0281
USIM5	13	0.0865	0.0075	0.0045	0.1013	10.6136	0.0069
VCPA4	14	0.5883	0.3461	0.0683	0.9447	6.3519	0.0256
VALE5	14	0.1695	0.0287	0.0591	0.6741	0.3549	0.5616
VIVO4	10	0.2428	0.0590	-0.1714	0.8682	0.0759	0.7891
WEGE3	14	0.3376	0.1140	-0.0263	0.9678	1.5439	0.2360
Summary of firm-regressions							
Mean	*12*	*0.1227*	*0.1612*	*0.0502*	*0.2025*	*Number of significant regressions*	
Maximum	*14*	*0.9443*	*0.8918*	*0.2652*	*2.1478*	*at 0.10*	*21*
Minimum	*6*	*-0.8239*	*0.0005*	*-0.1714*	*-2.7991*	*at 0.05*	*16*
Std. Deviation		*0.3854*	*0.2035*	*0.0868*	*0.8906*	*at 0.01*	*6*

Appendix 6 - Annual regressions by firm for RET x UNEPS

Firm	n	Correl	Rsquare	Coeficient	Slope	F Value	F Sig
GETI4	9	0.7603	0.5781	0.0086	1.2341	8.3843	0.0200
ALLL11	9	0.5879	0.3456	0.1613	17.9140	1.0563	0.3797
AMBV4	14	-0.5634	0.3174	0.0867	-1.3655	5.5790	0.0344
ARCZ6	14	0.2741	0.0751	0.0710	0.2140	0.9748	0.3415
BRSR6	9	0.2543	0.0646	0.0133	0.3568	20.1517	0.0020
BBDC4	14	-0.0412	0.0017	0.1782	-0.0733	0.0204	0.8885
BBAS3	12	-0.1610	0.0259	0.0181	-0.3288	1.4549	0.2510
BRTP3	10	0.5084	0.2585	-0.0719	3.7331	1.9433	0.1968
BRTO4	12	-0.0369	0.0014	0.0581	-0.0615	0.5785	0.4629
BRKM5	8	0.0763	0.0058	0.0209	0.1005	0.0364	0.8519
PRGA3	14	0.2661	0.0708	0.1180	0.2979	0.9144	0.3564
CLSC6	10	-0.0730	0.0053	0.1804	-0.0808	1.4080	0.2583
CMIG4	11	-0.4023	0.1618	0.0267	-0.1745	0.2934	0.5999
CESP6	5	-0.8709	0.7584	-0.5050	-0.7719	5.0989	0.0869
CGAS5	11	0.1744	0.0304	0.0173	0.3086	0.2822	0.6081
CNFB4	12	-0.4824	0.2327	0.0951	-0.3046	11.8233	0.0055
CPLE6	12	-0.2513	0.0631	-0.0191	-0.2318	14.2185	0.0031
CYRE3	12	0.4685	0.2195	0.1799	4.7576	2.8122	0.1217
DURA4	14	0.2478	0.0614	0.1321	0.2158	0.7850	0.3917
ELET3	10	-0.1412	0.0199	0.0044	-0.1947	0.0483	0.8297
ELPL6	10	0.0474	0.0022	0.1301	0.0625	1.8651	0.2052
EMBR3	13	0.5766	0.3325	0.1685	0.9255	4.2925	0.0605
ETER3	12	-0.2910	0.0847	0.0953	-0.1574	0.0185	0.8940
FFTL4	13	0.0114	0.0001	0.1936	0.0130	0.0241	0.8792
GGBR4	11	-0.0163	0.0003	0.0158	-0.0138	3.6261	0.0860
GOAU4	11	0.0125	0.0002	0.0888	0.0080	2.9544	0.1164
IDNT3	8	-0.6669	0.4447	-0.1528	-0.9092	4.3112	0.0765
ITSA4	13	0.0613	0.0038	0.1128	0.0965	0.0008	0.9775
ITUB4	14	0.1224	0.0150	0.1484	0.1677	0.1825	0.6763
KLBN4	11	0.0596	0.0036	0.0264	0.0361	13.9160	0.0039
LIGT3	8	-0.3018	0.0911	-0.1017	-0.2707	5.2027	0.0566
LAME4	14	0.3862	0.1491	0.1679	0.6572	2.1032	0.1707
LREN3	13	0.3548	0.1259	0.0265	0.2424	1.4406	0.2553
POMO4	14	-0.1825	0.0333	0.0453	-0.1017	0.4135	0.5314
NETC4	11	0.3357	0.1127	-0.0572	0.6353	13.3894	0.0044
PCAR5	13	0.2263	0.0512	0.0651	1.4690	0.5939	0.4572
PETR4	13	-0.4041	0.1633	0.1646	-0.2317	1.1706	0.3005
PLAS3	8	0.3506	0.1229	0.2188	0.4517	0.4032	0.5456
RAPT4	12	0.3839	0.1474	0.1243	0.2934	0.6164	0.4490
RSID3	10	-0.1580	0.0250	-0.0694	-0.3572	0.8772	0.3764
SBSP3	10	0.2603	0.0678	-0.0109	0.2506	2.6796	0.1361
SDIA4	14	0.2596	0.0674	0.0945	0.2582	0.8668	0.3688
CSNA3	9	0.3996	0.1597	0.0682	0.2487	6.2153	0.0373
CRUZ3	13	0.0821	0.0067	0.0938	0.0774	0.0115	0.9163
SUZB5	12	0.3882	0.1507	0.0254	0.2671	2.0220	0.1828
TAMM4	7	-0.3805	0.1448	-0.0486	-0.2947	12.1984	0.0129
TELB4	8	-0.3724	0.1387	-0.1290	-0.4417	0.0001	0.9923
TNLP4	10	-0.5884	0.3463	-0.0906	-0.4127	3.2924	0.1030
TMAR5	12	0.6450	0.4160	0.0296	0.5377	5.8000	0.0347
TMCP4	10	-0.4833	0.2335	-0.1071	-0.6187	2.6210	0.1399
TLPP4	13	-0.0323	0.0010	0.0268	-0.0238	0.3728	0.5529
TCSL4	10	-0.5808	0.3373	-0.1439	-2.5858	3.8375	0.0818
TBLE3	9	-0.1916	0.0367	0.2802	-0.1705	0.4422	0.5248
TRPL4	6	0.5262	0.2769	0.1890	0.3395	0.9456	0.3755
UGPA4	9	0.0492	0.0024	0.0880	0.1649	0.1231	0.7348
UNIP6	9	0.3886	0.1510	-0.0055	0.6973	4.7640	0.0606
USIM5	12	0.5028	0.2528	0.1031	0.3475	3.1707	0.1026
VCPA4	14	0.4466	0.1995	0.0072	0.7833	2.9903	0.1074
VALE5	13	0.2046	0.0419	0.0928	0.1514	0.0720	0.7931
VIVO4	10	0.1064	0.0113	-0.0847	0.3818	0.0917	0.7698
WEGE3	14	0.4152	0.1724	0.0029	0.5435	2.4999	0.1379
Summary of firm-regressions							
Mean	*11*	*0.0582*	*0.1381*	*0.0437*	*0.4764*	*Number of significant regressions*	
Maximum	*14*	*0.7603*	*0.7584*	*0.2802*	*17.9140*	*at 0.10*	*17*
Minimum	*5*	*-0.8709*	*0.0001*	*-0.5050*	*-2.5858*	*at 0.05*	*10*
Std. Deviation		*0.3700*	*0.1541*	*0.1198*	*2.4619*	*at 0.01*	*5*

Appendix 7 - Annual regressions by firm for ARET x SEPS

Firm	n	Correl	Rsquare	Coeficient	Slope	F Value	F Sig
GETI4	9	-0.0666	0.0044	0.0131	-0.0947	0.0312	0.8642
ALLL11	3	-	-	-	-	-	-
AMBV4	14	0.1509	0.0228	-0.0030	0.3252	0.2797	0.6058
ARCZ6	14	0.3769	0.1421	0.0248	0.9687	1.9875	0.1821
BRSR6	9	-0.1092	0.0119	0.3805	-0.1347	20.3211	0.0020
BBDC4	14	0.4000	0.1600	-0.0665	2.1216	2.2855	0.1545
BBAS3	11	0.1471	0.0216	0.0694	0.8685	2.5857	0.1389
BRTP3	10	0.0093	0.0001	0.0002	0.0409	0.0007	0.9796
BRTO4	14	0.1039	0.0108	-0.0005	0.1602	0.1311	0.7231
BRKM5	12	0.0392	0.0015	-0.0990	0.0514	3.0522	0.1085
PRGA3	14	0.3962	0.1570	-0.0236	0.8155	2.2343	0.1589
CLSC6	12	0.5271	0.2779	-0.0570	0.6325	3.6592	0.0821
CMIG4	14	0.2782	0.0774	-0.0012	0.1954	1.0066	0.3340
CESP6	12	0.1687	0.0285	0.0609	0.1705	0.2930	0.6002
CGAS5	11	0.6631	0.4397	-0.0697	1.8934	7.0615	0.0240
CNFB4	11	0.5421	0.2939	-0.0111	0.5674	19.5436	0.0013
CPLE6	14	0.2452	0.0601	-0.0225	0.6390	0.7674	0.3969
CYRE3	12	0.4018	0.1614	-0.0792	3.4219	1.9249	0.1928
DURA4	14	0.3742	0.1400	-0.0239	1.6863	1.9533	0.1856
ELET3	14	0.4035	0.1628	-0.0080	0.9994	2.3333	0.1506
ELPL6	9	0.4331	0.1876	-0.0553	0.3588	2.0134	0.1937
EMBR3	13	-0.1978	0.0391	0.1031	-0.5714	0.4477	0.5172
ETER3	11	0.5120	0.2621	-0.0601	0.4262	3.7660	0.0810
FFTL4	14	0.5019	0.2519	-0.0507	0.6379	4.0411	0.0656
GGBR4	13	0.5414	0.2931	-0.0403	0.9379	3.7233	0.0776
GOAU4	13	0.7347	0.5398	-0.1385	0.9956	11.2730	0.0057
IDNT3	8	-0.4620	0.2135	0.0945	-0.7606	1.6285	0.2426
ITSA4	14	0.2252	0.0507	-0.0246	0.3158	0.6411	0.4377
ITUB4	14	0.4585	0.2102	-0.0453	0.8909	3.1942	0.0972
KLBN4	13	-0.4904	0.2405	-0.1427	-0.9293	3.5668	0.0834
LIGT3	13	-0.1109	0.0123	-0.0161	-0.0969	0.1370	0.7183
LAME4	13	0.3386	0.1147	-0.0550	1.1904	1.1397	0.3067
LREN3	13	0.2040	0.0416	0.0167	1.2248	0.3909	0.5458
POMO4	14	-0.1190	0.0142	0.0136	-0.2819	0.1723	0.6848
NETC4	11	-0.5027	0.2527	-0.0435	-2.2196	2.0203	0.1856
PCAR5	13	-0.0819	0.0067	0.0018	-0.6705	0.0743	0.7899
PETR4	14	-0.0324	0.0010	0.0024	-0.0563	0.0126	0.9124
PLAS3	11	0.2115	0.0447	0.0611	0.5326	0.4213	0.5325
RAPT4	13	0.3774	0.1425	-0.0971	0.9311	0.8511	0.3744
RSID3	11	0.2932	0.0860	0.0069	1.4326	0.8466	0.3792
SBSP3	12	0.0594	0.0035	-0.0009	0.0500	0.0355	0.8540
SDIA4	14	0.6054	0.3665	-0.0182	0.8841	6.9417	0.0206
CSNA3	12	-0.0690	0.0048	0.0077	-0.0637	0.0479	0.8312
CRUZ3	14	0.1149	0.0132	-0.0173	0.1538	0.1605	0.6952
SUZB5	13	0.2020	0.0408	-0.0831	0.4830	3.2343	0.0973
TAMM4	7	0.6420	0.4121	-0.2466	1.6723	2.8042	0.1549
TELB4	6	-0.4291	0.1841	0.2212	-1.0297	0.5007	0.5108
TNLP4	10	-0.3407	0.1161	0.0147	-1.0080	1.0504	0.3322
TMAR5	14	0.4299	0.1848	-0.0263	0.9396	2.7198	0.1231
TMCP4	9	0.3271	0.1070	-0.0808	1.8104	1.3304	0.2820
TLPP4	14	0.0773	0.0060	-0.0059	0.1810	0.0722	0.7924
TCSL4	10	-0.5650	0.3192	-0.0184	-1.4630	3.7515	0.0847
TBLE3	10	0.8420	0.7090	-0.0543	0.6789	19.4890	0.0017
TRPL4	9	0.0726	0.0053	-0.0134	0.1700	0.0371	0.8520
UGPA4	9	0.5263	0.2769	-0.0401	2.4562	2.6812	0.1402
UNIP6	11	0.3082	0.0950	0.0120	0.5987	6.1110	0.0330
USIM5	13	-0.3002	0.0901	-0.0742	-0.4415	6.1691	0.0288
VCPA4	14	0.4598	0.2114	-0.0361	1.3109	3.2172	0.0961
VALE5	14	-0.2496	0.0623	0.0635	-1.7050	0.7974	0.3881
VIVO4	10	0.1217	0.0148	-0.0127	0.4029	0.1203	0.7367
WEGE3	14	0.3441	0.1184	-0.0709	1.7717	1.6118	0.2265
Summary of firm-regressions							
Mean	*12*	*0.1844*	*0.1420*	*-0.0144*	*0.4578*	*Number of significant regressions*	
Maximum	*14*	*0.8420*	*0.7090*	*0.3805*	*3.4219*	*at 0.10*	*17*
Minimum	*3*	*-0.5650*	*0.0001*	*-0.2466*	*-2.2196*	*at 0.05*	*8*
Std. Deviation		*0.3314*	*0.1465*	*0.0833*	*0.9989*	*at 0.01*	*4*

Appendix 8 - Annual regressions by firm for ARET x UNEPS

Firm	n	Correl	Rsquare	Coeficient	Slope	F Value	F Sig
GETI4	9	0.4965	0.2465	-0.0518	0.6606	2.2904	0.1686
ALLL11	9	-0.0891	0.0079	-0.0292	-3.7546	0.0160	0.9074
AMBV4	14	-0.3984	0.1588	-0.0561	-0.9069	2.2647	0.1563
ARCZ6	14	0.1555	0.0242	0.0190	0.2688	0.2975	0.5947
BRSR6	9	-0.3247	0.1054	0.5157	-0.6467	22.6233	0.0014
BBDC4	14	0.0468	0.0022	-0.0121	0.0463	0.0263	0.8737
BBAS3	12	0.5678	0.3224	-0.0740	1.4072	2.8542	0.1350
BRTP3	10	-0.6393	0.4087	0.4242	-4.8180	7.2999	0.0243
BRTO4	12	0.6263	0.3922	0.1121	1.0759	9.7117	0.0124
BRKM5	8	-0.1899	0.0361	-0.0964	-0.2544	1.5288	0.2562
PRGA3	14	0.3739	0.1398	0.0905	1.0691	1.9504	0.1859
CLSC6	10	0.1749	0.0306	0.0804	0.1236	4.4530	0.0640
CMIG4	11	0.5679	0.3226	0.0502	0.7651	2.3807	0.1738
CESP6	5	0.7559	0.5714	0.1923	0.3784	6.9695	0.0576
CGAS5	11	0.4648	0.2160	0.0162	0.6172	1.0062	0.3420
CNFB4	12	-0.4384	0.1922	0.0057	-0.5076	1.3335	0.2727
CPLE6	12	0.1903	0.0362	0.0976	0.5617	0.3383	0.5737
CYRE3	12	-0.1947	0.0379	-0.0109	-1.6173	26.9131	0.0003
DURA4	14	-0.2375	0.0564	0.0821	-2.5914	0.0598	0.8297
ELET3	10	0.4556	0.2076	0.3071	0.5699	5.5822	0.0424
ELPL6	10	-0.6406	0.4104	0.0013	-0.5379	1.3919	0.3231
EMBR3	13	0.0736	0.0054	-0.0096	0.1460	0.0544	0.8198
ETER3	12	-0.5336	0.2847	0.0760	-2.5689	0.7961	0.4380
FFTL4	13	0.4007	0.1606	-0.0172	0.5296	2.1832	0.1653
GGBR4	11	0.2167	0.0469	-0.0295	0.2492	6.7195	0.0236
GOAU4	11	-0.0111	0.0001	0.0011	-0.0124	0.0011	0.9741
IDNT3	8	-0.7742	0.5994	-0.3654	-0.8282	77.0187	0.0001
ITSA4	13	0.4156	0.1727	-0.0411	0.6649	6.6293	0.0243
ITUB4	14	0.4612	0.2127	-0.1106	1.0181	3.2425	0.0950
KLBN4	11	-0.0319	0.0010	0.0000	-0.0244	0.0010	0.9774
LIGT3	8	-0.3915	0.1533	-0.0866	-0.1410	75.3644	0.0001
LAME4	14	0.3800	0.1444	-0.0105	0.6762	2.0247	0.1783
LREN3	13	0.5079	0.2580	-0.1961	2.5646	0.6953	0.4655
POMO4	14	0.2241	0.0502	-0.1769	4.0404	0.3174	0.5908
NETC4	11	0.3025	0.0915	0.0255	0.2648	1.0752	0.3242
PCAR5	13	0.0963	0.0093	-0.0135	0.3542	1.1106	0.3145
PETR4	13	0.6463	0.4176	-1.6038	13.2738	2.8687	0.1511
PLAS3	8	0.3701	0.1370	-0.0983	0.2774	12.4990	0.0095
RAPT4	12	0.1349	0.0182	0.0419	0.1700	0.5131	0.4875
RSID3	10	-0.7230	0.5228	-0.2433	-1.8825	14.9971	0.0038
SBSP3	10	-0.1641	0.0269	0.1708	-0.5625	1.0671	0.3286
SDIA4	14	0.2299	0.0529	0.0482	0.2531	0.6698	0.4279
CSNA3	9	-0.2676	0.0716	0.1485	-1.7525	0.1543	0.7207
CRUZ3	13	0.0148	0.0002	-0.0207	0.1006	0.0022	0.9635
SUZB5	12	0.0340	0.0012	-0.0518	0.0238	3.4941	0.0884
TAMM4	7	-0.3893	0.1516	0.0536	-0.1350	1.0876	0.3372
TELB4	8	-0.4543	0.2064	-0.0788	-0.6598	0.8106	0.3979
TNLP4	10	-0.7831	0.6132	0.0578	-3.5327	3.1712	0.1730
TMAR5	12	-0.0035	0.0000	0.0211	-0.0058	4.1339	0.0669
TMCP4	10	0.0196	0.0004	0.0998	0.1210	0.0511	0.8268
TLPP4	13	0.2566	0.0658	0.0479	0.2748	0.7049	0.4190
TCSL4	10	-0.1872	0.0350	0.0260	-0.9659	1.6176	0.2353
TBLE3	9	-0.5312	0.2822	0.0758	-0.6224	3.6726	0.0916
TRPL4	6	-0.8324	0.6929	-0.1552	-0.3943	9.8573	0.0257
UGPA4	9	-0.0122	0.0001	0.1214	-0.0810	9.5862	0.0148
UNIP6	9	0.4921	0.2422	0.0217	3.7883	1.2781	0.3095
USIM5	12	0.3200	0.1024	0.0727	0.9318	1.9109	0.2002
VCPA4	14	0.1801	0.0324	-0.0396	0.2529	0.2682	0.6170
VALE5	13	0.3748	0.1405	0.0165	0.5918	0.8134	0.3849
VIVO4	10	0.0716	0.0051	0.0345	0.2225	0.0413	0.8436
WEGE3	14	-0.1932	0.0373	-0.0067	-0.3497	0.4651	0.5072
Summary of firm-regressions							
Mean	*11*	*0.0273*	*0.1635*	*-0.0087*	*0.1341*	*Number of significant regressions*	
Maximum	*14*	*0.7559*	*0.6929*	*0.5157*	*13.2738*	*at 0.10*	*19*
Minimum	*5*	*-0.8324*	*0.0000*	*-1.6038*	*-4.8180*	*at 0.05*	*13*
Std. Deviation		*0.4067*	*0.1772*	*0.2467*	*2.2371*	*at 0.01*	*6*

Appendix 9 – Summary of Quarterly regressions considering civil quarters accumulation return

Quarterly Linear Regressions							
				Regressions at Level			
Firm	**n**	**Correl**	**Rsquare**	**Constant**	**Slope**		
			RET x SEPS				
Mean	*46*	*0.0241*	*0.0367*	*0.0350*	*0.5619*	***Number of significant regressions***	
Maximum	*56*	*0.6092*	*0.3711*	*0.0975*	*19.0979*	*at 0.10*	*16*
Minimum	*12*	*-0.4140*	*0.0000*	*-0.0952*	*-1.5151*	*at 0.05*	*13*
Std. Deviation		*0.1913*	*0.0634*	*0.0379*	*2.8569*	*at 0.01*	*6*
			RET x UNEPS				
Mean	*47*	*0.1242*	*0.0818*	*0.0461*	*1.0182*	***Number of significant regressions***	
Maximum	*56*	*0.9032*	*0.8157*	*0.1213*	*24.1935*	*at 0.10*	*28*
Minimum	*13*	*-0.6559*	*0.0001*	*-0.2157*	*-2.3546*	*at 0.05*	*20*
Std. Deviation		*0.2596*	*0.1312*	*0.0448*	*4.0238*	*at 0.01*	*11*
			ARET x SEPS				
Mean	*46*	*-0.0085*	*0.0372*	*-0.0020*	*0.2532*	***Number of significant regressions***	
Maximum	*56*	*0.4585*	*0.2814*	*0.0527*	*15.9092*	*at 0.10*	*16*
Minimum	*12*	*-0.5305*	*0.0000*	*-0.0773*	*-2.2581*	*at 0.05*	*10*
Std. Deviation		*0.1940*	*0.0601*	*0.0203*	*2.0225*	*at 0.01*	*5*
			ARET x UNEPS				
Mean	*48*	*0.0400*	*0.0403*	*-0.0017*	*0.1690*	***Number of significant regressions***	
Maximum	*57*	*0.5312*	*0.2822*	*0.0519*	*6.5080*	*at 0.10*	*11*
Minimum	*13*	*-0.4959*	*0.0000*	*-0.0673*	*-2.7703*	*at 0.05*	*7*
Std. Deviation		*0.1981*	*0.0608*	*0.0224*	*1.0447*	*at 0.01*	*5*

Appendix 10 - Quarterly regressions by firm for RET x SEPS

Quarterly Linear Regressions														
	Regressions at Level							Regression at Lag 1						
Firm	n	Correl	Rsquare	Constant	Slope	F Value	F Sig	n	Correl	Rsquare	Constant	Slope	F Value	F Sig
GETI4	38	-0.0017	0.0000	0.0796	-0.0015	2.6006	0.1153	37	0.0211	0.0004	0.0749	0.0183	2.5613	0.1182
ALLL11	16	0.2712	0.0736	0.0348	39.1956	1.1115	0.3085	15	-0.4696	0.2205	0.0198	-67.7554	2.7564	0.1191
AMBV4	56	0.2896	0.0838	0.0668	1.4334	4.9420	0.0303	55	0.1419	0.0201	0.0650	0.6974	1.0884	0.3015
ARCZ6	55	0.1553	0.0241	0.0145	0.8988	5.0527	0.0287	55	-0.2328	0.0542	0.0027	-1.4044	3.0378	0.0870
BRSR6	45	0.1763	0.0311	0.0717	0.2345	33.8941	0.0000	44	-0.1114	0.0124	0.0779	-0.1444	35.1572	0.0000
BBDC4	56	0.1326	0.0176	0.0590	1.4168	0.9665	0.3299	55	0.0113	0.0001	0.0596	0.1199	0.0067	0.9349
BRAP4	32	0.1167	0.0136	0.0437	0.1488	0.4401	0.5120	31	0.2752	0.0757	0.0477	0.3555	0.6219	0.4365
BBAS3	52	-0.1635	0.0267	0.0500	-0.2127	1.1184	0.2953	51	0.1435	0.0206	0.0516	0.1817	0.8115	0.3720
BRTP3	41	0.1024	0.0105	0.0607	1.1527	0.3486	0.5582	40	0.3259	0.1062	0.0568	3.6568	3.0352	0.0894
BRTO4	56	-0.1379	0.0190	0.0349	-1.0023	1.0469	0.3107	55	0.1549	0.0240	0.0308	1.1321	1.3022	0.2589
BRKM5	53	0.1702	0.0290	0.0096	0.3073	8.3116	0.0057	52	0.1111	0.0123	-0.0023	0.2621	7.6394	0.0079
PRGA3	56	0.0184	0.0003	0.0542	0.0785	0.0183	0.8929	55	0.2066	0.0427	0.0511	0.8860	2.3620	0.1302
CCRO3	28	-0.1502	0.0226	0.0810	-0.2168	0.0852	0.7725	27	-0.2478	0.0614	0.1021	-0.3068	9.1717	0.0055
CLSC6	54	0.3052	0.0932	0.0176	0.6859	3.4112	0.0703	53	-0.0744	0.0055	0.0219	-0.1670	1.3571	0.2494
CMIG4	56	0.0118	0.0001	0.0471	0.0219	0.0076	0.9309	55	0.1996	0.0398	0.0461	0.3682	2.1995	0.1439
CESP6	49	0.0114	0.0001	0.0180	0.0109	1.7677	0.1900	48	-0.0151	0.0002	0.0206	-0.0145	0.0807	0.7776
CGAS5	46	-0.2202	0.0485	0.0441	-1.0366	4.3046	0.0438	45	0.3761	0.1414	0.0410	1.7696	8.2241	0.0063
CNFB4	56	0.2274	0.0517	0.0647	0.5128	2.9434	0.0919	55	0.0474	0.0022	0.0751	0.1086	0.1194	0.7310
CSMG3	12	-0.3775	0.1425	0.0404	-2.6344	2.9857	0.1119	11	0.1276	0.0163	0.0354	0.9550	0.3104	0.5897
CPLE6	56	-0.0129	0.0002	0.0453	-0.0587	0.0089	0.9250	55	0.1732	0.0300	0.0405	0.7850	1.6390	0.2059
CPFE3	18	0.5267	0.2774	0.0398	5.9353	6.1416	0.0240	17	-0.2508	0.0629	0.0575	-2.7213	1.7364	0.2061
CYRE3	49	-0.0281	0.0008	0.0489	-0.4767	0.0370	0.8482	48	0.2720	0.0740	0.0414	4.7852	2.6729	0.1087
DASA3	17	0.4155	0.1726	-0.0138	7.0798	4.7004	0.0456	16	0.0227	0.0005	0.0095	0.5723	0.4457	0.5145
DURA4	56	-0.1522	0.0232	0.0328	-1.1294	1.2805	0.2627	55	0.2325	0.0541	0.0329	1.7251	3.0296	0.0875
ELET3	56	0.2209	0.0488	0.0239	0.3455	2.7710	0.1017	55	-0.2639	0.0697	0.0180	-0.4145	3.9685	0.0514
ELPL6	44	0.3686	0.1359	0.0182	0.6789	6.6051	0.0137	43	-0.1073	0.0115	0.0370	-0.1944	1.4393	0.2370
EMBR3	56	-0.2600	0.0676	0.0524	-0.6102	3.9142	0.0529	55	0.0825	0.0068	0.0325	0.1928	0.3632	0.5493
ETER3	54	0.2425	0.0588	0.0555	0.2813	1.3924	0.2433	53	0.0186	0.0003	0.0569	0.0210	1.1421	0.2901
FFTL4	56	0.0202	0.0004	0.0788	0.0470	0.0220	0.8827	55	0.0194	0.0004	0.0836	0.0446	0.0200	0.8882
GFSA3	12	0.3663	0.1341	-0.0563	8.4391	0.5889	0.4590	11	-0.1358	0.0185	-0.0395	-5.2964	1.1817	0.3025
GGBR4	56	0.0584	0.0034	0.0805	0.1822	0.1850	0.6688	55	-0.0651	0.0042	0.0911	-0.1981	0.2253	0.6369
GOAU4	56	0.1951	0.0381	0.0725	0.6304	2.1372	0.1495	55	-0.0110	0.0001	0.0862	-0.0353	0.0064	0.9366
GOLL4	19	0.1332	0.0178	-0.0592	0.5213	0.3072	0.5862	18	0.1782	0.0317	-0.0541	2.4221	0.6100	0.4455
IDNT3	35	-0.4243	0.1800	-0.0203	-1.5002	7.2451	0.0109	34	-0.0815	0.0066	0.0008	-0.2684	4.0998	0.0510
ITSA4	56	-0.1895	0.0359	0.0726	-0.5660	2.0123	0.1617	55	0.1384	0.0191	0.0653	0.4310	1.0344	0.3137
ITUB4	56	-0.2259	0.0510	0.0734	-1.0612	2.9042	0.0940	55	0.2265	0.0513	0.0620	1.3341	2.8666	0.0962
KEPL3	26	-0.0523	0.0027	-0.0670	-0.3460	0.0658	0.7997	25	-0.4205	0.1768	-0.0653	-2.7932	3.9165	0.0594
KLBN4	55	0.0332	0.0011	0.0254	0.0341	0.6205	0.4343	54	-0.1837	0.0338	0.0150	-0.1838	5.4409	0.0235
LIGT3	55	0.1443	0.0208	-0.0148	0.1882	0.1431	0.7067	54	-0.1084	0.0117	-0.0220	-0.1409	0.3256	0.5707
LAME4	54	-0.0711	0.0051	0.0553	-0.2316	0.9544	0.3330	53	0.1234	0.0152	0.0568	0.4115	1.0416	0.3122
LREN3	46	0.0859	0.0074	0.0859	0.1867	2.4270	0.1263	45	-0.0036	0.0000	0.0824	-0.0078	0.9955	0.3239
POMO4	56	0.0136	0.0002	0.0527	0.0584	0.0099	0.9209	55	0.0655	0.0043	0.0481	0.2827	0.2284	0.6346
NATU3	19	0.0684	0.0047	0.0531	1.7688	2.5147	0.1302	18	0.0695	0.0048	0.0466	1.7553	2.2457	0.1523
NETC4	47	0.1469	0.0216	-0.0645	0.4645	0.5871	0.4474	46	0.1745	0.0305	-0.0741	0.5510	0.1279	0.7223
PCAR5	53	0.0350	0.0012	0.0355	0.4406	0.6901	0.4099	52	-0.1082	0.0117	0.0329	-1.3584	0.5442	0.4641
PETR4	56	-0.2488	0.0619	0.0743	-1.0542	3.5631	0.0644	55	0.2333	0.0544	0.0707	0.9901	3.0504	0.0864
PLAS3	53	0.1972	0.0389	0.0209	0.4673	2.0588	0.1573	52	-0.1521	0.0231	-0.0065	-0.3036	22.1149	0.0000
PSSA3	17	0.3247	0.1054	0.0325	5.7288	2.6967	0.1201	16	0.2157	0.0465	0.0434	3.7727	1.0242	0.3276
RAPT4	56	-0.2072	0.0429	0.0453	-0.4264	2.4233	0.1253	55	0.1274	0.0162	0.0502	0.2609	0.8745	0.3539
RSID3	45	-0.0203	0.0004	0.0299	-0.1433	1.3972	0.2437	44	0.0478	0.0023	0.0290	0.3060	1.3339	0.2545
SBSP3	49	-0.0833	0.0069	0.0261	-0.1238	8.6569	0.0050	48	0.1682	0.0283	0.0162	0.2435	11.4526	0.0014
SDIA4	56	0.1942	0.0377	0.0411	0.3518	2.1173	0.1513	55	0.0311	0.0010	0.0432	0.0701	0.0512	0.8218
CSNA3	54	-0.1856	0.0344	0.0902	-0.2787	1.2761	0.2637	53	0.0949	0.0090	0.0960	0.1445	1.0152	0.3183
CRUZ3	56	-0.0914	0.0084	0.0728	-0.1789	0.4554	0.5026	55	-0.0161	0.0003	0.0696	-0.0313	0.0138	0.9070
SUZB5	56	0.2098	0.0440	0.0281	0.3974	2.4862	0.1206	55	0.0382	0.0015	0.0306	0.0731	0.0775	0.7818
TAMM4	31	-0.1234	0.0152	0.0596	-0.1324	1.4783	0.2335	30	-0.0283	0.0008	0.0653	-0.0317	3.6188	0.0671
TELB4	36	0.1325	0.0176	0.0510	0.3196	3.7164	0.0620	35	0.1835	0.0337	0.0554	0.4133	0.4214	0.5206
TNLP4	42	0.2490	0.0620	0.0314	0.6348	2.6430	0.1117	41	-0.1884	0.0355	0.0319	-0.4804	0.4922	0.4870
TMAR5	55	0.1378	0.0190	0.0229	0.2771	2.7676	0.1020	54	-0.1944	0.0378	0.0176	-0.3845	2.5666	0.1151
TMCP4	42	-0.0066	0.0000	0.0344	-0.0429	0.0017	0.9670	41	0.1980	0.0392	0.0282	1.3016	0.6770	0.4155
TLPP4	56	-0.0011	0.0000	0.0456	-0.0061	0.0001	0.9938	55	0.2304	0.0531	0.0376	1.2946	2.9707	0.0905
TCSL4	42	0.1262	0.0159	0.0177	1.3870	0.6478	0.4255	41	-0.1387	0.0193	0.0108	-1.6787	0.6031	0.4420
TBLE3	43	-0.0595	0.0035	0.0800	-0.0715	0.1458	0.7045	42	0.3189	0.1017	0.0765	0.3829	3.4680	0.0697
TRPL4	38	-0.3736	0.1396	0.0833	-1.3940	9.3276	0.0042	37	0.3441	0.1184	0.0679	1.1350	18.5742	0.0001
UGPA4	37	-0.0464	0.0022	0.0482	-0.4037	0.8092	0.3743	36	0.0422	0.0018	0.0593	0.3247	7.2673	0.0107
UNIP6	54	0.0863	0.0075	0.0389	0.1175	0.7018	0.4060	53	0.0089	0.0001	0.0360	0.0121	1.2384	0.2709
USIM5	54	-0.0305	0.0009	0.0581	-0.0481	0.2463	0.6217	53	-0.0849	0.0072	0.0361	-0.1289	3.9356	0.0526
VCPA4	56	0.3836	0.1472	0.0221	2.3587	9.3189	0.0035	55	-0.2517	0.0634	0.0249	-2.6666	3.5852	0.0637
VALE5	56	-0.0070	0.0000	0.0680	-0.0538	0.0027	0.9591	55	-0.1051	0.0110	0.0696	-0.8072	0.5920	0.4450
VIVO4	42	0.0321	0.0010	-0.0221	0.1333	0.0413	0.8401	41	-0.0506	0.0026	-0.0313	-0.2045	1.3888	0.2456
WEGE3	56	0.1351	0.0183	0.0691	1.0681	1.0040	0.3207	55	-0.0780	0.0061	0.0751	-0.6137	0.3243	0.5714

Appendix 11 - Quarterly regressions by firm for RET x UNEPS

Quarterly Linear Regressions														
	Regressions at Level							Regression at Lag 1						
Firm	n	Correl	Rsquare	Constant	Slope	F Value	F Sig	n	Correl	Rsquare	Constant	Slope	F Value	F Sig
GETI4	39	0.0938	0.0088	0.0889	0.1254	0.3284	0.5700	38	0.0861	0.0074	0.0804	0.1097	2.8886	0.0976
ALLL11	17	0.0654	0.0043	0.0354	10.2187	0.0602	0.8095	16	-0.3491	0.1219	0.0255	-60.1316	1.9428	0.1837
AMBV4	56	0.1199	0.0144	0.0651	0.7436	0.7883	0.3785	56	-0.2200	0.0484	0.0702	-1.3191	2.7466	0.1032
ARCZ6	56	0.0848	0.0072	0.0262	0.1525	0.3910	0.5344	56	-0.3198	0.1023	-0.0136	-0.5753	6.1518	0.0162
BRSR6	55	-0.3962	0.1569	0.0035	-0.0221	8.8730	0.0043	54	0.0661	0.0044	0.0189	0.0037	1.4341	0.2364
BBDC4	56	-0.0198	0.0004	0.0622	-0.1146	0.0212	0.8849	56	-0.0268	0.0007	0.0619	-0.1353	0.0387	0.8448
BRAP4	35	0.2944	0.0867	0.0482	0.2775	3.1324	0.0857	34	-0.0269	0.0007	0.0493	-0.0247	0.8693	0.3579
BBAS3	56	0.0558	0.0031	0.0484	0.0151	0.1685	0.6830	56	0.0093	0.0001	0.0458	0.0023	0.0046	0.9460
BRTP3	42	0.0751	0.0056	0.0708	0.4501	0.2272	0.6362	41	-0.0509	0.0026	0.0524	-0.3054	0.6549	0.4232
BRTO4	56	-0.2284	0.0522	-0.0064	-0.7246	2.9714	0.0904	56	-0.1546	0.0239	0.0079	-0.4309	1.3225	0.2551
BRKM5	56	0.2088	0.0436	0.0364	0.1226	2.4610	0.1224	56	0.2216	0.0491	0.0388	0.1301	2.7889	0.1006
PRGA3	56	0.0650	0.0042	0.0589	0.2865	0.2294	0.6339	56	0.0740	0.0055	0.0596	0.3159	0.2976	0.5876
CCRO3	29	-0.2773	0.0769	0.0961	-0.3826	2.2484	0.1449	28	0.0788	0.0062	0.0790	0.1079	0.3442	0.5623
CLSC6	56	0.1681	0.0283	0.0379	0.1817	1.5712	0.2153	56	-0.0480	0.0023	0.0150	-0.0512	0.1248	0.7252
CMIG4	56	0.0695	0.0048	0.0538	0.0863	0.2620	0.6108	56	0.0154	0.0002	0.0487	0.0175	0.0128	0.9104
CESP6	56	0.0588	0.0035	0.0298	0.0194	0.1876	0.6666	56	0.0767	0.0059	0.0325	0.0253	0.3194	0.5743
CGAS5	47	0.0042	0.0000	0.0332	0.0210	0.0008	0.9777	46	0.2260	0.0511	0.0554	1.1019	4.4358	0.0408
CNFB4	56	0.2344	0.0550	0.0917	0.2197	3.1398	0.0819	56	0.0576	0.0033	0.0805	0.0524	0.1797	0.6733
CSMG3	13	-0.3369	0.1135	0.0369	-4.3769	1.4081	0.2583	12	0.1729	0.0299	0.0286	2.1352	1.4789	0.2494
CPLE6	56	-0.0751	0.0056	0.0368	-0.1347	0.3065	0.5821	56	-0.0697	0.0049	0.0370	-0.1159	0.2638	0.6096
CPFE3	19	0.1796	0.0323	0.0084	3.0852	0.5334	0.4751	18	-0.3389	0.1149	0.1039	-3.4029	2.0761	0.1678
CYRE3	50	0.0453	0.0020	0.0444	0.9299	0.0965	0.7575	49	0.0988	0.0098	0.0416	1.9925	0.4634	0.4993
DASA3	18	0.2875	0.0827	0.0461	6.7230	1.4421	0.2463	17	-0.2895	0.0838	-0.0295	-7.3197	2.7913	0.1142
DURA4	56	-0.0523	0.0027	0.0248	-0.2004	0.1479	0.7020	56	0.0619	0.0038	0.0423	0.2326	0.2077	0.6504
ELET3	56	-0.0563	0.0032	0.0084	-0.0861	0.1720	0.6800	56	-0.2108	0.0444	-0.0251	-0.2934	2.5118	0.1187
ELPL6	44	0.3335	0.1112	0.0544	0.5434	5.2558	0.0268	43	-0.1287	0.0166	0.0232	-0.2054	1.6577	0.2050
EMBR3	56	0.2359	0.0557	0.0533	0.2187	3.1831	0.0799	56	0.3161	0.0999	0.0624	0.2855	5.9961	0.0176
ETER3	56	0.1989	0.0396	0.0564	0.1668	2.2239	0.1416	56	0.0747	0.0056	0.0600	0.0616	0.3031	0.5842
FFTL4	56	0.1299	0.0169	0.0784	0.2359	0.9262	0.3401	56	0.0897	0.0081	0.0793	0.1561	0.4384	0.5107
GFSA3	13	-0.1375	0.0189	-0.0393	-3.3313	0.2121	0.6534	12	-0.5388	0.2903	-0.0902	-13.1122	2.9183	0.1156
GGBR4	56	0.1729	0.0299	0.0946	0.1946	1.6632	0.2026	56	0.1050	0.0110	0.0905	0.1132	0.6023	0.4410
GOAU4	56	0.1846	0.0341	0.0903	0.2275	1.9051	0.1731	56	0.0662	0.0044	0.0859	0.0764	0.2378	0.6278
GOLL4	20	0.3312	0.1097	-0.0293	1.0716	2.0939	0.1651	19	0.1222	0.0149	-0.0454	0.3962	0.2576	0.6179
IDNT3	36	-0.0489	0.0024	-0.0421	-0.1900	0.0790	0.7804	35	0.3136	0.0983	0.0649	1.2177	3.5987	0.0663
ITSA4	56	-0.0855	0.0073	0.0739	-0.2429	0.3974	0.5310	56	0.1358	0.0184	0.0668	0.3622	1.0138	0.3184
ITUB4	56	-0.1498	0.0224	0.0817	-0.7219	1.2397	0.2704	56	0.1505	0.0226	0.0617	0.6769	1.2511	0.2682
KEPL3	27	-0.0845	0.0071	-0.0770	-0.6632	0.1725	0.6815	26	0.0402	0.0016	-0.0635	0.3196	0.0388	0.8454
KLBN4	56	-0.0369	0.0014	0.0274	-0.0361	0.0737	0.7870	56	-0.3164	0.1001	0.0005	-0.3093	6.0075	0.0175
LIGT3	56	0.0882	0.0078	-0.0025	0.0739	0.4234	0.5180	56	-0.0668	0.0045	-0.0285	-0.0549	0.2417	0.6249
LAME4	56	0.3007	0.0904	0.0647	0.4356	5.3697	0.0242	56	0.0744	0.0055	0.0643	0.1078	0.3009	0.5856
LREN3	47	0.3014	0.0908	0.0877	0.4359	4.3963	0.0417	47	0.0708	0.0050	0.0855	0.0985	3.3488	0.0739
POMO4	56	-0.1216	0.0148	0.0480	-0.3897	0.8108	0.3718	56	-0.0701	0.0049	0.0494	-0.1841	0.2668	0.6075
NATU3	20	0.4288	0.1839	-0.1262	14.3336	4.0563	0.0584	19	0.4216	0.1777	-0.1190	12.8412	6.6212	0.0191
NETC4	49	0.2557	0.0654	0.0106	0.3551	2.4023	0.1277	48	0.0186	0.0003	-0.0518	0.0253	0.4525	0.5045
PCAR5	54	-0.0891	0.0079	0.0304	-1.3414	0.4165	0.5215	53	-0.2058	0.0424	0.0126	-3.0512	2.9101	0.0940
PETR4	56	-0.1086	0.0118	0.0705	-0.2704	0.6448	0.4254	56	-0.0023	0.0000	0.0726	-0.0051	0.0003	0.9863
PLAS3	56	-0.1195	0.0143	-0.0155	-0.0996	0.7819	0.3804	56	-0.0277	0.0008	0.0073	-0.0231	0.0416	0.8391
PSSA3	18	0.5968	0.3562	-0.1655	14.6081	8.8522	0.0085	17	0.4291	0.1842	-0.1147	10.1165	4.4043	0.0521
RAPT4	56	-0.0508	0.0026	0.0395	-0.0780	0.1398	0.7099	56	0.0813	0.0066	0.0570	0.1252	0.3597	0.5512
RSID3	46	-0.0631	0.0040	-0.0051	-0.2737	0.1680	0.6839	45	-0.0553	0.0031	0.0194	-0.2405	1.5125	0.2254
SBSP3	50	-0.1349	0.0182	0.0201	-0.2307	0.8891	0.3503	49	-0.0479	0.0023	0.0185	-0.0750	8.3976	0.0056
SDIA4	56	0.2177	0.0474	0.0539	0.4446	2.6876	0.1068	56	-0.0678	0.0046	0.0407	-0.1385	0.2494	0.6195
CSNA3	56	0.0518	0.0027	0.0968	0.0305	0.1455	0.7043	56	0.0595	0.0035	0.0979	0.0321	0.1921	0.6629
CRUZ3	56	0.0088	0.0001	0.0714	0.0154	0.0042	0.9488	56	0.0938	0.0088	0.0680	0.1394	0.4791	0.4917
SUZB5	56	-0.0215	0.0005	0.0303	-0.0276	0.0249	0.8753	56	-0.2032	0.0413	0.0110	-0.2615	2.3247	0.1331
TAMM4	32	0.0401	0.0016	0.0551	0.0549	0.0467	0.8304	31	0.3374	0.1139	0.0351	0.4645	1.5851	0.2177
TELB4	43	0.0823	0.0068	0.0219	0.0421	0.2727	0.6043	42	0.0230	0.0005	0.0167	0.0113	0.0211	0.8853
TNLP4	43	-0.0634	0.0040	0.0265	-0.1427	0.1613	0.6901	42	-0.3540	0.1253	0.0042	-0.7906	5.7299	0.0213
TMAR5	56	0.1275	0.0163	0.0340	0.1165	0.8929	0.3488	56	-0.1411	0.0199	0.0077	-0.1279	1.0970	0.2995
TMCP4	43	-0.0474	0.0022	0.0329	-0.3095	0.0902	0.7654	42	-0.0646	0.0042	0.0314	-0.2585	0.1676	0.6844
TLPP4	56	-0.1607	0.0258	0.0324	-0.3646	1.4308	0.2368	56	-0.1515	0.0230	0.0328	-0.2908	1.2688	0.2649
TCSL4	43	0.0629	0.0040	0.0245	0.8818	0.1587	0.6925	42	-0.0986	0.0097	0.0047	-1.4064	0.3923	0.5345
TBLE3	44	0.0786	0.0062	0.0839	0.0923	0.2546	0.6165	43	0.1513	0.0229	0.0884	0.1781	0.9605	0.3327
TRPL4	39	-0.3122	0.0975	0.0439	-0.6703	3.9953	0.0528	38	-0.1700	0.0289	0.0560	-0.3499	4.1613	0.0485
UGPA4	38	0.0719	0.0052	0.0420	0.7690	0.1872	0.6678	37	0.0631	0.0040	0.0416	0.6790	0.7465	0.3933
UNIP6	56	0.2711	0.0735	0.0685	0.1992	4.2846	0.0432	56	0.1352	0.0183	0.0546	0.0994	1.0055	0.3204
USIM5	56	0.1000	0.0100	0.0608	0.1012	0.5458	0.4632	56	0.2160	0.0467	0.0657	0.2183	2.6435	0.1097
VCPA4	56	0.0453	0.0020	0.0367	0.1091	0.1109	0.7404	56	-0.2227	0.0496	-0.0058	-0.5251	2.8171	0.0989
VALE5	56	-0.0589	0.0035	0.0655	-0.1791	0.1882	0.6662	56	0.0366	0.0013	0.0696	0.0987	0.0723	0.7890
VIVO4	43	0.2425	0.0588	0.0246	0.9937	2.5003	0.1215	42	0.0838	0.0070	-0.0063	0.3401	0.2831	0.5975
WEGE3	56	0.2139	0.0457	0.0568	1.3169	2.5889	0.1133	56	0.1374	0.0189	0.0631	0.8229	1.0389	0.3125

Appendix 12 - Quarterly regressions by firm for ARET x SEPS

Quarterly Linear Regressions														
	Regressions at Level							Regression at Lag 1						
Firm	n	Correl	Rsquare	Constant	Slope	F Value	F Sig	n	Correl	Rsquare	Constant	Slope	F Value	F Sig
GETI4	38	0.0518	0.0027	-0.0101	0.0432	0.0967	0.7576	37	-0.1515	0.0229	-0.0303	-0.0650	0.5814	0.4507
ALLL11	16	0.3002	0.0901	-0.0327	0.2663	1.2877	0.2755	15	-0.0639	0.0041	-0.0055	-3.5402	0.4847	0.4977
AMBV4	56	0.4696	0.2205	-0.0146	1.9668	15.2789	0.0003	55	0.0143	0.0002	-0.0040	0.0332	0.0109	0.9172
ARCZ6	55	-0.0171	0.0003	-0.0170	-0.0622	0.5045	0.4806	55	-0.2236	0.0500	-0.0103	-0.4266	2.7889	0.1007
BRSR6	45	0.1769	0.0313	0.0499	0.2347	27.5159	0.0000	44	-0.1388	0.0193	-0.0004	-0.0970	18.4753	0.0001
BBDC4	56	0.3243	0.1051	-0.0120	2.1771	6.3448	0.0147	55	-0.2385	0.0569	-0.0013	-1.0660	3.1977	0.0794
BRAP4	32	-0.1607	0.0258	0.0128	-0.1072	12.6942	0.0012	31	0.3060	0.0937	0.0068	0.1200	1.1325	0.2957
BBAS3	52	-0.1540	0.0237	0.0064	-0.1325	5.5722	0.0221	51	0.3350	0.1122	0.0098	0.1492	7.6967	0.0078
BRTP3	41	0.1572	0.0247	0.0063	1.3996	0.9877	0.3263	40	0.0059	0.0000	-0.0133	0.0334	1.8079	0.1865
BRTO4	56	-0.1110	0.0123	-0.0010	-0.4732	0.6732	0.4155	55	-0.1151	0.0133	-0.0002	-0.3256	0.7120	0.4025
BRKM5	53	0.1345	0.0181	-0.0269	0.1765	5.7687	0.0199	52	-0.0342	0.0012	-0.0365	-0.0375	0.4705	0.4959
PRGA3	56	0.0360	0.0013	-0.0117	0.1268	0.0699	0.7924	55	0.1388	0.0193	-0.0062	0.3113	1.0417	0.3120
CCRO3	28	-0.2663	0.0709	0.0042	-0.2407	1.9847	0.1703	27	-0.3050	0.0930	0.0271	-0.1699	5.1677	0.0315
CLSC6	54	0.2437	0.0594	-0.0064	0.3717	1.2953	0.2602	53	0.0086	0.0001	-0.0151	0.0064	1.5364	0.2207
CMIG4	56	-0.0924	0.0085	-0.0030	-0.1133	0.4645	0.4984	55	0.0307	0.0009	-0.0064	0.0192	0.0499	0.8241
CESP6	49	-0.0421	0.0018	-0.0216	-0.0302	2.5466	0.1171	48	0.0371	0.0014	0.0258	0.0153	2.3508	0.1319
CGAS5	46	-0.0935	0.0087	0.0030	-0.3285	0.3882	0.5364	45	0.2848	0.0811	0.0206	0.5115	1.8010	0.1865
CNFB4	56	0.3141	0.0987	-0.0103	0.6424	5.9105	0.0183	55	0.1414	0.0200	0.0011	0.1352	1.0806	0.3032
CSMG3	12	-0.4964	0.2464	0.0135	-1.9981	3.2692	0.0980	11	0.2148	0.0461	0.0577	0.6570	0.9222	0.3595
CPLE6	56	0.0119	0.0001	0.0057	0.0390	0.0076	0.9308	55	-0.0509	0.0026	-0.0041	-0.0825	0.1377	0.7120
CPFE3	18	0.2020	0.0408	-0.0176	2.4050	0.6384	0.4360	17	-0.0219	0.0005	0.0074	-0.1513	0.7885	0.3877
CYRE3	49	-0.0935	0.0087	-0.0042	-1.0936	0.4054	0.5274	48	0.2314	0.0536	-0.0103	1.8405	1.7238	0.1956
DASA3	17	0.1792	0.0321	-0.0259	2.0935	0.4976	0.4907	16	-0.0645	0.0042	0.0016	-0.5243	0.8021	0.3846
DURA4	56	-0.0695	0.0048	-0.0102	-0.3410	0.2617	0.6110	55	0.1353	0.0183	-0.0099	0.5665	0.9880	0.3247
ELET3	56	0.2073	0.0430	-0.0079	0.2282	2.4252	0.1251	55	-0.0761	0.0058	-0.0175	-0.0429	0.3086	0.5808
ELPL6	44	0.2954	0.0873	0.0132	0.3939	3.9204	0.0543	43	-0.1603	0.0257	0.0102	-0.1316	0.5379	0.4674
EMBR3	56	-0.0425	0.0018	0.0118	-0.0935	0.0976	0.7559	55	0.0807	0.0065	-0.0185	0.0944	0.3475	0.5580
ETER3	54	0.2437	0.0594	-0.0044	0.2487	1.6384	0.2061	53	0.1203	0.0145	-0.0288	0.0556	1.1214	0.2945
FFTL4	56	0.0910	0.0083	-0.0053	0.1692	0.4510	0.5047	55	-0.0417	0.0017	-0.0054	-0.0343	0.0922	0.7625
GFSA3	12	0.0818	0.0067	-0.0422	0.9071	0.0674	0.7999	11	0.2764	0.0764	-0.0786	4.5433	1.8755	0.2008
GGBR4	56	0.0986	0.0097	-0.0002	0.2097	0.5300	0.4697	55	0.0850	0.0072	-0.0057	0.0925	0.3858	0.5371
GOAU4	56	0.1895	0.0359	-0.0114	0.4303	2.0107	0.1618	55	-0.0727	0.0053	-0.0052	-0.0948	0.2813	0.5980
GOLL4	19	-0.0794	0.0063	-0.0537	-0.2033	0.1014	0.7540	18	-0.0418	0.0017	0.0030	-0.2004	0.7680	0.3930
IDNT3	35	-0.3708	0.1375	0.0743	-0.9585	5.1013	0.0306	34	0.1766	0.0312	0.0391	0.2629	4.7297	0.0369
ITSA4	56	-0.1727	0.0298	-0.0026	-0.3135	1.6600	0.2030	55	0.0182	0.0003	0.0068	0.0216	0.0175	0.8952
ITUB4	56	-0.2707	0.0733	-0.0071	-0.7003	4.2715	0.0435	55	-0.1238	0.0153	-0.0013	-0.2923	0.8252	0.3677
KEPL3	26	-0.1791	0.0321	-0.0805	-1.0751	0.7626	0.3912	25	-0.2815	0.0792	-0.0257	-0.8882	0.9824	0.3315
KLBN4	55	0.0942	0.0089	-0.0172	0.0823	2.3708	0.1295	54	0.0065	0.0000	-0.0130	0.0026	1.8341	0.1814
LIGT3	55	0.1135	0.0129	0.0052	0.1177	0.1998	0.6567	54	-0.0306	0.0009	0.0109	-0.0179	0.0540	0.8172
LAME4	54	0.0004	0.0000	-0.0082	0.0008	3.5045	0.0667	53	0.0550	0.0030	-0.0184	0.0781	0.6293	0.4312
LREN3	46	-0.0572	0.0033	-0.0631	-0.0992	0.2940	0.5904	45	0.1486	0.0221	-0.0131	0.1144	3.5167	0.0676
POMO4	56	0.0688	0.0047	-0.0027	0.2302	0.2570	0.6142	55	0.0249	0.0006	0.0005	0.0583	0.0329	0.8567
NATU3	19	-0.0106	0.0001	-0.0194	-0.2712	0.0019	0.9655	18	-0.0366	0.0013	-0.0081	-0.5168	0.8442	0.3710
NETC4	47	0.2156	0.0465	-0.0336	0.5068	5.0440	0.0296	46	0.0457	0.0021	0.0079	0.0510	0.0763	0.7836
PCAR5	53	0.1087	0.0118	-0.0168	1.0308	0.6094	0.4386	52	-0.3599	0.1296	0.0053	-1.9406	8.3574	0.0056
PETR4	56	-0.2644	0.0699	0.0064	-0.5293	4.0604	0.0488	55	0.0369	0.0014	0.0030	0.0475	0.0721	0.7893
PLAS3	53	0.1642	0.0270	-0.0036	0.3456	1.1243	0.2939	52	-0.2680	0.0718	-0.0233	-0.2277	8.3821	0.0056
PSSA3	17	0.4141	0.1715	-0.0294	5.0437	3.1043	0.0972	16	0.4209	0.1771	-0.0201	3.2344	2.0915	0.1687
RAPT4	56	-0.1035	0.0107	0.0005	-0.1624	0.5847	0.4477	55	0.1818	0.0330	0.0077	0.1510	1.8108	0.1840
RSID3	45	-0.0333	0.0011	0.0473	-0.2113	0.0433	0.8361	44	-0.0712	0.0051	0.0287	-0.2008	9.4875	0.0036
SBSP3	49	-0.0098	0.0001	-0.0186	-0.0087	0.0045	0.9468	48	-0.0092	0.0001	0.0051	-0.0050	0.8094	0.3729
SDIA4	56	0.0773	0.0060	-0.0009	0.0807	0.3248	0.5711	55	0.0208	0.0004	-0.0031	0.0146	0.0229	0.8803
CSNA3	54	-0.2378	0.0565	-0.0061	-0.2391	2.3178	0.1338	53	0.0371	0.0014	-0.0039	0.0225	1.1066	0.2977
CRUZ3	56	-0.0629	0.0040	0.0017	-0.1056	0.2148	0.6448	55	-0.1589	0.0252	0.0052	-0.1572	1.3723	0.2466
SUZB5	56	0.1263	0.0160	-0.0092	0.1902	0.8753	0.3536	55	0.1890	0.0357	-0.0083	0.1143	1.9633	0.1669
TAMM4	31	-0.1326	0.0176	-0.0290	-0.1204	0.4830	0.4928	30	0.1894	0.0359	0.0256	0.1066	2.1278	0.1554
TELB4	36	0.0487	0.0024	0.0492	0.1052	3.4613	0.0712	35	0.0155	0.0002	0.1216	0.0280	4.0407	0.0524
TNLP4	42	0.0730	0.0053	-0.0098	0.1487	0.2087	0.6502	41	-0.0217	0.0005	0.0083	-0.0211	3.5936	0.0652
TMAR5	55	0.2306	0.0532	-0.0106	0.3190	4.2976	0.0430	54	0.0673	0.0045	0.0106	0.0571	0.3956	0.5321
TMCP4	42	-0.2511	0.0631	0.0040	-1.2569	2.6251	0.1130	41	0.2651	0.0703	0.0083	0.7609	2.2106	0.1449
TLPP4	56	-0.1101	0.0121	0.0004	-0.4417	0.6625	0.4192	55	0.0475	0.0023	-0.0092	0.1090	0.1196	0.7308
TCSL4	42	0.2280	0.0520	-0.0146	1.9328	2.1382	0.1515	41	-0.2524	0.0637	-0.0057	-1.3350	3.6977	0.0616
TBLE3	43	-0.0752	0.0057	0.0086	-0.0815	0.2273	0.6360	42	0.0982	0.0096	-0.0368	0.0635	0.0007	0.9787
TRPL4	38	-0.0498	0.0025	-0.0084	-0.1170	0.0896	0.7664	37	-0.1577	0.0249	-0.0005	-0.2448	10.6155	0.0025
UGPA4	37	0.1565	0.0245	0.0175	1.0639	0.8784	0.3549	36	-0.0229	0.0005	0.0229	-0.1128	1.7383	0.1959
UNIP6	54	0.1216	0.0148	-0.0076	0.1168	0.3283	0.5691	53	0.0910	0.0083	0.0101	0.0576	1.4570	0.2329
USIM5	54	-0.0942	0.0089	-0.0112	-0.0875	0.9652	0.3303	53	-0.1191	0.0142	-0.0160	-0.0620	0.4635	0.4990
VCPA4	56	0.1493	0.0223	-0.0011	0.6954	1.2316	0.2719	55	-0.1325	0.0176	-0.0016	-0.5772	0.9470	0.3348
VALE5	56	0.0562	0.0032	-0.0020	0.3186	0.1709	0.6809	55	-0.0681	0.0046	-0.0085	-0.2180	0.2470	0.6212
VIVO4	42	-0.0444	0.0020	-0.0203	-0.1347	0.0770	0.7828	41	0.1001	0.0100	0.0057	0.1680	0.5614	0.4581
WEGE3	56	0.1707	0.0291	-0.0154	1.3058	1.6213	0.2083	55	0.1534	0.0235	0.0042	0.7395	1.2773	0.2634

Appendix 13 - Quarterly regressions by firm for ARET x UNEPS

Quarterly Linear Regressions														
	Regressions at Level							Regression at Lag 1						
Firm	n	Correl	Rsquare	Constant	Slope	F Value	F Sig	n	Correl	Rsquare	Constant	Slope	F Value	F Sig
GETI4	39	0.2276	0.0518	-0.0086	0.2777	1.9659	0.1692	38	0.0229	0.0005	-0.0293	0.0143	0.9097	0.3464
ALLL11	17	0.3098	0.0960	-0.0275	0.2929	1.3798	0.2597	16	0.3006	0.0904	-0.0066	20.0317	1.3910	0.2566
AMBV4	57	0.2678	0.0717	-0.0178	1.3559	3.9859	0.0508	56	0.0305	0.0009	-0.0045	0.0853	0.0112	0.9160
ARCZ6	57	-0.0677	0.0046	-0.0175	-0.0735	0.2290	0.6341	56	-0.0430	0.0018	-0.0101	-0.0248	0.1307	0.7191
BRSR6	55	-0.3971	0.1577	-0.0013	-0.0211	9.5495	0.0032	54	0.1725	0.0297	-0.0054	0.0046	0.8253	0.3677
BBDC4	57	0.1959	0.0384	-0.0071	0.6215	2.5386	0.1167	56	0.1489	0.0222	-0.0037	0.3151	1.1534	0.2875
BRAP4	35	0.2306	0.0532	0.0156	0.1319	1.7976	0.1892	34	-0.1307	0.0171	0.0030	-0.0368	0.5563	0.4610
BBAS3	57	0.1087	0.0118	0.0045	0.0188	0.1385	0.7112	56	0.0514	0.0026	0.0085	0.0044	0.3302	0.5679
BRTP3	42	0.1243	0.0155	0.0233	0.6960	0.6122	0.4386	41	0.0086	0.0001	-0.0127	0.0259	0.9031	0.3477
BRTO4	57	-0.1224	0.0150	-0.0122	-0.2004	0.5417	0.4648	56	-0.2090	0.0437	-0.0142	-0.2240	2.8481	0.0971
BRKM5	57	0.2181	0.0476	-0.0106	0.0919	2.6156	0.1114	56	-0.0010	0.0000	-0.0324	-0.0003	0.0162	0.8991
PRGA3	57	0.2092	0.0437	-0.0015	0.7394	1.8890	0.1748	56	0.0195	0.0004	-0.0056	0.0437	0.0181	0.8935
CCRO3	29	0.0296	0.0009	0.0064	0.0254	0.0228	0.8810	28	-0.0022	0.0000	0.0232	-0.0012	0.2705	0.6072
CLSC6	57	0.1840	0.0338	0.0098	0.1332	2.3255	0.1329	56	-0.1250	0.0156	-0.0197	-0.0443	1.1235	0.2938
CMIG4	57	0.1477	0.0218	0.0050	0.1119	0.9234	0.3407	56	0.0914	0.0084	-0.0038	0.0354	0.2654	0.6085
CESP6	57	-0.0236	0.0006	-0.0179	-0.0058	0.0225	0.8813	56	0.1429	0.0204	0.0283	0.0217	1.0635	0.3069
CGAS5	47	0.0134	0.0002	0.0030	0.0486	0.0079	0.9295	46	-0.0118	0.0001	0.0208	-0.0219	0.9303	0.3399
CNFB4	57	0.2624	0.0689	0.0088	0.2375	1.8393	0.1805	56	0.0211	0.0004	0.0066	0.0080	0.1000	0.7530
CSMG3	13	-0.2684	0.0720	0.0233	-1.8464	0.7763	0.3971	12	0.1581	0.0250	0.0623	0.8564	0.2565	0.6225
CPLE6	57	0.0000	0.0000	0.0013	0.0000	0.3871	0.5364	56	-0.0083	0.0001	-0.0007	-0.0052	1.0305	0.3145
CPFE3	19	-0.0096	0.0001	-0.0127	-0.1258	0.0014	0.9708	18	-0.0254	0.0006	0.0103	-0.1541	0.0103	0.9203
CYRE3	50	0.0727	0.0053	-0.0104	1.0390	0.2445	0.6233	49	0.2688	0.0722	-0.0171	2.4522	3.6596	0.0617
DASA3	18	-0.0152	0.0002	-0.0214	-0.2353	0.0034	0.9539	17	-0.2399	0.0576	-0.0079	-1.9422	0.9162	0.3527
DURA4	57	0.0355	0.0013	-0.0071	0.0878	0.0376	0.8470	56	0.0340	0.0012	-0.0095	0.0730	0.0185	0.8923
ELET3	57	0.0616	0.0038	0.0027	0.0608	0.9961	0.3226	56	0.0310	0.0010	-0.0155	0.0155	0.0182	0.8931
ELPL6	44	0.2337	0.0546	0.0322	0.2758	2.3683	0.1313	43	0.0855	0.0073	0.0118	0.0618	0.2312	0.6332
EMBR3	57	0.1231	0.0152	0.0009	0.1187	0.0018	0.9664	56	-0.3638	0.1324	-0.0271	-0.1690	6.3606	0.0146
ETER3	57	0.2982	0.0889	-0.0137	0.2288	3.9222	0.0526	56	0.2533	0.0642	-0.0267	0.0851	3.4813	0.0674
FFTL4	57	0.3610	0.1303	-0.0115	0.5308	5.1780	0.0267	56	0.1057	0.0112	-0.0079	0.0669	0.0656	0.7988
GFSA3	13	-0.3436	0.1181	-0.0552	-4.0461	1.3386	0.2718	12	0.1343	0.0180	-0.0476	1.5096	0.1838	0.6764
GGBR4	57	0.3156	0.0996	0.0136	0.2386	4.1390	0.0467	56	0.1772	0.0314	-0.0037	0.0703	0.4553	0.5027
GOAU4	57	0.2615	0.0684	0.0024	0.2132	3.3694	0.0717	56	-0.0291	0.0008	-0.0097	-0.0137	0.4845	0.4893
GOLL4	20	-0.4538	0.2060	-0.0806	-0.9671	4.1500	0.0575	19	-0.2244	0.0504	-0.0002	-0.2495	0.9014	0.3550
IDNT3	36	-0.4461	0.1990	-0.0288	-1.2714	7.9510	0.0081	35	0.0944	0.0089	0.0412	0.1652	0.2967	0.5895
ITSA4	57	-0.0189	0.0004	-0.0025	-0.0307	0.0179	0.8942	56	0.1588	0.0252	0.0038	0.1624	0.6539	0.4222
ITUB4	57	-0.0605	0.0037	-0.0086	-0.1518	0.8947	0.3483	56	-0.0579	0.0034	-0.0026	-0.1049	0.7241	0.3985
KEPL3	27	-0.2283	0.0521	-0.1076	-1.6454	1.2647	0.2719	26	0.2651	0.0703	-0.0153	0.9997	1.8136	0.1902
KLBN4	57	-0.1307	0.0171	-0.0219	-0.1099	0.9328	0.3383	56	-0.1422	0.0202	-0.0166	-0.0550	1.1663	0.2849
LIGT3	57	0.2061	0.0425	0.0277	0.1348	2.0361	0.1592	56	0.1679	0.0282	0.0237	0.0636	0.9889	0.3244
LAME4	57	0.2873	0.0826	0.0038	0.2867	4.9112	0.0308	56	-0.0283	0.0008	-0.0142	-0.0176	0.0243	0.8767
LREN3	48	-0.0305	0.0009	-0.0817	-0.0848	0.0718	0.7899	47	-0.1394	0.0194	-0.0155	-0.0726	0.7933	0.3778
POMO4	57	0.0026	0.0000	-0.0056	0.0054	0.9011	0.3466	56	0.1639	0.0268	0.0034	0.2323	0.8115	0.3716
NATU3	20	0.4147	0.1720	-0.1993	13.7698	3.5302	0.0766	19	0.1306	0.0171	-0.0371	2.1744	0.2950	0.5937
NETC4	49	0.0719	0.0052	0.0114	0.0762	0.7543	0.3894	48	-0.1273	0.0162	-0.0135	-0.0618	1.2021	0.2785
PCAR5	54	-0.1531	0.0234	-0.0303	-1.7298	1.2234	0.2738	53	-0.4067	0.1654	-0.0137	-2.5816	12.2952	0.0009
PETR4	57	-0.0424	0.0018	0.0034	-0.0438	0.7380	0.3940	56	0.0609	0.0037	0.0029	0.0404	0.0045	0.9465
PLAS3	57	-0.2870	0.0824	-0.0705	-0.2116	4.9228	0.0306	56	-0.1851	0.0343	-0.0288	-0.0577	1.9687	0.1662
PSSA3	18	0.4713	0.2221	-0.1343	7.5220	4.2836	0.0550	17	0.2511	0.0631	-0.0545	2.5689	1.0094	0.3300
RAPT4	57	-0.1181	0.0140	-0.0187	-0.1431	0.7713	0.3836	56	0.0303	0.0009	0.0097	0.0188	0.0295	0.8642
RSID3	46	-0.0788	0.0062	0.0322	-0.3585	0.2435	0.6244	45	-0.1704	0.0290	0.0238	-0.3632	0.7486	0.3917
SBSP3	50	0.1058	0.0112	-0.0100	0.1015	0.5321	0.4693	49	-0.0237	0.0006	0.0031	-0.0137	0.0264	0.8716
SDIA4	57	0.2482	0.0616	0.0051	0.2920	3.4217	0.0696	56	0.0227	0.0005	-0.0037	0.0145	0.0049	0.9445
CSNA3	57	0.0073	0.0001	-0.0068	0.0026	0.0426	0.8372	56	0.1055	0.0111	-0.0021	0.0227	0.5177	0.4749
CRUZ3	57	0.0685	0.0047	-0.0018	0.0874	0.2142	0.6453	56	0.2162	0.0468	-0.0011	0.1633	2.2271	0.1413
SUZB5	57	-0.2561	0.0656	-0.0344	-0.2661	4.1697	0.0459	56	-0.2174	0.0473	-0.0133	-0.0890	2.6160	0.1115
TAMM4	32	0.0853	0.0073	-0.0309	0.1225	0.1981	0.6597	31	0.3226	0.1040	0.0035	0.2257	1.2677	0.2691
TELB4	43	0.1131	0.0128	0.0450	0.0519	0.5051	0.4814	42	0.0896	0.0080	0.1082	0.0336	0.3235	0.5726
TNLP4	43	-0.0443	0.0020	-0.0112	-0.1009	0.0769	0.7830	42	0.0613	0.0038	0.0067	0.0553	0.1509	0.6997
TMAR5	57	0.1917	0.0367	-0.0007	0.1234	1.4800	0.2289	56	-0.2006	0.0402	0.0069	-0.0762	1.8198	0.1829
TMCP4	43	-0.1752	0.0307	-0.0007	-1.1863	1.2356	0.2730	42	-0.1671	0.0279	0.0107	-0.2927	1.1492	0.2900
TLPP4	57	0.0370	0.0014	0.0005	0.0497	0.0175	0.8951	56	-0.1394	0.0194	-0.0131	-0.1073	0.9728	0.3283
TCSL4	43	0.0989	0.0098	-0.0058	1.0613	0.3851	0.5384	42	-0.3035	0.0921	-0.0252	-1.9212	4.0587	0.0505
TBLE3	44	-0.0643	0.0041	0.0047	-0.0712	0.1663	0.6856	43	-0.1055	0.0111	-0.0415	-0.0673	0.4615	0.5007
TRPL4	39	-0.0203	0.0004	-0.0105	-0.0320	0.0148	0.9037	38	-0.4507	0.2032	-0.0274	-0.4457	8.2245	0.0068
UGPA4	38	0.1084	0.0117	0.0106	0.9047	0.4160	0.5230	37	-0.2334	0.0545	0.0351	-1.4210	1.0341	0.3160
UNIP6	57	-0.0069	0.0000	-0.0101	-0.0036	0.0155	0.9015	56	-0.1450	0.0210	0.0010	-0.0493	1.1515	0.2879
USIM5	57	0.0900	0.0081	-0.0102	0.0562	0.3313	0.5672	56	-0.0707	0.0050	-0.0167	-0.0235	0.2968	0.5881
VCPA4	57	0.0176	0.0003	-0.0024	0.0322	0.0209	0.8856	56	-0.0375	0.0014	-0.0048	-0.0366	0.1917	0.6633
VALE5	57	0.1328	0.0176	0.0014	0.2660	0.4832	0.4898	56	0.1801	0.0324	-0.0075	0.2069	0.5077	0.4792
VIVO4	43	-0.0549	0.0030	-0.0284	-0.1648	0.1180	0.7331	42	0.1118	0.0125	0.0142	0.1832	0.5065	0.4807
WEGE3	57	0.4221	0.1781	-0.0418	2.4848	10.3326	0.0022	56	0.2208	0.0487	-0.0058	0.8270	1.7546	0.1908

Appendix 14 – Economic Determinants of ERC: annual regressions for RET and SEPS variables

Pooled regressions estimated by Ordinary Least Square (OLS) and Generalized Least Square (GLS) for the functional model:

$$RET_{it} = a + b_1 SEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

Dependent Variable: RET

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
	Method: Pooled Ordinary Least Squares				
C	-0.2395	-2.0324	0.0425	0.0521	1.8170
SEPS	0.1608	3.1809	0.0015		
BETA	-0.1273	-4.8921	0.0000		
GRO	-0.0094	-0.9213	0.3572		
LEV	0.0201	0.3292	0.7421		
INTER	0.3028	2.0487	0.0409		
SIZE	5.2233	3.2259	0.0013		

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
	Method: Panel EGLS (Cross-section weights)				
C	-0.2128	-2.0840	0.0375	0.0781	1.8661
SEPS	0.2146	4.8727	0.0000		
BETA	-0.1192	-5.2087	0.0000		
GRO	-0.0123	-1.2572	0.2091		
LEV	-0.0105	-0.2001	0.8415		
INTER	0.3182	2.6436	0.0084		
SIZE	4.7347	3.4067	0.0007		

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
	Method: Panel EGLS (Period weights)				
C	-0.1383	-1.3238	0.1860	0.0561	1.7925
SEPS	0.1835	3.8570	0.0001		
BETA	-0.1068	-4.9864	0.0000		
GRO	-0.0133	-1.5304	0.1264		
LEV	0.0249	0.4827	0.6295		
INTER	0.0949	0.6534	0.5137		
SIZE	3.8515	2.7613	0.0059		

Appendix 15 – Economic Determinants of ERC: annual regressions for RET and UNEPS variables

Pooled regressions estimated by Ordinary Least Square (OLS) and Generalized Least Square (GLS) for the functional model:

$$RET_{it} = a + b_1 UNEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

Dependent Variable: RET

	Coefficient	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
	Method: Pooled Ordinary Least Squares				
C	-0.2531	-2.1055	0.0356	0.0514	1.7049
UNEPS	0.1248	2.7276	0.0066		
BETA	-0.1119	-4.2892	0.0000		
GRO	-0.0162	-1.5916	0.1120		
LEV	0.0135	0.2143	0.8304		
INTER	0.6014	3.2771	0.0011		
SIZE	4.7921	2.9371	0.0034		

	Coefficient	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
	Method: Panel EGLS (Cross-section weights)				
C	-0.2117	-1.9409	0.0527	0.0736	1.7768
UNEPS	0.1572	4.0005	0.0001		
BETA	-0.1084	-4.4946	0.0000		
GRO	-0.0233	-2.3723	0.0180		
LEV	-0.0320	-0.5746	0.5658		
INTER	0.7407	4.7129	0.0000		
SIZE	4.0615	2.7696	0.0058		

	Coefficient	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
	Method: Panel EGLS (Period weights)				
C	-0.1488	-1.3637	0.1732	0.0512	1.7246
UNEPS	0.1434	3.4299	0.0006		
BETA	-0.0901	-4.1292	0.0000		
GRO	-0.0184	-2.0934	0.0367		
LEV	-0.0071	-0.1329	0.8944		
INTER	0.5172	2.6486	0.0083		
SIZE	3.3028	2.3076	0.0213		

Appendix 16 – Economic Determinants of ERC: annual regressions for ARET and SEPS variables

Pooled regressions estimated by Ordinary Least Square (OLS) and Generalized Least Square (GLS) for the functional model:

$$ARET_{it} = a + b_1 SEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

Dependent Variable: ARET

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
		Method: Pooled Ordinary Least Squares			
C	-0.0508	-0.3079	0.7582	0.0907	1.5250
SEPS	0.2820	3.9992	0.0001		
BETA	-0.1540	-4.2509	0.0000		
GRO	-0.0514	-3.6104	0.0003		
LEV	0.1104	1.3001	0.1940		
INTER	-0.7904	-3.8357	0.0001		
SIZE	4.7705	2.1064	0.0355		

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
		Method: Panel EGLS (Cross-section weights)			
C	-0.0991	-0.8777	0.3804	0.1268	1.7231
SEPS	0.3516	6.5039	0.0000		
BETA	-0.1489	-5.3702	0.0000		
GRO	-0.0553	-4.5324	0.0000		
LEV	0.0788	1.4861	0.1377		
INTER	-0.4051	-2.9456	0.0033		
SIZE	4.4341	2.7178	0.0067		

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
		Method: Panel EGLS (Period weights)			
C	0.0217	0.1389	0.8896	0.1008	1.6408
SEPS	0.3399	4.9608	0.0000		
BETA	-0.1411	-4.1439	0.0000		
GRO	-0.0577	-4.3650	0.0000		
LEV	0.1649	2.0959	0.0365		
INTER	-0.8504	-3.7315	0.0002		
SIZE	3.1997	1.5224	0.1284		

Appendix 17 – Economic Determinants of ERC: annual regressions for ARET and UNEPS variables

Pooled regressions estimated by Ordinary Least Square (OLS) and Generalized Least Square (GLS) for the functional model:

$$ARET_{it} = a + b_1 UNEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

Dependent Variable: ARET

	Coefficient	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
		Method: Pooled Ordinary Least Squares			
C	0.0004	0.0024	0.9981	0.1128	1.5832
UNEPS	0.3042	4.8708	0.0000		
BETA	-0.1340	-3.7658	0.0002		
GRO	-0.0714	-5.1378	0.0000		
LEV	0.0383	0.4437	0.6574		
INTER	-0.2404	-0.9589	0.3380		
SIZE	3.7277	1.6692	0.0956		

	Coefficient	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
		Method: Panel EGLS (Cross-section weights)			
C	0.1236	1.0282	0.3042	0.1276	1.7323
UNEPS	0.3023	6.4743	0.0000		
BETA	-0.1175	-3.9107	0.0001		
GRO	-0.0759	-6.3581	0.0000		
LEV	0.0088	0.1545	0.8773		
INTER	0.0851	0.4513	0.6519		
SIZE	1.0342	0.6093	0.5425		

	Coefficient	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
		Method: Panel EGLS (Period weights)			
C	0.0647	0.4039	0.6864	0.1084	1.6880
UNEPS	0.2910	4.9353	0.0000		
BETA	-0.1182	-3.4773	0.0005		
GRO	-0.0732	-5.6170	0.0000		
LEV	0.0791	0.9760	0.3294		
INTER	-0.1927	-0.6964	0.4864		
SIZE	2.0545	0.9697	0.3326		

Appendix 18 – Economic Determinants of ERC: Quarterly regressions for RET and SEPS variables

$$RET_{it} = a + b_1 SEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

Pooled regressions estimated by Ordinary Least Square (OLS) and Generalized Least Square (GLS) for the functional model:

Dependent Variable: RET

	Coefficient	**t-Statistic**	**Prob.**	**R-squared**	**Durbin-Watson**
		Method: Pooled Ordinary Least Squares			
C	-0.0955	-1.8683	0.0618	0.0181	1.8335
SEPS	0.1064	2.7444	0.0061		
BETA	-0.0525	-4.9042	0.0000		
GRO	-0.0030	-0.5999	0.5486		
LEV	0.0598	2.4057	0.0162		
INTER	1.6549	5.3987	0.0000		
SIZE	1.1081	1.5951	0.1108		
		Method: Panel EGLS (Cross-section weights)			
C	-0.0667	-1.4315	0.1524	0.0199	2.0283
SEPS	0.0950	2.4267	0.0153		
BETA	-0.0470	-4.5886	0.0000		
GRO	-0.0005	-0.1221	0.9028		
LEV	0.0458	2.1025	0.0356		
INTER	1.6226	6.1380	0.0000		
SIZE	0.7691	1.1962	0.2317		
		Method: Panel EGLS (Period weights)			
C	0.0101	0.2385	0.8115	0.0139	1.8746
SEPS	0.0969	2.8704	0.0041		
BETA	-0.0451	-5.0916	0.0000		
GRO	0.0007	0.1579	0.8745		
LEV	0.0338	1.6368	0.1018		
INTER	0.8217	3.3810	0.0007		
SIZE	0.3026	0.5217	0.6019		

Appendix 19 – Economic Determinants of ERC: Quarterly regressions for RET and UNEPS variables

Pooled regressions estimated by Ordinary Least Square (OLS) and Generalized Least Square (GLS) for the functional model:

$$RET_{it} = a + b_1 UNEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

Dependent Variable: RET

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
		Method: Pooled Ordinary Least Squares			
C	-0.0828	-1.6568	0.0977	0.0239	1.8640
UNEPS	0.2032	5.8429	0.0000		
BETA	-0.0411	-3.9181	0.0001		
GRO	-0.0063	-1.2512	0.2110		
LEV	0.0454	1.8526	0.0640		
INTER	2.1171	6.9238	0.0000		
SIZE	0.7578	1.1056	0.2690		
		Method: Panel EGLS (Cross-section weights)			
C	-0.0556	-1.2169	0.2237	0.0270	2.0508
UNEPS	0.2079	5.8519	0.0000		
BETA	-0.0369	-3.6420	0.0003		
GRO	-0.0041	-1.0187	0.3084		
LEV	0.0343	1.5920	0.1115		
INTER	2.0505	7.6763	0.0000		
SIZE	0.4439	0.6980	0.4852		
		Method: Panel EGLS (Period weights)			
C	0.0199	0.4812	0.6304	0.0263	1.9176
UNEPS	0.2090	7.1110	0.0000		
BETA	-0.0375	-4.3193	0.0000		
GRO	-0.0028	-0.6561	0.5118		
LEV	0.0214	1.0557	0.2912		
INTER	1.3997	5.8065	0.0000		
SIZE	-0.0396	-0.0696	0.9445		

Appendix 20 – Economic Determinants of ERC: Quarterly regressions for ARET and SEPS variables

Pooled regressions estimated by Ordinary Least Square (OLS) and Generalized Least Square (GLS) for the functional model:

$$ARET_{it} = a + b_1 SEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

Dependent Variable: ARET

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
		Method: Pooled Ordinary Least Squares			
C	0.1634	4.3227	0.0000	0.0243	1.9354
SEPS	0.0736	2.5612	0.0105		
BETA	-0.0198	-2.4640	0.0138		
GRO	-0.0216	-5.6469	0.0000		
LEV	0.0528	2.8610	0.0043		
INTER	-0.3211	-1.4011	0.1613		
SIZE	-2.1676	-4.2481	0.0000		
		Method: Panel EGLS (Cross-section weights)			
C	0.1166	3.5662	0.0004	0.0142	2.1123
SEPS	0.0480	1.7036	0.0886		
BETA	-0.0161	-2.1400	0.0324		
GRO	-0.0155	-4.7554	0.0000		
LEV	0.0373	2.5248	0.0116		
INTER	-0.2934	-1.5727	0.1159		
SIZE	-1.4322	-3.1329	0.0017		
		Method: Panel EGLS (Period weights)			
C	0.1892	5.5593	0.0000	0.0278	1.9312
SEPS	0.0730	2.7917	0.0053		
BETA	-0.0172	-2.5185	0.0118		
GRO	-0.0200	-6.0064	0.0000		
LEV	0.0324	1.9928	0.0464		
INTER	-0.7594	-3.3416	0.0008		
SIZE	-2.0726	-4.6015	0.0000		

Appendix 21 – Economic Determinants of ERC: Quarterly regressions for ARET and UNEPS variables

Pooled regressions estimated by Ordinary Least Square (OLS) and Generalized Least Square (GLS) for the functional model:

$$ARET_{it} = a + b_1 UNEPS_{it} + b_2 BETA_{it} + b_3 GRO_{it} + b_4 LEV + b_5 INTER_{it} + b_6 SIZE_{it} + \varepsilon_{it}$$

Dependent Variable: ARET

	Coefficient	t-Statistic	Prob.	R-squared	Durbin-Watson
		Method: Pooled Ordinary Least Squares			
C	0.1667	4.4976	0.0000	0.0205	1.9406
UNEPS	0.0678	2.5874	0.0097		
BETA	-0.0133	-1.6663	0.0958		
GRO	-0.0203	-5.3206	0.0000		
LEV	0.0421	2.3098	0.0210		
INTER	-0.3857	-1.6835	0.0924		
SIZE	-2.1583	-4.2668	0.0000		
		Method: Panel EGLS (Cross-section weights)			
C	0.1235	3.8178	0.0001	0.0145	2.1107
UNEPS	0.0606	2.3363	0.0195		
BETA	-0.0111	-1.4693	0.1418		
GRO	-0.0155	-4.6958	0.0000		
LEV	0.0321	2.1776	0.0295		
INTER	-0.3306	-1.7429	0.0815		
SIZE	-1.5119	-3.3182	0.0009		
		Method: Panel EGLS (Period weights)			
C	0.1939	5.8032	0.0000	0.0273	1.9425
UNEPS	0.0870	3.5416	0.0004		
BETA	-0.0135	-1.9844	0.0473		
GRO	-0.0193	-5.7836	0.0000		
LEV	0.0275	1.7029	0.0887		
INTER	-0.6629	-2.9524	0.0032		
SIZE	-2.1825	-4.8781	0.0000		

ATTACHMENTS

Attachment 1 – The Effects of Transitory Components and Measurement Error on Valuation

Box fully extracted from White, Soundhi and Fried (2003) page 1058.

Permanent versus transitory earnings and valuation

The effects of the permanent/transitory dichotomy on the price/earnings (P/E) ratio are described below. The P/E ratio, as we have shown, is consistent with some simplified valuation models. Use of the P/E ratio is meant to be illustrative of the general class of models discussed. The effects are more readily shown on the P/E ratio due to its simplicity.

A firm's permanent earnings are defined as the portion of the earnings stream that is to be carried into future. For example, if we assume a constant dividend model where a firm pays out all earnings as dividends, the firm's expected earnings (dividends) are $5 per share, and the discount rate (*r*) is 10%, the value of the firm would be $5/0.1 = $50. the P/E ratio would be 10.

At the beginning of period 1, suppose it is known that due some windfall the firm will actually earn $6.10 but after that the EPS will revert to $5. The value of the firm will be equal to $51 derived as

$$P_0 = \frac{E_1}{1.1} + \frac{P_1}{1.1} = \frac{\$6.10}{1.1} + \frac{\$50}{1.1} = \$51$$

The extra $1.10 earned in period 1 was not capitalized (i.e. the value of the firm did not go to $6.10/0.1 = $61). Only the permanent portion of$5.00 was capitalized. The one-shot or transitory portion of earnings entered into valuation only as a one-period adjustment (adding $1.10/1.1 = $1 to value) without any carryover effects. The observed P/E ratio for this firm will be $51/6.10 = 8.4 even though the firm's "true" capitalisation rate is 10.

Would this low P/E ratio indicate that the firm is a buy? It should not. The potential distortion in P/E ratios can be even greater if we consider measurement error inherent in accounting earnings.

Measurement Error and Its Effects on Valuation

Let E_{acc} represent accounting earnings and E_e economic earnings. We will define the difference between them as measurement noise, $M = E_e - E_{acc}$. Further, assume that economic earnings has a permanent and transitory component, that is,

$$E_e = E_{eperm} + E_{etran}$$

The true relationship between price and earnings will be $P = E_{eperm}/r$, with an underlying "unobservable" P/E ration of $1/r$. The market will fully capitalise only the permanent E_{eperm}. Empirically, however, one observes P/E_{acc} , which is equivalent to $P/(E_{eperm} + E_{etran} + M)$. This observable P/E ratio may be larger or smaller than the true P/E_{eperm} capitalisation rate, depending on the magnitudes and directions of the transitory component (E_{etran}) and measurement error (M).

Attachment 2 – Description of Earnings Time-Series Process Having Transitory and Permanent Components

Box fully extracted from White, Soundhi and Fried (2003) page 1075.

The process is described as

$$X_t = X_{t-1} + v_t$$

$$Y_t = X_t + e_t$$

Therefore,

$$Y_t = X_{t-1} + v_t + e_t$$

Let X_t represent the firm's permanent earnings stream. Then the v_t are the periodic random occurrences that become part of the firm's earnings. [1] If there are transitory components, symbolized by e_t, the permanent stream X_t would be unobserved. Instead, one would observe Y_t (observed earnings at time *t*), which is made up of the permanent and transitory components. [2] If there are no transitory components, the description of the process would stop at the first equation ($X_t = X_{t-1} + v_t$), and we would have a random walk process. If, on the other hand, there are no permanent random components, the underlying permanent earnings stream of the firm is a constant, as $X_t = X_{t-1} = X_{t-2}$…. and so on. This constant would be the mean, as by definition all random occurrences are represented by the transitory component e_t and the process is mean reverting.

[1] Note that

$$X_t = X_0 + \sum v_t$$

This is, this period's permanent earnings is a summation of all previous permanent random occurrences since period 0.

[2] Note that

$$Y_t = X_0 + \sum v_t + e_t$$

This is, this period's reported earnings is a summation of all previous permanent random occurrences and this period's transitory component.