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ACCRUAL COMPONENT OF EARNINGS IN EQUITY VALUATION: A GREEK PERSPECTIVE

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ACCRUAL COMPONENT OF EARNINGS IN EQUITY VALUATION: A GREEK PERSPECTIVE

ABSTRACT

This study investigates information content of earnings and its major components in equity valuation and prediction of future stock prices. I use three cross-sectional accounting-based valuation models which use the linear information dynamics of Ohlson (1995) in order to investigate the following five issues: 1) to establish that earnings and equity book value provide relevant information to equity valuation, 2) to examine whether disaggregating earnings into major components provides investors with incremental information, 3) to investigate the role of accruals in equity valuation, 4) to test for industry-specific influence on the valuation procedure and finally, 5) to understand how the above issues are related to earnings forecast ability. For this reason, I obtain 1214 firm-year observations of listed firms in Athens Stock Exchange for the 12 year-period 1993-2004 from nineteen industries, which I merge in nine industry groups. Findings indicate that earnings and equity book value are information valid in the Greek context as well and that further earnings disaggregation, incorporating aggregate accruals or accrual components, may provide investors with incremental information regarding equity valuation. Nonetheless, earnings disaggregation shortly improves the explanatory power of each model respectively, whereas coefficients of earnings components are not statistically significant. Moreover, I result in a wide variation of forecasting and valuation parameters, which reflects the existence of and valuation's influence by industry-specific conditions. Finally, focusing on industry level seems to enhance aggregate earnings and earnings components ability to predict future stock prices. However, I did not succeed in applying jack-knifing in order to estimate future equity market value and therefore I am not able to draw more inferences.

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ΠΕΡΙΛΗΨΗ

Ένα από τα ουσιαστικότερα ερωτήματα της εμπειρικής έρευνας στη λογιστική είναι αυτό της χρησιμότητας των χρηματοοικονομικών καταστάσεων και των λογιστικών δεδομένων στη χρηματιστηριακή αποτίμηση του κεφαλαίου και την πρόβλεψη μελλοντικών τιμών των μετοχών. Ο ισολογισμός και τα αποτελέσματα χρήσεως είναι οι δύο κυριότερες λογιστικές καταστάσεις που υποχρεούνται οι εισηγμένες εταιρίες να δημοσιεύουν στο επενδυτικό κοινό και περιέχουν δυο σημαντικές λογιστικές μεταβλητές, το μετοχικό κεφάλαιο και τα λογιστικά κέρδη.

Πολλές μελέτες έχουν ασχοληθεί εκτενώς με τη συμβολή των μεταβλητών στο σημαντικό αυτό ζήτημα και τα αποτελέσματα στα οποία έχουν καταλήξει είναι ότι τόσο το μετοχικό κεφάλαιο όσο και τα λογιστικά κέρδη παρέχουν σημαντικές πληροφορίες για την αποτίμηση του μετοχικού κεφαλαίου και την διαμόρφωση προβλέψεων για μελλοντικές τιμές μετοχών. Το είδος των πληροφοριών είναι διαφορετικό (ή συμπληρωματικό) με αποτέλεσμα να προτιμάται ο συνδυασμός τους από τα περισσότερα εμπειρικά μοντέλα. Προχωρώντας ένα βήμα παραπέρα, ερευνητές εξέτασαν την επίδραση που έχει η ανάλυση των λογιστικών κερδών σε επιμέρους στοιχεία στην ποιότητα της πληροφορίας. Η πλειοψηφία αυτών κατέληξε ότι με την διάσπαση σε επιμέρους στοιχεία επιτυγχάνεται καλύτερη πληροφόρηση, η οποία με τη σειρά της βελτιώνει τη διαδικασία αποτίμησης του κεφαλαίου και την προβλεπτική ικανότητα των λογιστικών κερδών.

Ωστόσο, οι μελέτες κατά πλειοψηφία έχουν γίνει σε μεγάλες και ανεπτυγμένες αγορές, σε χώρες όπως τις ΗΠΑ και το ΗΒ όπου το λογιστικό σύστημα είναι βασισμένο στις αρχές του εθιμικού δικαίου. Το τελευταίο παραπέμπει σε αγορές που δίνουν έμφαση στη παροχή σωστής πληροφόρησης στους επενδυτές, αφού αυτοί αποτελούν τη κύρια πηγή χρηματοδότησης των επιχειρήσεων. Αντίθετα, λίγες μελέτες έχουν γίνει σε ευρωπαϊκές χώρες, όπου το λογιστικό σύστημα βασίζεται στις αρχές αστικού δικαίου. Στις χώρες αυτές, κύρια πηγή χρηματοδότησης αποτελούν ιδιώτες (π.χ. τράπεζες) με αποτέλεσμα η διαμόρφωση των χρηματοοικονομικών καταστάσεων να γίνεται προς κάλυψη των αντίστοιχων αναγκών. Αυτό συνεπάγεται λιγότερη διαφάνεια για τους επενδυτές. Επιπλέον, στις χώρες του αστικού δικαίου οι χρηματοοικονομικές

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καταστάσεις χρησιμοποιούνται για φορολογικούς σκοπούς, όπου σε συνδυασμό με το επίπεδο διαφάνειας, προφανώς καταλήγουν σε χαμηλότερη ποιότητα των λογιστικών κερδών. Παράλληλα, μια σημαντική διαφορά μεταξύ των αγγλοσαξονικών και των ευρωπαϊκών ηπειρωτικών χωρών είναι η έμφαση σε διαφορετικές λογιστικές αρχές. Για παράδειγμα, οι αγγλοσαξονικές χώρες δίνουν μεγαλύτερη έμφαση στην αρχή της συσχετίσεως των εσόδων με τα έξοδα, ενώ οι ευρωπαϊκές ηπειρωτικές χώρες δίνουν μεγαλύτερη έμφαση στην αρχή της συντηρητικότητας. Αυτό επηρεάζει, επίσης, τη σημαντικότητα των λογιστικών κερδών στη χρηματιστηριακή αποτίμηση του μετοχικού κεφαλαίου και τη δυνατότητα διαμόρφωσης μελλοντικών προβλέψεων.

Τούτων δοθέντων, είναι εξαιρετικά ενδιαφέρον να εξετάσουμε το ρόλο των δυο σημαντικότερων λογιστικών μεταβλητών στο πλαίσιο ενός λογιστικού συστήματος που βασίζεται στις αρχές του αστικού κώδικα, όπως αυτό της Ελλάδος. Για το σκοπό αυτό συγκεντρώνω ένα δείγμα 1214 παρατηρήσεων για τη περίοδο 1993-2004 από 19 κλάδους επιχειρήσεων. Το δείγμα αφορά εταιρίες εισηγμένες στο χρηματιστήριο και κατηγοριοποιείται σε εννέα ομάδες ομοειδών κλάδων βάσει συγκεκριμένων κριτηρίων. Για την επεξεργασία των δεδομένων υιοθετούνται τρία γραμμικά μοντέλα παλινδρόμησης που αναπτύσσονται στην εμπειρική μελέτη των Barth *et al* (2002). Το πρώτο μοντέλο (LIM1) περιλαμβάνει τις δυο μεταβλητές των λογιστικών κερδών και του μετοχικού κεφαλαίου. Το δεύτερο μοντέλο (LIM2) εισάγει τη μεταβλητή των συνολικών δεδουλευμένων εσόδων και εξόδων, προχωρώντας με αυτό τον τρόπο σε ανάλυση επιμέρους στοιχείων των λογιστικών κερδών. Τέλος, το τρίτο μοντέλο (LIM3) διαχωρίζει τα συνολικά δεδουλευμένα έσοδα και έξοδα σε τέσσερα επιμέρους στοιχεία. Καθένα από τα πρώτα τρία λαμβάνει υπ' όψιν του τις ετήσιες μεταβολές των απαιτήσεων, των αποθεμάτων και των υποχρεώσεων, ενώ το τελευταίο αφορά τις αποσβέσεις. Η παρούσα μελέτη με την υιοθέτηση των ανωτέρω μοντέλων αποσκοπεί στην διερεύνηση και την εξαγωγή συμπερασμάτων επί πέντε ζητημάτων: 1) αν το μετοχικό κεφάλαιο και τα λογιστικά κέρδη εξακολουθούν να παρέχουν σημαντικές πληροφορίες στα πλαίσια του ελληνικού λογιστικού συστήματος, 2) αν η ανάλυση των λογιστικών κερδών σε επιμέρους στοιχεία παρέχει πρόσθετη πληροφόρηση στους επενδυτές, 3) ποιος είναι ο ρόλος των δεδουλευμένων εσόδων και εξόδων στην διαδικασία αποτίμησης του μετοχικού κεφαλαίου, 4) αν τα τρία πρώτα ζητήματα χρήζουν διαφορετικών απαντήσεων

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σε κλαδικό επίπεδο και τέλος, 5) να κατανοήσουμε τον τρόπο με τον οποίο συνδέονται τα παραπάνω με την προβλεπτική ικανότητα των κερδών. Τα πρώτα τρία ζητήματα εξετάζονται παίρνοντας ολόκληρο το δείγμα των επιχειρήσεων και παρατηρώντας την επεξηγηματική ικανότητα των μοντέλων σε διαφορετικά επίπεδα ανάλυσης των λογιστικών κερδών, καθώς επίσης και τη στατιστική σημαντικότητα των συντελεστών των μεταβλητών. Το τέταρτο ζήτημα απαιτεί να «τρέξουμε» τα μοντέλα για κάθε κλάδο ξεχωριστά, επιτρέποντας έτσι την επίδραση των ενδοκλαδικών συνθηκών, και στη συνέχεια, να συγκρίνουμε τα αποτελέσματα με τα αντίστοιχα από το ενιαίο δείγμα παρατηρήσεων. Τέλος, το πέμπτο ζήτημα απαιτεί τον υπολογισμό των απολύτων τιμών του ποσοστιαίου στατιστικού σφάλματος των προβλέψεων, λαμβάνοντας υπ' όψιν το απόλυτο της διαφοράς της μελλοντικής χρηματιστηριακής αξίας της μετοχής από την αντίστοιχη τρέχουσα και διαιρώντας με την τελευταία.

Τα αποτελέσματα δείχνουν ότι οι δυο κύριες μεταβλητές εξακολουθούν να παρέχουν σημαντικές πληροφορίες σχετικά με τη χρηματιστηριακή αποτίμηση του κεφαλαίου και επιπλέον ότι το είδος της πληροφορίας τους χαρακτηρίζεται ως συμπληρωματικό, γεγονός που επιβεβαιώνει το θετικό της συμμετοχής και των δύο στα μοντέλα αποτίμησης. Στη συνέχεια, η ανάλυση των λογιστικών κερδών σε επιμέρους στοιχεία με την συνεπαγόμενη είσοδο των δεδουλευμένων εσόδων και εξόδων στο μοντέλο δε φαίνεται να βελτιώνει σημαντικά την επεξηγηματική ικανότητα των μοντέλων. Αυτό επιβεβαιώνεται και από το ότι ο συντελεστής της νέας μεταβλητής δεν είναι στατιστικά σημαντικός. Οι υπόνοιες για ανάλογα αποτελέσματα των συντελεστών των στοιχείων που συνιστούν τα δεδουλευμένα έσοδα και έξοδα επιβεβαιώνονται προχωρώντας στο μοντέλο με την αντίστοιχη ανάλυση των κερδών στα συστατικά του στοιχεία. Τα αποτελέσματα υποδεικνύουν ότι οι συγκεκριμένες μεταβλητές δε παρέχουν πρόσθετη πληροφόρηση στους επενδυτές στην Ελλάδα, σε αντίθεση με άλλες ευρωπαϊκές χώρες, γεγονός που ίσως να συνδέεται με τη χαμηλότερη συγκριτική ποιότητα των κερδών και την μεγαλύτερη έμφαση στον ισολογισμό για φορολογικούς σκοπούς. Όσον αφορά την υπόθεση της ιδιαιτερότητας του κάθε κλάδου, επιβεβαιώνεται από την μεγάλη διακύμανση των αποτελεσμάτων ανά κλάδο και εξηγείται από τις διαφορετικές οικονομικές και νομοθετικές συνθήκες που τους χαρακτηρίζουν (βλ. κλαδικά λογιστικά πρότυπα). Ο κλάδος με τα μεγαλύτερα αποτελέσματα αφορά την

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ομάδα των εταιριών εξόρυξης ορυκτών και μεταλλευμάτων, ενώ τα μικρότερα αποτελέσματα παρουσιάζει η ομάδα των εταιριών της πληροφοριακής τεχνολογίας. Τέλος, σχετικά με την συσχέτιση των ιδιαιτεροτήτων του κάθε κλάδου και του βαθμού ανάλυσης των κερδών με την διαμόρφωση προβλέψεων, αποφαίνομαι μόνο ως προς το πρώτο. Στη περίπτωση αυτή φαίνεται το στατιστικό σφάλμα να είναι μικρότερο όταν επιτρέπουμε την ανά κλάδο επίδραση. Ως προς το δεύτερο, απαιτείται η χρησιμοποίηση της μεθόδου jack-knifing κατά τον υπολογισμό των μελλοντικών προβλέψεων, ώστε να προκύπτουν αξιόπιστα αποτελέσματα. Δυστυχώς, η προσπάθειά μου δεν ήταν επιτυχής και γι' αυτό το λόγο δεν μπορώ να καταλήξω σε συμπεράσματα.

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INTRODUCTION

Over the past tree decades several studies have attempted to assess the usefulness of financial statements and accounting numbers in the equity valuation and prediction of future stock prices. Two financial statements published by a company for external users should be profit and loss and balance sheet. This reflects distinctive roles of these financial statements. Barth *et al* (1998) explain that the balance sheet provides information on liquidation values, whereas the income statement is useful in equity valuation by providing information about the enterprise's abnormal earnings opportunities. However, Barth *et al* (1998) suggests that balance sheet may be important in equity valuation too, depending on enterprise's financial health.

Researchers investigate the valuation content of financial statements by focusing on information content of two major accounting variables, earnings and equity book value. Most of them find that earnings as well as equity book value provide investors with incremental information regarding equity valuation and enhance significantly earnings forecast ability. In addition, many researchers result in incremental information about equity valuation and earnings forecast ability under earnings disaggregation.

However, these studies refer to developed markets and Anglo-Saxon accounting systems, such as those of USA and UK. Therefore, it is of great interest to examine whether above results are verifiable in the context of a less developed market and in a European continental accounting system, such as the Athens Stock Exchange of Greece. The motivation of the current study is fivefold: 1) to establish that earnings and equity book value provide relevant information to equity valuation, 2) to examine whether disaggregating earnings into major components provides investors with incremental information, 3) to investigate the role of accruals in equity valuation, 4) to test for industry-specific influence on the valuation procedure and finally, 5) to understand how the above issues are related to earnings forecast ability.

In order to investigate these issues, I apply three Ohlson type linear information dynamic models used in Barth *et al.* (2002) and I obtain a sample of 1214 firm-year observations of listed firms for the period 1993-2004. Each model has different level of earnings disaggregation.

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I continue to perform a regression analysis by using pooled data and assuming year and industry fixed-effects to ascertain whether the two major accounting variables are able to explain equity market value. Findings reveal that earnings and equity book value provide complementary information regarding equity valuation.

Next I test whether disaggregating earnings into accruals and cash flows provides additional information to investors. Findings imply that accruals have not significant explanatory power and therefore I predict that further disaggregation into major accrual components will not give considerable improvement to explanatory power of the model.

In succession, I estimate each model separately for each industry group, separating initial sample into nine industry groups and allowing for year fixed-effects. I predict that there is industry-specific influence, which reflects inter-industry circumstances.

Finally, I examine the relationship between aggregate earnings, earnings components, equity book value and future equity market value. Based on prior research, I predict that further disaggregation should enhance earnings forecast ability.

The remainder of the study is organized as follows. Chapter 1 refers to earnings components and their valuation properties in Anglo-Saxon accounting systems. Chapter 2 expands to European continental accounting systems, in order to individualize in the case of Greece in chapter 3. Chapter 4 analyzes Ohlson type linear information dynamic systems, whereas chapter 5 describes the sample and presents definitions of variables and primary findings as well. Chapter 6 passes on comments regarding results from regression analysis and, finally, the last section concludes and makes some summary remarks.

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CHAPTER 1: ACCOUNTING ACCRUALS INFORMATION IN COMMON-LAW COUNTRIES

1.1. INTRODUCTION

The traditional classification of national accounting systems is into two groups, depending on each country's finance, legal and tax system. The first group is the Anglo-Saxon system (common-law countries) and the second group is the continental system (code-law countries). Chapter 1 refers to the way accounting accruals and their components affect firm value and earnings' forecast ability in common-law countries. I should note that in Anglo-Saxon accounting system countries, accounting rules are settled on exposé needs; that is, they aim to provide information that is useful to present and prospective investors. In this environment, accounting standards occur in an accounting market and are generally separate from tax laws (Arce and Mora, 2002). This leads to resolve information asymmetry between investors and managers by timely public disclosure. Anglo-Saxon principles of accounting give priority to the matching of revenues and expenses as compared to continental European principle of conservatism (Bartov *et al.*, 2001, p. 108). This seems to increase the valuation relevance of earnings and its components in common-law counties.

1.2. THE ROLE OF ACCRUAL ACCOUNTING IN EARNINGS FORECAST ABILITY

Delaney *et al* (2004) mention that accrual accounting provides a better indication of an enterprise's present and continuing ability to generate favorable cash flows than information limited to the financial aspects of cash receipts and payments. The FASB supports this view and so does the accounting profession. Hope (2004) argues that accrual accounting is positively related to earnings forecast accuracy due to two factors. First, earnings under accrual accounting display less variation comparing with earnings under cash accounting, having that way a direct effect on the forecast ability. Second, to the extent accruals provide useful information to investors, we are better informed about

how the enterprise is doing when earnings are reported under accrual accounting rather than under cash accounting.

The IASC supports the FASB view, but academic research provides conflicting views. Some academics support via their empirical research the notion that cash flow information is a better predictor of future operating cash flows. Bernard and Stober (1989) attempt to prove that cash flows are preferred to accruals on average. They are based on a prior research that finds evidence that for a given amount of earnings, the stock market reacts more favorably the larger is the cash flow component and the smaller is the accrual component. However, they fail to confirm that the relation observed by prior researchers extends beyond the 2-year test period 1981-1982. Sloan (1996) examines the extent to which stock prices reflect information about future earnings contained in the accrual and cash flow components of current earnings. He assumes that investors might not fully discriminate between different components of earnings and assesses the extent to which the magnitude of the predictable stock returns is consistent with the predictions of the earnings expectations model. Sloan (1996) concludes that the persistence of earnings seems to depend on the relative magnitude of the cash and accrual components of earnings. However, stock prices do not fully reflect all publicly available information.

Dechow (1994), by using stock returns as a benchmark measure, investigates circumstances under which accruals improve earnings ability to evaluate enterprise performance. Among her results, she demonstrates evidence that accruals improve the ability of earnings to reflect enterprise performance and thereinafter expected cash flows. Dechow *et al* (1998) disaggregate accruals and, by incorporating Dechow's (1994) work, they suggest that accrual components bring to light information about delayed cash flows related to past transactions and about expected future cash flows related to management's expected future operating and investing activity. Hence, Dechow (1994) and Dechow *et al* (1998) indicate that accrual process not only improves cash flows as a measure of enterprise performance, but also generates an earnings number that better approximates current economic enterprise performance via the usage of historical cost convention and the application of the matching and revenue recognition principles. Historical cost convention states simply that resources acquired by the enterprise are recorded at their original purchase price. Revenue recognition principle refers to realization of revenue.

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Revenue is recognized as soon as, and is allocated to the period in which, it is capable of objective measurement and the asset value receivable in exchange is reasonably certain. The matching convention is often referred to as the accruals convention and is contrasted with the ideas of cash flow accounting. The essence of the matching (accruals) convention is that income determination is a process of matching against revenue the expenses incurred in earning that revenue. Finally, Barth *et al* (2001) disaggregate earnings into cash flow and six major accrual components and examine the role of accruals in predicting future cash flows. They use a 10-year sample of observations in Dechow's (1998) model to generate predictions for the relative ability of earnings and cash flow to predict future cash flows and they conclude that earnings disaggregation enhances the predictive ability of earnings.

1.3. THE SIGNIFICANCE OF ACCRUALS DISAGGREGATION

Many studies (i.e. Bernard and Stober, 1989; Dechow, 1994; Guay and Sidhu, 2001; Barth *et al*, 2004) examine the impact of accruals in earnings forecast ability and their valuation implications. It is of great interest to refer that throughout literature I often meet accruals separated into their components. Generally, there are two main categories: working capital (or short-term) accruals and investment and financing (or long-term) accruals. The first category concerns accruals that typically adjust operating cash flows that occur one year before or one year after they are recorded and reverse within one fiscal year. Short-term accruals are detected by measuring changes in working capital accounts, such as inventory, accounts receivable and accounts payable. The second category concerns accruals that result from enterprises' operating, investing or financing activities, such as depreciation and the change in deferred taxes. This kind of accruals mitigates timing and matching problems that are of longer duration. In case of depreciation, an asset's cost is not depreciated lump sum, but a portion of its cost is depreciated each period. That way we generate a kind of index which measures the utilization of an asset against the benefits derived from the use of that asset. This logic holds irrespective of the depreciation method that is used. In case of deferred tax expense or revenue, expected future tax costs or benefits are recognized in current period earnings.

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Short-term and long-term accruals take place in improvement of cash flows as a measure of enterprise performance, although concerning long-term accruals there is little support in performing this role.

Rayburn (1986) seeks to assess the ability of accruals to explain relative changes in equity valuation. By using a 20-year period sample (1963-1982) he reports that short-term accruals are information valid while long-term accruals are not, but he is unable to identify the specific role accruals play in the valuation process. Bernard and Stober (1989) consider that market responds more favorably to short-term accruals than to long-term accruals. However, they do not identify the logic underlying the way the market assimilates information about accruals. Dechow (1994) argues that short-term accruals are likely to be more important than long-term accruals in improving earnings as a performance measure because short-term accruals have evolved largely in a voluntary fashion, whereas long-term accruals are largely a product of the political process. Moreover, she finds no evidence that long-term accruals significantly reduce timing and matching problems and she concludes that short-term accruals have the more important role in capacity. On the other hand, Gauy and Sidhu (2001) based on Dechow's (1994) model provide evidence on the similarities and differences between short-term and long-term accruals and conclude that long-term accruals do reduce timing and matching problems in much the same way as short-term accruals. They also support that long-term accruals are a useful addition to a performance measure. Their argument is that earnings and therefore both categories of accruals are commonly employed in a variety of contracting environments and analyzed by many user groups, such as banks in case of debt covenants, managers in case of compensation contracts, investors, analysts and creditors. Guay and Sidhu (2001) cite indicative examples of studies that show how earnings inclusive of depreciation can result in a measure in structuring optimal compensations contracts or in evaluating an enterprise's management performance. Thus, there are other relevant criteria for evaluating the usefulness of earnings components too. Furthermore, Barth *et al* (2001) find that long-term accruals as well as short-term accruals have significant predictive ability for future cash flows, calling into question analysts' focus on "cash earnings", which exclude accrual components such as change in accounts receivable, change in inventory, change in accounts payable, depreciation,

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amortization and other accruals. Barth *et al* (2004) examine whether earnings disaggregation aids in predicting equity values and result in similar inferences. By using a 15-year period sample (1987-2001) and three accounting based valuation models with different levels of earnings disaggregation they examine mean prediction errors and median prediction errors. They conclude that total accruals provide information that is helpful to predicting equity values. Nonetheless, accrual components may provide additional information incremental to that in total accruals for enterprises with more extreme prediction errors.

1.4. ACCRUALS AND EQUITY VALUATION

The issue of how accrual accounting relates to the valuation of an enterprise's equity comes out of the dichotomy between unbiased versus conservative accounting, which is defined in terms of differentiation between market value and book value. In particular, Zhang (2000) points out that in case of unbiased accounting, there is on average equivalence between book value and market value. Contrary, the convention of conservatism results in absence of on average equivalence between book value and market value.[1] Collins *et al* (1997) mention that value-relevance of earnings is capable to accomplish the former differentiation and to explain maybe the configuration of market value. So far, we have seen that earnings, which consist of cash flows from operations plus accruals, are a better indicator of future earnings and cash flows than current and past cash flows. Barth *et al* (1999) suggest that since this argument is correct and if equity value reflects expected future earnings, then accruals will be valuation relevant. They use annual firm observations for the period 1987-1996 and they base their tests on Ohlson (1999) to conclude that, indeed, accruals aid in forecasting future abnormal earnings and that provide explanatory power for equity market value. Moreover, they find that, since they have different ability to help forecast future abnormal earnings, accrual and cash flow components of earnings have different valuation implications too. In particular, Barth *et al* (1999) find negative coefficients on accruals and positive coefficients on cash flows, which indicates that abnormal earnings is less persistent when accruals comprise a larger proportion of current earnings. Using this inference, they

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conclude that knowing the accrual and cash flow components of earnings helps explain market value of equity.

1.5. ACCRUAL COMPONENTS OF EARNINGS

As it was mentioned, accruals appear in many studies to be separated into their components. Researchers set that way models where accounting information is accumulated by using variables that represent short-term or long-term accrual components. This modulation aims at giving an answer to the more general problem of assessing the usefulness of accounting numbers in equity valuation and prediction of future stock prices. In this section I analyze the main categories of accruals that I met in literature.

1.5.1. INVENTORY

Bernard and Noel (1991) studied what information is revealed by inventory disclosure. They review alternative economic models (i.e production smoothing model, stock out model, lead time model) that describe the production – inventory cycle and discuss their implications for using inventory disclosures to predict future sales and future earnings. To evaluate the impact of inventory disclosure they use a sample of enterprises on seven manufacturing industries and the retail department store industry for fiscal years 1978-1987. The former disclose details on the components of inventory, where the latter do not. Bernard and Noel (1991) conclude that inventory data convey information to investors in at least two ways. First, unexpected inventory changes are positive leading indicators of future sales, since inventory changes reflect managers' private information about demand. This relation is driven primarily by unexpected changes in raw materials and work-in-process inventories. Second, unexpected inventory changes appear to be weak negative leading indicators of future earnings and profit margins, since current demand is only partially reflected in current sales and the remainder is being reflected in the frequency of stock-outs. This relation appears to be traceable to unexpected changes in finished goods inventories.

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Bernard and Stober's (1989) study is an earlier attempt to document the incremental usefulness of current operating account balances. Like Bernard and Noel (1991), Bernard and Stober (1989) assume that current and prior sales are already known. However, there are two differentiation points. First, they investigate the ability of inventory balances to predict future sales without investigating the predictive ability of inventory components. Second, they do not investigate predictions of future earnings and margins.

1.5.2. ACCOUNTS RECEIVABLE

Bernard and Stober (1989) investigate also the ability of receivables balances to predict future sales. However, their results were sensitive to the deletion of outliers. Stober (1992) extends the results of Bernard and Noel (1991) to provide evidence on the incremental information content of receivables in predicting future sales, earnings and profit margin. This is done by expanding the prediction equations of Bernard and Noel (1991) to include unexpected receivables along with the unexpected portions of inventory and its components. Stober's investigation is conducted on the Bernard and Noel (1991) sample and is driven by two simple explanations for the potential information content of receivables, the earnings quality explanation and the sales momentum explanation. His major findings are that receivables provide information that can be used to predict future sales, earnings and margins and moreover that this kind of information is incremental to that contained in inventory. Unexpected receivables are positive lead indicators of future sales, but their predictive power is short-lived. According to Stober (1991), it is evident only in one-quarter-ahead predictions of sales. Concerning future earnings and margins, unexpected receivables are strong negative leading indicators of earnings and margins for all predictions horizons.

1.5.3. ACCOUNTS PAYABLE

Barth *et al* (2002; 2004) mention that changes in payables can be negatively or positively related to future sales (pp. 24 and 31 respectively). Holding factor-input prices constant,

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increases in payables can reflect increases in inventory attributable to purchases, and hence, are positive in indicators of future sales increases. Holding quantity of inventory purchases, increases in payables can reflect increases in factor-input prices, which result in higher current expenses and lower current earnings. To the extent that current expenses predict future expenses, increases in payables are negatively associated with future earnings. Indeed, Barth *et al* (2004) find that the incremental abnormal earnings forecasting coefficient on changes in payables are consistently positive. In other cases (Barth *et al*, 1999; 2002), researchers result in a negative relation between changes in payables and abnormal earnings.

1.5.4. DEPRECIATION

Depreciation accounting is an important feature of accrual basis earnings measurement. In conventional accounting practice, depreciation is defined as the systematic allocation of the original acquisition cost of a fixed asset less its residual value (i.e. depreciable amount) over asset's useful life. The depreciation recognized for a specific accounting period can be interpreted either as an asset which measures fixed asset services consumed in that period, or as an expense that is the cost of fixed assets services consumed in an accounting period. The matching principle imposes to recognize and record depreciation cost as an expense at the same time as the revenues. Chambers *et al* (1998) use this framework from valuation perspective and conclude that ceteris paribus current depreciation estimates the enterprise's expected cash outflow for fixed assets per future accounting period, provided that future operations resemble current operations.

Feltham and Ohlson (1996) examine how an enterprise's depreciation policy influences the relation between the resulting accounting numbers and the market value of the enterprise's equity. They attempt that way to contradict criticism over the quality of information that historical-cost-based financial statements can provide, given their weakness to reflect an enterprise's current values. They make a suggestion that perceives goodwill (i.e. the difference between market value and book value) to be linear in abnormal earnings, beginning operating assets and current investments in operating assets. Hence, the weight on abnormal operating earnings is increasing with operating cash

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receipts persistence. Besides, the weight on beginning operating assets represents the effect of conservatism and a depreciation parameter.

Ahmed *et al* (1998) use the Feltham and Ohlson (1996) model to document evidence on the valuation effects of accounting conservatism. They turn out to three inferences. First, goodwill is a function of abnormal earnings and beginning operating assets. Second, with operating cash receipts persistence increases the effect of abnormal operating earnings on goodwill. Third, the effect of operating assets on goodwill increases with the difference between cash receipts persistence and the depreciation parameter.

1.6. DIVIDENDS AND TAXES IN EQUITY VALUATION

An important issue that received much attention in the 1970s and 1980s is whether the dividend taxes faced by shareholders are capitalized into share prices. A resurgence of interest in this question is reflected in recent work by Fama and French (1998), Collins and Kemsley (1999) and Hand and Landsman (1999). They briefly discuss these papers so as to delineate the literature on the pricing of dividends in equity valuation.

Fama and French (1998) adapt an ad hoc method of examining the relation between dividends and share prices. They are interested in isolating and measuring the effects of taxes in the pricing of dividends and debt. However, rather than appealing to an explicit valuation model, they use a wide range of past, current and future factors such as earnings, investment and R&D expenditures to serve as proxies for expected net cash flows of the enterprise. Fama and French (1998) find that dividends are positively related to enterprise value, though they hypothesize a negative relation due to the presence of tax effect in the pricing of dividends.

Collins and Kemsley (1999) examine effects of dividend and capital gains taxes on equity valuation by modifying the Ohlson (1995) model to reflect these taxes. They maintain that enterprises can reduce their shareholders' capital gains taxes on earnings by paying dividends, when capital gains taxes are taken into account. Collins and Kemsley (1999) find a positive relation between dividends and enterprise valuation. The latter is a function of the capital gains tax rate and researchers suggest a positive relation between

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investors' valuation of dividends and the tax rate on capital gains over the 20-year period 1975-1994. However, they do not mention anything about the relation between dividends and stock prices.

Hand and Landsman (1999) research the latter issue by using annual cross-sections of enterprises over the period 1974-1996. They conclude that dividends are positively priced and constitute information about future abnormal earnings that is reflected in price but is not yet captured by current financial statements. In contrast, Lo and Lys (2000) support a negative relation between dividends and share prices, since only this view is consistent with Ohlson (1995) framework.

1.7. CONCLUSION

The general problem of assessing the usefulness of accounting numbers in equity valuation and prediction of future stock prices is very old in Agglo-Saxon countries. This is because their accounting systems are based on common-law model, which implies that a lot of emphasis is given on providing useful to present and prospective investors information and in turn developing their stock markets.

Literature review makes me conclude that earnings are indeed valuation-relevant and, moreover, that disaggregation into major components provides investors with incremental information. Besides, accruals seem to have an important role in the procedure of earnings valuation, although it is not verifiable yet which components are more appropriate in doing so. Regarding major components of Barth *et al.* (2002) study (i.e. change in inventory, change in accounts receivable, change in accounts payable and depreciation), it seems that they are value-relevant and able to provide investors with incremental information.

In succession, a question arises as to whether earnings and its components are valuation-relevant in continental accounting systems as well, taking into account not only different economic conditions but also different regulation regimes (Ballas and Hevas, 2004). This issue is treated by the following chapter.

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CHAPTER 2: ACCOUNTING DIFFERENCES AND VALUATION OF EARNINGS IN CODE-LAW COUNTRIES

2.1. INTRODUCTION

Chapter 2 refers to the second group of accounting systems, which is the continental accounting system. It is applied mainly by countries with a code-based legal system and with a business financing structure that is based on private investors (e.g. banks).[2] In this environment, accounting is highly influenced by tax laws and its evolution is specified by governmental bodies rather than professional regulatory bodies. Belgium, France, Germany, Italy, Switzerland, Spain and Japan introduce representative examples of code-law countries.

Bartov *et al.* (2001) points out that, under code-law model, investors are not viewed as shareholders but rather as stakeholders. In addition, stakeholders prefer reduced volatility of payouts and conservative accounting. However, 'reduced volatility is achieved at the expense of timeliness by accounting methods that smooth accounting income over time gradually incorporating economic income' (ibid., p. 107). Moreover, conservative accounting influences calculation of profit and in succession dividend payments. Thus, many researchers attempted to investigate the way that the additional constraints on earnings in relation to dividends and differences in information needs in code-law countries affect not only stock market valuation of earnings and its components but also their forecast ability.

2.2. VALUATION OF EARNINGS IN CONTINENTAL SYSTEMS: ISOLATED COUNTRIES

At this point, I should note that I did not succeed in tracking down a study that investigates how the stock price is related with accrual components of earnings and how the latter are related to earnings forecasts in a particular European code-law country. I suppose that a study of Barth *et al.* (2002) kind in a continental accounting system country would be a valuable guide as to the processing of my study. Below I present a

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literature review that take into account empirical results from code-law countries in order to assess the usefulness of earnings in stock price valuation and forecasts configuration.

Giner and Reverte (1999) examine the value relevance of earnings disaggregation of Spanish listed companies in order to specify whether earnings components provide information incremental to aggregate earnings. However, I have the sense that this study lacks of credibility, since, first, researchers use a small sample of non-financial enterprises – 486 firm-year observations – for the period from 1991 to 1995 and, second, they use an Ohlson's (1995) version valuation model, which consists of two equations and variables that refer to per share values. The first equation associates firm value with equity book value and aggregate earnings, where as the second one relates firm value to equity book value, aggregate earnings and earnings components. The problem is that researchers double count earnings components by including in the second regression both earnings variable and earnings components variable. Giner and Reverte (1999) disaggregate earnings into three components, which are financial profit, extraordinary earnings and corporate tax. They find that the most consistently significant variable is corporate tax, which is attributed to the fact that it works as an earnings proxy. Moreover, they find lack of significance of extraordinary items, which leads to a not obvious incremental information content of the separate disclosure of this item. In conclusion, they suggest that earnings disaggregation is useful for valuation purposes.

Gajewski and Quéré (2001) investigate the information content of earnings and stock market reactions to the announcement of the annual as well as the interim results in France. Their results point at the higher information content of annual instead of interim earnings announcements. Superiority is attributed to investors' limited interim information, which is necessary for adjusting their expectations. Finally, they highlight the better quality of interim information that common-law countries, such as US and UK, provide to their investors.

Suda *et al.* (2005) refer to the information content of accounting accruals and their components in Japan. Accounting system of Japan is included in code-law model. Therefore the particular study, though it is not based on Ohlson (1995) and Feltham and Ohlson (1995) work, is extremely interesting as for its empirical results, since it is closely related to the empirical interest of my study – in the case of Greece of course.

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Researchers investigate two issues. First, they examine the valuation relevance of accounting accruals in Japanese stock market and, second, they test their relation to earnings forecasts. They create three groups of disaggregated accounting accruals (current and non-current accruals, asset and liability accruals, and normal and abnormal accruals) where each group constitutes a regression model. In succession, they run regression models on pooled data from Tokyo Stock Exchange and result in, among others, incremental explanatory power of selected components of accruals (mainly that of abnormal accruals). Furthermore, they conclude that, in spite of the information content of accounting accruals and their components into predicting future stock prices, it is difficult for analysts to assess their implications.

2.3. VALUATION OF EARNINGS IN CONTINENTAL SYSTEMS: CROSS-COUNTRY RESEARCH

Bartov *et al.* (2001) examine valuation relevance of earnings and cash flows among different countries. They use a sample of firm-year observations for the period 1987-1996 from three common-law countries (US, UK and Canada) and two code-law countries (Germany and Japan). Researchers make inferences by estimating three pooled regressions for each country separately and by comparing the multiple coefficient of determination (R^2) of equations using Vuong's test.[3] They result among others in two major conclusions. First, valuation relevance of earnings versus cash flows differs among sample countries. Second, earnings in code-law countries are less valuation-relevant than cash flows and vice versa in common-law countries.

Arce and Mora (2002) investigate the effect of European accounting differences on the stock market valuation of earnings and equity book value in eight countries. Two of them are included in Anglo-Saxon system (UK and The Netherlands), where as the rest of them are grouped into continental system (Belgium, Germany, France, Italy, Switzerland and Spain). In particular, researchers aim to highlight the three following issues. At first, whether valuation relevance of earnings and book value differs in a systematic manner across different accounting systems. In succession, whether earnings and book value provide dissimilar information to stock valuation and, finally, whether

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accounting numbers are less value relevant in code-law countries. They apply a two-variable regression (earnings and book value) equation to a 9-year period sample of 22.436 firm/year/country observations and they examine their hypothesis by applying an R^2-based analysis. Arce and Mora (2002) conclude that valuation relevance of earnings and book value does differ in a systematic manner across different accounting systems and in particular that the valuation relevance of earnings seems to be lower than valuation relevance of book value in code-law countries. However, they argue that, as for valuation relevance of accounting information as a whole (that is, earnings and book value), they do not find evidence which would support differentiation between common-law and code-law countries. Concerning the second issue, researchers' results lead them to conclude that both earnings and book value have incremental explanatory power to explain market values, which is consistent with prior research (see chapter 1).

Gastón *et al.* (2003) present an international comparison of earnings and their components' valuation among 36 capital markets. Among others, they aim to answer whether disaggregated earnings provide investors with incremental information and whether their particular earnings components affect stock prices. I should refer that they disaggregate earnings into four major components; that is, operating income, financial income, extraordinary income and the income tax expense. Researchers obtain a sample of 77.255 observations over the period 1995-1999 and they use regression analysis to investigate a relationship between stock prices and accounting earnings. This study is based on Ohlson (1995) and Feltham and Ohlson (1995) papers and leads to the following conclusions. First, earnings are valuation-relevant, which is consistent with prior research. Second, earnings components do provide investors with incremental information. Third, the most valuation-relevant component of earnings is operating income. This is consistent with prior research, since the core of the literature focuses on operating income.

Ballas and Hevas (2004) are based on Ohlson (1995) and Barth *et al.* (1999; 2002) papers to investigate whether earnings' valuation differs among European countries due to differences in their legal system (i.e. regulation effects) or due to economical reasons (i.e. industry effects). They use a 10-year period sample for French, German, Dutch and British non-financial enterprises. This study is extremely interesting because in a sense it

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represents an intermediate step of investigating the role of accruals component of earnings in equity valuation and forecasts configuration in a European continental system based on Ohlson's (1995) framework. The latter constitutes the core interest of my empirical research. Thus, researchers' results lead them to conclude among others that, first, earnings and book value have indeed different valuation relevance and, second, industry effects seem to be higher than country effects.

2.4. CONCLUSION

Research in code-law countries is not as developed as in common-law countries. This is because of financing structure, which is not based on public, but on individuals (e.g. banks). Furthermore, code-law countries are characterized by concentrated equity ownership, high private information concerning accounting numbers' disclosure and, finally, different usefulness (i.e. lower quality) of accounting numbers in equity valuation and prediction of future stock prices. Hence, we talk about less developed markets than those in common-law countries.

Literature review results in most empirical studies that have been focus on valuation of total earnings and its components either in a country-specific context or in comparison to other countries. These studies reveal that earnings are valuation-relevant, even under different circumstances (i.e. different economic conditions and regulation regimes). Remarkably, few studies investigate the role of accruals in earnings valuation in continental accounting systems.[4] In Europe, accruals are treated as separate variable only in one study, without to be disaggregated into a higher level, and among others it is revealed that they are significant only in a limited number of industries.

However, the purpose of this study is not to investigate European differences in earnings' valuation, but to examine the applicability of Barth *et al* (2002) framework in a code-law country-specific context; therefore, this chapter gets a holistic view of earnings' valuation in continental accounting systems in order to individualize below in the case of Greece.

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CHAPTER 3: THE ACCOUNTING SYSTEM IN GREECE

ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ ΒΙΒΛΙΟΘΗΚΗ

3.1. INTRODUCTION

Chapter 3 aims to present some evidence from Greece, since it is one of the less well-known states of Europe. It is about a developing country that has recently achieved macroeconomic stabilization. Concerning Greek accounting system, Ballas (1994) is one of the pioneers of Greece 'exploration'.[5] He mentions among others that Greek Commercial Law is based on French Commercial Code since 1835 and, moreover, that accounting framework in Greece is frequently updated with a time lag by developments in France. Our accounting system is influenced by the German one as well, since *The Massgeblichkeitsprinz* is important in Greece too. It is about a cornerstone of German accounting, which indicates that the treatment of transactions in the financial statements drawn up for tax purposes should be consistent with that in the commercial balance sheet.

Up until now, legal framework related to accounting in Greece includes two main categories; that is, company law and tax law. The former basically includes EU Directives and concerns instructions regarding financial reporting, whereas the latter specifies among other things when a fiscal year should end (30 June or 31 December) and the obligation of all enterprises to use the same date for their annual financial report and accounts. The tax law takes effect through the Code of Books and Records (hereafter CBR) since 1992 (Presidential Degree 186/92). I end this short presentation of Greek accounting system by saying few words about the Greek General Accounting Plan (hereafter GGAP). Its application is compulsory for all listed firms since 1998 and its structure is based on three principles, as these specified in Presidential Degree 1123/1980. I cite them below as they appear in Ballas (1994) study.

1. 'Grouping of purchases, expenses and revenues should be by type.
2. It must be possible to calculate the operating profit account only with accounting entries.
3. The management accounting and memorandum accounts groups should be self-contained and independent of financial accounting' (ibid., p.114).

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As has already been mentioned, Greek accounting system is basically influenced by the French plan-based accounting system. This influence is imaged in GGAP and FGAP by both having the same basic principles underlying their structure. For this reason, should we group Greek accounting system, we would type it in accordance with French accounting system i.e. continental accounting system. This means that it concerns a code-law country where accounting system is tax oriented, the government has an active role in modulating accounting regulation, investors are viewed mainly as stakeholders (which means higher emphasis in conservative accounting) and enterprises are basically financed by individual sources (e.g. banks) rather than public sources (e.g. stock issuance). This leads to high private information and, in turn, to low quality of accounting numbers in equity valuation and forecast ability.

3.2. VALUATION IN GREEK ACCOUNTING SYSTEM

In order to get a more detailed picture about accounting in Greece, we should pay attention to what the GGAP and regulations decide on assets valuation. Initially, I cite essential conventions on which assets valuation is based and, in succession, I present the basic valuation rules classified as clean surplus or dirty surplus accounting. Financial statements are reported on a clean surplus basis, which means that equity book value at the fiscal year end equals the sum of the opening equity book value and clean surplus earnings excluding dividends. Dirty surplus items cause changes in shareholders' equity bypassing reported earnings.

1. Going concern: the enterprise will continue its activity into the indefinite future. This at core means that the enterprise will manage not to collapse altogether.
2. Consistency: the enterprise should apply the same accounting rules, methods or procedures in each similar case.
3. Conservatism: the enterprise's accounting practices should recognize all possible losses, but not anticipating possible gains.
4. Accrual basis: the effects of transactions and other events of the enterprise are recognized when they occur and they are recorded in the accounting records and reported in the financial statements of the periods to which they relate.

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5. Opening balance sheet amounts of the fiscal year equals closing balance sheet amounts at the previous fiscal year end.
6. Assets and liabilities are evaluated separately and in accordance with specific regulations.

The most essential valuation rules, which predicate conservatism and objectivity, are classified into two major categories and are the following:

3.2.1. CLEAN SURPLUS ACCOUNTING

3.2.1.1. TANGIBLE ASSETS

Tangible assets are asset that the firm intends to use within the business, over an extended period, in order to assist its daily operating activities and usually their useful life is over 12 months.

According to Greek General Accounting Plan[6]: GGAP mention that adopting and implementing historical cost method is a prerequisite for conservatism application. Historical cost method requires all assets to be recorded at acquisition cost or manufacturing cost, which consist a valuation base at the fiscal year end. Preliminary and assembling expenses are added to acquisition cost, whereas repair and maintenance expenses go to profit and loss.

Historical cost method, beyond a valuable mean of conservatism, gives the advantage of objectivity. Except from provisions and depreciation cases, it works under specific rules which in turn do not permit subjectivity and extemporaneity scope. Thus, accounting numbers and accounting information can be verifiable and hence correct and reliable. In contrast, other methods such as current cost method and replacement cost method are based on subjective estimates and therefore data are in a high grade unreliable. This is the reason for ignoring those methods. They are used by states, at least theoretically, only in case of inflation and by firms for notification purposes (e.g. managers, investors). Instead, historical cost method is adopted by regulation due to its objectivity and is totally used in practice.

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According to Greek Commercial Law (L. 2190/1920)[7]: A tangible asset is valued at its historical cost (acquisition cost) or its manufacturing cost and this value is increased by improvement costs and decreased by depreciation costs (provision 43, § 5, L. 2190/1920).

According to Tax Law[8]: A tangible asset is valued at the same way as I described above. Tax law considers historical cost by contract, excluding other accessory expenses (e.g. tax for transfer of property). Moreover, historical cost in case of machinery includes preliminary and assembling expenses (provision 28, § 4, CBR).

3.2.1.2. FIXED ASSETS DEPRECIATION

Depreciation is the systematic allocation of the depreciable amount of an asset over its useful life. Depreciable amount is the cost of an asset, or another amount substituted for cost in the financial statements, less its residual value. Useful life is either the period of time over which an asset is expected to be used by the enterprise or the number of production or similar units expected to be obtained from the asset by the enterprise. Finally, residual value is the net amount which the enterprise expects to obtain for an asset at the end of its useful life after deducting the expected costs of disposal.

The process of depreciation is of great importance, since its absence (i.e. in case an enterprise does not depreciate its assets) leads to an equal to amount increase of profits, which in turn is transferred to stakeholder (e.g. investors, government) in the form of dividends and taxes. The problem is that this transaction comprises allocation of enterprise's capital and therefore it is certain that will lead to bankruptcy and will break down the enterprise. In contrast, stakeholders will be extremely satisfied, since they will have received dividends according to the letter of law.

According to Greek General Accounting Plan: GGAP modulators take into account core regulations of tax legislation. This is understandable, since '[...] failure [of enterprises] to comply with tax regulations could result in significant penalties' (Ballas, 1994, p. 113). However, in contrast to tax legislation, GGAP do not take into account the consideration of fixed asset's ownership. This is a basic differentiation, since it consist a major motivation for investments. In particular, in case an enterprise owns a fixed asset,

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its depreciation amount is tax deductible. On the other hand, when a fixed asset is leased, its depreciation amount goes to profit and loss and reduces earnings.

Depreciation amount is calculated using annual and consistent with situated legislation rates. That is, it is forbidden to use depreciation rates other than those legislation sets (i.e. higher or lower depreciation rates). However, if a fixed asset is inactive more than six months, then depreciation amount is calculated by using diminished rates. It is important to mention that the process of depreciation is compulsory for all enterprises and independent by the occurrence of profit or loss. Depreciation on fixed assets and their installation costs, which takes place once the fixed asset gets used, is recorded in enterprises' balance sheets. Enterprises' fixed assets go through a continuous gradual decrease of their value due to three reasons; that is, (1) usage, (2) time passing and (3) obsolescence. Finally, analysis of fixed assets' value and depreciation amount is based on the compulsory application of Record of Fixed Assets.

According to Greek Commercial Law (L. 2190/1920): The process of depreciation is compulsory and independent by an enterprise's profitability or loss (provision 43, § 1, L. 2190/1920). Depreciation amount of fixed assets is proportional to their annual value decrease because of (1) usage, (2) time passing and (3) obsolescence (provision 43, § 5, L. 2190/1920). Depreciation rates are shaped by situated legislation and used in a systematic and uniform manner (provision 43, § 5, L. 2190/1920). Depreciation of fixed assets and their installation costs should be recorded in enterprises' balance sheets (provision 42e, § 7, L. 2190/1920).

According to Tax Law: Presidential Degrees 100/1998 and 299/2003 set that we depreciate assets by choosing one of the following methods. The first one, which is called straight line method, assumes that the depreciable amount is allocated on a straight line basis (i.e. an equal amount is allocated to each year of the useful life). If an asset is revalued or materially improved then the new depreciable amount will be allocated equally over the remaining, possibly extended, useful life. This is far the most common method and it assumes, within the limits of materiality, that the asset is equally useful, or beneficial, each year. The second one, which took effect in 1998, is called reducing balance method. Under this method, depreciation each year is calculated by applying a

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constant percentage to the net book value brought forward from the previous year. I should note that this percentage is based on the cost less depreciation to date.

The process of depreciation is compulsory (provision 31, § 1, L. 2238/1994). The upper and lower depreciation rates per fixed asset's category are defined by the each time active Presidential Degree (provision 31, § 1, L. 2238/1994). Enterprises depreciate their assets using the straight line method. In case of acquiring new fixed assets, there is ability of using the reducing balance method (provision 31, § 1, L. 2238/1994). Depreciation amount that has been recorded in enterprises' accounting books is deducted from their gross income (provision 31, § 1 and 14, L. 2238/1994). Moreover, in case an enterprise owns a fixed asset, the relevant depreciation amount is tax deductible (Supreme Court 837/1990). It is noted that depreciation amount is recognized only in case that the fixed asset is used by the enterprise (Supreme Court 1889/1985 and 4517/1986).

3.2.1.3. INVENTORY

Inventories are assets (1) held for sale in the ordinary course of the business (finished goods), (2) in the process of production for such sale (work-in-progress) and (3) in the form of materials or supplies to be consumed in the production process or in the rendering services (raw material and consumables).

According to Greek General Accounting Plan (§2.2.205): Valuation inventory takes place for each kind of stock separately, at the lower of historic or current cost or net realizable value (78/660/EEC). Net realizable value is defined as the estimated selling price in the ordinary course of business less the estimated costs of completion and the estimated costs necessary to make the sale. Considering 4th EU Directive (i.e. 78/660/EEC) we could say that net realizable value represents a safety valve of conservatism, since it makes sure that inventories will be valued at the least favorable value for the enterprise.

According to Greek Commercial Law (L. 2190/1920): Inventory is valued at the lower of historical and current cost. If current cost is lower than historical cost but higher than net realizable value, inventory is valued at net realizable value (Presidential Degree 367/1920 and provision 43, § 7a, L. 2190/1920).

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According to Tax Law: We value each kind of stock separately at the lower of historical or current cost. In case the latter is lower than the former but higher than net realizable value, then we take into account net realizable value (provision 28, § 1, CBR).

In case inventory is recorded at its historical cost, it is mentioned that the latter is altered during fiscal year and therefore there is a problem concerning acquisition cost calculation. GGAP refers to seven methods of acquisition cost calculation and each enterprise is able to choose among them. However, there is limitation of fixed calculation method in all kinds of inventory's valuation. Below, I cite in short the seven methods of acquisition cost calculation.

- *First in, first out (FIFO)*. It is assumed that the units moving out are the ones that have been in the longest (i.e. came in first). The units remaining will therefore be regarded as representing the latest units purchased.
- *Last in, first out (LIFO)*. Here we reverse the assumption. We act as if the units moving out are the ones which came in most recently. The units remaining will therefore be regarded as representing the earliest units purchased.
- *Weighted average cost (WAC)*. Here we apply the average cost, weighted according to the different proportions at the different cost levels, to the items in inventory. In practice, an average cost of purchases figure it is often used rather than an average cost of inventory figure. This approximation reduces the need for calculation to a periodic requirement.
- *Unit cost*. Here we assume that we know the actual physical units that have moved in or out. Each unit must be individually distinguishable. In these circumstances, impractical in most cases, we simply add up the recorded costs of those units sold to give cost of sales and if those units left to give stock.
- *Base inventory*. This approach is based on the argument that certain minimum level of inventory is necessary in order to remain in business at all. Thus, it can be argued that some of the inventory viewed in the aggregate, is not really available for sale and should therefore be regarded as a fixed asset. This minimum level defined by management, remains at its original cost and the remainder of the inventory above this level is treated, as inventory, by one of the other methods.
- *Standard cost*. Under this method, inventory is valued at its standard cost.

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- *Successive balance*. Under this method, every time physical units have moved in we add their value and amount to residuals respectively. Then, we divide the total value to the total amount of new residuals and we result in an average cost.

3.2.1.4. R & D EXPENSES

The definition of R&D expenses encompasses expenses that arise in the course of research and development of the enterprise. These expenses are of great importance due to the increasing significance of intellectual property right.

According to Greek General Accounting Plan: R&D expenses are allocated between to categories. The first one concerns the part that is related to actual long-term production and is capitalized, whereas the second one concerns more general R&D expenses and goes to profit and loss. Expenses typed as of first category and related to fixed assets are amortized equally in amount in five years. The rest of them should be amortized at the moment of realization (i.e. lump sum). The view of GGAP is limited since it does not separate research and development expenses. Therefore it is possible the entire amount to be characterized as development expenses. The rationale is that research may result in creation of a new intangible asset, which can be incorporated into long-term production.

According to Greek Commercial Law (L. 2190/1920): These expenses are amortized like preliminary expenses. That is, either lump sum at the moment of realization or equally in amount in five years maximum (provision 43, §4, L. 2190/1920).

3.2.1.5. LEASED ASSETS

A lease is an agreement where by the lessor conveys to the lessee in return for a payment or series of payments the right to use an asset for an agreed period of time. Lease is distinguished between financial and operating lease. A financial lease is a lease that transfers to the lessee substantially all the risks and rewards incident to ownership of an asset, whereas an operating lease is a lease other than a finance lease. The risks of

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ownership relating to a finance lease are those of breakdown, damage, wear and tear, theft, obsolescence and so on. The rewards of ownership are extracted by using the asset for substantially all its productive usefulness, that is, its economic life, and by receiving its residual value at the time of its disposal.

According to Greek General Accounting Plan: GGAP, without considering International Accounting Standards application, ignores financial leases. According to national accounting council's opinion (106/1804/1992, ESYL), financial leases are encountered like operating leases; that is, rents alike. Thus, leases are not capitalized. Finally, GGAP provides specific quadratic and tertiary accounts (i.e. 62.04 *Rents* and 62.04.20, 62.04.21…62.04.25 and so on) for their debit. However, Sakellis (2002) notes that this accounting is not consistent with accounting principles and cooks profit and loss accounts as well as balance sheet ones.

According to Tax Law: Leases are considered as operating expenses and hence they are lapsed from gross income (N. 1665/1986). Thus, they are not capitalized. In particular, L. 2238/1994 decides on depreciation case and says that depreciable assets are those that belong hundred percent to the enterprise. Hence, in case of leased assets we cannot put into practice depreciation process.

›.2.1.6. PENSION AND RETIREMENT BENEFITS

According to Tax Law: The enterprise should take into account employee's benefits (i.e. pension funds) at the end of fiscal year. Therefore, they have to make provisions for pension funds and include them in balance sheet. Total amount of provisions should cover at least retirement expenses (i.e. amends). These provisions are amortized equally in amount in five years maximum (provision 42e, § 14, L. 2190/1920).

Thus, regulation sets a minimum level of pension funds' provision which is compulsory for all limited liability and joint stock companies. [9] It is worth mentioning two distinct views for provision's configuration. Under the first one, the enterprise should take into account the owed to all employees accrual amount of pension funds up until the date of balance sheet composition (*Epitropi Genikoy Logistikoy Sxediasmoy kai Logistikis Typopoiisis)*. This is the view of accountants' profession. Under the second

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view, the enterprise should take into account only those employees that perform prerequisites of retirement (*Olomeleia Nomikon Symboylon Dioikiseos)*. This is the view of legal advisors of management. Under the second view, there is ability of not recording in balance sheet specific obligations of the enterprise, which is not consistent with conservatism and going concern principles and therefore is rejected.

There are three methods in calculating pension funds provisions. These are the following: [10]

- *Termination method.* The enterprise should take into account the amount that would give in total to its employees, at date of balance sheet composition, as termination benefits (i.e. in case of retirement).
- *Present value of the defined benefit obligation method.* The enterprise should take into account the amount that represents present value of future termination benefits. The latter concern termination benefits for current employees that the enterprise will give at termination date.
- *Equal in amount allocation method.* The enterprise should allocate equally the perspective termination benefits among years (for its current employees only) and take into account this amount. Under this method, the enterprise has the advantage of smooth amounts, since it is constant every year.

3.2.1.7. PROVISIONS

According to Greek Commercial Law (L. 2190/1920): Provisions are accounted for on an accruals basis and they are distinguished in three major categories: operating results, extraordinary items and currency translation differences. The 4th Directive (78/660/EEC) puts a lot of emphasis on provisions and therefore their formation is compulsory regardless of whether enterprises are profitable. The issue of provisions' formation flows from convention of conservatism and this is the reason for encumbering profit and loss at the end of the fiscal year. Income should be clear of contingency, whereas in case of losses and expenses it should be taken into accounted.

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3.2.2. DIRTY SURPLUS ACCOUNTING

GGAP does not permit alternative practices as for related to profit and loss accounts (i.e. items which bypass reported earnings). There are only specific cases where we have a direct effect on equity and they have to do with items of a non-recurring or exceptional nature.

- Effects of financial reorganization whereby creditors and investors relinquish all or part of their rights in connection with the write-off of a loss.
- Losses due to natural disaster which may lead to the destruction of capital, but only in case it is not possible or not customary to take out insurance cover.
- One-off capital levies or similar forms of expropriation.

Moreover, there is another case of direct charge of equity; that is, the case of own shares. When an enterprise repurchases its own shares, it is created a reserve for the resulting profit. However, in case of loss, the latter either goes to a created reserve or it is subtracted directly from equity.

3.3. CONCLUSION

The accounting system in Greece is government driven and tax dominated. It has its roots to the plan-based accounting system of France and it is influenced by the statute-based accounting system of Germany as well. Accounting regulation may be categorized into two subgroups; that is, legal and accounting framework. The former concerns Greek Company Law (L. 2190/1920) and Tax Law, which include general guidelines about financial reporting, whereas the latter concerns Greek General Accounting Plan, which comprises a set of accounting regulations regarding financial reporting by listed companies.

I cite most essential valuation rules of Greek accounting system and I conclude that conservatism and objectivity are the core financial accounting conventions, which is consistent so to the nature of our accounting system (i.e. tax-driven) as to our financing structure (i.e. by individuals). I deem for this reason that balance sheet accounts rather than profit and loss ones are more important in the Greek context.

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CHAPTER 4: ACCOUNTING-BASED VALUATION MODELS

4.1. INTRODUCTION

Many researchers have long been interested in the role of accounting numbers in valuation. Much of the research into the relation between market values and accounting data has used the residual income model (RIM). At its core, this model relates market values to current book values plus the net present value of anticipated future residual income (i.e. accounting earnings minus a charge for the normal return on equity). Richardson and Tinaikar (2004) attempt to group the relative empirical research and mention that there are, in general, two basic types of it. First, the historical type, which investigates the relation between market values and reported accounting numbers using the linear dynamics of Ohlson (1995) and Feltham and Ohlson (1995, 1996) as a basis for developing their empirical models. Second, the forecast type, which investigates valuation based on forecasted accounting numbers, fundamental analysis and cost of capital studies.

Concerning this paper, I focus on the first type, since I refer to three linear information models (LIMs), which can, in sum, be called special cases of Ohlson's (1995) model (Barth *et al*, 2002). These LIMs rely on the hypothesis that to relate enterprise's market value and accounting earnings there must be a link between earnings and dividends (i.e. clean surplus accounting relation). Thus, models uses via clean surplus relation functions achieve to relate an enterprise's market value to the contemporaneous accounting variables and rely on a parametric setup to derive these valuation functions. Moreover, the theory of these models is to be used as the basis for estimating enterprise's market value, therefore an internally consistent link between current information and future abnormal earnings is necessary. Mayers (1999) mentions that linear models of the link between current and future information ensure consistency and are an integral component of accounting-based valuation (p. 14). Therefore, the three LIMs incorporate Ohlson's (1995) linear information dynamics too.

Valuation models applying linear information dynamics examine information content of accounting earnings and its components. According to Kothari and Zimmerman (1995), these investigations either assess the significance of estimated slope coefficients or investigate incremental explanatory power of a set of variables. They are price models (i.e. they use market values) which analyze linear regressions of prices on earnings components. Kothari and Zimmerman (1995) mention that the advantage of such models is that even in a regression of market value on various earnings components they yield unbiased (or less biased) slope estimates compared to return models. However, they note that we must pay attention during coefficients' interpretation on various earnings components and that their magnitude is based on the time-series properties of these components and on how much risky these components are. Also, it is important to know that price models do not measure information arrival over a period. The dependent variable, market value, is not a measure of the impact of information arriving in the current period. This is measured by stock returns. However, price models R^2s do not understate the extent to which current period's accounting numbers reflect the information affecting stock prices and therefore it is less potential to lead researchers to draw incorrect inferences.

Ohlson type models (Ohlson, 1995; Barth *et al*, 1999; Barth *et al*, 2002) recommend cross-sectional models of accounting-based valuation, which examine the relation between total net income and stock prices on a pooled sample by imposing some structural relation. Barth *et al* (2002) indicates three types of constraints on the relation in order to estimate such models. The first constraint is that all components of earnings have the same earnings forecasting coefficient and valuation multiple. This constraint pictures the 'mirror image' sign of cash flow and accrual components of earnings and leads us to inference that disaggregating earnings into major components aids in forecasting abnormal earnings and explaining equity market values (Ballas and Hevas, 2004). The second constraint adds the additional restriction that earnings valuation multiples are identical across industries. This constraint is very important in case of interest in valuation-relevance of earnings and its components and equity book value across industries. This interest flows from different levels of timeliness and conservatism application across industries, which in turn affect valuation multiples referred above.

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Industry difference is either due to the nature of business or due to the difference in the persistence of earnings. The third constraint implies that the linear information model describing the time-series evolution of earnings and other conditioning variables is descriptively valid. Based on Mayers (1999) and Hevas and Ballas (2004), omission of linear information dynamics by model's valuation equation could lead to biased estimates.

4.2. ACCOUNTING-BASED VALUATION MODELS' DEVELOPMENT

4.2.1. LINEAR INFORMATION MODEL OF OHLSON (1995)

The first model (LIM1) is comprised of four basic assumptions. I cite them below.

Assumption 1: Market value of equity is equal to the present value of expected dividends.

$$MVE_t = \sum_{\tau=1}^{\infty} R^{-\tau} E_t(DIV_{t+\tau}) \quad (1)$$

where MVE_t is the market value of equity at time t, DIV_t is net dividends paid at time t, $R^{-\tau}$ is risk-free rate plus one and $E_t(.)$ is the expected value operator conditioned on date t information.

Assumption 2: The clean surplus accounting relation that requires the change in book value to equal earnings minus dividends.

$$BV_t = BV_{t-1} + NI_t - DIV_t \quad (2)$$

where BV_t is the book value of equity at time t and NI_t is earnings (net income) for the period from t-1 to t. Under this assumption, the model forces value to depend on accounting data, since future dividends are expressed in terms of future earnings and book values.

Assumption 3: It is assumed that the book value of equity grows at a rate less than the discount rate, that is

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$$R^{-\tau} E_t(BV_{t+\tau}) \xrightarrow{\tau \to \infty} 0 \tag{3}$$

Incorporating (2) and (3) into (1) leads to the inference that market value of equity equals the book value plus the present value of abnormal earnings. In Ohlson's (1995) words, this means that 'the future profitability as measured by the present value of anticipated abnormal earnings sequence reconciles the difference between market and book values' (p. 667). Thus, the function that relates an enterprise's market value to the accounting variables is the following:

$$MVE_t = BV_t + \sum_{\tau=1}^{\infty} R^{-\tau} E_t(AB_NI_{t+\tau}) \tag{4}$$

According to Ohlson (1995), I should define abnormal earnings as earnings minus a charge for the use of capital. The final assumption concerns the time-series behavior of abnormal earnings and refers to Ohlson's information dynamics. Two variables enter the model: abnormal earnings and information other than abnormal earnings.

Assumption 4: Abnormal earnings follow a one-lag autoregressive process. Other information is incorporated into earnings with exactly one lag. The impact of other information on earnings is gradual, following a one-lag autoregressive process.[11] That is,

$$(AB_NI)_{t+1} = \omega(AB_NI)_t + v_t + \varepsilon_{t+1} \tag{5a}$$

$$v_{t+1} = \gamma v_t + \eta_{t+1} \tag{5b}$$

where v_t is value relevant information about event that have not yet affected book values and earnings, ε_t, η_t are mean zero disturbance terms and $0 \le \omega, \gamma \le 1$. Based on functions (4) and (5a) and (5b), Ohlson (1995) obtains the valuation function:

$$MVE_t = BV_t + a_1(AB_NI)_t + a_2 v_t \tag{6}$$

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where $a_1 = \omega/(1+r-\omega)$ and $a_2 = (1+r)/[(1+r-\omega)(1+r-\gamma)]$.[12] Finally, Lo and Lys (2000) mentions that the two parameters ω and γ are sufficient to characterize processes where earnings are purely transitory to processes where are highly persistent. In summary, the Ohlson's (1995) model provides a set of valuation equations for price levels in place of a number of ad hoc models used in past. Furthermore, the model allows us to derive specific predictions about abnormal earnings, book values and market values. Below, I summarize the three equations of the Ohlson's (1995) model.[13]

$$(AB_NI)_{it} = \omega_{10} + \omega_{11}(AB_NI)_{it-1} + \omega_{12}BV_{it-1} + \varepsilon_{1it} \quad (7a)$$

$$BV_{it} = \omega_{20} + \omega_{22}BV_{it-1} + \varepsilon_{2it} \quad (7b)$$

$$MVE_{it} = a_0 + a_1(AB_NI)_{it} + a_2BV_{it} + u_{it} \quad (7c)$$

As can be seen, all regression equations have an intercept as well as slope parameters. Regarding intercepts, ω_{10}, ω_{20} and a_0, they allow for the effects of other information. Each slope parameter represents the amount of increase (or decrease, in case it is negative) in expected value of the dependent variable for an increase of one unit in an independent variable when all other variables are kept constant.

I should note at this point that forecasting equations and valuation equation include book value of equity, when equations (5a) and (6) do not. This is consistent with prior research (Feltham and Ohlson (1995, 1996), Barth *et al* (1999, 2002, 2004), Ballas and Hevas (2004)). Including equity book value in forecasting and valuation equations allows for the effects of conservatism to manifest themselves and partially relaxes the assumption that the cost of capital associated with calculating abnormal earnings is a predetermined cross-sectional constant. Besides, 'equity book value provides a gauge of company size and is included to measure variables at different levels, thereby avoiding problems of heteroscedasticity in residuals resulting from the wide range of values in which they are distributed' (Gastón *et al.*, 2003, p. 5).

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4.2.2. LINEAR INFORMATION MODEL OF BARTH, BEAVER, HAND AND LANDSMAN (1999)

The second model (LIM2) makes use of the framework in Ohlson (1999), which in turn extends Ohlson (1995) by modeling earnings components. Barth *et al.* (1999) mention that, 'although Ohlson (1999) is modeled as transitory earnings, the model applies to any component of earnings' (ibid., p. 207). So, researchers attempt to provide insights into the characteristics of the accrual and cash flow components of earnings that affect their relation to firm value. Researchers impose total accruals and cash flow components of earnings to have the same model parameters. This is because by definition earnings equal accruals plus cash flows. Hence, they assume that findings relating to accruals in abnormal earnings and market value equations are 'mirror images' of findings relating to cash flows in abnormal earnings and market value equations. In this paper, I focus on the accruals system since I investigate their valuation-relevance and forecast ability.

$$(AB_NI)_{it} = \omega_{10} + \omega_{11}(AB_NI)_{it-1} + \omega_{12}ACC_{it-1} + \omega_{13}BV_{it-1} + \varepsilon_{1it} \tag{8a}$$

$$ACC_{it} = \omega_{20} + \omega_{22}ACC_{it-1} + \omega_{23}BV_{it-1} + \varepsilon_{2it} \tag{8b}$$

$$BV_{it} = \omega_{30} + \omega_{33}BV_{it-1} + \varepsilon_{3it} \tag{8c}$$

$$MVE_{it} = a_0 + a_1(AB_NI)_{it} + a_2ACC_{it} + a_3BV_{it} + u_{it} \tag{8d}$$

This model is relative to the prior one, LIM1, and imposes an additional restriction upon the valuation parameters by adding an additional forecasting equation. LIM2 is very important since if there are differences in valuation multiples due to heterogeneity across industries, this should be reflected in the accruals component. This model comprises four equations, where (8a) through (8c) are forecasting equations and equation (8d) is the valuation equation based on the linear information dynamics of the forecasting equations. *ACC* is the total accrual component of earnings.

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I would like to end the particular subsection with some notes regarding model's analysis. Barth *et al* (1999) pay specific attention to total accruals and its coefficient, ω_{12}, which is significantly negative across all industries. The latter makes them conclude that the lower the proportion of current earnings attributable to accruals, the higher the future abnormal earnings will be. Moreover, researchers point out results related to total accruals valuation coefficient, a_2, which reflects the incremental effect on valuation from knowing accruals and is a nonlinear function of ω_{11}, ω_{12}, ω_{22} and r with the sign of a_2 to be equal to the sign of ω_{12} (r is the discount rate applied to equity capital). Finally, their results reveal that accruals are less persistent than cash flows (that is, $\omega_{22} < 0$) and that their valuation coefficient, a_2, is negative for the majority of industries.

4.2.3. LINEAR INFORMATION MODEL OF BARTH, BEAVER, HAND AND LANDSMAN (2002)

Barth *et al* (2002) extend the model of Barth *et al* (1999) by disaggregating accruals into four major components (LIM3). This aims to investigate whether particular accrual components are descriptive valid. That is, whether they provide investors with incremental information. Model parameters for four major accrual components differ from one another. LIM3 includes seven equations, where (9a) through (9f) are forecasting equations and (9g) is a valuation equation based on information dynamics of the forecasting equations.

$$(AB_NI)_{it} = \omega_{10} + \omega_{11}(AB_NI)_{it-1} + \omega_{12}\Delta REC_{it-1} + \omega_{13}\Delta INV_{it-1} + \omega_{14}\Delta PAY_{it-1} + \omega_{15}DEP_{it-1} + \\ + \omega_{16}BV_{it-1} + \varepsilon_{1it} \quad (9a)$$

$$\Delta REC_{it} = \omega_{20} + \omega_{22}\Delta REC_{it-1} + \omega_{23}\Delta INV_{it-1} + \omega_{25}DEP_{it-1} + \omega_{26}BV_{it-1} + \varepsilon_{2it} \quad (9b)$$

$$\Delta INV_{it} = \omega_{30} + \omega_{32}\Delta REC_{it-1} + \omega_{33}\Delta INV_{it-1} + \omega_{34}\Delta PAY_{it-1} + \omega_{35}DEP_{it-1} + \omega_{36}BV_{it-1} + \varepsilon_{3it} \quad (9c)$$

$$\Delta PAY_{it} = \omega_{40} + \omega_{43}\Delta INV_{it-1} + \omega_{44}\Delta PAY_{it-1} + \omega_{46}BV_{it-1} + \varepsilon_{4it} \quad (9d)$$

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$$DEP_{it} = \omega_{50} + \omega_{55} DEP_{it-1} + \omega_{56} BV_{it-1} + \varepsilon_{5it} \quad (9e)$$

$$BV_{it} = \omega_{60} + \omega_{66} BV_{it-1} + \varepsilon_{6it} \quad (9f)$$

$$MVE_{it} = a_0 + a_1 (AB_NI)_{it} + a_2 \Delta REC_{it} + a_3 \Delta INV_{it} + a_4 \Delta PAY_{it} + a_5 DEP_{it} + a_6 BV_{it} + u_{it} \quad (9g)$$

ΔREC is change in receivables and reflects information about current sales and cash receipts. This accrual component may be either a positive or a negative indicator of future earnings depending on whether information content of receivables concerns earnings quality or sales momentum. *ΔINV* is change in inventory and this accrual components' level reflects either management's expectations about future demand or management's inability to respond to current sales shocks. *ΔPAY* is change in payables and can be positively or negatively related to future earnings, depending on whether the change indicates either inventory purchases or current expenses. *DEP* is depreciation and is positively related to future earnings, since depreciation is an indication of increased purchases of non-current assets in anticipation of increased production. Finally, Barth *et al* (1999) explain that *BV* is positively related to future abnormal earnings if earnings are conservative. However, many studies (Barth *et al*, 2002; 2004) find *BV* be negatively related to future abnormal earnings.

I estimate the three linear information dynamic systems by applying Zellner's Seemingly Unrelated Regression (SUR) method. It is also known as the multivariate regression and it estimates the parameters of the system, accounting for heteroscedasticity, and contemporaneous correlation in the errors across equations. The estimates of the cross-equation covariance matrix are based upon parameter estimates of the unbalanced system. Barth and Kallapur (1996) investigate the effects of cross-sectional scale differences on regression results in empirical accounting research. Their findings suggest that deflation can worsen coefficient bias. Moreover, deflation often does not noticeably reduce heteroscedasticity and can decrease estimation efficiency. Therefore, I estimate all equations using unbalanced data.

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4.3. TESTABLE HYPOTHESES

In this study, I investigate the valuation-relevance of three linear information models with different level of earnings decomposition. In addition, I attempt to provide evidence on how Barth *et al* (2002) constraints affect equity value forecasts in the national context of Greece. At first, I analyze the empirical validity of Ohlson's (1995) model. Therefore, the first two hypotheses are the following.

H_1: Aggregate earnings are more relevant than disaggregate earnings into aggregate accruals and cash flows to explain equity market value.

H_2: Aggregate accruals are more relevant than disaggregate accruals into four major components to explain equity market value.

The purpose of these hypotheses is to examine whether aggregate earnings, aggregate accruals and disaggregate accruals are good indicators of the variation in Greek stock market. Therefore, I view the multiple coefficient of determination (R^2) and the significance of the variables of linear information dynamic systems.

R^2 measures the proportion of the variation in the dependent variable that is explained by the combination of the independent variables in the multiple regression equation. Another measure of fit of a multiple regression model should be the adjusted multiple coefficient of determination ($\overline{R}^2$). $\overline{R}^2$, in contrast with R^2, is a measure that does not always increase as new variables are entered into our regression equation under consideration. When $\overline{R}^2$ does increase as a new variable is entered into the regression equation, it may be worthwhile to include the variable in the equation. At this point, I should note that R^2 and $\overline{R}^2$ are close to each other in value, unless the number of variables is relatively large compared to the number of data points.[14] In this case, there is no difference, if I evaluate the fit of each regression equation based on the uncorrected measures R^2 (Azcel and Sounderpandian, 2002).

A test of the significance of individual parameters is important because it gives us an idea about whether the variable in question has an explanatory power with respect to

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the dependent variable. Such a test shows whether the variable in question should be included in the regression equation. They are carried out by comparing each test statistic with a critical point of the distribution of the test statistics. To carry out the important test in each equation, I perform an analysis of variance. A point here is that I estimate k slope parameters and an intercept from a data set of n points. Therefore, the degrees of freedom for error are $n - (k + 1)$, the degrees of freedom for the regression are k and the total degrees of freedom are $n - 1$. The distribution of each statistic, when the appropriate null hypothesis is true i.e. all slope coefficients equal zero, is the t distribution with $n - (k + 1)$ degrees of freedom. The distribution depends on the assumption that the regression errors are normally distributed.

There are two problems that I have to encounter in making inferences about individual regression slope coefficients. The first problem is that of correlations among the independent variables themselves (i.e. multicollinearity). The independent variables should not be correlated with one another. When multicollinearity happens, the independent variables rob one another of explanatory power. It may also cause the signs of some estimated regression parameters to be the opposite of what it is expected. In this case, there are three possible solutions to the problem. I should either improve the sampling method or exclude one of the correlated variables from the model. Another method that would help me reduce the extent of multicollinearity is to change the form of some of the variables. A way to change the form of the variables is centering the data; that is, subtract the means from the variables and run the regression on the resulting new variable. The second problem is that of autocorrelation of the errors. One of the assumptions of the regression model is that the error terms are uncorrelated with one another. When this condition does not hold, as may happen when data are time series observations, we encounter this problem. It causes the standard errors of the slope estimators to be unusually small, making parameters seem more significant than they really are.

Barth *et al.* (2002) find that disaggregating earnings into cash flow and total accruals components enhances predictive ability of earnings by reducing equity market value forecast errors. Moreover, further disaggregation into major components provides us with incremental information regarding industry context. Consequently, it is of great

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interest to examine whether their results are verifiable in case of Greece and to determine disaggregation level that is more appropriate for enhancing earnings' forecast ability. Thus, there are two more hypotheses that have to be investigated. These are the following.

H_3: Earnings disaggregation into cash flow and total accrual components provides investors with incremental information beyond aggregate earnings.

H_4: Accruals disaggregation into four major components provides investors with incremental information beyond aggregate accruals.

That is, it is assumed the level of disaggregation to provide investors with incremental information respectively and therefore valuation-relevance of earnings to be affected. These two hypotheses are tested by examining multiple coefficients of determination of LIM1 and LIM2, and LIM2 and LIM3 respectively. Of the three LIMs with different level of earnings disaggregation, the model that maximizes R^2 (that is, the model that minimizes mean square error) will help me in selecting the combination of variables to be more valuation-relevant (i.e. the appropriate level of disaggregation). Moreover, it is important to check for coefficients' significance level.

Ballas and Hevas (2004) mention two reasons of heterogeneity across industries. They have been already mentioned above. Nonetheless, they are very important, since they make us realize that enterprises that belong to the same industry follow similar accounting policies and therefore the variation in the valuation parameters of earnings and book value may be better captured if we focus on industry groups. Thus, the next hypothesis is the following.

H_5: There are differences between industries in the valuation of earnings, aggregate accruals, accrual components and equity book value.

This hypothesis means that the estimated parameters for earnings and equity book value in equations (7c), (8d) and (9g) will be different between industries after adjusting for the linear information dynamics of the accounting variables.

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Finally, Barth *et al.* (2002) explain that prediction of market value of equity depends on earnings disaggregation. In particular, the model, which results in less equity market value forecast errors, represents the most appropriate disaggregation level of earnings in order to predict equity market value. I examine forecast ability of LIM1 and I compare it with forecast ability of LIM2 and LIM3.

H_6: LIM 1 gives better forecasts of equity market value comparing to LIM2 and LIM3.

This hypothesis means that equity market value forecast errors generated using LIM1 will be lower than those generated using LIM2 and LIM3 respectively. Following Ballas and Hevas (2004), I test this hypothesis by generating test statistics from the absolute percentage forecast errors. Initially, I estimate LIM1, LIM2 and LIM3 on a sample pooled across industries. Equations of the linear information dynamic systems assume for year and industry fixed effects, although capturing such effects ordinarily entails use of dummy variables. The former implies that the coefficients in forecasting and valuation equations will be constant over time and across industries. In succession, I estimate each of the three models per each group of industries. Then, I generate a distribution of the absolute value of the difference of the predicted value less the actual value divided by the actual value. At the end, I use the nonparametric Wilcoxon matched pairs signed-rank test to assess the statistical significance of error distribution of fixed-effects model pooled across industries versus industry-specific estimates.

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CHAPTER 5: DATA AND DESCRIPTIVE STATISTICS

5.1. DATA AND DEFINITIONS OF THE VARIABLES

I obtain data from Athens Stock Exchange database for the 12-year period 1993-2004. My sample period begins in 1993 due to a change in tax legislation the prior year. The new law (L. 2065/92) concerns reformation of direct taxation.[15] Following prior studies, such as Barth *et al* (1999, 2002, 2004), Kothari and Zimmerman (1995) and Fama and French (1998), I formulate my sample under certain constraints.

1. I restrict the sample to firms with total assets in excess of € 10 million to avoid the influence of small firms.
2. To mitigate the effects of outliers, for each variable I treat as missing observations that are in the extreme top and bottom one percentile.
3. To facilitate the comparison among three LIMs, I require sample firms to have full data to estimate each earnings forecasting, earnings component prediction and market valuation equations, which results in a sample common to each LIM.

Under these circumstances, my sample consists of 1214 firm-year observations. Table 1 shows industry composition of the sample. I use enterprises of all industries, except from financial institutions, assurance companies and investment companies. In particular, I classify industries as following: (1) chemicals, (2) construction and building manufactures, (3) equipment and machinery (which includes electronic and electrical equipment and, engineering and machinery), (4) food (which includes food and drug retailers and, food producers and processors), (5) health, (6) information technology (which includes information technology hardware and, software and computer services), (7) steel and other metals, mining and, oil and gas, (8) textile and printing (which includes forestry and paper and, household good and textile), (9) other industries (which includes pharmaceutical, tobacco, general retailers, transport and utilities). I focus on these nineteen industries to ensure that the accrual components on which I focus are meaningful for my sample. For example, Bernard and Noel (1991) mention that inventories are not predictors of future earnings for financial institutions.

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Table 1: Industry composition and firm-year observations

Industry description	# of enterprises	# of firm-year observations	% of observations
Chemicals	7	39	3,21
Construction and building manufacturers	35	219	18,04
Equipment and machinery	6	39	3,21
Food	42	244	20,10
Health	4	21	1,73
Information technology	23	95	7,83
Steel and other metals, mining and oil and gas	29	185	15,24
Textile and printing	50	290	23,89
Other industries	11	82	6,75
Total	207	1214	100,00

It is obvious that most of the observations are from four groups; that is, (1) construction and building manufacturers, (2) food, (3) steel and other metals, mining and oil and gas, and (4) textile and printing industries. I set number four as the minimum number of enterprises per industry. In case of fewer enterprises, I classify the respective industries as other industries group. Finally, there are three groups, which make estimation of the models more complicated because of the small number of observations per industry and the consequent effect on degrees of freedom (see p. 46). Based on this, the most critical industries are (1) health, (2) chemicals and (3) equipment and machinery.

Concerning the variables of the three LIMs, they encounter two more constraints.

4. All variables are measured as of fiscal year end, except equity market value, and are expressed in millions of euros.
5. Equity market value (common stock price) is the value six months after fiscal year end.[16]

As for their definitions, abnormal earnings, *AB_NI*, is earnings minus a charge for the use of capital. Earnings, *NI*, are income after adjusting for minority interests and preferred dividends. At this point, there is a confusion regarding inclusion of extraordinary items in earnings calculation. In the literature, there is no unanimity as to which is the best way to use net income. For instance, Barth *et al* (2002) exclude extraordinary items because they want to eliminate potentially confounding effects of large one-time items. Although defining earnings that way comes in contrast with the clean surplus accounting relation of Ohlson (1995), it is consistent with prior research

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(e.g. Dechow, Hutton and Sloan (1999)). Moreover, Hand and Landsman (1999) note that clean surplus assumption violation should have little effect on study's findings. On the other hand, Ballas and Hevas (2004) include extraordinary items because it is consistent with the clean surplus assumption of Ohlson (1995). Also, Arec and Mora (2002) note necessity for taking into account extraordinary items, since balance sheet plays a more important role in valuation than income statement in code-law countries. Considering what was mentioned above, I exclude extraordinary items because I aim to examine whether the adopted by Barth *et al.* (2002) framework is applicable in the Greek context. In addition, there is no strong evidence for valuation implications of extraordinary items (Ballas, 1999). Finally, I set *r* equal to annual rate of securities, in order to calculate a charge for the use of equity book value.

Equity book value, *BV,* is share capital and reserves, excluding preference capital.

Equity market value, *MVE*, is the number of ordinary shares at fiscal year end multiplied by per share value six months after fiscal year end. This presupposes that there is no change in share capital during semester (i.e. year fixed-effects).

Total accrual component of earnings, *ACC*, is usually measured as earnings minus cash flows from operations. However, there is limited information concerning this quantity, since enterprises did not compose a cash flows statement until few years ago. For this reason, I do not use cash flow statements, but balance-sheet accounts to estimate accruals. Following Epstein and Mirza (2004), I calculate the following system of equations (where *OCI*: operating cash inflows and *OCO*: operating cash outflows).

$$ACC = NI - (OCI - OCO)$$

$$OCI = changes\ in\ company\ turnover + changes\ in\ income\ from\ participations + changes\ in\ income\ from\ securities$$

$$OCO = changes\ in\ suppliers + changes\ in\ notes\ payable + changes\ in\ cheques\ payable + changes\ in\ taxes\ payable + changes\ in\ social\ insurance\ contributions + changes\ in\ other\ short\ term\ liabilities + changes\ in\ losses\ on\ investments\ and\ other\ securities + changes\ in\ debit\ interest\ and\ related\ charges$$

This procedure is similar (but not the same) to Suda *et al.* (2005) one, so it could be considered as a possible alternative in estimating accruals. However, it might be affected by a measurement error. On the other hand, excluding enterprises with limited operating cash flow information or bounding my sample into a shorter period leads to a small number of firm-year observations, which in turn might make difficult the estimation of models.

5.2. DESCRIPTIVE STATISTICS

Table 2 presents some distributional statistic on pooled data and across industry for each of the variables used in the estimating equations. It contains measures of central tendency, and measures of variability. There are two main measures of centrality: the mean and the median. The mean summarizes all the information in the data. It is the average of all observations and can be viewed as the point where all mass of the observations is concentrated. The median, on the other hand, is an observation (or a point between two observations) in the center of the data set. The median is resistant to extreme observations and reveals that one half of the data lie above this observation and one half of the data lie below it. Concerning measures of variability, I refer to standard deviation, minimum and maximum. Minimum and maximum reveal the extreme bottom and top observations of my sample for each variable. Using minimum and maximum, I can see the range (i.e. the difference between maximum and minimum) of my sample, which measures the dispersion of the observations. Standard deviation is a more meaningful measure, since it gives the deviation of the data points from the mean in values denoted in millions of euros.

It can be seen that the mean of market value of equity is € 97.33 million and the mean of book value of equity is € 12.80 million. This indicates that, on average, the book value of equity alone is insufficient to explain the market value of equity, which is a sign of capitalized earnings. Moreover, total accruals are, on average, negative (on pooled data and across industries). This indicates that cash flows are positive, since according to prior research findings relating to accruals are "mirror images" of findings relating to cash flows (Barth *et al*, 1999). I would expect that the negative mean value for accruals is

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Table 2: Distributional statistics (in € millions)

		MVE	BV	AB_NI	ACC	ΔINV	ΔREC	ΔPAY	DEP
Pooled data	Mean	97,33	12,80	4,54	-35,77	3,02	7,44	8,63	2,64
	Median	55,04	7,22	2,29	-18,86	1,04	3,41	3,76	1,26
	S.D.	114,91	16,30	8,35	49,22	8,80	17,72	21,95	3,94
	Minimum	0,01	0,56	-26,27	-433,46	-45,36	-62,70	-105,24	0,00
	Maximum	867,12	119,64	62,84	13,51	78,83	141,59	181,95	54,54
Sector statistics									
Chemicals	Mean	96,65	12,07	2,42	-36,68	2,47	7,00	9,79	3,58
	Median	81,12	7,99	1,83	-23,04	1,68	5,97	6,28	2,68
	S.D.	75,05	10,20	3,49	37,05	8,57	12,61	23,75	3,37
	Minimum	10,39	1,37	-11,06	-174,54	-22,22	-22,17	-38,82	0,26
	Maximum	293,02	34,59	12,29	-5,74	22,70	41,85	99,94	16,49
Construction and building manufacturers	Mean	116,84	15,61	6,74	-29,55	1,71	6,84	5,98	2,27
	Median	61,91	7,21	3,48	-14,63	0,65	3,97	3,44	0,97
	S.D.	157,15	21,35	9,95	41,99	6,53	16,97	18,22	3,52
	Minimum	4,81	0,56	-8,86	-227,41	-32,01	-55,40	-75,41	0,03
	Maximum	867,12	119,64	62,84	1,43	53,96	75,02	98,85	24,95
Equipment and machinery	Mean	69,58	5,47	3,95	-29,48	3,99	5,11	6,76	1,22
	Median	34,66	4,32	2,44	-21,93	1,39	1,79	2,19	0,43
	S.D.	83,63	4,66	4,22	30,94	10,10	11,46	18,79	2,47
	Minimum	9,02	0,94	0,11	-188,32	-6,24	-8,05	-6,59	0,08
	Maximum	361,58	16,62	18,04	-5,89	56,30	54,85	104,78	15,11
Food	Mean	91,89	11,23	3,86	-46,05	2,44	6,07	7,63	3,14
	Median	62,44	8,14	2,68	-23,86	0,96	3,04	3,91	1,53
	S.D.	86,88	11,78	6,08	60,10	5,47	13,01	15,00	4,21
	Minimum	3,02	0,89	-12,19	-323,65	-13,75	-47,55	-55,90	0,10
	Maximum	379,03	70,03	31,60	4,79	42,65	71,28	80,44	27,95
Textlile and printing	Mean	66,09	13,88	2,08	-29,24	3,29	5,96	7,03	2,42
	Median	43,01	7,60	1,22	-19,88	1,47	1,88	2,48	1,32
	S.D.	74,32	15,96	4,62	27,60	8,49	16,35	19,78	4,18
	Minimum	3,82	1,62	-8,31	-201,83	-11,49	-55,91	-55,10	0,06
	Maximum	515,05	101,75	34,87	-3,21	68,83	134,34	158,11	54,54
Health	Mean	192,91	19,38	11,65	-22,49	0,61	2,98	9,21	3,61
	Median	154,44	5,45	9,62	-17,44	0,20	2,21	7,40	1,63
	S.D.	126,79	24,78	7,77	21,14	1,13	7,36	19,30	3,35
	Minimum	38,84	1,38	2,62	-71,62	-0,85	-13,63	-36,55	0,42
	Maximum	404,37	81,87	27,76	5,09	3,72	18,52	47,35	9,38
Information technology	Mean	117,75	11,35	5,96	-48,27	2,95	11,38	9,65	2,56
	Median	80,28	6,48	3,34	-28,75	1,81	7,49	6,82	1,42
	S.D.	115,74	11,94	8,12	61,68	5,30	26,59	20,21	3,27
	Minimum	6,12	0,64	-13,80	-349,94	-11,53	-56,73	-46,96	0,11
	Maximum	556,09	52,63	37,74	-0,22	21,30	141,59	79,28	14,23
Steel and other metals, mining and oil and gas	Mean	121,48	11,08	6,08	-53,40	6,18	8,15	11,01	2,99
	Median	55,68	7,67	3,25	-21,91	1,70	4,30	4,81	1,25
	S.D.	142,15	9,46	8,38	75,86	14,41	21,06	28,81	3,86
	Minimum	4,68	1,43	-2,44	-330,58	-28,18	-62,70	-104,05	0,11
	Maximum	555,56	39,16	37,96	5,89	78,83	118,06	178,04	19,16
Other industries	Mean	99,22	13,09	4,74	-31,38	2,76	8,67	10,10	2,62
	Median	55,22	6,71	1,93	-16,32	0,80	4,00	4,52	1,21
	S.D.	117,23	18,49	10,11	45,21	9,04	18,84	24,77	4,10
	Minimum	0,01	0,73	-26,27	-433,46	-45,36	-50,39	-105,24	0,00
	Maximum	601,47	117,00	54,83	13,51	68,07	139,16	181,95	37,11

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attributable to depreciation expense being included in accruals but capital expenditures being included in investing cash flows (Guay and Sidhu, 2001).[17] In contrast, mean depreciation expense is the least among accrual components, € 2.64 million, and the negative mean value for accruals is attributable to changes in receivables and changes in payables being both negative leading indicators of earnings and margins (Stober, 1991; Barth *et al.*, 2002). Change in payables is the largest accrual component, € 8.63 million, and change in receivables follows, € 7.44 million. Furthermore, table 2 reveals that mean abnormal earnings is positive (on pooled data and across industries). Regarding sector statistics, we initially observe that there is variability in the size of the enterprises across industries. In particular, the biggest companies by market value are in health, though the median market value of construction and building manufacturers is larger than those of other industries. However, a more careful examination of results reveals that the median has its two largest values in two of the most critical industries (i.e. chemicals and health). This implies that small number of observations in these groups has affected my results. Therefore, I should focus on the four major groups; that is, those groups with highest percentage of observations. In this case, there is still variability in the size of the enterprises, even if the median market value of construction and building manufacturers is almost equal to that of food one. Note the large range in each of the industry groups; this could be an indication which permits to be positive about results validity. In addition, it is encouraging that the total number of observations of these industry groups consists in 77.27% of total sample; that is, 938 out of 1214 firm-year observations.

Finally, table 3 refers to Pearson and Spearman correlations. The correlation gives an indication of how well two variables move together in a straight-line fashion. Thus, it is a measure of the degree of linear association between two variables. A known sample correlation coefficient is the Pearson's correlation coefficient and its calculation requires the assumption of normal distributions of two variables. Sample correlation coefficient is often used for descriptive purposes as a point estimator of the population correlation coefficient. In cases where the normal distribution assumption is not realistic, there are alternative measures of the degree of association between two variables. The most frequently used non-parametric measure of the correlation between two variables is the Spearman's correlation coefficient. The Spearman correlation coefficient satisfies the

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usual requirements of correlation measures. It is equal to 1 when two variables are perfectly positively related, it is equal to -1 in the opposite situation and it is equal to zero when there is no relation between two variables. Values between these extremes give a relative indication of the degree of association between the two variables. As with the parametric Pearson correlation coefficient, Spearman statistic may be used as a descriptive statistic giving us an indication of the association between two variables. Consequently, I expect variables that are not correlated at a statistically significant level to be descriptively valid, since they will provide complementary information.

Table 3: Correlations with Pearson (Spearman) correlations

	MVE	BV	AB_NI	ACC	d(INV)	d(REC)	d(PAY)	DEP
MVE	1	,514**	,547**	-,454**	,108**	,246**	,180**	,515**
BV	,473**	1	,208**	-,557**	,069**	,110**	,121**	,671**
AB_NI	,635**	,281**	1	-,421**	,201**	,261**	,217**	,386**
ACC	-,496**	-,430**	-,559**	1	-,192**	-,188**	-,202**	-,669**
d(INV)	,163**	,142**	,218**	-,376**	1	,491**	,596**	,136**
d(REC)	,250**	,182**	,273**	-,362**	,593**	1	,682**	,176**
d(PAY)	,211**	,178**	,287**	-,384**	,763**	,776**	1	,180**
DEP	,451**	,501**	,419**	-,651**	,333**	,334**	,343**	1

Table Caption

** Correlation is significant at the 0.01 level (2-tailed).

As can be observed, table 3 reveals at first that most of the variables are highly correlated with each other. However, we see that abnormal earnings and equity book value are not significantly correlated, which implies that these parameters provide us with complementary information. This is consistent with prior research results (e.g. Barth *et al.*, 2002, 2004) and leads to the inference that it is better to include both variables in a common valuation model than to examine each one separately. Thus, it is less probable this way to receive limited information. Moreover, total accruals and accrual components are not significantly correlated too. The latter implies that their disaggregation provides us with incremental information.

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CHAPTER 6: RESULTS

In this chapter, I look into linear information models sequentially and I attempt so to analyze as to interpret summary statistics of forecasting and valuation equation coefficients. However, I would like to point out that I did not find relative empirical studies related to Barth *et al.* (2002) framework in a specific code-law country and therefore I did not have a direct measure (i.e. benchmark) of interpretation.

About empirical results, tables 4, 5 and 6 present regression statistics for the linear information dynamic systems (i.e. LIM1, LIM2 and LIM3). In particular, all but the last one panels in each table show estimation results for the forecasting equations, whereas the last panel shows estimation results for the valuation equation. Note that results regarding the equity book value forecasting equations of all LIMs are not presented, since as predicted they have a strong autoregressive behavior (i.e. R^2 is over 0.90). Within each panel, the first line refers to pooled regression, which is estimated with year and industry fixed effects. The following four lines refer to separate industry group regressions, which are estimated with year fixed-effects. Estimation results concern regression coefficients statistics (i.e. mean, standard deviation, minimum and maximum) in order to describe parameters in terms of signs, significance and magnitude.

6.1. FORECASTING EQUATIONS RESULTS

Concerning forecasting equations in all LIMs, findings do not reveal significant variation in multiple determination coefficients (R^2). In the cases of LIM1 and LIM2, the level of the R^2 varies among 0.30 and 0.35, whereas in the case of LIM3 its level reduces dramatically. This implies less explanatory power of the respective accounting variables.

Regarding abnormal earnings, the R^2 of the estimated equation is not considerably altered by including either aggregate accruals or accrual components as independent variables. The explanatory power of the variable remains constant at 0.32, which is low. This is not consistent with Barth *et al.* (2002, 2004) results and implies that accruals do not provide incremental information about future realizations in the Greek context. Results for LIM1 (table 4, panel A) reveal that mean coefficient across industries on

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lagged abnormal earnings, ω_{11}, is 0.31. The mean coefficients are positive and significant and range from 0.804 to -0.569, which indicates a substantial cross-industry variation in the persistence of abnormal earnings. For pooled data, the mean coefficients differ in magnitude (0.572) from those obtained across industries. As for LIM2 (table 5, panel A), results reveal that mean coefficients are still positive and significant, though their significance as well as their magnitude are diminished. The separate persistence parameter on aggregate accruals, ω_{12}, in the abnormal earnings estimation equation is negative, on average, but not significant. Moreover, the mean coefficient value across industries is -0.012. Findings for LIM3 (table 6, panel A) not only reveal a decrease in significance of mean coefficients of abnormal earnings, but also imply a considerable variation across industries in the coefficients on change in receivables, ω_{12}, change in inventory, ω_{13}, change in payables, ω_{14}, and depreciation, ω_{15}. As can be seen, they differ inter se on sign, since there are three positive coefficients and one negative one, and on magnitude. Note, however, that none of them is significant.

Regarding aggregate accruals forecasting equation (table 5, panel A), the coefficient on lagged total accruals, ω_{22}, is 0.59. Moreover, there is a broad range of coefficients across industries (from 0.74 to -0.41), but the mean coefficients are positive (0.43) and significant. About forecasting equations of accruals components (table 6, panels A and B), results exhibit much less significance of all but depreciation coefficients. This goes for lagged values of the other components in each of the forecasting equation too and indicates that these variables have not significant explanatory power concerning the Greek context. The latter comes in contrast to Barth *et al.* (2002, 2004) results according to which accrual components of earnings are variables with a lot of explanatory power.

6.2. VALUATION EQUATION RESULTS

In order to test whether the null hypothesis (i.e. all coefficients equal zero) is true, I use the standard deviation of the means of the nine economic sectors (Barth *et al.*, 2004). This leads to rejection of the null hypothesis. In succession, I analyze results related to valuation equations.

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Table 4: Summary results for LIM1. Sample of 1214 Datastream firm-year observations, 1994-2003

Panel A: Summary statistics from regressions of abnormal earnings on lagged abnormal earnings and equity book value: $(AB_NI)_{it} = \omega_{10} + \omega_{11}(AB_NI)_{it-1} + \omega_{12}BV_{it-1} + \varepsilon_{1it}$ (7a)

	ω_{11}		ω_{12}		R^2
	coefficient	t-statistic	coefficient	t-statistic	
Pooled fixed effects	0,572	23,192	-0,010	-0,823	0,321
Across industries					
Mean	0,316		0,082		0,308
S.D.	0,480		0,302		
Maximum	0,804		0,875		
Minimum	-0,569		-0,115		

Variable definitions are per pages 50-51

Panel B: Summary statistics from regressions of equity market value on equity book value and abnormal earnings: $MVE_{it} = \alpha_0 + \alpha 1(AB_NI) + \alpha_2 BV_{it} + u_{it}$ (7c)

	α_1		α_2		R^2
	coefficient	t-statistic	coefficient	t-statistic	
Pooled fixed effects	7,568	25,917	2,257	15,090	0,497
Across industries					
Mean	5,315		4,033		0,482
S.D.	4,322		4,764		
Maximum	11,551		16,372		
Minimum	-4,120		1,239		

Variable definitions are per pages 50-51

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Results for LIM1 (table 4, panel B) show that all coefficients are positive and significant in the pooled data and across industries, which in turn affect significance of mean coefficients across industries. In particular, the mean coefficient of abnormal earnings, a_1, is 5.32, while it ranges from 11.55 to -4.12. As for the mean coefficient of equity book value, a_2, its value is 4.03 and its range is wide across industries too. 'The large range in coefficient estimates across industries, as evidence by the minimums and maximums, suggest equity predictions based on separate industry estimations rather than pooled estimation may be more accurate' (Barth *et al.*, 2002, p. 17).

Results for LIM2 (table 5, panel B) reveal that the estimated coefficients on abnormal earnings, a_1, and equity book value, a_3, are significantly positive for both pooled data and across industries. However, the coefficient on aggregate accruals, a_2, is negative but not significant. The negative sign is consistent with prior research and could indicate incremental information content. But the low significance leads me to conclude that accruals in Greece (i.e. a code-law country) do not provide investors with incremental information. This could be related to balance sheet rather than income statement's greater importance in equity valuation and the consequences of such perception on earnings properties.

Results for LIM3 (table 6, panel C) show that incremental coefficients on change in receivables, a_2, change on inventory, a_3, change on payables, a_4, and depreciation, a_5, differ among each other on sign, since some are positive and some negative. Moreover, three coefficients do not differ from zero significantly. In particular, their estimates are 0.64, -0.10, -0.49 and 2.59 respectively, whereas their significance level is 3.09, -0.25, -2.32 and 3.49 respectively. As can be seen, the most significant among these four coefficients are on change in receivables and depreciation ones.

Finally, we observe minor improvement in R^2 by incorporating total accruals and accrual components, which in turn indicates that these accounting variables are not descriptively valid. The latter is verifiable by the following key findings. First, both earnings and equity book value coefficients are significant. Second, coefficient on aggregate accruals is negative but not significant. Third, the insignificance of aggregate accruals is pictured even more when examining coefficients on disaggregated accruals.

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Table 5: Summary results for LIM2. Sample of 1214 Datastream firm-year observations, 1994-2003

Panel A: Summary statistics from regressions of abnormal earnings on lagged abnormal earnings and total accruals: $(AB_NI)_{it} = \omega_{10} + \omega_{11}(AB_NI)_{it-1} + \omega_{12}ACC_{it-1} + \omega_{13}BV_{it-1} + \varepsilon_{1it}$ (8a) and regressions of total accruals on lagged total accruals and equity book value: $ACC_{it} = \omega_{20} + \omega_{22}ACC_{it-1} + \omega_{23}BV_{it-1} + \varepsilon_{2it}$ (8b)

	ω_{11}		ω_{12}		ω_{13}		R^2	ω_{22}		ω_{23}		R^2
	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.		coef.	t-stat.	coef.	t-stat.	
Pooled fixed effects	0,509	20,492	-0,010	-1,974	-0,014	-1,049	0,320	0,588	22,908	-0,011	-0,140	0,348
Across industries												
Mean	0,270		-0,012		0,063		0,307	0,427		-0,675		0,369
S.D.	0,427		0,048		0,237			0,358		1,661		
Maximum	0,615		0,081		0,708			0,740		1,044		
Minimum	-0,872		-0,101		-0,128			-0,405		-5,073		

Variable definitions are per pages 50-51

Panel B: Summary statistics from regressions of equity market value, abnormal earnings and total accruals: $MVE_{it} = \alpha_0 + \alpha_1(AB_NI)_{it} + \alpha_2ACC_{it} + \alpha_3BV_{it} + u_{it}$ (8d)

	α_1		α_2		α_3		R^2
	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	
Pooled fixed effects	6,924	20,549	-0,216	-3,561	2,072	13,082	0,502
Across industries							
Mean	4,725		-0,295		4,356		0,529
S.D.	4,032		1,119		5,008		
Maximum	10,104		1,857		16,585		
Minimum	-5,192		-2,727		0,907		

Variable definitions are per pages 50-51

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6.3. DIFFERENCES BETWEEN INDUSTRIES

I estimate the three linear information systems (i.e. LIM1, LIM2 and LIM3) separately by industry in order to investigate whether the estimated coefficients of earnings, earnings components and equity book value as well as the multiple determination coefficients of the valuation equations vary across industries. Moreover, I examine the extent to which further disaggregation of earnings is influential in changing the level of R^2 value.

Results reveal a large variation so in estimated coefficients as in R^2 values. For instance, we observe a range from 0.19 in information technology group to 0.64 in health one concerning results of LIM1. However, three of the industries belong to the critical zone (see p. 50); therefore, I focus on the rest of them. Even in this case, there is still large variation in the R^2 values with a range from 0.19 in information technology group to 0.60 in steel, mining and oil and gas one. As for valuation coefficients of earnings and equity book value respectively, the former range from 5.70 in information technology group to 11.55 in steel, mining and oil and gas group, whereas the latter range from 1.24 in information technology group to 3.92 in construction industry group. This indicates an altered valuation content per industry for each of the earnings and equity book value variables.

Incremental information content of earnings disaggregation seems to be industry-specific, which is consistent with Barth *et al.* (2002, 2004) results. In particular, valuation coefficients on aggregate accruals (i.e. LIM2) and accrual components (i.e. LIM3) respectively are industry-dependent; in turn, they range in accordance with the respective industry group. For instance, earnings disaggregation in information technology group enhances significantly the explanatory power of the valuation equation in LIM2 (0.32) and LIM3 (0.41) as well. However, coefficients' significance and the level of R^2 values remain still low. In contrast, earnings disaggregation in steel, mining and oil and gas group increases explanatory power of LIM2 (0.62) and LIM3 (0.63) as well, which is high. Nonetheless, the coefficients are not significant, which makes me suspicious either as to the models' accounting variables or as to the quality of the respective accounting data in the Greek context. This suspicion arises even in case of constant explanatory

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Table 6: Summary results for LIM3. Sample of 1214 Datastream firm-year observations, 1994-2003

Panel A: Summary statistics from regressions of abnormal earnings on lagged abnormal earnings and accrual components: $(AB_NI)_{it+1} = \omega_{10} + \omega_{11}(AB_NI)_{it} + \omega_{12}\Delta REC_{it} + \omega_{13}\Delta INV_{it} + \omega_{14}\Delta PAY_{it} + \omega_{15}DEP_{it} + \omega_{16}BV_{it} + \varepsilon_{1it}$ (9a), change in account receivable on the lagged components of accruals and equity book value: $\Delta REC_{it+1} = \omega_{20} + \omega_{22}\Delta REC_{it} + \omega_{23}\Delta INV_{it} + \omega_{25}DEP_{it} + \omega_{26}BV + \varepsilon_{2it}$ (9b), of change in inventory on the lagged accrual components and equity book value: $\Delta INV_{it+1} = \omega_{30} + \omega_{32}\Delta REC_{it} + \omega_{33}\Delta INV_{it} + \omega_{34}\Delta PAY_{it} + \omega_{35}DEP_{it} + \omega_{36}BV_{it} + \varepsilon_{3it}$ (9c)

	ω_{11}		ω_{12}		ω_{13}		ω_{14}		ω_{15}		ω_{16}		R^2
	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	
Pooled fixed effects	0,545	22,718	0,042	2,601	0,052	1,600	-0,049	-3,024	0,069	1,154	-0,153	-1,106	0,325
Across industries													
Mean	0,246		0,001		0,043		-0,047		0,245		0,075		0,380
S.D.	0,480		0,128		0,152		0,106		0,609		0,214		
Maximum	0,653		0,132		0,266		0,118		1,237		0,630		
Minimum	-0,913		-0,307		-0,252		-0,210		-0,726		-0,057		

	ω_{22}		ω_{23}		ω_{25}		ω_{26}		R^2
	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	
Pooled fixed effects	-0,050	-1,977	0,032	0,516	-0,035	-0,354	0,122	3,668	0,013
Across industries									
Mean	-0,083		-0,177		-0,226		0,325		0,142
S.D.	0,208		0,948		0,738		0,417		
Maximum	0,277		0,820		0,970		1,318		
Minimum	-0,476		-2,364		-1,484		0,022		

	ω_{32}		ω_{33}		ω_{34}		ω_{35}		ω_{36}		R^2
	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	
Pooled fixed effects	0,030	2,107	0,010	0,247	-0,035	-2,021	-0,086	-1,693	0,048	2,871	0,009
Across industries											
Mean	0,102		0,222		-0,120		-0,049		0,188		0,178
S.D.	0,242		0,690		0,312		0,490		0,269		
Maximum	0,735		1,818		0,100		1,116		0,654		
Minimum	-0,075		-0,521		-0,931		-0,566		-0,062		

Variable definitions are per pages 50-51

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power of the model, such as in other industries group, since coefficients insist on being not statistically significant.

6.4. FORECASTS OF EQUITY MARKET VALUE

Following Ballas and Hevas (2004) I estimate absolute percentage forecast errors and I use the nonparametric Wilcoxon matched pairs signed-rank test to assess the statistical significance of error distribution of fixed-effects model pooled across industries versus industry-specific estimates. Table 7 shows results of this procedure.

Table 7: Descriptive statistics for the absolute percentage error for equity market value forecasts

		Mean %	Median %	S.D. %	Minimum %	Maximum %
LIM1	Forecast with year and industry fixed-effects	1,37	0,68	1,67	0,00	14,91
	Forecast by industry with year fixed-effects	1,30	0,68	1,58	0,00	8,90
LIM2	Forecast with year and industry fixed-effects	1,37	0,68	1,67	0,00	14,91
	Forecast by industry with year fixed-effects	1,30	0,68	1,58	0,00	8,90
LIM3	Forecast with year and industry fixed-effects	1,37	0,68	1,67	0,00	14,91
	Forecast by industry with year fixed-effects	1,30	0,68	1,58	0,00	8,90

Findings reveal that the mean absolute percentage error is lower when allowing for industry effects, which is consistent with Barth *et al.* (2002) results. However, findings are the same as to those either for LIM2 or for LIM3. This is attributed to not succeeding in using jack-knifing procedure, in order to forecast equity market value. This comes in contrast to what Barth *et al.* (2002) study provides and consequently I result in not accurate estimations. Therefore, I am not able to draw any opinion regarding my last hypothesis.

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Panel B: Summary statistics from regressions of change in payable on the lagged components of accruals and equity book value: $\Delta PAY_{it+1} = \omega_{40} + \omega_{43}\Delta INV_{it} + \omega_{44}\Delta PAY_{it} + \omega_{46}BV_{it} + \varepsilon_{4it}$ (9d), depreciation on the lagged accrual components and equity book value: $DEP_{it+1} = \omega_{50} + \omega_{55}DEP_{it} + \omega_{56}BV_{it} + \varepsilon_{5it}$ (9e)

	ω_{43}		ω_{44}		ω_{46}		R^2	ω_{55}		ω_{56}		R^2
	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.		coef.	t-stat.	coef.	t-stat.	
Pooled fixed effects	0,151	1,691	-0,112	-3,573	0,169	4,354	0,192	0,499	18,974	0,015	2,272	0,290
Across industries						ω_{46}						
Mean	-1,583		-0,156		0,481		0,166	0,434		0,033		0,266
S.D.	5,285		0,288		0,665			0,223		0,056		
Maximum	1,682		0,171		1,850			0,709		0,147		
Minimum	-15,494		-0,836		-0,141			0,059		-0,028		

Variable definitions are per pages 50-51

Panel C: Summary statistics from regressions of equity market value, abnormal earnings and components of accruals: $MVE_{it} = \alpha_0 + \alpha_1(AB_NI)_{it} + \alpha_2\Delta REC_{it} + \alpha_3\Delta INV_{it} + \alpha_4\Delta PAY_{it} + \alpha_5 DEP_{it} + \alpha_6 BV_{it} + u_{it}$ (9g)

	α_1		α_2		α_3		α_4		α_5		α_6		R^2
	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	coef.	t-stat.	
Pooled fixed effects	7,216	23,158	0,643	3,085	-0,102	-0,248	-0,486	-2,321	2,591	3,458	1,978	11,995	0,508
Across industries													
Mean	2,563		0,803		2,118		-0,929		3,627		4,208		0,563
S.D.	4,548		1,494		4,478		1,382		10,004		4,894		
Maximum	6,328		4,127		10,646		0,275		24,551		16,539		
Minimum	-7,324		-1,363		-2,803		-3,298		-10,941		0,044		

Variable definitions are per pages 50-51

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SUMMARY AND CONCLUDING REMARKS

Many researchers have long been interested in the role of accounting numbers in equity valuation and earnings forecast ability. Relative studies use the linear information dynamic models (LIMs) of Ohlson (1995) and Feltham and Ohlson (1995; 1996) as a basis for developing their empirical research. The majority of them, however, are conducted in common-law countries, such as USA and UK, and do not take into account vital differences of code-law countries.

This study aims at investigating three cross-sectional accounting-based valuation models and making inferences concerning each model's significance level in the Greek context. LIM1 is based on Ohlson (1995) and uses aggregate earnings. LIM2 is based on Barth, Beaver, Hand and Landsman (1999) and permits earnings' disaggregation into accrual and cash flow components. Finally, LIM3 is based on Barth, Beaver, Hand and Landsman (2002) and permits a higher level of earnings' disaggregation, since it disaggregates accruals into four major accrual components.

I obtain a 12-year period sample from nineteen industries, which are merged in nine industry groups. In succession, I use them to make estimations and to test the validity of each forecasting and valuation parameter. I find that coefficients of aggregate earnings and equity book value are significantly positive and provide complementary information regarding equity valuation. However, coefficients on earnings components such as on aggregate accruals and accruals components may have the expected signs, but they are not significant. This implies that accruals in the Greek context do not release further information regarding equity valuation, which may be attributed to low quality of earnings due to high private information.

Next, I test for industry-specific influence on forecasting and valuation coefficients. I estimate each model separately for each industry group by assuming fixed-year effects. I result in a wide variation of forecasting and valuation multiples, which indicates that they are industry-dependent. Steel, mining and oil and gas group is the one with the highest estimates, where as in contrast information technology group is the one with lowermost estimates.

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Finally, I attempt to investigate earnings forecast ability by examining the absolute percentage of forecast errors. Findings imply lower forecast error in industry-specific context, which is consistent with Barth *et al.* (2002). However, I did not succeed in applying the jack-knifing procedure in order to estimate future stock prices and, therefore, my results may not be accurate.

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END NOTES

[1] In summary, Zhang (2000) examines the framework of conservative accounting and unbiased accounting in relevance to accounting data and firm value. However, he does not explain the way conservatism affects the prediction of future earnings and equity market value.

[2] The Netherlands is a code-law country. However, it has been included in Anglo-Saxon system due to the characteristics of its accounting system (Arce and Mora, 2002; p. 577).

[3] Vuong's test is applied by Dechow (1994) too. It is about a test which shows the model that better explains the data without assuming that the null hypothesis of each model is true.

[4] See Suda *et al.* (2005).

[5] This is, of course, subjective and based on the literature review that I did in order to modulate my study. There may be other studies too, that I was not able to track down.

[6] See Gregorakos (2001) and Sakellis (2002) for more details.

[7] See Sakellis (2002) and Alifandis (2004) for more details.

[8] See Sakellis (2002) and Alifandis (2004) for more details.

[9] These are the two main types of company recognized by Greek Law. See Ballas (1994).

[10] Method names are only a direct translation from Greek.

[11] Callen and Morel (2001) refer to this assumption as an ad hoc assumption which begs investigation. They use Mayers (1999) framework to examine a two-lag autoregressive version of Ohlson's (1995) model. Their results show that an AR(2) version of Ohlson's (1995) model is no better at predicting stock prices than the AR(1) model.

[12] Following Barth, Beaver, Hand and Landsman (2002), a_1, is the same for all three models (p. 6).

[13] I use Barth, Beaver, Hand and Landsman (2002) format, because it better supplies the needs of the specific paper. These premise comparability between linear information models and therefore I should use similar parameters.

[14] In the literature, it is noted that a good statistical model fits the data well but is also parsimonious; that is, it has as few parameters as possible.

[15] FEK – A' 113/30.6.1992. According to this law, dividends are not taxable anymore, since they are received from an enterprise's residual income. It has been already imposed a tax on an enterprise's residual income prior dividends' giving.

[16] Hevas and Papadaki (2001) mention that there is no common sense as to which is the best equity market value to use as the dependent variable in share valuation models. In their study, they use market values six months after the end of the fiscal year, because "most earnings announcements occur within the fifth and sixth months following the end of the fiscal year" (p.185).

[17] Because capital assets are long-term assets, the cash expended is called 'investing'. This kind of accruals, which Guay and Sidhu (2001) call positive accrual, never appears in the reconciliation between operating cash flows and earnings. The negative accrual does appear in the form of depreciation expense.

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 Δωρεά

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