

Neurofinancial Accounting

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Abstract

In this study the term 'Neurofinancial Accounting' is proposed in order to connect research endeavors in the relatively new branch of Behavioral Finance, with the impact of subjectivity on the accounting cycle of each fiscal year, as well as on the preparation of financial statements. The investigation of subjective factors in Financial Accounting expands its scope, while the systematic utilization of its two-way relationship with the field of Neurofinance (unbiased data) may create a broader framework of knowledge for the further improvement of the investment process, through an understanding of the methodology required by accounting operations and rules up until the preparation of financial statements. By extension, a better understanding of how financial markets operate will be beneficial not only for governments wishing to promote savings incentives and responsible management, but also for supervisory authorities seeking to ensure that the market for personal financial services operates rationally and without bias.

Keywords: Behavioral Finance, Neurofinance, Financial Accounting

JEL Classification: D87, G41, M41

Introduction

Empirical research has revealed a large number of deviations from the efficient market hypothesis, resulting in considerable doubt about the reliability of traditional financial theory in describing and satisfactorily interpreting financial markets and their operation.

According to Statman (2005), investors are normal people and so it is logical that they should be affected by emotions, as well by cognitive biases. Moreover, the limited capacity of the human brain to process complex and possibly conflicting information, in order to suitably adapt its convictions, often leads to the adoption of commonplace heuristic (empirical) rules, which do not contribute to optimal investment decision-making.

The term 'heuristic rules' refers to the empirical ways in which people attempt to quickly solve complex problems. Thus, they significantly affect people's predictions and their perception of the risk involved or not in a decision. In psychology, heuristic rules are simple approximate rules, used to show that people make decisions to solve complex problems with inadequate information (Spyrou 2009). Similarly, in Accounting, the heuristic method is used to create assumptions (hypotheses), which along with its basic principles shape its theoretical framework.

The text of this study is organized as follows: Section II sets out the theoretical framework of the field of Behavioral Finance; Section III explains Prospect Theory in combination with mental and behavioral accounting; Section IV presents the field of Neurofinance; Section V analyzes the impact of subjectivity on the accounting cycle; Section VI its impact on the preparation of financial statements; while Section VII concludes with the relationship between Behavioral Finance and Neurofinance on the one hand and the processes and broader framework of Financial Accounting on the other.

Behavioral Finance

In financial theory, with regard to economic behavior and the way in which individuals make decisions in conditions of uncertainty, the expected utility theory came to be the dominant descriptive model. It is based on the principles of Comparability, Transitivity, Independence, and Certainty Equivalence. Each ordinal preference relation in a finite set of states of nature may be referred to as an expected utility, if the subjects' preferences satisfy the aforementioned principles.

Violations of expected utility in economic decision-making created a new approach to economic behavior, which developed primarily in the field of financial analysis. The number of participants, but also the variety of differentiations in the quantity of financial data, facilitated the specialized scientific observation of the human factor in a particularly reliable way and led to conclusions that developed the financial analysis on the basis of human behavior, better known as Behavioral Finance.

Barberis, Shleifer, Vishny (1998) presented a general theory regarding investor sentiment which was based, inter alia, also on an idea of Griffin and Tversky (1992). According to the latter, when making forecasts, people focus too much on the strength of the evidence presented to them and too little on its statistical weight. They found that after the publication of financial statements announcing corporate earnings (low strength, high statistical weight), stock prices underreact, while after persistent trends of good or bad news (high strength, low statistical weight), stock prices overreact. Thus, in the 1987 stock market crash, prices plummeted (news of panic selling), but bounced back strongly in the next few weeks, because the news was not consistent with the fundamentals relating to security values.

Since the early 1990s, some researchers have realized that the financial models being applied are not infallible and that, when a stock or a bond is not offered at equilibrium price, the correction attempt entails risk and cost. So, while smart investors, institutional or not, might be aware that the price is wrong, they may not undertake aggressive initiatives to correct it, with the wrong price continuing to affect the market for weeks, months, even years. This means that non-rational investors, institutional or not, may significantly and for a long period affect the prices of securities and, by extension, the information reaching a company's financial backers, namely investors (shareholders, bondholders) and creditors in general, who are primarily interested not only in its present and future financial position, but also its profitability (Grigorakos 2013).

Similar theoretical advances have given rise to the keen research interest in Behavioral Finance. Undoubtedly, this development has also been spurred by the major stock market bubbles that appeared towards the end of the same decade, when the new circumstances prompted researchers to look for an alternative interpretation model and Behavioral Finance offered a logical research/scientific option.

Over time, the tools of science in many cases significantly impact new scientific domains. For example, the telescope provided the means for the development of new fields in astronomy, just as the microscope played a key role in the development of biology (Alexakis and Xanthakis 2008). The same is true of economics, given that the boundaries of economic science have been shaped and systematized by the tools of different disciplines (mathematics, econometrics). However, in the Economic Sciences and by extension in Financial Management, there are magnitudes such as capital, revenue, expense, cost and income, which are not calculated separately for the exercise of financial/economic policy and it is required their recognition or non-recognition, their recording at their fair value or historical cost and the selection of the appropriate valuation method in the framework of Financial Accounting. In this study, it is noted that the scope of Financial Accounting may be further developed and systematized through its two-way participation in the making of a company's main financial decisions, an issue of particular relevance for Financial Management, and this relates not only to investment decisions but also financing decisions.

A milestone for the wider recognition of the importance and for the establishment of research in the field of Behavioral Finance was its decisive contribution to the award of three separate Nobel prizes in the early 21st century. Firstly, Professor Daniel Kahneman won the 2002 Nobel Prize in Economics, marking the first time this prize was awarded to a psychologist rather than an economist. The prize would have been shared with his close colleague, Amos Tversky, but he had died in 1996. Considered to be the world's most distinguished living psychologist, Kahneman is recognized for his pivotal contribution to our understanding of the economic decision-making process. Through their pioneering work, the two cognitive psychologists questioned the existence of the rational investor and highlighted the existence of heuristic rules, cognitive biases and errors to which people are prone, and they are considered to be the founding fathers of Behavioral Finance (Philippas 2015).

The field of Behavioral Finance also gained wide recognition with the award of the 2013 *Nobel Prize* in Economics to *Eugene Fama*, *Lars Peter Hansen*, and *Robert Shiller* for laying the foundations for the current understanding of asset prices, which relies in part on fluctuations in risk and risk attitudes, and in part on behavioral errors and market distortions.

Then in 2017, Richard Thaler, Professor of Behavioral Science and Economics, received the Nobel Prize in Economics for managing to build a bridge between the economic and psychological analyses of individual decision-making. Inspired by the work of Kahneman and Tversky, he highlighted the importance of deviations from rational behavior.

Lastly, another leading academic and co-founder of Behavioral Finance is Professor Hersh Shefrin, whose articles and research are considered to be of particular importance (Philippas 2015). In his now classic book *Beyond Greed and Fear*, Shefrin warns of the imminent bursting of the US stock market bubble (2000), while in collaboration with Professor Statman he was instrumental in the development of the Behavioral Portfolio Theory (2000). This descriptive theory concerns the construction of investment portfolios and highlights the fact that investors build their portfolios under the influence of behavioral biases, in their attempt to achieve alternative investment goals.

However, the main problem that arises with this approach is that investors ignore or overlook the existing

correlations between the different levels and the corresponding investments.

Prospect Theory, Mental and Behavioral Accounting

According to Shefrin (2000), the subject-matter of Behavioral Finance can be classified into three main themes: a. heuristic-driven bias, b. frame dependence and c. inefficient markets. These themes cover an enormous variety of issues, but in the context of this study it will be referred to, in summary form, as ‘prospect theory’ and very briefly as ‘mental’ and ‘behavioral’ accounting.

Given that investors do not behave in accordance with the principles of the expected utility theory, Kahneman and Tversky (1979) came up with an alternative theory to explain its violations, Prospect Theory, which distinguishes two phases in the choice process: a. editing or framing (analysis of the offered prospects), and b. evaluation and choice of the prospect of highest value. They varied the classical utility theory and above all pointed out the asymmetry of preferences when these relate to gains and losses.

Their theory revealed numerous behavioral biases based on the fact that investors evaluate gains and losses in a different way, but losses have greater importance and more emotional impact than gains of equal magnitude. It is, in effect, a correction of the expected utility theory, to prevent anomalies arising in the decision-making process. They argue that value should be treated as a function of two factors, the starting position of the capital that serves as a reference point and the magnitude of the positive or negative change from that point (Zhang and Sussman 2018a). Thus, Thaler (1985) proposed replacing the utility function with the value function from Prospect Theory and directly introducing the price of commodities into the value function by means of the ‘reference price’.

The utility function of Kahneman and Tversky reveals the asymmetry between the utilities that individuals incorporate in their gains and losses, which is known as loss aversion. Empirical studies have shown that losses are weighted almost twice as strongly as gains. A similar situation can also appear among individuals who wish to speculate, sometimes to a considerable degree, when they have incurred losses and anticipate that they will make gains to cover them. If loss aversion is correlated with the tendency of individuals to evaluate their investment strategies at infrequent intervals and ignore events that may occur after the end of the investment horizon, the phenomenon known as myopic loss aversion occurs (Fennema and Koonce 2010). According to Benartzi, Thaler (1995), the individual examines a series of prospects one-at-a-time within a specific time period as opposed to overall and cumulatively. If investors display this behavior, the result is that each investment will be examined myopically and uniquely, as opposed to a simultaneous investment strategy, in which case they will not know the benefits of the differentiation and will require higher returns on each separate investment, since they will view it as riskier.

Investors also have a tendency to hold losing investments for a longer time and sell profitable ones sooner. Jordan and Diltz (2004) showed that approximately 65% of investors in their sample held losing investments longer than profitable ones. While Locke and Mann (2005) found there was a significant difference in the length of time that gains and losses are held. Professional traders hold onto losing positions for much longer than winning positions in respect of all the contracts examined. Lastly, Barber, Lee, Liu and Odean (2007), who analyzed trading activity on the Taiwan Stock Exchange in the period 1995-1999 using a dataset with over one billion trades and nearly four million traders, found that investors were twice as likely to sell a stock if they were holding it for a gain rather than a loss.

The aforementioned research works highlight one of the most common behavioral biases, the ‘disposition effect’, which is related to both ‘loss aversion’ and ‘mental accounting’ to which reference is made in the next part of this section.

In a profitable trading period, many investors have the tendency to sell all their stocks. Thus, any loss-making stocks are easily released in the overall profit, since there is no examination of each one separately. This may be explained by mental accounting, a component of the theory of expectation which refers to the tendency of investors to keep separate mental accounts for different investment goals (Frydman, Hartzmark, and Solomon 2018). It describes the tendency of people to place specific events into different mental accounts created on the basis of specific characteristics (Paul, Parker, and Dommer 2017).

According to Thaler (1985, 1980, 1999), individuals mentally separate and divide events and prospects, but also their current and future assets, while ignoring possible interactions. The direct result for investors is the formation of biased portfolios, to the extent that the intercorrelations between the separate chosen securities, such as stocks and bonds, are not taken into account (Zhang and Sussman 2018b). A different level of utility is assigned to each group of mental accounts and this influences investor decisions, for instance behavior towards losses, marginal propensity to consume or to invest (Kőszegi and Matějka 2020).

Shefrin and Thaler (1988) have argued that people create mental accounting systems, which function in a similar

way to those of businesses, and separate their wealth into three accounts: current income, current assets and future income. As a consequence, by using mental accounts, instead of optimizing their consumer choices in the long term, individuals make relatively short-term decisions that reduce the efficiency of their transactions.

Finally, Behavioral Accounting is a branch of Accounting that is related to behavior in addition to conventional accounting knowledge (Hopwood 1989), the objective of which is to understand, explain, and predict human behavior in accounting situations or contexts (American Accounting Association, Committee on the Relationship of Behavioral Science and Accounting, Report 1974). It attempts to correct and enrich traditional approaches to accounting theory, where perceptions, attitudes, values and behaviors are underemphasized by both preparers and users of financial statements (Rogow 1989). Also referred to as human resources accounting, Behavioral Accounting is related (Birnberg 2011) to issues of Ethics, Accountability, Strategy, Organization and Environment, while it may also be connected with the subject-matter of Management Accounting and/or Auditing (Kutluk 2017). As to whether Neuroaccounting can emerge as a separate sub-field within Behavioral Accounting, Birnberg and Ganguly (2012) conclude that it is not likely in the near future due mostly to practical reasons, such as the stringency of criteria demanded by social sciences, funding, and the relevant data processing support.

Neurofinance

Since the time of Aristotle, scientists and philosophers have accepted the hypothesis of the existence of two major brain functions that are fundamental to almost all human behavior:

- a. pleasure-seeking (gain) and
- b. pain avoidance (loss)

These two incentive systems can be activated or deactivated independently (Alexakis et al. 2008). Thus, when potential financial/accounting gains or potential financial/accounting losses are faced, one or both of these incentive systems may be activated in the decision-making process. If, in this process, the reciprocal relationships of Accounting are examined with the associated scientific disciplines, irrespective of the kind of discipline, the examination of related issues can be located, such as the adoption of hypotheses (minimization of loss-sacrifice, maximization of gain-benefit), the evaluation of magnitudes (optimal magnitude and cost of production, marginal cost), as well as the utilization of methods (breakeven point, statistical sampling). These are issues that can be significantly affected by subjective factors contained in International and, by extension, Greek Accounting Standards / GAS (Papadeas 2005).

Moreover, a modern economic approach, apart from a fundamental knowledge of mathematics, statistics, sociology and history, should also be based on evolutionary biology, neuroscience and psychology (Alexakis et al. 2008). Thus, the interest of modern researchers in Neuroeconomics emerged largely from new methods for imaging brain functions. Neuroeconomics helps us understand the characteristics of the aforesaid incentive systems, as well as their impacts on our behavior. Generally speaking, it could be said that Neuroeconomics deals with the recording of the physiology of behavioral finance (Camerer, Loewenstein and Prelec 2005).

In addition, researchers have also turned to the field of Neurofinance, which uses modern tools to image the human brain, investigate the way it functions and reacts, while providing useful information to further our understanding of the decision-making process. The detailed analysis of the 'mysteries' of the brain could provide answers to seemingly irrational behavior and investment decisions, which were to a large extent responsible for the emergence of economic crises and market 'anomalies' (Philippas 2015). Neurofinance researchers seek to verify observed behavior patterns through experiments (Diacogiannis and Bratis 2010). Clearly, this also helps improve the investment process by furthering the understanding of the way decisions are made, which to a significant extent appear as repeated actions of the individual, performed automatically or subconsciously.

Automation is considered to be one of the three key elements of brain functions. It relates to the result from the performance of specific actions that are initially characterized by a high degree of difficulty, which is eliminated through practice. Examples could include driving a car on a mountain road with sharp turns or monitoring stock returns on different computer screens or monitoring accounting estimates/forecasts in the shaping of the market price of a share. Through practice, one's driving or financial/accounting skills are optimized, but it is difficult to explain one's experience in detail. In addition, complex decisions require the cooperation of different brain units. One revealing image of the human brain is likened to a large company, whose different departments specialize in different planning and decision operations, but at the same time, when necessary, communicate with each other (Alexakis et al. 2008). This correlation was used by Professor Shefrin (2001, 2006) to formulate an analytical framework, the field of Behavioral Corporate Finance, in an effort to describe and analyze the way in which behavioral biases and emotions are also present in business people, resulting in the influencing of the corporate-decision making process.

In the broader field of Business Administration, for the classification, analysis and interpretation of a company's

economic events (magnitudes), Financial Accounting relies on a systematized body of knowledge that is similar, apart from Economic Science to that of Law, having a crucial role at the center of an information system that, related to the behavioral sciences and organizational theory, constitutes the nucleus of every modern economic unit and establishes the branch of management information systems. In the international literature, different views have been put forward about what Accounting means, which have so far not led to a commonly accepted definition. To some extent, this difficulty is akin to that faced by the various disciplines in the social sciences, such as Accounting, when their development takes place in a rapidly changing international environment. So, there is much interest surrounding the difficulty of displaying the economic (accounting) magnitudes of businesses in the new circumstances of the globalized environment, particularly with regard to offshore companies, e-commerce, mergers/acquisitions and international financial scandals. It has now become necessary to further expand the theoretical framework with new knowledge in various fields, such as Corporate Governance and audit systems for groups of enterprises active internationally (e.g. big data, blockchain). It is clear that a rapidly evolving framework of theoretical principles of Accounting can co-exist with a constantly growing field of Accounting applications, just as theory and application co-exist in most scientific disciplines.

One approach is to consider the overall behavior of investors, institutional or not, and business people as the result of relations of neural systems that subconsciously trigger automatic and consciously controlled processes, 'warm' emotion and 'cold' logic. Economics, as a science that studies intricate problems, such as preferences or the purchase and sale of shares, can create a new approach to these problems through the complex decision-making system of the human brain (Alexakis et al. 2008). In the subject-matter of Financial Accounting, automatic actions are associated with increased, or not, subjectivity during the process of the estimated useful life of an asset, the presentation of financial assets as Current, or not, Assets, the creation, or not, of possible future financial benefit from an intangible asset, the recognition of forecasts, etc. Correspondingly, controlled actions relate to obligatory, detailed processes of implementation of legislation at a national, EU and international level. Hence, the investigation of the proposed term 'Neurofinancial Accounting' in this study seeks to improve the way to address a large number of research/business problems that arise and can be resolved, to a significant degree, by Financial Accounting.

The Impact of Subjectivity on the Accounting Cycle of Each Fiscal Year

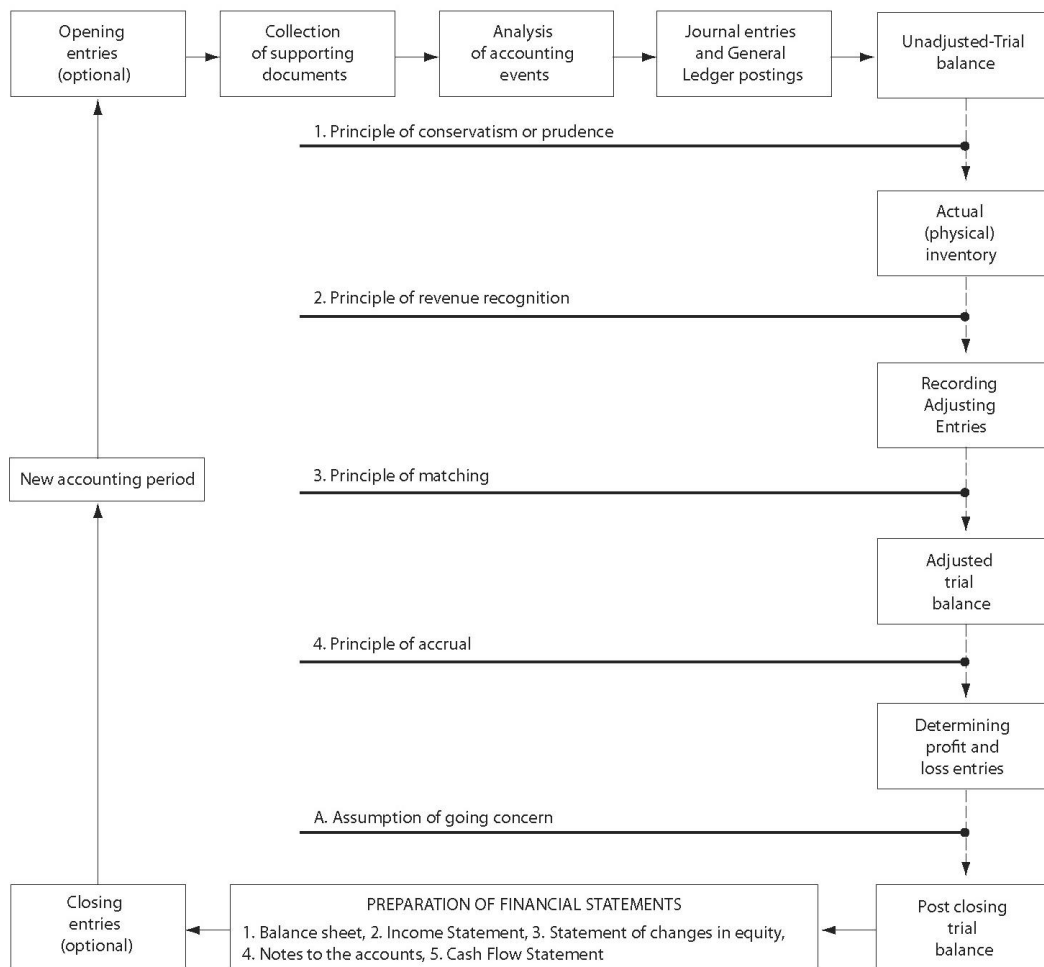
In Accounting, theory has a huge impact on the understanding, analysis and more rational solution of the relevant problems. On a theoretical level, the terms 'concepts', 'assumptions', 'hypotheses', 'rules', 'principles' and 'standards' are used with a wide divergence of views regarding their content and the formation of a single theoretical framework of Accounting. On a practical level, the aforementioned terms are largely treated as identical for the recording of economic events in account books and the preparation of financial reports.

Theory in Accounting does not stand out for the degree of rigor that characterizes other fields of Business Economics, since in the subject-matter of Accounting, the constantly changing environment and diversity of needs cast suspicion on even well documented conventional wisdom. The complexity of problems means methods that provide valid information must be chosen to gain a deeper and richer understanding of the socioeconomic framework of businesses, as well as to improve reporting and the likelihood of solving the aforesaid problems. Thus, the theoretical framework of Accounting, based primarily on generally accepted assumptions and principles, constitutes the distillation of many years of engagement and reflection on the part of all those involved in the theory and practical application of Financial Accounting.

As an Accounting Assumption one can adopt the heuristic method that consists in the formulation of a plausible conjecture to explain the operation of economic units, which must be verified by observation and may develop into a theory if it has scope and interpretive competence. Assumptions are formulated *ex ante* and, if verified, take on a generalized character that enables the development of Accounting Principles and 'rules' or 'guidelines' for their application in Financial Accounting.

All accounting operations of each fiscal year, resulting from subconsciously automatic or consciously controlled actions, are manifested as a systematic-cyclical sequence of processes which may be correlated with selected Assumptions-Principles as shown in Figure 1

Figure 1. Subjectivity in the accounting cycle



In Figure 1, Assumptions and Principles of Financial Accounting are selected, which contain, to some degree, subjective assessments and affect the amounts of entries in specific operations of the accounting cycle of each fiscal year, such as the actual (physical) inventory, adjustment entries, adjusted trial balance, profit or loss entries, and post-closing trial balance.

More specifically, according to the 1st principle, of conservatism or prudence, expenses should be recognized as soon as possible, revenue as late as possible, losses as soon as they are quantified and even if they have not yet been incurred, and gains only when they are realized and are no longer just a probability. In addition, revenues are recognized and recorded on the income statement for the period in which they are earned, while expenses and losses at the time they are discovered, anticipated or forecast, irrespective of whether they are incurred or not, as long as they relate to the fiscal year in question. In a word, less evidence is required to recognize possible losses as compared to possible gains.

The 2nd principle, of revenue recognition, arises as a result of the related periodicity assumption, the 1st principle and the 4th principle of accrued revenues and expenses (accrual accounting), and chiefly concerns the nature of the revenue and the point in time it should be recognized, particularly in respect of whether: a. the procedure for its sale has been completed or is soon to be completed, and b. the purchase price has been or is certain to be received (sales on credit) in the immediate future.

Given that the 2nd principle determines the time of revenue recognition, the 3rd principle, of matching expenses with revenues, determines the time when expenses are actually paid and constitutes the basis of the next principle, that of accrued revenues and expenses. Thus, the recognition of revenues precedes the recognition of expenses, while not ruling out cases of recognition of expenses without any revenues. Moreover, the presentation of the purchase or production cost (e.g. of goods or products) as an Asset item is based on the fact that the relevant expenses are associated with the corresponding revenues (e.g. sales of goods or products) which will be recognized in the future.

On the basis of the preceding two principles, the accounting result for the fiscal year is the difference between revenues, which are recognized in accordance with the 2nd principle of revenue recognition (when earned), and expenses, which are recognized in accordance with the 3rd principle of matching revenues with expenses.

This process constitutes the cornerstone of Financial Accounting, namely the principle of accrued revenues and expenses (4th principle), alternatively known as accrual Accounting, which has also been adopted by tax legislation for the taxation of the results of each fiscal year separately.

The 3rd and 4th principles, along with the periodicity assumption, constitute fundamental theoretical bases of Financial Accounting which are harmonized with accounting magnitudes by means of adjustment entries. These include, inter alia, depreciation of fixed assets based on their estimated useful life and impairment of fixed assets based on the relevant requirements of IAS 16, 36 (IASB 2012), which are then completed with the use of Asset and Liability suspense accounts.

Lastly, the A assumption of going concern affects both the choice of method for the valuation of balance sheet items and the usefulness of the monetary unit assumption, which is referred to in the next section, as well as the determination of the profit or loss and the assessment of credit risk. A risk associated with the entry (recognition) of provisions, provided they are obligating events, with a probable outflow of economic resources for which a reliable estimate can be made in accordance with IAS 37 (IASB 2012).

As for accounting magnitudes recorded through profit or loss entries, these are affected by the aforementioned subjective estimates, as well as by the possible payment of a satisfactory or not dividend. Regarding the preference of investors for dividends, Shefrin and Statman (1984), in the framework of mental accounting, had put forward two explanations:

- a. people divide their wealth into ‘capital’ and ‘income’ and consume only from income, i.e. dividends, so they prefer stocks which pay dividends.
- b. when there are alternative choices of distribution of either capital gains with or without dividends, or capital losses with or without dividends, investors choose the cases with dividends. According to Prospect Theory, the choice of dividend payment leads the investor to apply the principle of segregation. Whether usefulness increases or decreases is due to the segregation of gains or losses in different mental accounts of the investor.

And in this regard, many decades ago, Lintner (1956) had shown that companies do not decide on dividend payouts on the basis of maximizing the wealth of their shareholders, but instead use subjective perceptions about what is a fair return to investors.

The Impact of Subjectivity on the Preparation of Financial Statements

The culmination of processes in an accounting cycle at the end of each fiscal year is the preparation and publication (disclosure) of financial statements. Among these, the balance sheet and the income statement partly cover the financial reporting in respect of issues related to investing (size of fixed assets) and financing (size of loans, dividends) activities.

The balance sheet presents a ‘static image’ of the company and does not include the dynamics of the situation regarding changes in net worth or cash flows. The Cash Flow Statement supplements, without replacing, the aforementioned financial statement, while systematically presenting, in narrative form, the operating, investing and financing activities. At the same time, it serves as the link not only between successive balance sheets but also to the results of each fiscal year with the corresponding balance sheet, since it is prepared on the basis of two successive balance sheets, the income statement and the notes to the accounts.

According to IAS 7 ‘Statement of Cash Flows’ (IASB 2012), for a financial institution, interest paid and interest and dividends received are usually classified as operating cash flows. However, there is no consensus on the classification of these cash flows by other companies. They may be classified as operating cash flows because they enter into the determination of profit or loss. Alternatively, they may be classified as financing cash flows and investing cash flows respectively, because they constitute the cost of obtaining financial resources or the returns on investments respectively.

Moreover, dividends paid may be classified as a financing cash flow because they are a cost of obtaining financial resources. Alternatively, they may be classified as a component of cash flows from operating activities, so that users can determine the ability of a company to pay dividends out of operating cash flows.

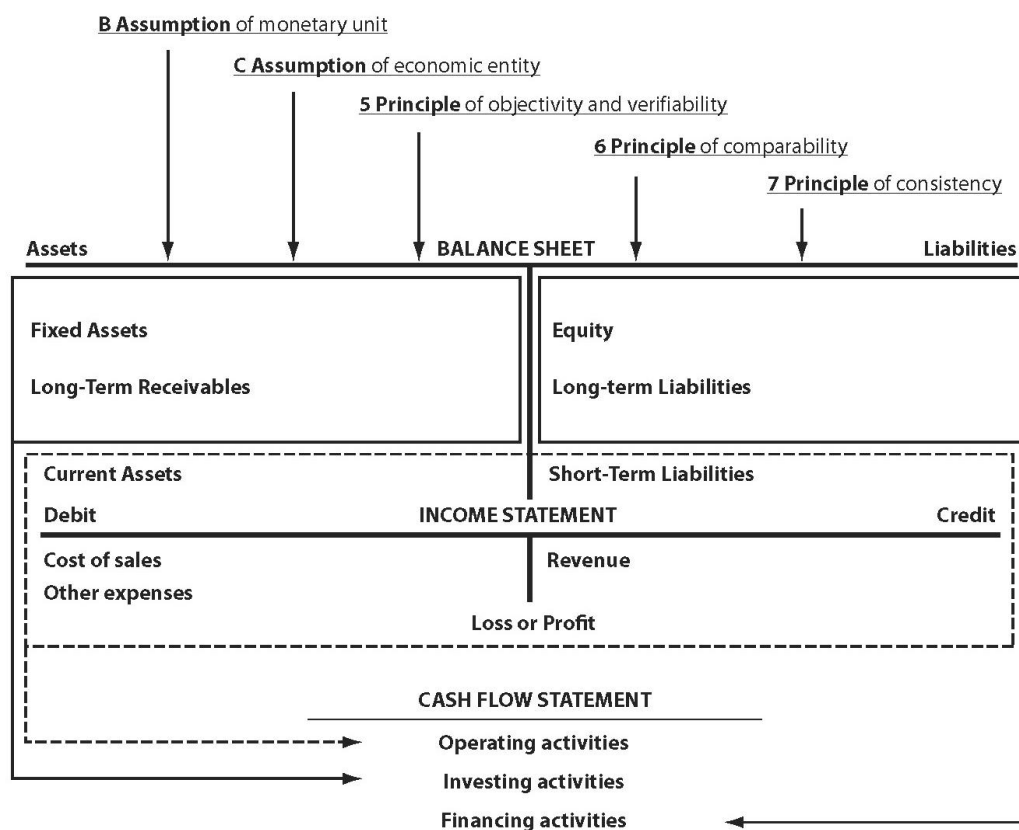
In addition, cash flows arising from taxes on income should be separately disclosed and classified as cash flows from operating activities unless they can be specifically identified with financing and investing activities.

The option of an alternative choice is also provided by Accounting Standards for financial assets in accordance with IFRS 9 (IASB 2012), since they may be presented on the balance sheet as non-current or as current assets,

depending on the intentions of the company’s management and their contractual or expected settlement date. These are characteristic indications which can be correlated with one of the three main themes of Behavioral Finance (Shefrin 2000) to which reference was made at the beginning of the section III, namely that of frame dependence. Its existence violates the traditional view of rational choice, which assumes that the information reporting frame does not influence an investor’s decision. In the specific cases of the Cash Flow Statement (CFS) and the picture of the Balance Sheet, traditional financial theory assumes that the rational investor possesses the skills to weigh up the alternative participation of accounting magnitudes between different CFS activities and different categories of Asset accounts. However, Tversky and Kahneman (1982) have shown that there are systematic changes in preferences when the same problem (e.g. CFS, Non-current or Current assets) is presented in a different way.

Following on from the above, the shaping of the three main financial statements, as the result of subconsciously automatic or consciously controlled actions, is presented by transferring the separate parts of the Balance Sheet and Income Statement to the creation of corresponding activities of the Cash Flow Statement which can be correlated with selected Principles-Assumptions as shown in Figure 2.

Figure 2. Subjectivity in financial statements



Apart from the previously mentioned information reporting frame which influences investor preferences (decisions), in Figure 2 the expansion of selected Principles and Assumptions of Financial Accounting contains, to some degree, additional subjective factors that affect the amounts recorded in certain accounts, such as tangible and intangible assets, debt instruments, reserves, provisions, dividends, retained earnings, depreciation, impairment and revenue.

In particular, with the B Assumption of monetary unit, from the systematized approach of Accounting to business entities, information is provided according to financial value, since it accepts money (e.g. in national or European currency) as the most appropriate unit of measurement and expression of the value of various items and transactions of the economic unit. This assumption is simple, generally accepted, widely understood, relevant for measurements and enables the display and aggregation of dissimilar items of financial statements. These include financial information, which is now of particular interest to the global financial system and is intended primarily to inform a company’s financial backers, who are chiefly interested in its financial position. Hence, following the

continuous two-way relationship between Accounting and the field of Finance in recent decades, the term 'Financial Statements' has come to prevail over 'Accounting Statements' and the term 'Financial Accounting' over 'General Accounting'. And it is no coincidence that International Accounting Standards (IAS) have since 2002 been renamed International Financial Reporting Standards (IFRS), a fact that influenced the titles of the relevant literature as well as the naming of the respective academic departments. Consequently, it is clear that a simple, but fundamental accounting assumption has contributed considerably not only to the systematization of accounting knowledge, but also to the search for new accounting research procedures in the framework of Behavioral Finance. According to the C Assumption of economic entity, the economic activities of a business entity are distinct and should be kept separate from those of its owners.

A problem frequently arises from a conflict of interests between managers and shareholders (and lenders), which in Finance is known as the 'agency problem' and causes the redistribution over time of part of the wealth at the expense of small investors. The problem is further exacerbated if combined with 'information asymmetry' in financial markets, where one of two contracting parties (e.g. an analyst) has more and/or better information than the other.

One important phenomenon ('anomaly') which cannot be explained by traditional financial theory and relates to the characteristics of a legal entity is the 'phenomenon of value'. It involves the behavior of three ratios: B/M (book-to-market value of a share), E/P (earnings-price ratio of a share) and CF/P (cash flow-to-price ratio of a share), which are calculated after publication (disclosure) of the Balance Sheet, Income Statement and Cash Flow Statement respectively (Baker and Wurgler 2012). According to Lakonishok, Shleifer and Vishny (1994), U.S. stocks with high B/M, E/P and CF/P ratios earn significantly higher returns, over time and on average, than stocks whose respective ratios are low (individually or in combination). They also looked at the performance of portfolios, either on the basis of stock market returns or on the basis of GDP, and found that in 'bad' states, high B/M stocks had higher returns than low B/M stocks, while in 'good' states, returns were at least the same. Fama and French (1998) extended their research beyond the USA and found similar results in many international markets: Japan, United Kingdom, France, Germany, Italy, Netherlands, Belgium, Switzerland, Sweden, Australia, Hong Kong and Singapore.

The above findings are based both on behavioral explanations, such as 'agency cost' and 'agency error', and on the behavior of analysts (Shefrin 2018). The latter are motivated by self-interest to promote 'popular' stocks (increase in commissions and investment business) and low B/M stocks (high market value) in sectors with growth prospects which enjoy greater mass media exposure, as opposed to low B/M stocks (low market value). Hence, they excessively promote an entity's prior growth rate, undervaluing high B/M stocks and overvaluing low B/M stocks, which, however, are not consistent with fundamentals or common sense. So, the use of heuristic rules is repeated for decision-making, which leads to additional errors and/or biased decisions.

In addition, according to the 5th Principle, that of objectivity and verifiability, the various measurements and the results deriving from them should be unbiased and auditable-verifiable. Unbiased measurements are those that are not influenced by subjective assessments and judgments, which is not exactly the case with certain accounting information that derives from subjective assessments, such as the valuation of reserves and debt securities, depreciation and provisions. Similarly, verifiable measurements are those that are based on evidence or supporting documents and ensure the correctness of their accounting treatment in any subsequent audit. This, however, is not possible in at least two cases, since Accounting Standards state, inter alia, that: a) for the correct classification of intangible assets in accordance with IAS 38 (IASB 2012), the main requirement is whether they will generate possible future economic benefits (Asset) or not (Expense) and b) deferred tax assets according to IAS 12 (IASB 2012) are recognized to the extent that it is probable and substantiated that taxable profit will be available against which the deductible temporary differences can be utilized.

Moreover, according to the 6th Principle, that of comparability of information, its combination with the consistency of accounting methods which follows below, relates not only to the statements of different companies (cross-sectional analysis) in the same accounting period, but also of the same company for different accounting periods (time series analysis), while the comparative information should also be included in the supplementary information or notes that accompany the financial statements. However, the margin for comparability is limited in the framework of Behavioral Corporate Finance, where behavioral biases and emotions are displayed by business people. They therefore put together, as investors, biased portfolios, since with the asymmetry of utilities which they incorporate in their gains and in their losses, it is highly likely that they will attach almost twice as much greater importance to losses than to gains.

Lastly, the 7th Principle, that of consistency, is inextricably linked to the 6th, since comparability of information requires that companies are consistent in their use of the same accepted accounting methods. However, the intertemporal and cross-sectional nature of financial statements is significantly distorted, since a change of method (e.g. valuation of reserves) or procedure (e.g. manner of calculating depreciation) is not ruled out, provided that the

new method or procedure better expresses the economic reality, is disclosed and its effects on the results divulged.

Conclusions

To the content of the three main themes of Behavioral Finance (Shefrin 2000), the following points are added in summary:

- a. Heuristic-driven bias. This relates to mechanical/non-rational decision processes displayed also by business persons (Shefrin 2001, 2006), which affects the corporate decision-making process.

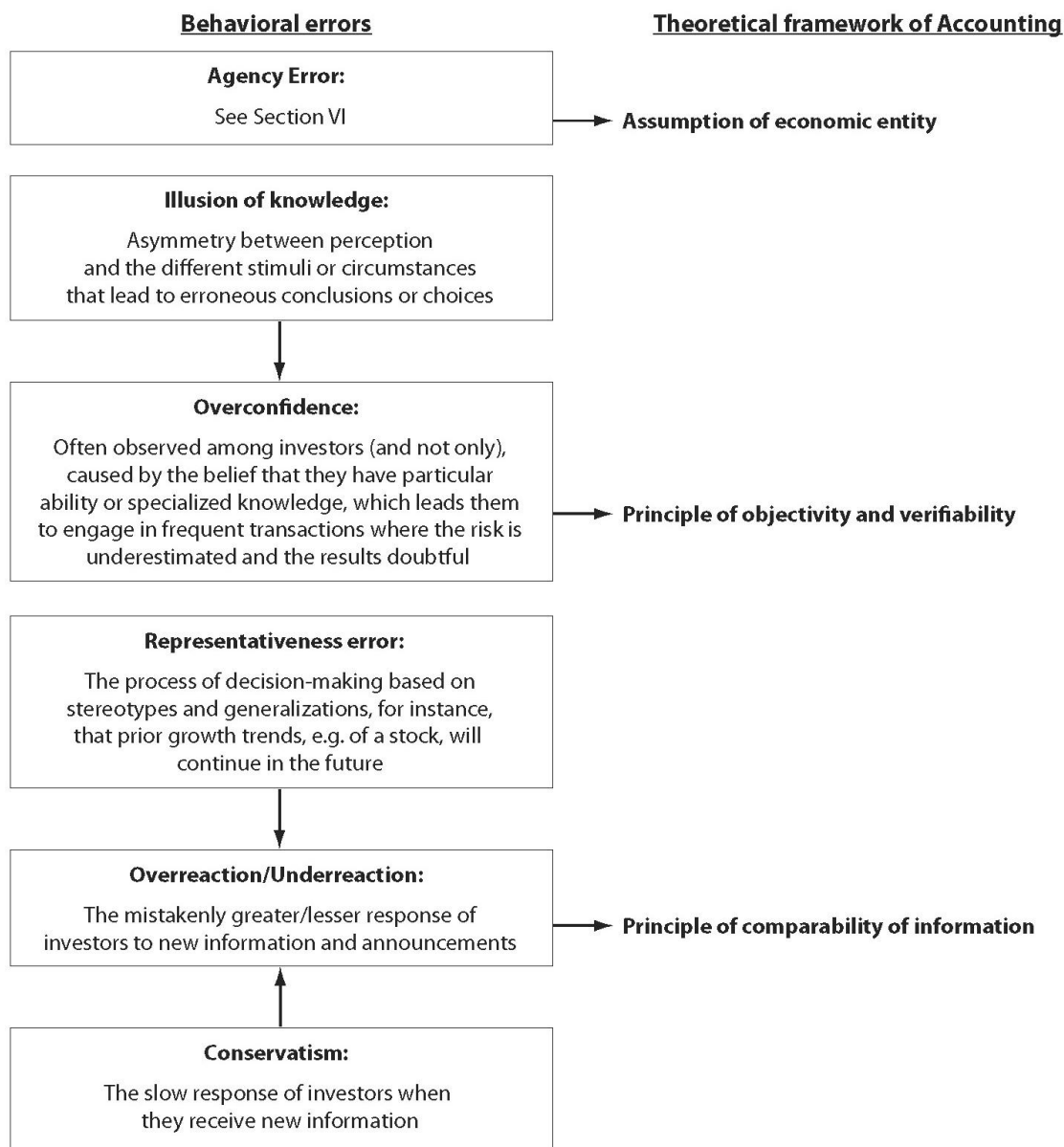
Overconfidence, positive illusions and optimism are behaviors that characterize not only investors, but also corporate managers to a significant degree. Thus, the actual cost of an investment may double in relation to what managers had budgeted (Merrow, Phillips and Myers 1981; Statman and Tyebjee 1985), while in a sample of 5,334 mergers and acquisitions in the UK (1980-2004), managerial overconfidence resulted in much lower stock returns (Doukas and Petmezas 2007).

- b. Frame dependence. This theme concerns the erroneous manner of formulating reporting information which is presented in a particular way during the process of evaluating investments (e.g. in securities) or investors. In the preceding section there was reference to alternative ways of presenting accounting magnitudes in different activities of the CFS and in different categories of Asset accounts. The manner of presentation, however, also affects perception of risk in investor choices of equity (mutual) funds primarily, and secondarily of fixed income funds when, for example, their prior performance is presented sometimes as a FTSE stock index and other times as percent yields (Diacon and Hasseldine 2007). A variation which affects the evaluation of risk in investment choices and, by extension, the ongoing concern assumption and the principle of comparability of information.

- c. Inefficient markets. Here, the focus is on indications of the existence of an inefficient market. In Section V there was reference, in the context of prospect theory, to investor preference for dividends and, in Section VI, to the 'phenomenon of value' with regard to the behavior of the B/M, E/P and CF/P ratios. These are affected in combination both by 'heuristic rules' and the misjudgment of investors who overlook some fact, e.g. that growth rates are transitory in the prices of certain stocks, with the result that investors overly extrapolate the prior growth rate into the future, without this being justified by fundamentals.

Apart from the above additional points, there should also be mentioned the subjectivity present not only in year-end entries, in calculations such as measurements or provisions, but also in the preparation of the balance sheet or income statement in respect of matters such as the recognition of intangible assets or deferred tax assets. Moreover, there may, as a supplementary step, be shown in Figure 3 indicative cases of behavioral errors with the corresponding indicative impacts on one Assumption and two Principles of Financial Accounting.

Figure 3. Indicative cases of behavioral errors in Accounting



As research interest in Behavioral Finance continues to grow, in Financial Accounting the constant improvement and development of procedures, rules and guidelines, the gradual adoption of International Financial (Accounting) Reporting Standards and the systematic co-existence of decisions of different supranational organizations such as the International Accounting Standards Board and the Basel Committee (Papadeas, Hyz and Kossieri 2017) are strengthening (enriching) the application/adjustment of its Assumptions and Principles.

Furthermore, the contribution of Neurofinance to Accounting can be correlated with the capacity to provide adequate indicators of financial activity which incorporate conclusions about human behavior. At the same time, the input of technology is expected to improve our knowledge about the function of the brain, the most complex structure in the universe, which may help establish more consistent theories of financial behavior. The findings to date have created an interesting framework for the measurement of activity during the learning process and the creation of relevant rules or stereotypes.

The examination of the proposed term ‘Neurofinancial Accounting’ in this study is aimed at connecting the aforementioned research endeavors involving the investigation of common themes that extend from the complexity of financial conditions to the content of International Accounting Standards, without creating a new field or sub-field of knowledge. In the globalized stock market environment, the constant, voluminous and specialized provision of economic information from financial statements could be presented in a manner that is more relevant, comprehensible, verifiable, neutral, adequate, comparable, complete and significant. Undoubtedly, Accounting information is now a social good, the quality of which is of key importance for business administration, decision-making, resource allocation, market transparency and the functioning of the economy. The investigation of the subjective factors of Financial Accounting is expanding its boundaries, while the systematic use of its two-way relationship with the field of Neurofinance (unbiased data) may create a broader, single framework of knowledge for the improvement of the investment process, through a better understanding of the methodology required by accounting operations and rules up until the preparation of financial statements (Bergner, Peffer and Ramsay 2016). By extension, a better understanding of how financial markets operate will be beneficial not only for governments wishing to promote savings incentives and responsible management, but also for supervisory authorities seeking to ensure that the market for personal financial services operates rationally and without bias (AICPA 2014).

References

- Alexakis, C., and M. Xanthakis. 2008. *Behavioral Finance*. Athens, Greece: Stamoulis Publications. (In Greek).
- American Institute of Certified Public Accountants/AICPA. 2014. *Code of Professional Conduct*.
- Baker, M., and J. Wurgler. 2012. Behavioral Corporate Finance: A Current Survey. In *Handbook of the Economics of Finance*, vol. 2, edited by G. Constantinidis, M. Harris and R. Stulz. Elsevier Press.
- Barber, B., Y. Lee, Y. Liu, and T. Odean. 2007. Is the Aggregate Investor Reluctant to Realise Losses? *Evidence from Taiwan. European Financial Management* 13: 423-447.
- Barberis, N., A. Shleifer, and R. Vishny. 1998. A model of investor sentiment. *Journal of Financial Economics* 49: 307-345.
- Benartzi, S., and R. Thaler. 1995. Myopic loss Aversion and the Equity Premium Puzzle. *The Quarterly Journal of Economics* 110(1): 73-92.
- Bergner, J., S. Peffer, and R. Ramsay. 2016. Concession, contention and accountability in auditor-client negotiations. *Behavioral Research in Accounting* 28(1): 15-25.
- Birnberg, J. 2011. A proposed framework for behavioral accounting research. *Behavioral Research in Accounting* 23(1): 1-43.
- Birnberg, J., and A. Ganguly. 2012. Is neuroaccounting waiting in the wings? An essay. *Accounting, Organizations and Society* 37: 1-13.
- Camerer, C., G. Loewenstein, and D. Prelec. 2005. Neuroeconomics: How neuroscience can inform economics. *Journal of Economic Literature* 43(1): 9-64.
- Diacogiannis, G., and T. Bratis. 2010. Neurofinance: A collaboration of psychology, neurology and investor behavior. *SPOUDAI – Journal of Economics and Business* 60(3-4): 35-57.
- Diacon, S., and J. Hasseldine. 2007. Framing effects and risk perception: The effect of prior performance presentation format on investment fund choice. *Journal of Economic Psychology* 28: 31-52.
- Doukas, J., and D. Petmezas. 2007. Acquisitions, overconfident managers and self-attribution bias. *European Financial Management* 13: 531-577.
- Fama, E., and K. French. 1998. Value versus growth: the international evidence. *The Journal of Finance* 53: 1975-1999.
- Fennema, M., and L. Koonce. 2010. Mental Accounting in Financial Reporting and Voluntary Disclosure: 11-13. *SSRN Electronic Journal*. Available at SSRN: <https://ssrn.com/abstract=1717078> or <http://dx.doi.org/10.2139/ssrn.1717078>
- Frydman, C., S. Hartzmark, and D. Solomon. 2018. Rolling mental accounts. *Review of Financial Studies* 31(1): 362-397.
- Griffin, D., and A. Tversky. 1992. The weighing of evidence and the determinants of confidence. *Cognitive Psychology*. 24(3): 411-435.
- Grigorakos, T. 2013. *Analysis – Interpretation of the Greek General Accounting Plan*. Athens, Greece: A. Sakkoulas Publications. (In Greek).
- Hopwood, A. 1989. Behavioral accounting in retrospect and prospect. *Behavioral Research in Accounting* 1:1-22.
- International Accounting Standards Board. 2012. *IAS 7, 12, 16, 36-38, IFRS 9, IASB*. London.
- Jordan, D., and J. Diltz. 2004. Day Traders and the Disposition Effect. *The Journal of Behavioral Finance* 5: 192-200.
- Kahneman, D., and A. Tversky. 1979. Prospect Theory: An Analysis of Decision under Risk. *Econometrica* 47: 263-291.

- Köszegi, B., and F. Matějka. 2020. Choice simplification: A Theory of Mental Budgeting and Naive Diversification. *The Quarterly Journal of Economics* 135(2): 1153-1207.
- Kutluk, F. 2017. Behavioral Accounting and its Interactions. In *Book Accounting and Corporate Reporting - Today and Tomorrow*, chapter 11, 192-207. IntechOpen.
- Lakonishok, J., A. Shleifer, and R. Vishny. 1994. Contrarian Investment, Extrapolation, and Risk. *The Journal of Finance* 49(5): 1541-1578.
- Lintner, J. 1956. Distribution of incomes of corporations among dividends, retained earnings and taxes. *American Economic Review* 46(2): 97-113.
- Locke, P., and S. Mann. 2005. Professional trader discipline and trade disposition. *Journal of Financial Economics* 76: 401-444.
- Morrow, E., K. Phillips, and C. Myers. 1981. *Understanding cost growth and performance shortfalls in pioneer plants*. Santa Monica, CA: RAND.
- Papadeas, P. 2005. Tax Provisions for Listed EU Companies and Subjectivity. *Journal of Finance Informatics* 1(1): 54-63.
- Papadeas, P., A. Hyz, and E. Kossieri. 2017. IAS Basel: The contribution of losses to the banks' capital adequacy. *International Journal of Business and Social Research* 17(2): 1-13.
- Paul, I., J. Parker, and S. Dommer. 2017. *Don't forget the accountant: Role-integration increases the fungibility of mentally accounted resources*. Working Paper, Georgia Tech, Scheller College of Business, and Georgia State University.
- Philippas, N. 2015. *Market Psychology*. Athens, Greece: Pediobooks. (In Greek).
- Report of the Committee on the Relationship of Behavioral Science and Accounting. 1974. *Accounting Review* 49: 127-139 (Committee Reports: Supplement to volume XLIX of the Accounting Review).
- Rogow, R. 1989. Book Review of "Belkaoui, A. Behavioral Accounting: The Research and Practical Issues: 1-178" Westport, CT: Quorum Books. In: Kunin, T. 1990. *Personnel Psychology, Book Review Section* 43(2): 438-442.
- Shefrin, H. 2018. Valuation Bias and Limits to Nudges. *The Journal of Portfolio Management* 45(5): 112-124.
- Shefrin, H. 2000. *Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing*. Harvard Business School Press.
- Shefrin, H. 2001. Behavioral Corporate Finance. *Journal of Applied Corporate Finance* 14(3): 113-124.
- Shefrin, H. 2006. *Behavioral Corporate Finance*. New York: McGraw-Hill/Irwin.
- Shefrin, H., and R. Thaler. 1988. The Behavioral Life-Cycle Hypothesis. *Economic Inquiry* 26(4): 609-643.
- Shefrin, H., and M. Statman. 1984. Explaining investor preference for cash dividends. *Journal of Financial Economics* 13(2): 253-282.
- Shefrin, H., and M. Statman. 2000. Behavioral Portfolio Theory. *Journal of Financial and Quantitative Analysis* 35(2): 127-151.
- Spyrou, S. 2009. *Introduction to Behavioral Finance*. Athens, Greece: Benou Publishing. (In Greek).
- Statman, M. 2005. Normal investors, then and now. *Financial Analysts Journal* 61: 31-37.
- Statman, M., and T. Tyebjee. 1985. Optimistic capital budgeting forecasts: an experiment. *Financial Management* 14: 27-33.
- Thaler, R. 1980. Toward a Positive Theory of Consumer Choice. *Journal of Economic Behavior and Organization* 1(1): 39-60.
- Thaler, R. 1985. Mental Accounting & Consumer Choice. *Marketing Science* 27: 15-25.
- Thaler, R. 1999. Mental Accounting Matters. *Journal of Behavioral Decision Making* 12: 183-206.
- Tversky, A., and D. Kahneman. 1982. Evidential Impact of Base Rates. In *Judgment under Uncertainty: Heuristics and Biases*, edited by Kahneman, D., P. Slovic, and A. Tversky. Cambridge University Press.
- Zhang, C., and A. Sussman. 2018a. Perspectives on mental accounting: An exploration of budgeting and investing. *Financial Planning Review* 1(1-2): 18-21.
- Zhang, C., and A. Sussman. 2018b. The role of mental accounting in household spending and investing decisions. In *Client psychology*, edited by C. Chaffin, 65-96. NY: Wiley.