# FROM SCHRÖDINGER'S CAT TOWARDS A QUANTUM APPROACH OF ACCOUNTING ESTIMATES, JUDGMENTS AND DECISION MAKING

Motto: *All is alive, all is interconnected*
*Cicero*

**Victoria Bogdan**
University of Oradea, Faculty of Economics
victoria.bogdan10@gmail.com

***Abstract*** *This initiative proposes an approach to professional accounting judgment and decision-making process from the perspective of quantum probability theory. Thus, we have considered human cognitive system, a system that functions as a quantum system, and have defined the quantum probability wave (using the Schrödinger equation and his experiment with the cat) as accounting knowledge wave, because just like a quantum particle, accounting estimates and judgments are influenced by stochastic processes. Accounting estimates and judgments are continually evaluated and are based on management experience and other factors, including the expectations of future events that are considered reasonable in the circumstances. The uncertainty and / or the risk associated with these assumptions and estimates may generate results different than the initial estimates, and may lead to significant adjustments to the accounting value of assets and liabilities in future periods. The professional judgment in the last decades of accounting modernization is more frequently invoked in the preparation of financial statements and the process of making decisions regarding accounting policies and treatments. Considering KPMG Professional Judgment Framework as being complex, consistent and refined, we have defined a set of endogenous and exogenous variables which, in our opinion, influence the exercise of a professional accounting judgment optimally. However, research in cognitive psychology has demonstrated that our judgments tend to be influenced subconsciously by biases related to self-interest and by the use of mental shortcuts (KPMG, 2011). Moreover, the agents i.e. people, professional accountants in our case, act in bounded rationality when making decisions and are pressed for time, they are constrained by restrictions of the regulatory system, environment and of course, they reason having certain cognitive abilities. Taking into account all these, we believe that quantum probability and quantum modeling of human cognition could be an attempt to find solutions to improve professional judgments in accounting and make high quality decisions. The likelihood of events can be estimated using quantum probability and thus minimizing the risk of errors of judgment and professional reasoning in conditions of bounded rationality.*

**Key words:** *quantum probability theory, Schrödinger's equation, accounting estimates, judgments, decision-making, accountant, knowledge, exogenous and endogenous variables*

**JEL classification: M41, D81, D83, C44**

## 1. Introduction. Quantum dynamics and human cognition and decision

Nowadays everything is in a continuous dynamics, events seem to flicker and are frequently characterized by an oscillating evolution. Yet, in addition to this chaotic

and effervescent dynamic chaotic we easily identify a lot of links and connections between areas of science, in search of those answers that provide more light on the purpose or reconfiguration of some issues more or less investigated in some areas. In previous studies, Bogdan et al (2009), Balaciu et al (2014), Bogdan, Meşter and Popa (2015) and Bogdan, Ban and Tara (2015), we investigated possible connections of human psychology with accounting, we analyzed the behavior of the potential user of financial and accounting information in conjunction with certain psychological factors and we tested the impact of endogenous variables on the professional accounting judgment, using empirical experimental studies. Our previous efforts converge towards one working hypothesis which will be further explored, the quantum interpretation of the estimates, assumptions and professional accounting judgment in case of exposing the company to risk, uncertainties and other vulnerabilities related to capital management. Based on those described by Akerlof and Schliller (2009), Kahneman and Tversky (1979), Kahneman (2011), Koonce and Mercer (2005), Libby and Luft (1993), we make the following assumptions or working hypotheses from which we start in our approach: the continuous nonlinear and sometimes chaotic dynamics of economy is explained by its sensitivity to the influence of political, socio-cultural, demographic, environmental factors and by the action of animal spirits that is endogenous human traits; the need to adapt accounting and financial reporting to the challenges generated by the continuous dynamics of the economy; the increasing need to improve the management decision-making performance in the corporate act; the awareness of psycho-sociological factors that are influencing the quality of the management decisions and determines the limited rational thinking (bounded rationality); taking risks and becoming aware of the awareness in the exercise of judgments and decisions; the assimilation of prospect theory and its implications; the need to study the behavior of users of financial and accounting information to improve the financial reporting system. Also, the current concern of researchers from various fields can be considered a working premise related to exploring the fundamental principles of physics and quantum mechanics and testing their applicability in biology, psychology, philosophy, IT, medicine, economics, finance, etc. Thus, studies conducted by Haven (2005), Choustova (2007), Nastasiuk (2014), Dima, Paşca and Preda (2015), using the principles and concepts of mechanics or quantum physics describes the stochastic processes generated by the price dynamics of the financial instruments traded on the market capital. Dima, Paşca and Preda (2015) use the Schrödinger's equation and Hamilton-Jacobi model as tools in the construction of the *'financial wave*' concept. By the model proposed by them the changing in the investor behavior can be studied in terms of its reaction to changes in stock prices and other financial instruments traded on the capital market. On the other hand, Busemeyer and Bruza (2012) bring their contribution to the development of quantum theory with application in the field of psychology and cognitive thinking, analyzing the significant aspects of the application of quantum theory in decision making, the exercise of judgment, presenting modeling of the human cognitive process in processing the information using the quantum information theory. In Busemeyer and Wang (2014) we find explanations concerning the applicability of quantum theory in psychology, the details of the construction of a quantum model of decision and the step by step description of the application of the quantum theory in psychology. Of interest to us are the six arguments described and presented by Busemeyer and Trueblood

(2011) supporting the quantum approach to human cognitive system. According to the authors, these arguments are: superposition state; sensitivity to measurement of the cognitive system; quantum concept of measurement incompatibility; human judgments do not always obey classical laws of logic and probability; quantum probability does not assume the principle of unicity; quantum concept of entanglement. White, White, Pothos and Busemeyer (2015) argued that many researchers have questioned in the last decades the relevance of the classicalal rational model and classicalal probability theory in modelling human decision making, especially in the case of applied decision making situations, as those relating to risk and loss aversion (Wakker, 2010). As a result, it has been proved that decision makers operate within the limits of „*bounded rationality*" so quantum probability theory has gained field in the attempts of measurements of human judgments and decisions. White, Pothos and Busemeyer (2015) noted that quantum proabiblity theory is a formal framework for how to assign probabilities to events and so it is possible to develop some normative arguments for quantum probability theory, analogous to those for classicalal proability theory (Pothos and Busemeyer, 2014). We agree with White, Pothos and Busemeyer (2015) that models based on rational analysis and *classicalal probability theory* offer the best prescription for *how decisions should be made* while *quantum probability* deliver models for *how decisions are made*. In Schiller (2013) we find that the judgments and intentions produced by the automatic thinking system can be modified and polished by the system of reflective thinking there being a direct interrelation between intuition and judgment. This makes interesting and provocative the study of accounting judgments from a heuristic perspective and that of biases. Analyzing in-depth the cognitive processes we can find out and learn more about how professional accountants judge different events, transactions and how the professional accounting judgment that assigns an appropriate accounting treatment which lies at the basis for management decisions is exercised. In this respect, Schiller's attention (2013), to demonstrate the above is aimed at analyzing the accounting judgments targeting the internally generated intangible assets. This paper aims to present the possibility of applicability of quantum theory in analyzing the professional accounting judgment starting from the assumption that the cognitive system of the professional accountant behaves like a quantum system. Thus, unlike the original classical state of certain events, transactions or estimates on certain circumstances, any further entry of information, forming, the *accounting knowledge wave* can change the initial state and may influence the exercise of the accounting judgment. The central objective of this paper is to identify the accounting options that involve risks, uncertainties, various assumptions, estimates, lending to bounded rationality and prediction or judgment errors.

**2. Probability wave, *Schrödinger's cat and accounting knowledge***

According to Presura (2014), if we want to quantify any system, we must stock all the possible classical states of the system, and for each classical condition we have one complex number whose module gives essentially the probability of finding the system in that state classical. Thus, all *these complex numbers ψ is called the probability wave of the system or the wave function* (Presura, 2014). Thus, the behavior of a quantum system is given by its probability wave, also called a quantum wave function (Presura, 2014). The first to find an equation of the evolution of the probability wave was the physicist Erwin Schrödinger (1887-1961),

in 1926, for which he was awarded the Nobel Prize in 1933 (Presura, 2014). He obtained the equation called the *Schrödinger equation and it describes how the probability wave of the electron evolves over time*. Erwin Schrödinger, one of the founders of modern quantum theory, became famous due to its story with the cat in the box, which throws light on the quantum superposition, one of principles of quantum theory. Thus, Schrödinger's cat, according to quantum theory, may be simultaneously dead and alive until our observation makes it either be dead or alive. (Rosenblum and Kuttner, 2011). Yet, *between measurements we have a wave of probability.*

***Who is Schrödinger's cat?***

Schrödinger's cat is a common cat which is in a box with a radioactive atom. Of course, before placing the cat in the box and close the box tightly, the cat is alive. After closing the box, however, and as long as we do not look in the box (therefore no observer intervenes – the human agent), the cat is in a quantum superposition of two classical states Presura (2014): / *atom- not-disintegrated; alive cat*> *and* / *atom-disintegrated; dead cat*>. When we open the box, we find only one of two classical states and the probability wave will collapse, describing only that classical state. To an observer, the cat will be either live or dead, and the quantum superposition state will be lost (Presura, 2014). Therefore, as long as there is the margin of uncertainty, the uncertainty of classical states, we are in *a quantum superposition and the probability wave that will contain complex numbers, one for each classical state could be measured*. Between measurements we must consider only the probability wave. If we admit that the human cognitive system behaves like a quantum system then Schrödinger's equation can describe *how the probability wave of the accounting estimates and judgments to be processed by the human cognitive system evolves over time* in relation to the state of knowledge.

**Schrödinger's equation**

Schrödinger's equation takes different forms[2] that depend on the physical situation under review for a general quantum system it is

$$i\hbar\frac{\partial}{\partial t}\Psi(\mathbf{r},\,t) = \hat{H}\Psi(\mathbf{r},t)$$

where:

$i$ is the imaginary unit

$\Psi(\mathbf{r},t)$ isthe wave function

$\hbar$ is Planck's reduced constant

$\hat{H}$ is the Hamiltonian operator in quantic mechanics describing the total state of energy of the system.

The adoption of a vector space instead of a sample space to represent events may be the most important assumption that is made in the application of quantum theory to psychology (Busemeyer and Wang, 2014). In quantum theory, the system under investigation is represented as a unit lengh vector, |ψ>, in the Hilbert space and as Busemeyer and Wang (2014) explained, in physics the system often refers

[2] https://ro.wikipedia.org/wiki/Ecua%C8%9Bia_lui_Schr%C3%B6dinger/15.02.2016

to a particle, but in psychology the system usually refers to a person. Thus, Busemeyer and Wang (2014) noted that the state vector |ψ>, can be expressed as a linear combination of the basis vectors and the coordinates of the state vector with respect to a basis are called the amplitudes. The purpose of using quantum theory for both physicists and psychologists is to predict the probability of events (Busemeyer and Wang, 2014). In physics, the state of the system changes following a measurement but Busemeyer and Wang (2014) highlighted that the same process occurs in psychology – asking a question and deciding on a definite answer changes the state of the person. If we take into account that the human cognitive system consists of the automatic / intuitive system and the reflective / rational system representing a dynamic system that supports as a whole the endogenous and exogenous influences, we notice that it behaves like a quantum system when faced with the risks, uncertainties, ambiguities, vagueness, vulnerabilities or turbulence generated by events. As noted by Demski et al. (2006), making the analogy to quantum information, all uncertainties cannot be resolved and the presence of accounting measurements affects the entity and its manager. Thus, if we accept the idea that the human cognitive system behaves like a quantum system in what we analyzed, it results:

$\Psi(\mathbf{r},t)$ the wave function of accounting estimates

$\hat{H}$ the Hamiltonian operator describing the knowledge state of the system

**Probability wave of accountant's knowledge**

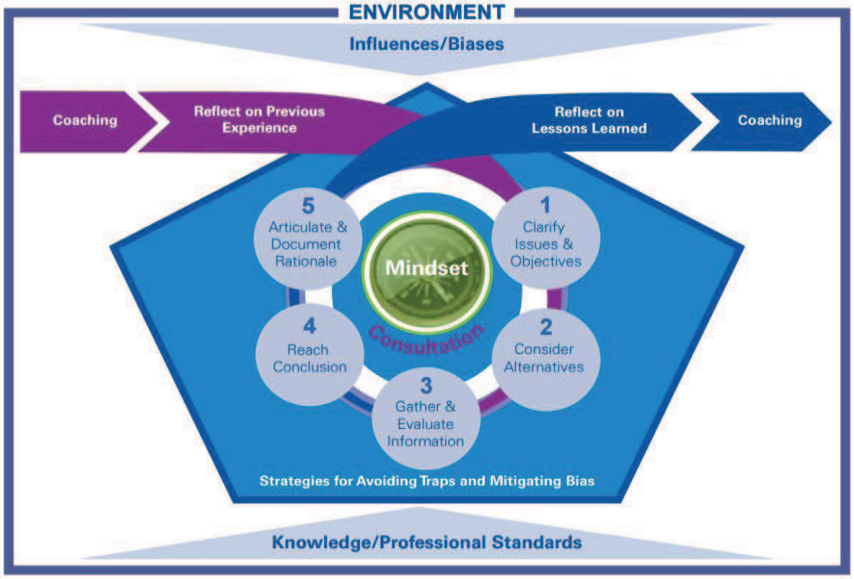
Tversky and Kahneman (1983), Tversky and Shafir (1992) and others have demonstrated that the cognitive system is generally sensitive to environmental statistics, but is also routinely influenced by heuristics and biases that can violate the prescription from probability theory. This position has had a massive influence not only on psychology, but also on management sciences and economics (Pothos and Busemeyer, 2009). Based on two experimental tasks in psychology (the two stage gambling game and the Prisoner's dilemma game) that show the fact that people violate the sure thing principle of decision theory, Pothos and Busemeyer (2009), argued that quantum probability provides better framework for modelling human decision making and a quantum probability model, based on a Hilbert space representation and Schrödinger's equation, provides a simple and elegant explanation of this behavior. The authors considered (Pothos and Busemeyer, 2009), that the main problems in developing a convincing cognitive quantum probability model are to determine an appropriate Hilbert space and Hamiltonian. Like a quantum particle, the accounting estimates and judgments are influenced by stochastic processes. The estimates and judgments are continually evaluated and are based on the management experience and other factors, including the expectations related to the future events that are considered reasonable in the those circumstances. However, the uncertainty related to these assumptions and estimates may generate different results from those estimates and may result in significant adjustments of the book value of the assets and liabilities in future times. Thus, started from Busemeyer and Wang (2014), we can assume that receiving an information and choosing between the accounting options in order to decide on an adequate accounting treatment for the event, changes the state of the professional accountant judgment. Moreover, we consider that in these conditions the professional accountant's knowledge can be characterized as a superposition

state, with respect to particular information, which means that precise values for the corresponding information do not exist, until a measurement is made.

### 3. Accounting judgments and decisions in a quantum view

Professional judgment is a key skill for prepares, auditors and regulators of financial statements, especially under a principle-based accounting regime, but making a judgment can be difficult and there is not necessarily one correct answer (ICAS, 2012). Accounting professional judgment refers to a process where the accountants use their professional knowledge to judge and select daily accounting work related to enterprise operation features in accordance with accounting standards and accounting system (Yufang Qi, 2014). Judgment is the process of reaching a decision or drawing a conclusion where there are a number of possible alternative solutions (KPMG, 2011). Making judgments can be distinguished from making decisions. Decision making involves the act of choosing among options or alternatives (KPMG, 2011) while judgment involves the process of forming an opinion or evaluation by discerning and comparing (Webster's 11th). Thus, judgment is a subset of the process of decision making and generally many judgments are typically made in coming to a decision. Also, as the judgments become more complex, difficult and more important it is crucial to have a framework to guide the person in the process. We considered the KPMG Professional Judgment Framework (2011) one of the finest framework due to its complexity, utility and consistency. The Framework includes a number of components (see figure no. 1), such as mindset, consultation, knowledge and professional standards, influences and biases, reflection and coaching (KPMG, 2011).

**Figure no. 1 KPMG Professional Judgment Framework**




*Source: The KPMG Professional Judgment Framework 2011*

As we all know reasoning, judgments and decision making are mare by humans. But humans are humans…not always rational. As we have pointed out in Bogdan,

Ban and Tara (2015) our choice and decisions in life are shaped by different factors like: personal and professional profile, experience, beliefs, knowledge and not least the *"patterns"* existing in society or the so-called *"herd instinct"* or the *"wave"* which many times makes its presence felt. The table presented bellow describes the variables/factors that, in our opinion, are likely to influence the exercise of a professional judgment in accounting. Some of the variables can be pitfalls of an optimal professional judgment but all have an impact on the quality of reasoning and judgments and ultimately on decisions.

**Table no. 1 Variables affecting professional judgment and decision making in accounting**

| Exogenous variables | Endogenous variables |
|---|---|
| • Time pressure - deadlines | • Age and gender |
| • Environmental stress | • Specialized studies and educational status |
| • Climate job | • Professional status |
| • Limited resources | • Work experience |
| • Regulatory system | • Personality traits |
| • Client needs and satisfaction | • Self-interest |
| • Managers expectations | • Incentives |
| • Industry or type of activity | • Cognitive abilities |
| • Disclosure requirements | • Judgment traps |
| • Requirements of professional accounting bodies regarding training, education and improvement of skills | • Patterns and judgment shortcuts |
| • Other socio-demographic, economic, cultural and political factors | • Other intrinsic factors that influence reasoning, judgment and decision making related to accounting and financial reporting issues |

*Source: Own projection and opinion inspired by KPMG (2011)*

Research in cognitive psychology has demonstrated that our judgments tend to be influenced subconsciously by biases related to self-interest and by the use of mental shortcuts (KPMG, 2011). As Franco (2009) wrote, in general, an agent (a person which make decisions), acts in bounded rationality regime when there is a limited time in which to make decisions, or when he is also limited by schemas and other decisional limitations. So, as a result, decisions are not fully thought through and they are rational only within limits such as time and cognitive capability (Franco, 2009). There are two major causes of bounded rationality, the limitations of the human mind, and the structure within the mind operates (Franco, 2009). Since it has been shown that bounded rationality impacts decision models it is merely an illusion to assume that agents are fully rational when they are making judgments and decisions. Taking into account all these we believe that quantum

probability and quantum modeling of human cognition could be an attempt to find solutions to improve professional judgments, free of errors and biases, and make high quality decisions. We could predict the probability of events that could generate errors or judgment traps.

## 4. Discussion about accounting issues suitable to quantum modeling of accounting estimates

To demonstrate the quantum approach to accounting estimates, judgments and decisions, we consider the case of contingent liabilities and changes of accounting estimate.

**Example 1:**

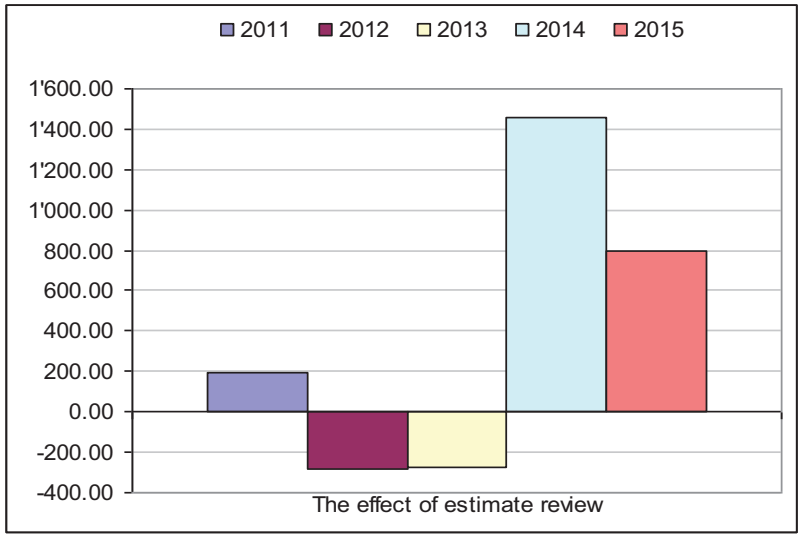
ALFA company is defendant in a copyright infringement lawsuit. At 31.12.N, the probability of loss of the process is estimated to 75%. The dispute is only in the initial stage and the company would have remedies that would allow the deferral of payment of damages by about 2 years. At this time, ALFA cannot reliably estimate the amount of debt that will have to pay. At 31.12.N + 1, ALFA is notified that it has to pay in year N + 2, 2,000,000 m.u. damage as a result of having lost the dispute.

**The quantum approach of accounting estimates:** At the time the company was notified on the dispute, *the accounting estimate is in a quantum superposition* for the estimate at this time may lead to future accounting recognition of certain debts, a provision or contingent liabilities. At 31.12.N, it is estimated the probability of loss of the trial by the managers and in terms of accounting they check the recognition criteria of a provision, the certain debt cannot be recognized due to the fact that the dispute is only in its initial phase. Thus, there is an obligation generated by a previous event, the copyright infringement, the likelihood to make payments in order to clear off the debt is clearly due to the fact that the dispute is in progress yet a reasonable and credible estimate of the debt to be paid in the future cannot be made. At this moment since the professional accountant has new information, the probability wave of the initial accounting estimate collapses and having not met the three criteria for recognition of the provision, will identify a contingent liability that will not be accounted for, in accordance with IAS 37, but will be subject to notification in the explanatory notes to the financial statements. At 31.12.N + 1, new information is known on progress made and the contingent liability. From the perspective of the existing accounting estimate at 31.12.N, all the new information bring to the attention of the professional accountant the recognition criteria of the provision for litigation. Since, at this date it can be estimated the debt on payment of damages, it may be recognized in accounting the provision in the amount of 2,000,000 m.u. At N + 2, at the time of payment of damages owed and bearing the legal costs, the provision recognized in N + 1 will be cancelled, registering the actual expense that will directly affect the result of the year N + 2. Thus, information on events ranging from N to N + 2, in our case, form the *knowledge wave*, which acts as a force as it leads to changes in the accounting treatment from one period to another. In circumstances of uncertainty, we find ourselves in the quantum superposition of the accounting estimate yet evolving from one accounting period to another, each new measurement of the information changes the quantum system that is the accounting judgment.

**Example 2:**
At the beginning of year N, we suppose that EPSILON company acquired technological equipment at the cost of 20,000 lei. The duration utility is estimated to be 20 years and depreciation is calculated with the linear method. During the life of the equipment the following revaluations were made: a) at the end of year N + 2 when the fair value of the asset was 25,000 lei. At the end of N + 3 the duration utility is re-estimated at 19 years (16 years remaining); b) at the end of N + 4 when the fair value of the asset was 20,000 lei; at the end of N + 5, the duration utility is re-estimated at 15 years (10 years remaining). **The quantum approach of accounting estimates:** If the case of this accounting treatment of events producing changes on the value of tangible asset is one which involves a classic behavior from the perspective of the professional accounting judgment to year N + 3. Following the revaluation of the technological equipment at the end of N + 2, the depreciation of the asset is rethought and recalculated, therefore all the depreciation parameters are reconsidered: the depreciable amount, the asset's useful life and the depreciation method. At this time the *accounting estimate is in a quantum superposition because the change in estimate of useful life remaining is not yet known*. In year N + 3, following a change in estimate and rethinking the useful life remaining, the quantum collapse occurs and the accounting treatment of the change in estimate is certain, of a prospective manner (IAS 8). In year N + 4 at the end, there is a new revaluation of the equipment which requires rethinking and recalculation of the depreciation, implicitly of all its parameters. Again, the *accounting estimate is in quantum superposition because the change of estimate of useful life remaining is not known*. In year N + 5, following a change in estimate and establishing the useful life of the asset to 15 years (10 years, remaining life), intervenes the quantum collapse, there is a new measurement of the parameters of depreciation and the accounting treatment of the change in the accounting estimate is certain, of a prospective manner (IAS 8). Therefore, the *accounting knowledge wave* propagates like a force and drives the changing of the reasoning and the dynamics of decisions regarding the accounting estimate of the useful life of the intangible asset. Similarly, the dynamics may arise from changes in estimating the residual value of the tangible asset. Considering the above, we believe that the quantum theory can be applied in modeling the financial and accounting decisions following the choice of accounting options and policies. We believe that the quantum probability can be applied to cases and situations involving companies' exposure to risks and uncertainties. Thus, the accounting issues that are suitable for our reasoning in applying the quantum probabilities are: the judgments and assumptions concerning changes in accounting estimates; the depreciation of non-monetary assets and determining the cash generating units; the judgments and assumptions on quotas (possible assets and liabilities); the estimates of costs of tangible assets decommissioning; the evaluation of the risks related to the conduct of litigation; the estimates of the residual value of tangible fixed assets; the policies related to capital and financial risk management; the assessments of goodwill and other intangible assets related to acquisitions or clusters and the depreciation of goodwill; the measurement of income from intellectual property rights; the measurement of intellectual capital of a company or organization; others involving estimations, measurements, assumptions and accounting judgments that lead to decisions. To illustrate the applicability of the quantum probability theory we present below the case of cost estimates for

decommissioning of tangible assets, using data of a real company[3], published in annual reports. According to data published by OMV Petrom in the explanatory notes to the annual financial statements[4], the review of the estimates for the decommissioning and restoration provisions is determined by the annual analysis of the: restoration costs; the number of wells and other relevant elements; the estimated time frame for carrying out the decommissioning and restoration works; and the review of actualization rates used. The evolution of review of the estimates for the decommissioning and restoration provisions[5] can be seen in the figure bellow:

**Figure no. 2 Evolution of the review of estimates for the decommissioning and restoration provisions**




*Source: Own processing of information released by OMV Petrom in the annual reports*

According to the data published by the company[6], the resulting effect in recent years (2014 and 2015) from revising the estimates is due to the reduction of actualization rates combined with the increased costs for carrying out decommissioning works in Romania for wells and various facilities. By a quantum

[3] https://www.omvpetrom.com/portal/01/petromcom/petromcom/OMV_Petrom/Relatia_cu_investitorii/Rapoarte_si_prezentari_pentru_investitori/Rapoarte_anuale/11/04/2016

[4] https://www.omvpetrom.com/portal/01/petromcom/petromcom/OMV_Petrom/Relatia_cu_investitorii/Rapoarte_si_prezentari_pentru_investitori/Rapoarte_anuale/11/04/2016

[5] https://www.omvpetrom.com/portal/01/petromcom/petromcom/OMV_Petrom/Relatia_cu_investitorii/Rapoarte_si_prezentari_pentru_investitori/Rapoarte_anuale/12.04.2016. Due to deontological reasons and to ensure the confidentiality of information, the data presented above is not real. An indexing coefficient for maintaining the evolution trends of the estimates has been used.

[6] https://www.omvpetrom.com/portal/01/petromcom/petromcom/OMV_Petrom/Relatia_cu_investitorii/Rapoarte_si_prezentari_pentru_investitori/Rapoarte_anuale/12.04.2016

interpretation of the revisions of accounting estimates and of the evolution of that provision we could study the change in the behavior of the manager regarding its reaction to the changes in the cost of restoration, the number of wells, the time frame for carrying out the decommissioning and restoration works, or of other items.

**5. Conclusions, limitations and future works**

In this approach we intended to present some aspects regarding the potential use of the quantum theory in the evaluation and analysis of accounting judgments in conditions of risk, uncertainty, ambiguity. Thus, our attention has been particularly focused on the accounting estimates and the understanding of the accounting judgment in terms of endogenous and exogenous variables that can influence it. Admitting in the light of previous research that the human cognitive system and the professional accounting judgment is a dynamic system that behaves like a quantum system, the *accounting knowledge wave* acts as a force and generates changes of the accounting treatment depending on the circumstances. On the other hand, as Demski et al. (2006) observed, the probability of an event is influenced by the amplitude of the probability of different options or alternatives in a quantum system, a feature that is reflected in accounting as endogenous expectations. Demski et al. (2006) noted that accounting estimates reflect the managers' expectations, which presumably stem from managers' actual and anticipated transactions. Considering what we analyzed and presented above, the conclusion that we wish to formulate is that the quantum approach of the accounting judgment is possible and can bring some clarification regarding the measuring of the predictability of certain events and the reduction of serious errors in exercising the accounting judgment and reasoning. Reducing the risk of error in the accounting reasoning and managerial decision making we believe it could be the biggest gain of such a quantum approach. The main limitation of our approach lies in the actual failure of quantum measurements based on simulations, or starting from concrete data. Future research will deal with the possibility of quantum modeling the accounting judgments against risks, uncertainties and ambiguities, following the impact of measuring the accounting estimates on the behavior of the professional accountant and manager. We are aware of the controversial aspect of our approach and that the quantum approach is not supported by all the researchers. Thus, the opinion of physicist Stephen Hawking, on the cat experiment is: *"When I hear about Schrödinger's cat, I reach for my gun..."*

**References**

Akerlof, G., Schiller, R.J. (2010), *Spirite animale. Despre felul în care psihologia umană influenţează economia şi ce înseamnă asta pentru capitalismul global,* [Animal spirits. How Human Psychology Drives the Economy and Why It Matters for Global Capitalism]. Bucureşti: Publica.

Balaciu, D.E.., Bogdan, V., Feleagă, L.,Popa, A.L. (2014) "Colorful" approach regarding creative accounting. An introspective study based on the association technique", *Journal of Accounting and Management Information Systems*, ISSN 1583-4387, vol. 13, no. 4, 643-664.

Bogdan, V., Pop, C., Mester I.T., Balaciu D.E., (2009), How could psychological variables explain investor reactions to changes in firm's disclosure policy, *Journal*

*of Accounting and Management Information Systems (JAMIS)*, ISBN 978-606-505-236-9, Bucharest, chief editor Albu N.
Bogdan,V., Ban, O.I., Tara, I.G. (2015), Endogenous human variables affecting performance of JDM in accounting. Experimental research on Romanian students, *Proceedings of the 14th European Conference on Research Methodology for Business and Management Studies*, University of Malta, Valetta, ISBN 978-1-910810-11-8, E-book ISBN 978-1-910810-12-5, 55-62.
Bogdan, V., Mester, I.T., Popa, D.N. (2015), Testing master students perception regarding judgment and decision making in accounting, *Annals of University of Oradea, economic Sciences*, Tom XXIV, 1st issue/july 2015, University of Oradea, ISSN 1222- 569X (printed format), ISSN 1582-5450 (electronic format), 1339-1347.
Busemeyer, J.R., Wang, Z., (2014), Applying Quantum Principles to Psychology, available on-line at: https://arxiv.org/pdf/1405.6427.pdf/12.02.2016.
Busemeyer, J.R., Bruza, P.D., (2012), *Quantum models of cognition and decision*, Cambridge, Cambridge University Press.
Busemeyer, J.R., Trueblood J.S, (2011), Theoretical and empirical reasons for considering the application of quantum proability theory to human cognition, available on-line at: http://www.ai.rug.nl/conf/quantumTARK/busemeyer.pdf/07.01.2016
Choustova, O., (2008), Toward Quantum-like Modelling of Dinancial Processes, available on-line at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.252.6285&rep=rep1&type=pdf
Demski, J.S., FitzGerald, S.A., Ijiri, Y., Ijiri, Y., Lin, H. (2006), Quantum information and accounting information: Their salient features and conceptual applications, *Journal of Accounting and Public Policy*, 25, 435-464
Dima, B., Paşca, L., Preda, C., (2015), A financial wave model for stock indices, *Economic Computation and Economic Cybernetics Studies and Research*, issue 4, pp. 5-19.
Franco, R., (2009), The conjunction fallacy and interference effects, *Journal of Mathematical Psychology*, vol. 53, issue 5, Special Issue: Quantum Cognition, 415–422
Haven, E., (2005), Pilot-wave Theory and Financial Option Pricing, *International Journal of Theoretical Physics*, 44 (11), 1957-1962.
IAS 37 "Provisions, contingent liabilities and contingent assets", available online at: https://inform.pwc.com/inform2/s/IAS_37_Provisions_contingent_liabilities_and_contingent_assets/informContent/0904082003182693/12.02.2016
IAS 8 "Accounting Policies, Changes in Accounting Estimates and Errors", available online at: http://www.iasplus.com/en/standards/ias/ias8/12.02.2016
ICAS (2012), *A professional judgement framework for financial reporting. An international guide for preparers*, auditors, regulators and standard setters, august, ISBN: 978-1-904574-88-0, EAN: 9781904574880, ICAS 21 Haymarket Yards, Edinburgh EH12 5BH.
Kahneman D. (2011), *Thinking Fast and Slow*, New York, ISBN 978-0-374-27563-1
Libby R. (1983), "Determinants of Performance in Accounting Decisions", *Accounting Research Convocation*, University of Alabama.
Kahneman, D., Tversky, A. (1979), Prospect theory: an analysis of decision under risk*, Econometrica,* 47 (2), 263-291.

Koonce, L., Mercer, M. (2005), Using psychology theories in archival financial accounting research, Research Paper no. ACC-01-05. doi:10.2139/ssrn.311105
KPMG (2011), Elevating Professional Judgment in Auditing and Accounting: The KPMG Professional judgment Framework, available online at: http://www.researchgate.net/publication/258340692/12.10.2015
Libby R., Luft J. (1993), Determinants of Judgement Performance in Accounting Settings: Ability, Knowledge, Motivation and Environment, *Accounting Organizations and Society,* vol. 18, no. 5, 425-450.
Nastasiuk, V.A., (2014), Emergent Quantum Mechanics of Finances, Physica A, 403, 148-154.
Pothos, E.M., Busemeyer, J.R., (2009), A quantum proability explanation for violations of rational decision making, *Procedeedings of the Royal Society B*, 276, 1665, 2171-2178.
Pothos, E.M., Busemeyer, J.R., (2013), Can quantum probability provide a new direction for cognitive modeling?, *Behavioral & Brain Sciences*, 36, 255-327.
Pothos, E.M., Busemeyer, J.R., (2014), In search for a standard of rationality, *Frontiers in Cognitive Science*, 5, 1-3.
Presură, C., (2014), Fizica povestită [Stories about physics], Bucharest, Humanitas
Rosenblum, B., Kuttner, F., (2011), Enigma cuantică [Quantum enigma], Bucharest, Prestige.
Schiller, S. (2013), Heuristics or experience-based techniques for making accounting judgments and learning, *Problems and Perspectives in Management*, volume 11, issue 3, pp. 63-75.
Tversky, A., Kahneman, D., (1983), Extensional versus intuitive reasoning: The conjunction fallacy in probability judgment, Psychological Review, 90(4), 293-315.
Tversky, A., Shafir, E., (1992), Choice under conflict: The Dynamics of Deferred Decision, Psychological Science, vol. 3, no. 6, 358-361.
Wakker, P.P. (2010), *Prospect Theory for Risk and Ambiguity*, Cambridge, Cambridge University Press.
White, L.C., Pothos, E.M., Busemeyer, J.R., (2015), Insights from quantum cognitive models for organizational decision making, *Journal of Applied Research in Memory and Cognition*, 4, 229-238.
Yufang, Qi (2014), Intervention and Display of Accounting Professional Judgment via Performance, *Advances in Social Sciences, Education and Humanities Research*, ICSSR-14, ISBN 978-94-6252-009-7, ISSN 2352-598, doi:10.2991/icssr-14.2014.224, 1020-1024.