
ANALYSIS OF THE USE OF THE CODE OF ETHICS OF AGRICULTURAL ACCOUNTANTS USING QUANTITATIVE METHODS

Ivan Milojević¹, Vladan Vladisavljević², Svetlana Tasić³, Miloš Miljković⁴

*Corresponding author E-mail: vlada91@gmail.com

ARTICLE INFO

Original Article

Received: 23 April 2023

Accepted: 28 May 2023

doi:10.59267/ekoPolj2302

UDC 174:631.162

Keywords:

accounting ethics, agricultural sector, financial reporting, strategic games

JEL: Q14, G59

ABSTRACT

This paper investigates the possibility of applying the meta theory of strategic games in the domain of the ethical code of conduct of agribusiness accountants. The focus is on the case when an accountant detected incorrect financial reporting by the client's management of material nature. As a generally quantitative method, the model of strategic games in such a case allows to quantify and find a balanced relationship between the interests of management and accountants in the world where, there is constantly sustainable problem of ethics and unethics of accountants, which is an extremely important issue in the agricultural sector, which is a developing branch.

Introduction

International accounting standards and positive national legislative regulations provide frameworks for the methodological corpus of processes of accounting inclusion in business changes. The ultimate goal is for agribusinesses to obtain financial reports that objectively reflect the state of such enterprises without material errors, through the proper inclusion of business changes. If we formalize the process of accounting reporting (Vasić, 2022) to our problem, then we position the following case in the form

-
- 1 Ivan Milojević, Phd, The University of Business Studies in Banja Luka, Jovana Dučića no. 23a, Bosnia and Herzegovina, Phone: +381692702697, E-mail: drmilojevic@gmail.com, ORCID ID (<https://orcid.org/0000-0003-3653-3477>)
 - 2 Vladan Vladisavljević, Phd, Seavus d.o.o., Žorža Klemensoa no. 19, Belgrade, Serbia, Phone: +381631339317, E-mail: vlada91@gmail.com, ORCID ID (<https://orcid.org/0009-0001-9475-7076>)
 - 3 Svetlana Tasić, Ph.D., professor of applied studies, Belgrade Business and Arts Academy of Applied Studies, Kraljice Marije 73, Beograd, Serbia, Phone: +381 607112711, E-mail: cecatasic1@gmail.com, ORCID ID (<https://orcid.org/0000-0003-3049-6396>)
 - 4 Miloš Miljković, M.A., Trade Union Confederation „Nezavisnost“, Nušićeva no. 21, Belgrade, Serbia, Phone: +381605890985, E-mail: milos.miljkovic.mekis@gmail.com, ORCID ID (<https://orcid.org/0000-0002-8381-256X>)

of developing strategies that are the basis for applying the theory of strategic games, namely on the following problem of our research: financial reports are not fairly and objectively presented by accountants and as such are accepted by the management (this is a case where both parties acted intentionally and violated ethical standards). Positioning our subject of the contribution, we will try to apply the Theory of Strategic Games more precisely to the Prisoner's Dilemma model. What are the relations between management and accountants in this case following the fact that only 5% of the total audit reports in Serbia are negative, and that reports with a reserve or a distraction are not of material importance.

Research methodology

The paper uses game theory as a basic method to relate the relationship between management and accountants.

Numerous literature has covered the topic of applying the game theory. We tried to present this theory in a simple way, that can be applied in this research segment as well, as an example when both the manager and the accountant did not comply with ethical codes, using the Prisoner's Dilemma model because corporate social responsibility is present in real business environments (Hohenfels, Quick, 2022; Casey, Grenier, 2015). This game belongs to non-zero sum games for two participants. For such a game, each input must contain a_{ij} and b_{ij} payoffs-benefits for both First (I) and Second (II) player, respectively, corresponding to strategies A_i and B_j .

When using game theory, a game is most often defined as a set of rules and agreements that players must follow (Tošić, 2022). The subject of game theory are conflict situations in which the interests of two or more parties are opposed, so game theory analyzes mathematical models of real conflict situations.

According to the nature and scope of information about the game, there are games with complete and incomplete information. In a game with complete information, each player knows all previous moves and the state of the game with each new move. Games in real conflict situations, especially war games, take place with incomplete information.

According to the rules of the game theory model, the results of the game should be expressed numerically. The simplest game is the one between opponents in which the gain of one side corresponds to the loss of the other side.

In general, players prepare for a game by having good moves available for many expected game situations, which are called strategies. When players have a finite number of strategies, then the game will be finite.

Finite games are presented in matrix forms as in the example.

Table 1. Game model

$i \backslash j$	1	2	...	n
1	a_{11}	a_{12}	...	a_{1n}
2	a_{21}	a_{22}	...	a_{2n}
...
m	a_{m1}	a_{m2}	...	a_{mn}

Source: Authors' form

Note: Choice of games with P_i

The matrix shows that the player P_1 has m , and that player P_2 has n strategies. When player P_1 chooses strategy i , then player P_2 will answer with strategy j . In the intersection of those strategies, there is a coefficient a_{ij} that represents the gain of the player with strategy i , as a result of the conflict with strategy j .

Johann van Neumann has proved the basic theorem – minmax in 1928 while studying game strategies in his paper “Towards a theory of social games” (Mukić, 2014). In his paper he starts from the realistic assumption that players P_1 and P_2 are both intelligent (they adopt a rational game system) and prudent (Hemed, 2022). They show prudence by choosing a strategy for which both of them will obtain the greatest gain. For player P_1 this means choosing a strategy in row i of the matrix with the lowest coefficient. $\min a_{ij} = a_{ij^0}$ guarantees him a minimum profit. Any strategy that player P_2 plays other than 0 can only increase that gain.

Since player P_1 does not want to take a risk in order to ensure the maximum safe gain, he will choose strategy $i=i_0$ for which:

$$\max_i \min_j a_{ij} = a_{i_0 j_0}$$

Since, according to the rules of the game, player P_1 's gain is equal to player P_2 's loss, as a prudent player he tries to reduce the loss as much as possible. That's why he chooses column j of the payoff matrix, with the expectation that player P_1 will choose strategy i^0 that would mean the biggest loss for P_2 , i.e.

$$a_{i^0 j} = \max_j a_{ij}$$

As a prudent player, P_2 chooses strategy j^0 for which his loss will be the smallest, regardless of player P_1 's moves, i.e.

$$a_{i^0 j^0} = \min_j a_{i^0 j} = \min_j \max_i a_{ij}$$

It has been proven for games that the maximum is most often equal to the minimax

$$\max_i \min_j a_{ij} \leq \min_j \max_i a_{ij}$$

When a case happens that all elements of one column are greater than the elements of another column of a matrix, it can be reduced for that dominant column of the matrix. This is because the dominant strategy is always less favorable for player P_2 and he will never choose it. Dominance reduction certainly simplifies the game.

In order to improve the quality of strategy games and bring them closer to practical problems, it is necessary to analyze the used models and adjust them with real parameters.

Non-zero sum strategy games

The normal form of The Prisoner's Dilemma is:

Table 2. Prisoner's Dilemma

Management	An accountant	
	N	P
N	3.3	1.4
P	4.1	2.2

Source: Authors' form

Where N is a plea of not guilty, and P is a plea of guilty. Hypothetically speaking, suppose that an independent audit found beyond dispute that the financial statements were unfairly and falsely presented and the manager and the accountant were reasonably suspected of having committed an ethical violation together. They are guilty and the management and the accountant know it, but it is difficult to prove in the proceedings (Đorđević, 2020) whether the accountant did it knowingly or not, which is analogously true for management, whether he knew about it or not. If management and the accountant admit guilt and do not cooperate with each other, the respective "results-gains" i.e. their punishment will be greater than if they both did not confess (N). This would mean that if they cooperate and if one confesses and the other does not, the "gain-result-punishment" of the one who confesses is greater (he confessed) and for the one who did not confess, the "gain-result-punishment" is also figuratively greater (he did not confess). The dilemma is that no matter what his colleague (manager, accountant) testifies, the suspect (management, accountant) prefers the outcome in case they do not cooperate. When both admit that the reports are false - the result is worse than if both did not admit to unfairly and falsely presenting their financial statement, which is the case where the authorities are involved. A manager can influence employees, including accountants, if he possesses certain abilities (power, knowledge of the nature of people and ability to motivate) (Adžić et al., 2022).

Our case investigates how will management and accountants behave if they are not constrained by any rules, which is the subject of our further consideration. Under the influence of American theory, there is a slogan „leadership cycle“, which is orientation, decision-making, realization (Beasley et al., 2021). In this sense, let's assume that the dilemma of the strategic game is actually a conflict between management and the accountant. Each of them has two possibilities before reaching judicial authorities,

which is to escalate or non-escalate the conflict, it must be noted that leadership is considered to be the most studied and least understood phenomenon. (Jestrović, 2021) In this sense, let's take into consideration the conflict situation between management and the accountant, which assumes that both parties are aware of the fact that the financial statements are unfairly and untruthfully presented in the material sense. Both parties have the option to go to court or opt out. If one conditionally speaking escalates (comes into conflict) and the other does not, the one who escalates has won, because he can refer to the fact that he unwittingly generated false reports. If both sides escalate, that means one side says that it unwittingly generated untrue reports, and the other management says that it is impossible to determine the validity of the reports with the given samples, then in the event of a dispute, both sides are worse off. It is a much better strategy for both sides not to escalate the conflict. This can be shown with the Prisoner's Dilemma on the next matrix, where escalation is marked with E and non-escalation with N.

Table 2. Management's and accountant's alternative

I alternative Management	II alternative An accountant	
	N	E
N	(3.3) non-escalation	(1.4) accountant's win
E	(4.1) management's win	(2.2) escalation

Source: Authors' form

The basic characteristic of strategy results - escalation or non-escalation - their quantitative indicator (Galjak, 2022) is the relativity of sizes. These sizes are chosen according to the preferences of management and accountants (Vukša, 2019). For example, management prefers winning through non-escalation versus losing through escalation. In further elaboration of the Prisoner's Dilemma, it is necessary to introduce the concepts of individual rationality.

Individual rationality

In a strategic game of two players, result - profit - outcome is determined as rational for player I (player according to the rows of the matrix - management), if the highest value for him is in the column (where each column corresponds to the profit of the strategy from the strategic choice of player II - Accountants for each of the strategies of player I - management). I strategy game corresponds to the gain for each choice of player II – the accountant. A similar definition applies to player II (column player - Accountant). For each player we define a similar rational choice - payoff for each strategy of player I (management) where that strategic game corresponds to that benefit for each choice of player II.

Here an essential question arises when the equilibrium state is reached, i.e. when are the benefits of management and accountants stable? (Garcia-Sanchez et al., 2022)

This balance marks a departure from ethical principles and the acceptance of profit maximization. According to the theory, the Nash equilibrium point (1) occurs when both parties escalate (E-E). It was experimentally established that through multiple iterations a stable equilibrium is more likely to be obtained at the point of non-escalation (N-N). What does the Metastrategic theory say (Mihajlović, 2018), does it confirm that 5% of negative opinions in Serbia, does it confirm meta strategic games with unregulated financial reporting?

Metastrategic games

Metastrategic games show that both escalation and non-escalation are equilibrium points and will produce stable results-gains (achieved by spoken - agreed or unagreed agreement of both sides, management vs accountants) for any of the mentioned strategies. Let us note, which is not the subject of our consideration, that the equilibrium result (N-N) satisfies the concept of group rationality and the growth rate (Ashraf et al., 2020).

When we generalize the original game for the purpose of determining the equilibrium points, we determine all possible ways of reaction of player II (the accountant) to the moves of player I (management). More precisely, the possible reactions of player II to player I's moves are UN ("always non-escalating"), UE ("always escalating in relation to player I's moves"), T ("reciprocated with the same measure", same move of player II as player I), O ("always opposite of I player"). Such a sequence would form the following matrix:

Table 3. Management's and accountant's alternative – Metastrategic games

I alternative Management	II An accountant's meta alternative			
	UN	UE	T	O
	N 3,3 non-escalation	E 1,4 II-win	N 3,3 non-escalation	E 1,4 II - win
N 4,1 I- win	E 2,2 escalation	E 2,2 escalation	N 4,1 I - win	

Source: Authors' form

Player II's alternatives are called meta alternatives, or policies. They constitute a set of all functions from first alternatives relative to second alternatives, i.e. elections. If we look at the Nash equilibrium profits in the matrix, we find that only E-UE (referring analogous to E-E of the first example of the prisoner's dilemma) contains the maximum numerical score in its column (for the first number) and its row (for the second number). Thus, we do not have a new Nash equilibrium.

Let's form a matrix of all combinations between I (management) and II (accountant) strategies for the accountant's meta alternatives.

Table 4. Matrix of combinations

	II-meta alternative				
		AN	NE	T	O
II-meta alternative	NNNN	3,3	1,4	3,3	1,4
	EEEE	4,1	(2,2)	2,2	4,1
	EEEN	4,1	2,2	2,2	1,4
	<u>EENE</u>	<u>4,1</u>	<u>2,2</u>	<u>(3,3)</u>	<u>4,1</u>
	EENN	4,1	2,2	3,3	1,4
	ENEE	4,1	1,4	2,2	4,1
	ENEN	4,1	1,4	2,2	1,4
	ENNE	4,1	1,4	3,3	4,1
	ENNN	4,1	1,4	3,3	1,4
	NEEE	3,3	2,2	2,2	4,1
	NEEN	3,3	2,2	2,2	1,4
	<u>NENE</u>	3,3	2,2	<u>(3,3)</u>	4,1
	NENN	3,3	2,2	3,3	1,4
	NNEE	3,3	1,4	2,2	4,1
	NNEN	3,3	1,4	2,2	1,4
NNNE	3,3	1,4	3,3	4,1	

Source: <http://www.math.rs/p/files/16-TI2020.pdf>

In this matrix there are three equilibria - one refers to the relation E-E as in the previous one, and the other to two cases for the relation N-N (underlined row). This case represents a key policy for I - player escalating against any other player's policy, except strategies (T - retaliation). This policy EENE and policy T (retaliation in kind) for player II is an equilibrium and leads to unique non-escalation. The remaining second pair is NENE for I - player and T (reciprocity) for the II - player. By choosing these policies, players can reach an equilibrium in relations. It is essential to identify that the current strategy is available to the opponent and to recognize that policy can and should be formulated by each player, and both players will strive to achieve an equilibrium outcome (Bogavac et al., 2021). The target strategy of EENE, as well as NENE, manifests the profit orientation and the devastation of the ethical behavior of accountants and management, indicating that "turning a blind eye to untrue and non-objective financial reports" signifies the poor position of the accounting profession (Nadoveza, 2022) in the agro-industrial complex.

Conclusions

Our research and application of the Prisoner's Dilemma model shows us that the accountant is a rational economic agent, i.e. profit maximizer, as we treated him in our case as an ethical subject of an oriented rational individual. The results of the model analysis indicate that the accountant, apart from negligible recklessness and incompetence, has a stronger impulse to maximize profit. Often, the variables that express change management, as well as activities aimed at research and innovation, show a connection with the variable expressing conflict resolution. A reasonable

assurance procedure, which provides reasonable but not absolute assurance that material misstatements will be detected. An accountant can avoid material errors, but in some cases he is not able to. We have analyzed precisely the case where the account can avoid material errors, but that due to striving to maximize profit and his fear of losing a client, he is blocked. Then there is the case when both management and the accountant know that financial reports are unfair and untrue. It is the case that indicates the Prisoner's Dilemma in the case of Metastrategic games, where opportunities are created for both parties to defend their positions by creating one of the possible equilibria on a given hypothetical example, which leads to de-escalation of cases (3,3) for EENE, and the case of NENE with values (3,3), which correspond to both participants of the games.

Conflict of interests

The authors declare no conflict of interest.

References

1. Adžić, S., Kostić, R., Milunović, M., Savić-Tot, T., Jeremić, D., & Stanojević, S. (2022). Uloga timskog menadžmenta u savremenim uslovima poslovanja [Role of team management in modern business conditions]. *Oditor*, 8(1), 63-83. <https://doi.org/10.5937/Oditor2201062A>
2. Ashraf, M., Michas, P. N., & Russomanno, D. (2020). The impact of audit committee information technology expertise on the reliability and timeliness of financial reporting. *The Accounting Review*, 95, 23–56. <https://doi.org/10.2308/accr-52622>
3. Beardsley, E., Lassila, D., & Omer, T. (2019). How do audit offices respond to audit fee pressure?: Evidence of increased focus on nonaudit services and their impact on audit quality. *Contemporary Accounting Research*, 36(2), 999– 1027.
4. Beasley, M. S., Carcello, J. V., Hermanson, D. R., & Lapedes, P. D. (2000). Fraudulent financial reporting: Consideration of industry traits and corporate governance mechanisms. *Accounting Horizons*, 14, 441–454. <https://doi.org/10.2308/acch.2000.14.4.441>
5. Bogavac, M., Todorović, V., Karić, D., & Rosić, M. (2021). Dokazivanje u postupku računovodstvene kontrole. *Oditor*, 7(2), 25-35. <https://doi.org/10.5937/Oditor2102025B>
6. Casey, R. J., & Grenier, J. H. (2015). Understanding and contributing to the enigma of corporate social responsibility (CSR) assurance in the United States. *Auditing: A Journal of Practice & Theory*, 34(1), 97– 130. <https://doi.org/10.2308/ajpt-50736>
7. Clarkson, P. M., Li, Y., Richardson, G., & Tsang, A. (2019). Causes and consequences of voluntary assurance of CSR reports. *Accounting, Auditing & Accountability Journal*, 32(8), 2451– 2474. <https://doi.org/10.1108/AAAJ-03-2018-3424>

8. Coate, C. J., Florence, R. E., & Kral, K.L. (2002). Financial Statement Audits, a Game of Chicken? *Journal of Business Ethics*, 41, 1–11, Kluwer Academic Publishers. Printed in the Netherlands.
9. Cushing, B. E. (1999). Economic Analysis of Accountant's Ethical Standards: The Case of Audit Opinion Shopping, *Journal of Accounting and Public Policy* 18, 4-5, 339–363, David Eccles School of Business, School of Accounting, The University of Utah, Salt Lake City, USA.
10. Dakić, P., Lojaničić, D., Issa, H. R., & Bogavac, M. (2021). Izbor, stvaranje i razvoj menadžera [Choosing, creating and developing managers]. *Oditor*, 7(3), 105-134. <https://doi.org/10.5937/Oditor2103105D>
11. Đorđević, S. M., & Mitić, N. (2020). Alternativni računovodstveni postupci, kreativno računovodstvo i lažno finansijsko izveštavanje [Alternative accounting procedures, creative accounting and fraudulent financial reporting]. *Oditor*, 6(2), 21-37. <https://doi.org/10.5937/Oditor2002021D>
12. Galjak, I., (2022). Pravno uređenje inventarisanja u javnom sektoru. *Revija Prava - Javnog Sektora*, 2(1), 27–43.
13. Garcia-Sanchez, I.-M., Raimo, N., Uribe-Bohorquez, M.-V., & Vitolla, F. (2022). Corporate reputation and stakeholder engagement: Do assurance quality and assurer attributes matter?. *International Journal of Auditing*, 26(3), 388-403. <https://doi.org/10.1111/ijau.12287>
14. Goddard, F., & Schmidt, M. (2021). Exploratory insights into audit fee increases: A field study into board member perceptions of auditor pricing practices. *International Journal of Auditing*, 25(3), 637– 660.
15. Hatherly, D., L. Nadeau, & L. Thomas. (1996): Game Theory and the Auditor's Penalty Regime, *Journal of Business Finance and Accounting* 23(1), 29–45.
16. Hemed, R. I., (2022). Normative arrangement of financial innovations in banking. *Finansijski Savetnik*, 27(1), 25–64.
17. Hohenfels, D., & Quick, R. (2020). Non-audit services and audit quality: Evidence from Germany. *Review of Managerial Science*, 14, 959– 1007. <https://doi.org/10.1007/s11846-018-0306-z>
18. Hoitash, U., Hoitash, R., & Bedard, J. C. (2009). Corporate governance and internal control over financial reporting: A comparison of regulatory regimes. *The Accounting Review*, 84, 839–867. <https://doi.org/10.2308/accr.2009.84.3.839>
19. http://www.ipn.org.rs/uploads/35271/documents/akcionarstvo_1_2018.pdf
20. http://www.ipn.org.rs/uploads/35271/documents/akcionarstvo_20191.pdf
21. http://www.ipn.org.rs/uploads/35271/documents/akcionarstvo_slozeno_1_20211.pdf
22. <http://www.math.rs/p/files/16-TI2020.pdf>

23. Ilić, B., & Tasić, S. (2021). Kvantitativna analiza uloge proizvodnje u stvaranju vrednosti [Quantitative analysis of the role of production in value creation]. *Održivi razvoj*, 3(1), 17-33. <https://doi.org/10.5937/OdrRaz21010171>
24. Jestrović, V., & Jovanović, V. (2022). Uloga korporativnog rukovođenja u održivom razvoju [The role of corporate leadership in sustainable development]. *Održivi razvoj*, 4(1), 43-53. <https://doi.org/10.5937/OdrRaz2201043J>
25. Meuwissen, R., & Quick, R. (2019). The effects of non-audit services on auditor independence: An experimental investigation of supervisory board members perceptions. *Journal of International Accounting, Auditing and Taxation*, 36, 1–14. <https://doi.org/10.1016/j.intaccudtax.2019.05.004>
26. Mihajlović, M., & Stanojević, P., & Tešić, A. (2018). Menadžment znanja kao faktor povećanja efikasnosti organizacije [Knowledge management as a factor in increasing organizational efficiency]. *Akcionarstvo*, 24(1), 5-14.
27. Mitchell van der Zahn, J.-L. W. (2022). Abolition of mandated joint-audit requirements: Impact on audit reporting lag in an emerging capital market. *International Journal of Auditing*, 27(1), 45-68. <https://doi.org/10.1111/ijau.12300>
28. Nadoveza, B. (2022). Uloga ljudskih resursa u sportskim organizacijama. *Menadžment u sportu*, 13(1), 13-24.
29. Nash, J. (1951). Non-Cooperative Games, *Annals of Mathematics*, 54(2), 286-215, Mathematics Department, Princeton University.
30. Niemi, L., Knechel, W. R., Ojala, H., & Collis, J. (2018). Responsiveness of auditors to the audit risk standards: Unique evidence from big 4 audit firms. *Accounting in Europe*, 15(1), 33– 54.
31. Shin, H., & Park, S. (2022). Does human resource investment in internal controls and information technology improve audit efficiency?. *International Journal of Auditing*, 26(4), 515-533. <https://doi.org/10.1111/ijau.12293>
32. Tošić, M. Z., (2022). Specifičnosti korporativnog upravljanja. *Српска Академска Муцао*, 7(1), 7–21.
33. Vasić, S. (2022). Pravna analiza značaja poreske kontrole budžeta [Legal analysis of the importance of tax control of the budget]. *Revija prava – javnog sektora*, 2(1), 7-26. [http://www.revijaprava.in.rs/uploads/37551/documents/CASOPIS_BROJ_1_2022_\(1\).pdf](http://www.revijaprava.in.rs/uploads/37551/documents/CASOPIS_BROJ_1_2022_(1).pdf)
34. Vukša, S. (2019). Napomene kao osnovni finansijski izveštaj [Notes as a basic financial report]. *Akcionarstvo*, 25(1), 33-60.