


**WHY AUDITORS INCREASINGLY RELY ON ANALYTICAL PROCEDURES: AN EMPIRICAL APPROACH IN PORTUGAL**

**Carlos Santos Pinho<sup>A</sup>, Paula Gomes dos Santos<sup>B</sup>, António Eduardo Martins<sup>C</sup>**



ARTICLE INFO	ABSTRACT
<p><b>Article history:</b></p> <p><b>Received</b> 10 July 2023</p> <p><b>Accepted</b> 12 October 2023</p>	<p><b>Purpose:</b> The study aims to reflect on the reasons behind the increasing use of analytical procedures during evidence collection as a way of corroborating the claims made in financial statements.</p>
<p><b>Keywords:</b></p> <p>Auditing; Analytical Procedures; Financial Reporting; Risk.</p>	<p><b>Theoretical framework:</b> The study develops the problem arising from more complex financial information due to more complex transactions within market players, and develops all the theoretical approach to auditing and the analytical procedures ruled in ISA 520.</p>
	<p><b>Design/methodology/approach:</b> A relevant sample was taken from the auditing market in Portugal, and thus principal component analysis was develop in order to conclude why auditors tend to rely increasingly in analytical procedures, as a source of evidence in auditing approaches.</p> <p><b>Findings:</b> The conclusions of this empirical study point to the fact that, in general terms, the increasing use of analytical procedures stems from a risk-based approach to auditing together with reasons that have to do with time pressure and the need to carry out more efficient audits with fewer substantive detail tests as well as improvements in the interpretation of norms applicable to auditing work.</p> <p><b>Research, Practical &amp; Social implications:</b> Comprehensive conclusions identify the increasing usage and confidence on analytical procedures by auditors, pointing out objective reasons the justify that fact.</p> <p><b>Originality/value:</b> There are several investigations about risk based approach in auditing, but no actual study was found that explores the reasons behind the increasing usage of such procedures, within the International Standards on Auditing (ISA's). The study thus provides evidence about reliability and relevance of such procedures.</p> <p>Doi: <a href="https://doi.org/10.26668/businessreview/2023.v8i10.3691">https://doi.org/10.26668/businessreview/2023.v8i10.3691</a></p>

**PORQUE OS AUDITORES CONFIAM CADA VEZ EM PROCEDIMENTOS ANALÍTICOS: UMA ABORDAGEM EMPÍRICA EM PORTUGAL**

**RESUMO**

**Objetivo:** O estudo visa refletir sobre as razões do uso crescente de procedimentos analíticos durante a coleta de evidências como forma de corroborar as afirmações feitas nas demonstrações financeiras.

**Enquadramento teórico:** O estudo desenvolve o problema decorrente de informações financeiras mais complexas devido a transações mais complexas entre os intervenientes no mercado, e desenvolve toda a abordagem teórica à auditoria e aos procedimentos analíticos regidos na ISA 520.

<sup>A</sup> Doctor of Management. Universidade Aberta. CAPP – Investigation Center. Universidade de Lisboa. Quality Control Commission of the Chamber of Statutory Auditors in Portugal. Portugal.

E-mail: [carlos.pinho@uab.pt](mailto:carlos.pinho@uab.pt) Orcid: <https://orcid.org/0000-0002-5509-2921>

<sup>B</sup> Doctor of Management with Specialization in Accounting. Professor. Universidade Lusíada. Instituto Politécnico de Lisboa. Portuguese Accounting Standards Setter. Portugal.

E-mail: [pasantos@iscal.ipl.pt](mailto:pasantos@iscal.ipl.pt) Orcid: <https://orcid.org/0000-0003-2192-8855>

<sup>C</sup> Doctor of Organizational Behavior in ISCSP. Universidade de Lisboa. Universidade Aberta. Portugal.

E-mail: [antonio.martins@uab.pt](mailto:antonio.martins@uab.pt) Orcid: <https://orcid.org/0000-0002-0830-7483>

**Desenho/metodologia/abordagem:** Foi retirada uma amostra relevante do mercado de auditoria em Portugal, e assim foi desenvolvida uma análise de componentes principais para concluir porque é que os auditores tendem a confiar cada vez mais em procedimentos analíticos, como fonte de evidência nas abordagens de auditoria.

**Constatações:** As conclusões deste estudo empírico apontam para o facto de que, em termos gerais, a utilização crescente de procedimentos analíticos decorre de uma abordagem de auditoria baseada no risco, juntamente com razões que têm a ver com a pressão do tempo e a necessidade de realizar mais auditorias eficientes com menos testes de detalhamento substantivo, bem como melhorias na interpretação das normas aplicáveis aos trabalhos de auditoria.

**Implicações de pesquisa, práticas e sociais:** Conclusões abrangentes identificam o crescente uso e confiança nos procedimentos analíticos pelos auditores, apontando razões objetivas que justificam esse fato.

**Originalidade/valor:** Existem diversas investigações sobre abordagens baseadas em risco em auditoria, mas nenhum estudo atual foi encontrado que explore as razões por trás do uso crescente de tais procedimentos, dentro das Normas Internacionais de Auditoria (ISA's). O estudo fornece, portanto, evidências sobre a confiabilidade e relevância de tais procedimentos.

**Palavras-chave:** Auditoria, Procedimentos Analíticos, Relatório Financeiro, Risco.

## POR QUÉ LOS AUDITORES CONFÍAN CADA VEZ MÁS EN PROCEDIMIENTOS ANALÍTICOS: UN ENFOQUE EMPÍRICO EN PORTUGAL

### RESUMEN

**Propósito:** El estudio tiene como objetivo reflexionar sobre las razones detrás del creciente uso de procedimientos analíticos durante la recolección de evidencia como una forma de corroborar las afirmaciones hechas en los estados financieros.

**Marco teórico:** El estudio desarrolla el problema que surge de la información financiera más compleja debido a transacciones más complejas dentro de los actores del mercado, y desarrolla todo el enfoque teórico de la auditoría y los procedimientos analíticos regidos en la ISA 520.

**Diseño/metodología/enfoque:** Se tomó una muestra relevante del mercado de auditoría en Portugal y, por lo tanto, se desarrolló un análisis de componentes principales para concluir por qué los auditores tienden a confiar cada vez más en procedimientos analíticos, como fuente de evidencia en los enfoques de auditoría.

**Hallazgos:** Las conclusiones de este estudio empírico apuntan al hecho de que, en términos generales, el uso cada vez mayor de procedimientos analíticos se debe a un enfoque de auditoría basado en el riesgo junto con razones que tienen que ver con la presión del tiempo y la necesidad de realizar más auditorías eficientes con menos pruebas de detalle sustancial, así como mejoras en la interpretación de las normas aplicables al trabajo de auditoría.

**Implicaciones de investigación, prácticas y sociales:** Las conclusiones integrales identifican el creciente uso y confianza en los procedimientos analíticos por parte de los auditores, señalando razones objetivas que justifican ese hecho.

**Originalidad/valor:** existen varias investigaciones sobre el enfoque basado en el riesgo en la auditoría, pero no se encontró ningún estudio actual que explore las razones detrás del uso cada vez mayor de tales procedimientos, dentro de las Normas Internacionales de Auditoría (ISA). Por tanto, el estudio proporciona pruebas sobre la fiabilidad y relevancia de dichos procedimientos.

**Palabras clave:** Revisión de Cuentas, Procedimientos Analíticos, Informes Financieros, Riesgo.

### INTRODUCTION

The International Standard on Auditing 520 – Analytical Procedures (ISA 520)<sup>D</sup> states that the use of analytical audit procedures is inevitable in the planning stage, during the risk assessment period, and in the stage in which an audit opinion is expressed after a joint and contextualized review of financial statements. Furthermore, this standard also suggests that

<sup>D</sup> The Portuguese translation for *International Standard on Auditing* is Norma Internacional de Auditoria.

analytical procedures should be used as corroborating evidence for the claims made in transaction classes and in financial statements and corresponding disclosures.

This norm corroborates previous studies carried out by Ameen and Strawser (1994), Albrecht (1977), Hylas and Ashton (1982), Blocher and Willingham (1988), and Calderon and Green (1994), in which the use of analytical procedures was found to be consistent at each stage of an audit, that is, in the planning and execution stages and in the stage in which the audit opinion is expressed in line with the stipulations made in the above-mentioned ISA 520. These studies highlight the undeniable usefulness of analytical procedures, which enhance the efficiency and efficacy of the audit, being very appealing in cost terms and in their ability to guide the auditor's work and to provide relevant evidence to support the conclusions.

Other works share a different view, concluding that the analytical procedures should mostly be used in the planning phase of the audit (Coakley, 1982, Loebbecke and Steinbart, 1987, and Biggs, et al., 1989).

Finally, other studies claim that analytical procedures are more useful at the stage when auditors must state their opinion (Puncel, 2007).

Regardless of the fact that opinions might diverge on the stage of auditing work in which this type of procedure might be more relevant, it is clear that, during an audit, material errors are detected through the use of substantive procedures, whether they be detail tests or analytical procedures (Marten, Quick and Ruhnke, 2006).

In Portugal, research work already conducted on this matter (Pinho, 2011) has concluded that, in general terms and regardless of the size of the audit company and the way that professionals work, Portuguese auditors use analytical procedures more frequently during the planning phase to the detriment of the phases in which evidence is collected and opinions formed. This study also revealed that although little use is made of these procedures during the evidence-collection stage in comparison with other countries, the use of analytical audit procedures is increasing across the country.

Our study aims to reflect on the reasons behind this increasing use of analytical procedures during evidence collection as a way of corroborating the claims made in financial statements.

## **THEORETICAL REFERENTIAL**

In recent years, the topic of auditing efficiency and efficacy has been increasingly discussed (Bader and Khoshnaw, 2023; Hubais et al., 2023; Sullivan et al., 1985; Tabor and

Willis, 1985; McDaniel, 1990; and Messier, 1995). In general, audit professionals tend to define efficiency as the fulfilment of the goals set for the auditing work in the shortest possible period of time (Hollingshead, 1996).

McDaniel (1990) studied the impact of time pressure on audit results. In order to assess auditing efficiency, the quantity of relevant evidence collected was divided by the time spent by the auditor. The conclusions of the study show that time pressure only affected auditing efficiency in extreme cases. On the other hand, Apostolou et al. (1993) defined efficiency as the ability to comply with a pre-established time budget, which corresponded to a variation in percentage terms between the time established for the work and the time actually spent doing the work.

The reasons behind auditors' increasing use of analytical procedures mainly have to do with the growing pressure to reduce the costs of auditing work in view of the increasing competition between companies in this sector (Ameen and Strawser, 1994, Mulligan and Inkster, 1999, Anderson et al. 1995), the new risk-assessment based approach to auditing (Mulligan and Inkster, 1999), and the growing development of the information and accounting systems used by the companies being audited and computer tools supporting the auditor's work that make it more efficient to use this type of procedure (Mulligan and Inkster, 1999, and Blocher, 2002). However, Fraser et al. (1997) reject this last reason, stating that the use of more complex or elaborate analytical procedures has not risen significantly despite developments in and the generalized use of computers and computer tools.

Another important issue concerns the impact of auditing norms on the degree to which analytical procedures are used. Concerning this question, previous studies (Mulligan and Inkster, 1999, Ameen and Strawser, 1994 and Blocher and Loebbecke, 1992) suggest that the positive impact of the norms has been particularly felt by small and medium-sized audit companies, leading the Big 4 to anticipate the extensive use of analytical audit procedures in their internal audit manuals for the planning phase, the evidence-collection phase and the final review phase of the work (Lin and Fraser, 2003) even before they were published.

According to these authors, one of the main flaws in the norms is that they provide no guidelines for unusual or unexpected variations, which, in practice, leaves it up to the auditor to define what is reasonable and what is unreasonable. This factor brings an undesirable degree of subjectivity to the auditor's work and to the auditing profession as a whole.

Using these starting premises to approach this problem, this study aims to assess the relative importance of each of the above-mentioned factors, thereby defining the basic vectors underlying the significant increase in the use of analytical procedures within financial audits.

In terms of the International Standard on Auditing 520 - Analytical Procedures<sup>E</sup> (ISA 520), these procedures correspond to assessments of financial information stemming from analysis of the plausible relationships between financial and non-financial data as well as investigations into fluctuations and identified relations that are inconsistent with other relevant information or that differ from expected values by a significant amount.

According to ISA 520, analytical procedures can be divided into two main categories<sup>F</sup>:

(i) Comparisons of financial information, including information from previous years, comparisons with the auditor's budgets or predictions or even ratios (relationships) between the entity under audit and sectoral values for similar-sized companies; and

(ii) The establishment of relations between the financial data of the company under audit (including gross income, gross added value, and asset profitability) or between financial data and non-financial data (such as average salaries).

ISA 520 also highlights that when unusual elements - such as unexpected time fluctuations or unexpected variations in relations or ratios - are detected through the use of analytical procedures the auditor should take the following actions:

(i) Ask for additional explanations from the management body of the company under audit; and

(ii) Corroborate every answer with additional audit evidence resulting from detailed tests and their own knowledge of the business, assessing whether it is necessary to adopt more extensive and thorough substantive procedures in relation to the matter.

The use of analytical audit procedures also includes the following basic goals according to ISA 520 (paragraph 7):

*a) "As risk-assessment procedures in order to understand the entity and its environment;*

*b) As substantive procedures when their use might be more effective or efficient than detail tests in reducing to an acceptably low level the risk that the claims have been materially distorted;*

<sup>E</sup> Paragraph 3 of ISA 520 - Analytical Procedures.

<sup>F</sup> Paragraph 4 and 5 of ISA 520 - Analytical Procedures.

c) *As an overall review of financial statements in the final phase of the audit.”*

## METHODOLOGY

This study was based on the preparation of a survey that was sent by email to every working auditor through the Auditors Association.

The survey was developed in order to collect information on the reasons why auditors make increasing use of analytical procedures in auditing work. Therefore, the total number of professionals surveyed is around 897 working auditors, according to the data supplied by the last Report and Accounts published by the Auditors Association (2021).

To determine whether the size of the sample was relevant to this research, it was assumed that:

- The average number of individuals who use analytical audit procedures is 92.9%, according to the number resulting from the random sample of 99 surveys collected from working auditors.
- The target population was finite (897 working auditors) according to the data made available by the Auditors Association.
- The margin of error is 5%.
- The level of confidence was 95%, corresponding to a statistical significance of 5%.

From this perspective, according to Reis et al. (2007), the size of the relevant sample for this study should be calculated as follows:

$$n = \frac{0.929 \times 0.071}{\frac{0.05^2}{(1.96)^2} + \frac{0.929 \times 0.071}{897}} = 91 \quad (1)$$

Therefore, the conclusion is that the size of the sample used in this research ( $n = 92$ ) is appropriate, being higher than the result above. Therefore, the conclusions can be extended to the population, in this case the population of Portuguese working auditors.

However, the average value of the distribution includes variance, so the minimum value of the sample should validate the hypothesis in terms of the value of the variance. According to Reis et al. (2007), this validation can be carried out using the chi-square test ( $\chi^2$ ) with a

significance level of  $\alpha$  and a number of degrees of freedom equal to the size of the sample less one unit. In this case, the distribution function of  $\chi^2$  for a sample of 92 and  $\alpha = 0.05$  is 114.27, a number that is higher than the statistic  $T = 93.42$ , thus the hypothesis that the population variance is less than or equal to  $0.0651G$  is accepted.

In short, the sample of 92 used in this study meant that it was not necessary to reject the hypothesis concerning the average value of the distribution or the hypothesis concerning the distribution variance. In this case, it is safe to conclude that the sample is statistically relevant for the study.

The selected sample may be described based on the elements that characterize the interviewees, as can be observed in Table 1.

Table 1. – Composition of Sample

Type of Practice	Volume of Business			Total
	< €500,000	> €500,000 and < €1,500,000	> €1,500,000	
Individual Auditor	40	0	0	40
Member of the Auditors Association	18	12	8	38
Employee	0	0	14	14
<b>Total</b>	<b>58</b>	<b>12</b>	<b>22</b>	<b>92</b>

Source: Own elaboration

The sample results shown in Table 1. are consistent with the empirical observation of the audit sector. Individual auditors have less turnover potential, which is why they are all included in the class of auditors with smaller business volumes.

Auditors working as employees (non-members) fall into the class of auditors with larger business volumes since they usually work for large audit companies, including the Big 4.

The data was initially subjected to a descriptive analysis of absolute and relative frequencies. In the second phase, the main components were analysed.

This methodology consists of a process that allows the original space of the variables to be projected into a smaller space. Variables deriving from the originals are the main components. In this context, it is possible to transform a set of intercorrelated original variables into a new set of non-intercorrelated variables that can be called main components. According to Reis and Moreira (1993), the procedure for analysing main components creates a division in the variance of the main components, each main component being calculated in a way that retains the largest variation seen in the original variables.

<sup>G</sup> The variance is the product of  $p(1-p)$ , in this case  $0.93 \times 0.07 = 0.0651$ .

Taking vector  $\tilde{X} = [X_1 \ X_2 \ X_3 \ \dots \ X_p]$ , averages  $\mu$  and variance is  $\sum$  the intention is to create a new set of variables  $Y_1, Y_2, \dots, Y_p$  among which no correlation exists and whose variances are decreasing, that is:

$$\text{Var } Y_1 \geq \text{Var}Y_2 \geq \text{Var}Y_3 \geq \dots \geq \text{Var}Y_p \quad (2)$$

Each new variable  $Y_j$  corresponds to a linear combination, such that:

$$Y_j = a_{1j}X_1 + a_{2j}X_2 + \dots + a_{pj}X_p = a'_{j} \tilde{X} \quad (3)$$

Therefore, the first main component  $Y_1$  is calculated in such a way that the constant vector  $a_1$  allows it to obtain the maximum possible variance. If  $\lambda$  is the variance of  $[a'_{1} \tilde{X}]$ , then the higher value  $\lambda$  parameters should be selected so that the smaller number of main components can explain the maximum possible variance in the responses. In this case, the proportion of variance explained by the  $j^{\text{th}}$  main component is calculated as follows:

$$\frac{\lambda_j}{\sum_{j=1}^p \lambda_j} \quad (4)$$

By default, the statistical software used in this study<sup>H</sup> determines the main components for which  $\lambda > 1$  should be removed.

## RESULTS AND DISCUSSION

The reasons stated in the survey stem from the above-mentioned reasons behind the definition of the problem. Therefore, taking into account several studies carried out in other countries that have already been mentioned in this study, the following were selected as reasons for the increasing use of analytical procedures in auditing works:

- a) Time pressure to carry out the work quickly; (A)
- b) Better understanding of applicable norms; (B)
- c) More technical sophistication of analytical procedures; (C)

---

<sup>H</sup> SPSS v.17.



- d) Risk-based auditing methodology; (D)
- e) Improvement of available auditing tools; (E)
- f) Influence of auditing norms. (F)

Table 2 provides a descriptive analysis of the absolute and relative frequencies of the answers provided to this question.

Table 2. – Descriptive Analysis

	A	B	C	D	E	F
<b>Frequency</b>	22	6	38	74	50	22
<b>Average</b>	0.239	0.065	0.413	0.804	0.543	0.239
<b>Variance</b>	0.184	0.062	0.245	0.159	0.251	0.184
<b>Confidence Interval (5%)</b>	0.150	0.014	0.310	0.722	0.439	0.150
	0.328	0.117	0.516	0.887	0.647	0.328

Source: Own elaboration

In terms of the frequencies observed, the study makes it very clear that the answer concerning risk-based auditing is the most frequently cited by auditors (80.4%) while the improvement of computer tools is indicated as the second most relevant reason (54.3% of auditors surveyed). Curiously enough, both the reasons related to norms and time pressure associated with auditing costs present considerably low frequencies although they have very high variability.

It should, however, be noted that four of the people interviewed added the following reasons to the previously mentioned options:

- *“It is generally the most efficient way of obtaining review evidence”;*
- *“To check that the evidence obtained from substantive tests supports the analytical procedures”;*
- *“Reliability of internal data”;* and
- *“Possible variations in income in view of planning predictions and greater efficacy in the detection of significant variations”.*

In terms of content, the first reason relates to the time pressure to carry out a job and was therefore included in the first option.

The second and fourth answers have to do with the *risk-based approach*, which is also included in the options that have been given.

Lastly, the answer regarding the reliability of external data was not considered in that it relates to the audit context, which is analysed in another question and is not a reason that can justify the use of analytical audit procedures on its own.

In view of these results, the main components were analysed in order to define the series of reasons that explain the variance seen in this question. The conclusions found are shown in Table 3.

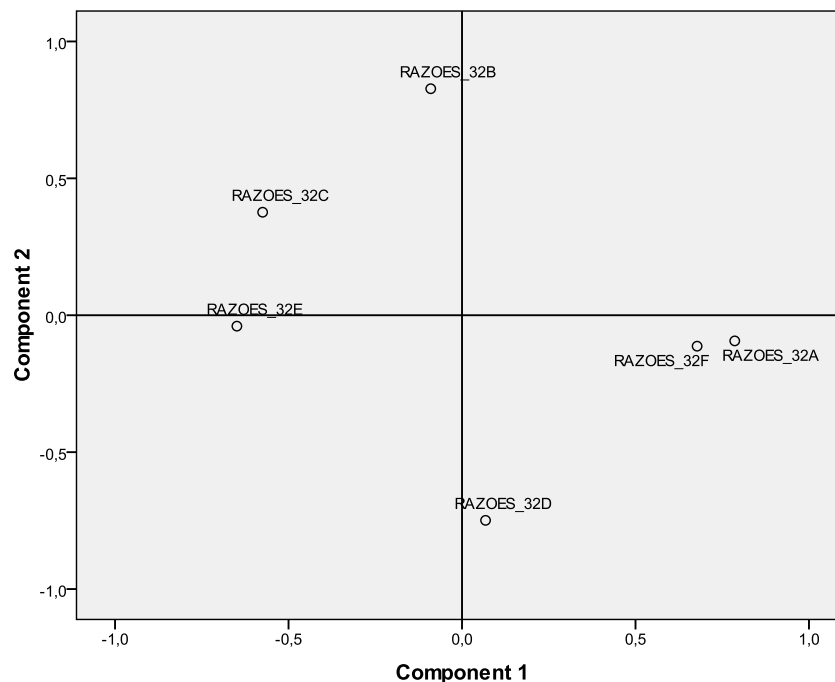
Table 3. – Main Component Analysis

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
C1	2.139	35.648	35.648	1.841	30.682	30.682
C2	1.112	18.537	54.186	1.410	23.503	54.186
C3	.825	13.751	67.936			
C4	.790	13.165	81.102			
C5	.596	9.937	91.039			
C6	.538	8.961	100.000			

Source: Own elaboration

Figure 1 shows the reasons that characterize the two main components (variance greater than 1).

Figure 1. – Varimax Rotation for Determining Main Components



Source: Own elaboration

Analysis of Figure 1 shows that Main Component 1 is essentially made up of reasons related to time pressure in auditing work (A) whereas Main Component 2 is associated with the improvement of applicable norms (B).

## CONCLUSION

The results suggest that Portuguese auditors are increasingly using analytical audit procedures because the new approach (risk-based auditing) demands that they be used as part of their working methodology. In this respect, the concentration of answers is higher than 80%. This merely descriptive analysis reinforces what Mulligan and Inkster (1999) had already suggested in their studies.

Despite the near unanimity of the responses, the main component analysis suggests that time pressure, associated with a better understanding of the norms, would explain a large part of the variable.

This confirmation upholds the conclusions reached by Albrecht (1977), Hylas and Ashton (1982), Blocher and Willingham (1988), and Calderon and Green (1994), who highlight the undeniable usefulness of using analytical procedures, arguing that they are a proven way of increasing the efficiency and efficacy of auditing work. According to the collected data, analytical procedures are especially attractive in cost terms, which is something that auditors appreciate.

It is worth noting that, even though Portuguese auditors are increasingly using analytical procedures when collecting evidence - for the reasons described above and validated by the work undertaken - such procedures do not always provide evidence to corroborate the claims made in financial statements. Such evidence is generally obtained through detailed tests that often remain an indispensable part of financial auditing in many areas of work.

## REFERENCES

- Albrecht, W. (1977). *Towards Better and More Efficient Audits*. Journal of Accountancy, December, pp. 48-50.
- Ameen, E., Strawser, J. (1994). *Investigating the use of analytical procedures: an update and extension*; Auditing: A Journal of Practice & Theory, 13, pp. 69–76.
- Anderson, J., Jennings, M., Kaplan, S., Reckers, P. (1995). *The effects of using diagnostic decision aids for analytical procedures on judges' liability judgments*. Journal of Accounting and Public Policy, 14 (1), pp. 33-65.
- Apostolou, B., Pasewark, W., Strawser, J. (1993). *The effects of senior internal auditor behaviour on staff performance and satisfaction*. Journal of Business Research, 23, pp. 110-122.
- Arens, A., (2006), *Auditing and Assurance Services – An Integrated Approach*, 11th, pp. 208-216, Prentice Hall, New Jersey.

Bader, A. and Khoshnaw, N. S. S. (2023). *IT Tools Applications in Audit Profession: The CPA's Perspective*. International Journal of Professional Business Review, 8(8), e03334. <https://doi.org/10.26668/businessreview/2023.v8i8.3334>

Biggs, S., Mock, T.J. & Watkins, P.J. (1989). *Analytical review procedures and process in auditing*, Research Monograph No. 13, The Canadian Certified General Accountants' Research Foundation.

Blocher, E. (2002). *Updating analytical procedures*. The CPA Journal. New York.

Blocher, E. Loebbecke, J. (1992). *Research in analytical procedures: implications for establishing and implementing auditing standards*, AICPA, Auditing Standards Board Expectation Gap Roundtable.

Blocher, E., Willingham, J. (1988); *Analytical Review: A Guide to Analytical Procedures*, (2<sup>nd</sup> ed.), New York: Prentice Hall.

Calderon, T.G. and Green, B.P. (1994). *Signaling fraud by using analytical procedures*. Ohio CPA Journal, 53, April, pp. 27-38.

Coakley, J.R. (1982). *Analytical review: A comparison of procedure and techniques used in auditing*, Ph.D dissertation, University of Utah.

Cushing, B., Graham, L., Jr., Palmrose, Z., Roussey, R., Solomon, I (1995); *Risk Orientation, In Auditing Practice, Research and Education: A Productive Collaboration*, edited by Bell, T. B. E Wright, A. M., AICPA, New York: 11-54.

Fraser, I., Hatherly, D., Lin, K., (1997). *An empirical investigation of the use of analytical review by external auditors*. The British Accounting Review (March); pp 35–47.

Hollingshead, R.T. (1996). *Discussion of an empirical test of Bentham's theory of the persuasiveness of evidence*. Auditing: A Journal of Practice and Theory, 15(Supplement); pp. 33-36.

Hubais, A. S. A., Kadir, M. R. A., Bilal, Z. O. and Alam, M. N. (2023). *The Impact of Auditor Integrity to Audit Quality: an Exploratory Studies from the Middle East*. International Journal of Professional Business Review, 8(1), e01254. <https://doi.org/10.26668/businessreview/2023.v8i1.1254>

Hylas, R., Ashton, R. (1982). *Audit Detection of Financial Statement Errors*; The Accounting Review Vol. LVII, No. 4 – pp 751-766.

International Federation of Accountants (IFAC); ISA 520 – Analytical Procedures - translated by OROC (effective for audits of financial statements for periods beginning on or after December 15, 2004).

Lin, K., Fraser, I. (2003). *The use of analytical procedures by external auditors in Canada*; Journal of International Accounting, Auditing & Taxation 12, pp. 153-168.

Loebbecke, J.K. & Steinbart, P.J. (1987). *An investigation of the use of preliminary analytical review to provide substantive audit evidence*, Auditing: A Journal of Practice & Theory, 5, Spring, pp. 74–88.

- Mahathevan, P. (1999); *Auditors' Use and Perception of Analytical Procedures: Evidence from Singapore*; International Journal of Auditing 1(3), pp 225 – 239.
- Marten, Kai-Uwe; Quick, Reiner y Ruhnke, Klaus (2006): “*Lexikon der Wirtschaftsprüfung*”.
- McDaniel, L.S. (1990); *The effects of time pressure and audit program structure on audit performance*; Journal of Accounting Research, 28, pp. 267-285.
- Messier, W., (1995). *Research in and development of audit-decision aids. In Judgment and Decision-Making Research in Accounting and Auditing*; Cambridge University Press, pp. 207-228.
- Mulligan, C., Inkster, N. (1999). *The use of analytical procedures in the United Kingdom*. International Journal of Auditing, 3, pp 107–120.
- Nach nationalen und internationalen Normen, Stuttgart.
- Pinho, C. (2011). *A Utilização de Procedimentos Analíticos no Trabalho de Auditoria*, XIII Accounting and Auditing Congress, ACIM 2011.
- Puncel, Luis. (2007). *Audit Procedures 2008*. Chicago: CCH – a Wolters Kluwer Business. ISBN 978-0-8080-9123-3.
- Reis, E.; Melo, P.; Andrade, R.; Calapez, T. (2007) – *Estatística Aplicada Vol. 2*; Edições Sílabo.
- Reis, E.; Moreira, R. (1993); *Pesquisa de Mercados* - 1st edition; Edições Sílabo
- Sullivan, J., Gnospelius, R., Defliese, P., Jaenicke, H. (1985). *Montgomery's Auditing*, Tenth Edition. New York: John Wiley & Sons.
- Tabor, R.H. and Willis, J.T. (1985). *Empirical evidence on the changing role of analytical review procedures*. Auditing: A Journal of Practice and Theory, 4, pp. 93-109.