The Usefulness of Analytical Procedures: An Empirical Approach in the Auditing Sector in Portugal

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ABSTRACT

The conceptual conflict between the efficiency and efficacy on financial auditing arises from the fact that resources are scarce, both in terms of the time available to carry out the audit and the quality and timeliness of the information available to the external auditor.
Audits tend to be more efficient, the lower the combination of inherent risk and control risk is assessed to be, allowing the auditor to carry out less extensive and less timely auditing tests, meaning that in some cases analytical audit procedures are a good tool to support the opinions formed by the auditor.
This research, by means of an empirical study of financial auditing in Portugal, aims to evaluate the extent to which analytical procedures are used during a financial audit engagement in Portugal, throughout the different phases involved in auditing.
The conclusions point to the fact that, in general terms and regardless of the size of the audit company and the way in which professionals work, Portuguese auditors use analytical procedures more frequently during the planning phase rather than during the phase of evidence gathering and the phase of opinion formation.

1. Introduction

The problem associated with the conflict between an effective financial audit and an efficient one arises from the fact that, in the context of this type of work, there is a scarcity of resources, whether in terms of time available to carry it out or the quality and timeliness of the information available to the external auditor.

In this context, the effectiveness of the audit means the opinion given by the auditor is free from errors and efficiency relates to the auditor carrying out the audit with a sufficiently reduced margin of error, in other words, with an adequate level of security within the context and using as few resources as possible. This implicit conflict inevitably leads to risk analysis and the development of audit risk theory.

Traditional audit risk analysis maintains that it is a function of inherent risk, control risk and detection risk, assuming independence between these three components. In recent years, financial auditing has followed a risk-based approach in which the nature, opportunity and range of planned procedures derives from the evaluation of accounts or classes of transaction with greater likelihood of distortion (Cushing *et al., 1995*). However, more recent approaches to this topic (Messier and Austen, 2000, and Barros, 2006) have concluded that there is greater correlation between the factors of inherent risk and control risk. As such, the inherent and control risks should not be evaluated independently. Otherwise the audit risk model may produce erroneous results that lead the auditor to adopt unsuitable procedures. These conclusions coincide with those of Graham (1985), who clearly showed that auditors are aware of the existence of an obvious dependency between these two components of audit risk. Given this premise, the global risk of an audit is a function of the risk of material distortion and the risk of the auditor not detecting this distortion.

Auditing procedures result from the auditor's need to be able to manipulate the detection risk in order to keep the global audit risk at an acceptably low level, given the objectives set out for the audit engagement. For accounts or transaction classes where there is a raised risk of material distortion, the detection risk should be reduced, implying, as such, that the auditor should carry out more extensive and timely tests.

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On the other hand, audits tend to be more efficient, that is, they use fewer resources, when the risk of material distortion is assessed to be lower, allowing the auditor to carry out auditing tests that are not classified as substantive detail tests, that are less extensive and, potentially, less timely. These types of substantive audit procedures for collecting evidence, not classified as detail procedures, are called analytical audit procedures.

2. Problem Definition

In recent years, the topic of efficiency compared to effectiveness in auditing has become increasingly relevant. (Sullivan *et al.*, 1985; Tabor and Willis, 1985; McDaniel, 1990; Messier, 1995).

Deshmukh *et al.* (1998) developed the Signal Detection Theory, a model that argues the existence of a trade-off between efficiency and efficacy in auditing. These authors assume that the auditor's increased sensitivity to fraud, given, for example, the existence of fraud histories, is a decisive factor in carrying out effective auditing, which inevitably involves the collecting of more information by the auditor, which is likely to mean the audit resulting in an appropriate opinion, but will not reflect a particularly efficient job in terms of use of resources, such as the time spent by auditors, the number of auditors involved, or excessive time demands on employees of the audited company. From both perspectives, inefficient auditing is inappropriate because, despite leading to an opinion that tends to be well founded and correct, it is not optimised (efficient) in terms of use of resources, whether for the company carrying out the audit or the company under audit.

Two other studies carried out on this subject, Pincus (1990) and Bernardi (1993), originally focused on the problem of efficiency in auditing work, drawing conclusions consistent with the above-mentioned increase in the auditor's sensitivity to fraud, which is a key factor for effectiveness in auditing. In particular, Pincus *et al.* (1999) showed that fraud was more easily detected by auditors who had previously been personally involved or working for the same auditing company on cases where fraud had been detected.

Singling out the concept of efficiency in economic terms, it is generally associated with the optimisation of inputs, lack of waste and methodologies associated with the minimisation of cost (Amacher and Ulbrich, 1992; Baumol and Blinder, 1994). In the same way, in auditing, the concept of efficiency is related to the minimisation of use of resources (Taylor and Glezen, 1994). Reinforcing this initial idea, 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). In general terms, these same concepts have been adopted in the area of accounting studies (Davis and Solomon, 1989; Libby, 1995).

There are two articles that must be mentioned in this context. 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. Apostolou et al. (1993) defined efficiency as the ability to comply with a pre-established timeframe, which corresponded to a variation in percentage terms between the time allocated for the work and the time actually spent doing the audit work.

These studies show that there appears to be a compromise between efficacy in auditing and efficiency in the use of resources in auditing. Auditing procedures result from the auditor's need to be able to manipulate the detection risk in order to keep the global audit risk acceptably low, given the objectives set out for the auditing work. For items or transaction classes where the product between the inherent risk and the control risk is raised, the detection risk should be reduced, implying, as such, that the auditor should carry out more extensive and timelier tests, in other words, tests that are less efficient, as this uses more resources.

One of the factors that most compels auditors to use analytical procedures in auditing, according to Ameen and Strawser (1994), is the restriction imposed by the timeframe for auditing work and the significant development of computing tools (technological resources) available to auditors.

The *International Standard on Auditing* 520 - Analytical Procedures (ISA 520) clarifies that the use of analytical procedures is vital, whether during the planning phase, as part of the risk assessment procedures, or at the stage of issuing an opinion, suggesting, furthermore, that analytical procedures should be used as

corroborating evidence for the claims made in items, transaction classes and financial statements and corresponding disclosures. Ameen and Strawser (1994) have already concluded that the use of analytical procedures is consistent at each stage of an audit, i.e., in the planning and execution stages and in the stage in which the audit opinion is expressed, in line with ISA 520.

In fact, previous studies highlight the undeniable usefulness of analytical procedures, arguing that they are a proven way of increasing the efficiency and efficacy of auditing work (Albrecht, 1977, Hylas and Ashton, 1982, Blocher and Willingham, 1988, Calderon and Green, 1994). In particular, analytical audit procedures are extremely attractive in cost terms, and have a significant capacity to guide the auditor's work and provide relevant evidence to support the auditor's conclusions (Blocher and Willinham, 1988, Calderon and Green, 1994).

Other authors argue, however, that use of analytical procedures in a homogenous way over the three phases of an audit is not defendable, underlining that analytical procedures should mostly be used in the planning phase of the audit (Coakley, 1982, Loebbecke and Steinbart, 1987, and Biggs, *et al.*, 1989). However, Fraser *et al.* (1997) highlight that the extensive use of analytical procedures in the planning phase can mean the reduction of detail tests in the execution phase.

This study aims to identify the practices adopted in Portugal by the entities responsible for carrying out financial audits (auditing firms or individual auditors), in terms of the usage of analytical audit procedures during the various phases of an audit.

The main objective of this work is, therefore, to contextualise the conclusions relating to the use of analytical audit procedures in Portugal, especially in terms of the homogeneity, or lack thereof, in their use during each of the three phases of the audit: *(i)* planning, *(ii)* evidence gathering and *(iii)* opinion formation.

In order to achieve the objectives set for this study, three hypothesis were formulated and tested, based on the above described about this issue:

(i) "Analytical procedures are used equally by auditors in all phases of the audit;
(ii) Bigger auditing companies use analytical procedures more extensively; and
(iii) The use of analytical procedures is not influenced by the type of practice carried out by auditors.

3. Characterisation of Analytical Procedures

In the terms of the International Standard on Auditing 520 - Analytical Procedures[2] (ISA 520), these procedures correspond to assessments of financial information deriving from analysis of the plausible relationships between financial and non-financial data as well as investigations into fluctuations and identified relationships 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[3]:

(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 relationships between the financial data of the company under audit (including gross income, gross added value, 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 relationships 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 detail 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.

[2] Paragraph 3 of ISA 520 - Analytical Procedures.
[3] Paragraph 4 and 5 of ISA 520 - Analytical Procedures.

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

Looking at these initial considerations regarding analytical audit techniques in more detail, according to Arens (2006), analytical audit procedures are composed of:

- Comparison of the client's data with data from the sector;
- Comparison of the client's data from the period with data from the past;
- Comparison of the client's data with budgetary data or data estimated by the client;
- Comparison of the client's data with estimates carried out by the auditor;
- Comparison of the client's data with the data expected according to non-financial data.

This approach suggested by Arens (2006), based on comparative procedures, is specified in the context of the above-mentioned ISA 520 which states in its third paragraph that analytical procedures:

> *"...are evaluations of financial information through analysis of plausible relationships among both financial and non-financial data. Analytical procedures also encompass such investigation as is necessary of identified fluctuations or relationships that are inconsistent with other relevant information or that differ from expected values by a significant amount."*

According to Costa (2007), the techniques associated with analytical procedures constitute the greatest challenge in the profession of auditing. The author admits that, on the whole, the various analytical procedures are very seldom used in Portugal, chiefly because they require a high level of knowledge of mathematics and computing, skills that, as a rule, small- and medium-sized auditing firms do not possess.

4. Methodology

In order to carry out the empirical study on the use of analytical audit procedures in Portugal, a survey was prepared and sent by email to every working auditor, facilitated by the National Auditors Association (OROC).

The survey was devised in order to collect information on the use of analytical audit procedures by working auditors. As such, the total number of professionals surveyed is around 800 working auditors, according to the data supplied by the most recent annual report published by the national Auditors Association (2013).

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 was 92.9%, according to the number resulting from the random sample of 99 surveys collected from working auditors;
- The target population was finite (800 working auditors) according to the data made available by the National Auditors Association (OROC);
- The margin of error set for 5%;
- The level of confidence set for 95%, corresponding to a statistical significance of 5%.

From this perspective, according to Reis et al. (2007), the sample estimated for this study will be:

$$n = \frac{0{,}929\,x\,0{,}071}{\frac{0{,}05^2}{(1{,}96)^2} + \frac{0{,}929\,x\,0{,}071}{800}} = 89 \qquad (4.1)$$

It can therefore be concluded that the size of the sample used in this research ($n = 92$) is appropriate, being higher than the result above. For this reason, the conclusions drawn 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 (χ^2) with a significance level of sα and a number of degrees of freedom equal to the size of the sample less one unit. In this case, the distribution function of χ^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 0.0651 is accepted[4].

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. It is possible, therefore, to conclude that the sample collected is statistically relevant for the study carried out.

The selected sample may be analysed as follows:

Table 4.1. – Composition of Sample

Type of Practice	Turnover Amount			Total
	< 500,000 €	> €500,000 and < €1,500,000	> 1,500,000 €	
Individual Auditor	40	0	0	40
Firm Partner	18	12	8	38
Employee	0	0	14	14
Total	**58**	**12**	**22**	**92**

The sample results shown in Table 4.1 are consistent with the empirical observation of the Portuguese audit sector. Individual auditors have less turnover potential, which is why they are all included in the class of auditors with smaller turnovers.

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

5. Research Results

The results of the study are described below, for each of the three phases of auditing work:

a) Use of analytical procedures (AP) in the planning phase

Table 5.1 - Use of AP in the Planning Phase

	Absolute Frequency	Relative Frequency	Accumulated Frequency
Rarely	2	2.2	2.2
Sometimes	2	2.2	4.3
Frequently	36	39.1	43.5
Always	52	56.5	100.0
Total	**92**	**100.0**	

As shown above, auditors have a clear tendency to always (56.5%) or frequently (39.1%) use analytical procedures for the planning phase of an audit.
The results of the means comparison test of the responses relating to the way in which the activity is carried out leads to the conclusion that there are no significant differences in the level of use of analytical procedures in the planning phase according to the way in which the activity is carried out[5].

[4] The variance is the product of *p (1-p)*, in this case 0.93 x 0.07 = 0.0651.
[5] ANOVA test for equality of 3 means, for a significance of 5% = 0.626

The results of the means comparison test of the responses relating to the size of the auditing company leads to the conclusion that there are no significant differences in the level of use of analytical procedures in the planning phase according to the size of the auditing company[6].

b) Use of analytical procedures (AP) in the evidence gathering phase

Table 5.2 - Use of AP in the Evidence Gathering Phase

	Absolute Frequency	Relative Frequency	Accumulated Frequency
Sometimes	22	23.9	23.9
Frequently	56	60.9	84.8
Always	14	15.2	100.0
Total	**92**	**100.0**	

The results show that auditors generally tend to use analytical audit procedures frequently (60.9%) in the collecting evidence phase, while the "always" response was only observed in 15.2% of cases, and the "sometimes" response in 23.9% of cases. It is noted that there were no "*never*" or "*rarely*" responses.

The results of the means comparison test of the responses relating to the way in which the activity is carried out leads to the conclusion that there are no significant differences in the level of usage of analytical procedures in the collecting evidence phase according to the way in which the activity is carried out[7].

The results of the means comparison test of the responses relating to the way in which the activity is carried out also leads to the conclusion that there are no significant differences in the level of usage of analytical procedures in the collecting evidence phase according to the size of the auditing company[8].

c) Use of analytical procedures in the opinion formation phase

Table 5.3 - Use of AP in the Opinion Formation Phase

	Absolute Frequency	Relative Frequency	Accumulated Frequency
Rarely	10	10.9	10.9
Sometimes	22	23.9	34.8
Frequently	32	34.8	69.6
Always	28	30.4	100.0
Total	**92**	**100.0**	

As shown above, in the final phase of the audit, the use of analytical procedures is less consensual than has been observed in the previous two phases. However, most auditors responded "*frequently*" (34.8%) or "*always*" (30.4%).

The results of the means comparison test of the responses relating to the way in which the activity is carried out leads to the conclusion that there are no significant differences in the level of usage of analytical procedures in the final opinion formation phase according to the way in which the activity is carried out[9].

The results of the means comparison test of the responses relating to the size of the auditing company leads to the conclusion that there are no significant differences in the level of usage of analytical procedures in the final opinion formation phase according to the size of the auditing company[10]. However, this shows that the result of this statistic is much closer to the rejection area of the null hypothesis (equality of means) than in previous tests carried out for the other two phases of audit work. This statement is concordant with the previously mentioned and significant dispersion of the results obtained.

[6] ANOVA test for equality of 3 means, for a significance of 5% = 0.523
[7] ANOVA test for equality of 3 means, for a significance of 5% = 0.869
[8] ANOVA test for equality of 3 means, for a significance of 5% = 0.311
[9] ANOVA test for equality of 3 means, for a significance of 5% = 0.196
[10] ANOVA test for equality of 3 means, for a significance of 5% = 0.083

In order to verify in which phase, globally and on average, auditors make a most frequent use of analytical audit procedures, a confidence interval of 95% was prepared (Table 5.4) for the mean use in each of the audit phases.

Table 5.4 - Confidence Intervals - Use of Analytical Procedures by Phase

Phases	Average	Variance	Lower Limit	Upper Limit
Planning	4.5	0.429	4.3655	4.6356
Evidence Gathering	3.9	0.388	3.7841	4.0420
Opinion Formation	3.8	0.966	3.6443	4.0513

It becomes clear that, with a confidence level of 95%, auditors use analytical procedures most frequently in the planning phase of an audit (on average *always*) compared to the two other phases (on average *frequently*).

In terms of the dispersion of responses, greater variability is recorded at the level of use of analytical procedures in the final revision phase of the audit. As a consequence, the confidence interval calculated at a 95% confidence level, has a greater range than in the other two phases of the audit.

6. Conclusion

The results of this study point to the fact that auditors in Portugal use analytical procedures most frequently in the planning phase, rather than in the other two audit phases. This statement is confirmed homogenously across the groups analysed, which means that it is independent from both the way in which the activity is carried out and the size of the auditing company.

This conclusion therefore leads to the rejection of the hypothesis: "*Analytical audit procedures are used equally by auditors in all phases of the audit.*"

The rejection of this hypothesis clashes, to a certain degree, with what is set out in ISA 520, which anticipates the use of analytical procedures in all three phases of auditing work. This conclusion also does not corroborate the position held by Ameen and Strawser (1994), that there should be a certain homogeneity in the level of use of analytical procedures throughout all the audit phases.

However, the rejection of this hypothesis is consistent in a certain degree with the conclusions drawn by Fraser *et al.* (1997) and Lin and Fraser (2003), which observed that, in the United Kingdom and Canada, respectively, auditors tend to use analytical procedures less frequently in the evidence gathering phase and more frequently in the planning and in the opinion formation phases. In the same vein, Loebbecke and Steinbart (1987), although not supported by empirical studies, argue that it is precisely in the planning phase that analytical procedures are most effective and, therefore, they should be used more frequently by auditors.

The increased use of analytical procedures in the planning phase of an audit also falls in line with the theories argued by Glover *et el.* (2007) and Houck (2003) which confirm that not making use of analytical procedures in this phase tends to lead to inefficient audits, as auditors do not concentrate adequate time and procedures on areas with increased material distortion risk, as well as ineffective audits as these type of procedures often allow for the detection of errors that would not be detectable in other phases. However, given the conclusions drawn by Lin and Fraser (2003) and Cohen (1994), in the sense of analytical procedures being used most frequently in the phase where an opinion is formed, the results observed do not corroborate this claim.

It must also be highlighted, in what concerns to the second hypothesis, that the results of this study do not confirm the fact that bigger auditing companies use analytical procedures more extensively (Fraser *et al.*, 1997; Lin and Fraser, 2003; Mahathevan, 1999; Mulligan and Inkster, 1999), given the acceptance of the hypothesis of equality of means for the three groups defined according to the size of the auditing company in Portugal.

Finally, this study leads to the conclusion that the use made of analytical procedures in Portugal is independent of the way in which the profession is carried out by auditors, as the results obtained allow for the validation of the hypothesis of equality of means between the three groups defined in this context.

To summarize, taking into account the above mentioned, this study points out to fact that, in general, and independently of the firm size or type of professional practice, Portuguese auditors are still quite conservative about the usefulness of analytical procedures, and, therefore, tend to accept its usage as a planning technique, rather than for evidence gathering purposes or as a global revision and opinion forming helpful tool.

Further investigation needs to be made in order to understand the reasons for this scepticism about the usefulness of analytical procedures in Portugal, and to identify specifically in what auditing areas and what type of such procedures are in fact considered being relevant in the financial auditing work.

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