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Use of Analytical Hierarchy Process (AHP) to identify the preference of accounting experts regarding the company valuation method in accounting expertise

Abstract

This article aimed to show the preferences of accounting experts as to the choice of the corporate valuation method in accounting expertise, as well as the main criteria, quantified on the basis of a multi-criterion method, called Analytic Hierarchy Process (AHP). In the theoretical framework, the relationship between forensic accounting and company valuation was assessed, in which the expert procedure is called inventory of assets. The main methods of business valuation and the Special Balance Sheet were presented, which is a particular procedure by the Brazilian judicial power that shows the assets at market value, liabilities at present value and goodwill. The use of AHP proved to be fit for the research, showing the preference of accounting experts for the Special Balance Sheet with Discounted Cash Flow (ABDFC), with 62.66%. Among the criteria for the choice of the corporate valuation method, continuity obtained the highest percentage with 46.13%.

Key words: Company valuation. Forensic accounting. Inventory of assets. AHP.

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1. Introduction

Accounting expertise, fulfilling the objectives of accounting, also generates useful information for decision making, being an instrument for testing, disclosure and verification of the veracity of the facts. The expert procedures include the inventory of assets, which seeks to measure the fair value of the company, as a rule, in actions that deal with the partial dissolution of companies, or even in inventories. To measure the fair value of the company, the expert accountant may use methods deriving from the framework of finance theory and asset and income valuation theory, and the expert procedures should be supported by neutrality, reliability and verifiability. According to the theoreticians, there is no method to be used for all kinds of companies that is absolute and independent of the contexts the company is inserted in. Thus, it is up to the expert accountant to use certain methods that depend on the characteristics, forecasts and attributes of the assets, as well as on the company's going concern. The expert accountant should be aware of the tools that you can use to accomplish this task, taking into account the conditions and restrictions inherent in the valuation methods.

The framework of the Theory of Finance and the Theory of Asset and Income Valuation offer the whole basis for the construction of company valuation models, constituted by approaches that evaluate the project based on future cash prospects, ability to generate higher than normal profits, comparison with valuations of similar companies or sale multipliers, and valuation of assets at book or market value in function of the discontinuity of the business discontinuity of the function and, on the opposite, the continuity of the company as a determinant for the choice of the valuation model and the calculation of goodwill (Iudícibus, 2000; Damodaran, 2005; Assaf Neto, 2006).

In this set of models and empirical applications through corporate valuation methods, other issues emerge that deserve attention, such as the criteria to select these assessment methods and additional procedures that seek to provide for valid and reliable valuations and expert reports. These aspects demand a process of choice, of decision on what to use, when and how.

It is this context that the Analytic Hierarchy Process (English, AHP) stands out. This method helps in decision-making processes involving the analysis of multiple criteria that influence the assessment of the variables that influence the problem and the alternative resulting from the choice. According to its founder, Thomas Saaty, it is used to answer questions about the type of preferences of the decision maker and the available or desired alternatives, as well as to answer questions about what is most important in terms of criteria and what is more likely at the level of the alternatives (Saaty, 1997).

The use of the AHP method can show the priorities of forensic accountants to choose the company valuation methods, as well as which method is preferred over the others. Thus, the guiding question for this research is established: Based on the application of the AHP method, can the preference of forensic accountants be identified in the choice of the method and approaches in company valuation of companies in expertise for the inventory of assets?

2. Accounting Expertise and Company Valuation in Asset Inventory Processes

Legal expertise, according to Art. 420 of the Civil Procedure Code, consists of an examination, inspection or valuation, and can also be understood as an instrument for testing, observing and verifying the truth. Expertise work is realized by means of a scientifically and technically founded work or report, with a conclusive finding on the truth of the fact, also resulting in forensic accounting evidence (Alberto, 2000; Ornelas, 2000b)

Art. 145 of the CPC establishes that when "the proof of the fact depends on technical or scientific knowledge, the judge will be assisted by an expert", according to the provisions of Art. 421 (Brazil, 1973, p. 267). This forensic accounting procedure is present not only in the Brazilian judiciary, but there are international publications focused on this issue, as highlighted in Laro and Pratt (2005).

Pires (2006, p. 60) points out that the expert evidence is constituted by the application of technical procedures, with the "aim of establishing the causal connection between the damage and the object that requests the action." For Peleias, Nogueira, Parisi and Ornelas (2009), the forensic legal accounting is a specialized occupation to deliver a specialized technical service, with the judges and the parties to the proceedings as the users of the information.

Paulo Cunha, Alencar & Martins (2006) point out that, in asset inventory processes to determine the value of the company, the accounting experts need to use procedures supported by the technical literature.

Thus, the construction of the expert report aims to elucidate aspects or situations that require technical / scientific knowledge and shall present its validity and reliability based on the qualitative aspects of the accounting information, such as the faithful representation of the company value, neutrality and verifiability and theoretical basis of the work done, as advocated by Tibúrcio Silva (2008).

Note that the expert's work, when performed in order to determine assets, should not only possess theoretical foundation and technical consistency since, according to Ornelas (2003, p. 102), "it should be categorically justified how the value determined was obtained".

3. Fair Value and Company Valuation in the Inventory of Assets

The measuring of the fair value, based on IFRS, should derive from unforced transactions, without pressures imposed by the market (Shanklin, Hunter & Ehlen, 2011). Guided by the Accounting Procedures Committee, through CPC 46, which deals with the measuring of the fair value, a broader understanding of the valuation process is obtained, realizing that the fair value can come from impartially established estimates, however using the same assumptions that market participants would use when pricing the asset being valuated.

Thus, the impartial and accurate nature the expertise in the calculation of assets should be based on, supported by the quality of the information produced, whose aim is to provide clarifications to the parties and the judge. This information should rest on procedures supported by accounting and/or finance theory. Hence, it is understood that the sense of fair value measurement is perfectly suited to the objectives and procedures of judicial expertise in the inventory of assets.

In addition to the impartiality inherent in and conditional of expert work, the accounting expert often needs to minimize or eliminate any conditions of information asymmetry. Therefore, in this valuation process, the condition and justification of the search for the fair value takes form in its full conceptual and empirical aspect.

4. Valuation Methods

According to Damodaran (1997), there is no such thing as the best company valuation method. The choice of what method to use will depend on the specific scenario and a range of characteristics of the asset or the company being valuated. In the same line of reasoning, Martins *et al.* (2001) add that there is no absolute formula.

With the finance bias, Martelanc, Pasin and Pereira (2010) highlight that the most used company valuation methods are: accounting/equity; discounted cash flow, multiples or relative valuation; and EVA/MVA (Economic Value Added and Market Value Added), and that the investment banks and consulting companies prefer the Discounted Cash Flow method.

According to Fernández (2007), the valuation methods are divided in six main groups, highlighting that, in the field of corporate finance, understanding the mechanisms of the company valuation processes is fundamental. In Figure 1 below, some of these methods are exemplified per valuation group.

Figure 1

Groups of company valuation methods

Balance Sheet	Economic Income	*Mixed (Goodwill)*	Discounted Cash Flow	Value Creation	Options
• Accounting value model • Adjusted accounting value model • Settlement value model • Substantial value model	• Income value model • Dividend value model • Sales multiples model	Models: • Classical • Simplified European Union • European forensic accountants • Indirect method • Annual earnings purchase method • Relative risk rate and free risk rate model	• Free Cash Flow • Equity Cash Flow • Capital Cash Flow • Dividend model • Adjusted Present Value (APV)	• Economic Value Added (EVA) • Cash Flow of Return on Investments (CFROI)	• Black and Scholes • Investment option • Project expansion • Investment postponement

Source: Fernández (2007, p. 4).

Hitchner (2003) and Laro and Pratt (2005) highlight that the approaches to determine company value can be based on the fair market value (comparisons of market prices), investment value (according to attributes set by the investors), the intrinsic value (based on fundamental analysis) or on the accounting value (verified based on the financial statements).

In accounting expertise for the inventory of assets, according to Tibúrcio Silva (2008), different methods can be used: New York, Hatfield, Ornelas, Moschini and Scotti, Pellegrino, Delaware Method and sales multiples.

5. Special Balance Sheet

Although the Special Balance Sheet is not a company valuation method by itself, its function is to show the market value of the company equity. It is related with the special balance sheet, according to Art. 1031 of the Civil Code. Law No. 10.406/2002, however, should not be mixed up with this, as the special balance sheet shows the financial position of the company at the event date, while the Special Balance Sheet shows the assets at market value, liabilities at present value and goodwill, when the company's attributes indicate this.

According to Ornelas (2003, p. 83), the Special Balance Sheet is "prepared for the date of the event, when the property elements are valued and reflect market values. It is used to determine the amount of the migrant or deceased partner's assets".

Ornelas (2000a); Perez and Famá (2004) appoint Precedent 265 of the Supreme Federal Court (STF), which states: "In the inventory of assets, the balance not approved by the deceased or retired member does not prevail." Thus, according to Ornelas (2000a), without the balance sheet for the date of the event, or even if the balance sheet exists but without the approval of the migrant partner in the asset determination processes, a Special Balance Sheet needs to be elaborated.

It follows from this review that, although there is no specific law establishing or requiring the use of the Special Balance Sheet or CFC standard for this purpose, Ornelas (2000a); Hoog (2010), Santos (2011) and Oliveira (2011) consider its use as an accounting procedure that aims to provide more accurate and reliable information at the moment of the corporate resolution, effectively fulfilling the understanding issued by the judiciary power through judgments formally drawn up by the state courts and the Superior Court of Justice.

6. The AHP – Analytic Hierarchy Process Method

According to Saaty (1997), in decision making processes, if there is an appropriate structure able to offer the conditions to analyze the whole decision process, it is possible to predict the best alternative despite the present and future conditions, resulting in a better grounded decision.

To optimize the decision making process, Saaty developed the Analytic Hierarchy Process (AHP), whose essence is rooted in the comparison and allocation of pairs, a procedure psychologists have previously used and which they called pairwise comparisons (Ishizaka & Labib 2011). Saaty (1997) describes that the AHP can be used to answer questions of preference in alternative terms, intended to be descriptive and not a normative theory. The author highlights that the method is used to answer questions about what is more important on the basis of established criteria and/or what is more likely in terms of alternatives.

According to Kroenke and Hein (2011), this method allows you to create a hierarchical structure through priorities and can be used to support decision making, such as the definition of a company rating in a particular sector in function of hierarchically structured indices. According to Saaty himself, the AHP can be used to model and structure economic, social, and management problems (Saaty, 1991).

The AHP is a tool to support decision making that seeks to determine clearly and through the synthesis of the values and characteristics of each alternative those that will be prioritized or classified, finally determining a global measure that will show the best alternative deriving from the criteria and judgments made. This structuring of hierarchical levels facilitates the understanding and evaluation of these criteria in order to choose the best alternative (Gomes, Araya & Carignano, 2004).

Lyra (2008, p. 51) highlights synthetically that the AHP use process basically consists of five steps:

a) define the problem and the hierarchical structure;
b) build priority matrices;
c) obtain the relative priority matrices;
d) check the consistency of the matrices;
e decide on priorities.

Figure 2. Decisions and procedures in company valuation in asset inventory expertise

Source: elaborated by the authors.

Figure 2 illustrates the variety of approaches, procedures, and, why not say, decisions inherent in the company valuation process which should be considered when developing asset inventories, such as: theoretical foundation in the report, quality of bookkeeping and the search for the fair value.

6.1 the problem and the hierarchical structure

In the decision making process, the problem should be structured, which is one of the advantages of the AHP method, as it permits the construction of a hierarchical structure for the criteria, providing users with a more objective focus and highlighting specific criteria and sub-criteria for the subsequent assignment of weights (Ishizaka & Labib, 2011). Lyra (2008) points out that the stage of structuring the problem and elaborating the hierarchy is fundamental because, after the assignment of weights, the criteria can be compared pair by pair, followed by the alternatives.

6.2 comparisons of pairs and the scale matrix

In the application of the Hierarchical Analysis Method, the pair comparisons are fundamental for their use (Saaty, 1987). The main criteria for judging these pairs and the relative importance in these comparisons should be set, and judgments will be represented by numbers on a fundamental scale and ordered by an *n* matrix. According to Saaty, the formation of the comparison matrix is given by:

$$a_{ij} > 0 \qquad \text{for } i = 1, 2,..., n \qquad j = 1, 2,..., n$$
$$a_{ji} = 1/a_{ij} \qquad \text{for } i = 1, 2,..., n \qquad j = 1, 2,..., n$$

The elements above the main diagonal, represented by a_{ij} are formed by equal judgments on a scale from 1 to 9 and the elements below the main diagonal are represented by a_{ji} determined by $1/a_{ij}$,. The judgments should however be quantified to the criteria pairs, $\boldsymbol{I_i}$ and $\boldsymbol{I_j}$, which should be represented in an **n x n** matrix, that is, a quadratic matrix, since the comparison will always equal one (a) (Lyra, 2008). These matrices are positive and reciprocal (Saaty, 1987). That is, the elements below the main diagonal are reciprocal function of the elements above this diagonal. Thus, with $a_{ij} > 0$, a_{ji} is $= 1 / a_{ij}$.

$$A = \begin{bmatrix} 1 & a_{12} & a_{13} & \dots & a_{1j} \\ 1/a_{12} & 1 & a_{23} & \dots & a_{2j} \\ 1/a_{13} & 1/a_{23} & 1 & \dots & a_{3j} \\ \dots & \dots & \dots & 1 & \dots \\ 1/a_{1j} & 1/a_{2j} & 1/a_{3j} & \dots & 1 \end{bmatrix}$$

According to Lyra (2008, p. 55), in these judgment matrices, in which the $\mathbf{a_{ij}}$ elements represent a number that indicates the importance of $\boldsymbol{I_i}$ when compared to $\boldsymbol{I_j}$, the following conditions should be attended to:

Rule 1: If $\mathbf{a_{ij}} = \alpha$, then $\mathbf{a_{ji}} = \mathbf{1}/\alpha$ **,** $\alpha \neq \mathbf{0}$**.**
Rule 2: If $\boldsymbol{I_i}$ is considered equally important as $\boldsymbol{I}$, then $\mathbf{a_{ij}} = \mathbf{1}$**,** $\mathbf{a_{ji}} = \mathbf{1}$**.** And, particularly, $\mathbf{a_{ii}} = \mathbf{1}$ for any **i**.

Judgment matrices are constructed in function of scales of degrees of importance, which should be determined for each criterion or sub-criterion. As Saaty (1991) suggested, the scales of degree of importance are determined according to Figure 2 below:

Figure 2
Scale of degree of importance

Degree of importance	Definition	Explanation
1	Same importance	Both activities equally contribute to the objective
3	Moderate importance of one over the other	Experience and judgment slightly favor one activity over the other
5	Strong or essential importance	Experience and judgment strongly favor one activity over the other
7	Very strong importance	One activity is very strongly favored and its dominion is demonstrated in practice
9	Extreme importance	Evidence definitely favors one activity over the other
2,4,6,8	Intermediary scores between two adjacent judgments	When looking for a condition between two definitions

Source: adapted from Saaty (1987, 1991).

6.3 standardization and consistency of priorities

Following the order established by Saaty (1991), the next step is the standardization of the priority matrix, wherein the relative weights are calculated for each matrix element as a function of the sum of the column it belongs to. According to Lyra (2008), in this standardization process of the matrix, the eigenvector is calculated which, after standardization, will become the vector of priorities.

The matrix resulting from the standardization process will be defined as follows (Santos, 2008):

$$A' = \left[a'_{ij}\right] \text{ where } a'_{ij} = a_{ij} \Big/ \sum_{k=1}^{n} a_{ik} \quad \text{for } 1 \leq i \leq n, \text{ and } 1 \leq j \leq n$$

The next step is to obtain the Average Local Priorities, in line with Costa (2002), or the calculation of the relative weight of each alternative (Lyra, 2008). This relative weight is calculated by the arithmetic mean of each row. After calculating the vectors of the Average Local Priorities (ALP), the Global Priority (GP) will be calculated because the intention is to identify a vector "that stores the priority associated with each alternative in relation to the primary focus or global target "(Costa, 2002, p. 61). To calculate the GP, the ALPs should be combined into a Global Priority Vector (GP). Santos (2008) clarifies that the result will be the determination of a single weight value (C) for every decision choice, represented by the following mathematical notation, in which the compound weight *C* is given by:

$$C = \left[c_d\right] \text{ for } 1 \leq d \leq n \text{ where } c_d = \sum_{t=1}^{nt} W_t * \prod_{l=1}^{n1-1} W_l$$

Being **A = (a_{ij}),** an *n* x *n* matrix with positive elements, $a_{ij} = a_{ji}^{-1}$, "**A**" will be consistent if, and only if $\lambda_{max} \geq n$ (Saaty, 1991, p. 272). That is, having been obtained through subjective judgments, the **aij** coefficients may not be based on exact measures. To calculate the consistency of the matrices, Saaty (1987) considered the following equation:

$$IC = \frac{|\lambda_{MAX} - N|}{N - 1}$$

Where,
IC = Index of Consistency;
N = Dimension of the Matrix;
λ_{max} = Maximum Eigenvalue (Saaty, 1987).

Nevertheless, to validate the priority scores or scales, the consistency ratio is calculated, to be obtained through the following division:

$$RC = \frac{IC}{IR}$$

Where *IC* = Index of consistency and *IR* = Random Index (Saaty, 1987)

According to this scale calculated by Saaty (1987), the RC index is acceptable at a ratio lower or equal to 0.10. The IR is obtained from the matrix scale (n), elaborated by Saaty.

6.4 Studies Using AHP

Many studies have been published on the application of AHP in various fields. Ho, Dey and Higson (2006), after performing a literature review of research on AHP, showed that various tools can be combined with this method, among which mathematical programming, SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) and data envelopment analysis (DEA). The author analyzed 66 related articles published in international journals in 1997-2006. Of the articles analyzed, 33 studies (50%) accounted for the integration of AHP with mathematical programming, presenting techniques combined with linear programming (alone or mixed) and goal programming; and five studies (7.6%) incorporated AHP integrated into SWOT analysis.

Granemann and Gartner (1998) used AHP to choose the best form of aircraft funding, justifying that, for this sector, funding exerts significant influence on the capital structure of those companies. Different variables have to be considered for the best choice, thus presenting fertile ground for the application of AHP, and the funding options studied were: financial leasing, operational leasing and bank loan.

Amaral, Silva and Teixeira (2007) discussed the application of the Decision Support System (DSS), using Analytic Hierarchy as a tool to support small and medium farmers in the region of Betim (MG), in beef cattle production planning activities. The survey was conducted in two phases. In the first, efforts were made to classify the following objectives: maximizing the gross margin, minimizing the risk and maximizing the trading. In the second phase, the focus was on the ranking of the important factors of each phase of beef cattle production. The conclusion was that, for the rural producer in the region of Betim (MG), the activity of cattle fattening offers the best conditions to obtain a higher gross margin, lower risk and good trading conditions, mainly in the city of Betim (MG), where agricultural production is very small and lands have a high opportunity cost.

7. Methodological Procedures

This article is based on the inductive method, with an empirical quantitative approach. According to Demo (1995, p. 136), induction "departs from the particular and generalization is put forward as a product of the effort to collect particular cases." As for its goals, this research adopted a descriptive-exploratory design, presenting a new approach to a theme and expanding its studies, fitting into the typology by Martins (2007).

As for research procedures, we used semistructured interviews. These interviews were conducted with accounting experts accredited in the Association of Legal Experts, Arbitrators, Mediators and Conciliators of Minas Gerais (Aspejudi - MG). We opted for the forensic accountants registered in this professional association to better focus on the baseline population for the sample, since not all accountants registered in the Regional Accounting Council of Minas Gerais perform accounting expertise, nor do all accounting experts perform asset inventory expertise. Thus, a survey was undertaken on the Aspejudi-MG website, showing 17 experts in asset inventories and six who reported expertise in company valuation, three of whom figure in both groups. Hence, in total, 20 accounting experts were registered in Aspejudi-MG who reported company valuation and/or inventory of assets among their specialties. Of these, eight were interviewed, corresponding to 40% of the total. In line with Rose and Arnoldi (2008), an interview protocol was elaborated, which aims to build a script and a structure for data collection.

The responding accounting experts are characterized as professionals active in the market, with a degree in Accounting and, of the eight respondents, four obtained another degree, ranging from Administration to Economics and Law. Five professionals have provided expertise for over 20 years, while two professional have worked for more than 14 years and one professional had seven years of experience during the interviews. All professionals hold at least one *lato sensu* post-graduation degree, with emphasis ranging from Controllership to Audit and Finance, and three professionals hold a *stricto sensu* post-graduation degree, M.Sc. in Accounting. As to gender, seven professionals are male and one female.

Although the data survey was conducted through interviews, this article specifically focuses on the disclosure of key issues and priorities for the accounting experts, regarding company valuation in asset inventory expertise, using the Analytic Hierarchy process (AHP), which constitutes an eminently quantitative procedure. Nevertheless, it is noteworthy that, for the use of AHP, as a matrix model for decision making, small samples are relevant, according to the method to be detailed. Hence, interviews were structured to get to know the professional training, the time of operation, the amount of work already done, the form of planning, the approach to intangible assets, values and choices of valuation methods. In addition, the viewpoint and the consequent choice of the valuation method was investigated in terms of financial aspects, such as the going concern of the business, the quality of accounting, revenues, profitability, as well as property.

In this context, the objective was to determine which valuation method the accounting experts consider better. This entire structure was based on academic background, work experience, perceived intangibility attributes, revenue, profitability, among other aspects capable of enabling the researcher, as proposed by the AHP method, to quantify aspects the judges prefer, considering the various criteria and alternative choices, granting a hierarchy of values to what is being assessed.

However, the limitation of AHP to work in small samples is emphasized, because the geographical aspect of Aspejudi-MG's work is limited to the forensic accountants operating in the State of Minas Gerais. Therefore, no nationwide generalizations can be made, whether in terms of the population or the sample size.

8. Quantitative Analysis: Application of AHP

8.1 Determination of Hierarchical Structure

Adopting the structure proposed by Lyra (2008) for the construction of the hierarchical analysis, the hierarchical structure and the comparative parameters were defined, according to the model displayed in Figure 3.

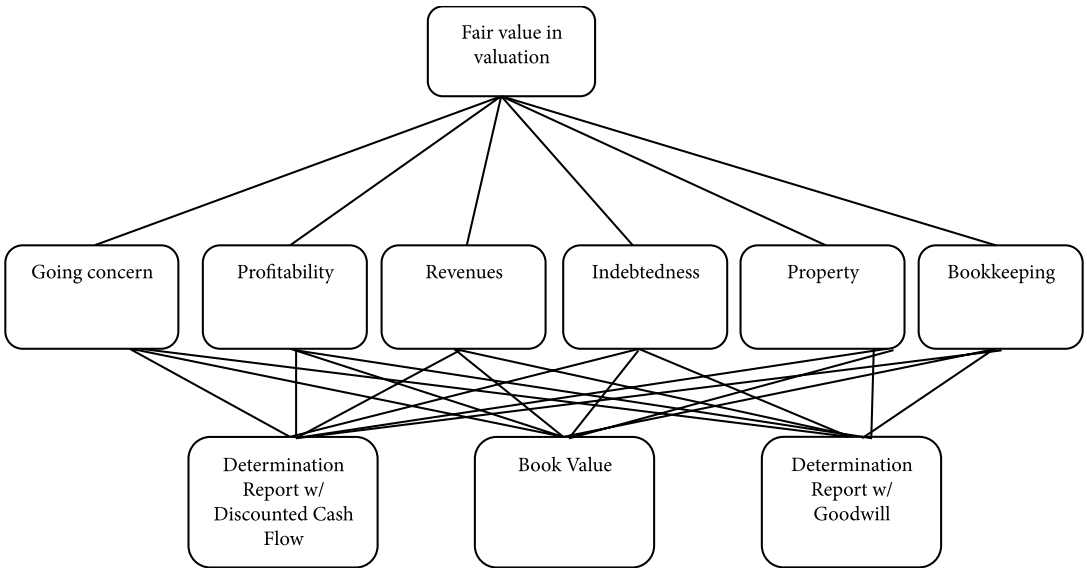

Figure 3. Hierarchical structure of decision problems of the Valuation Method in asset inventories

Source: elaborated by the authors.

Based on this hierarchical structure, the following are defined:

- **Target / goal = fair value in valuation:** shows the overall goal of what is intended with the hierarchical analysis. For the purposes of this research, it is understood that the purpose of using the alternatives (different valuation methods) derives from determinant criteria. The goal of the accounting experts is the value the company at its fair value, considering all these variables.
- **Criteria = (Going Concern, Profitability, Revenue, Indebtedness, Property and Bookkeeping):** are the main factors that will determine the choices of alternatives. These criteria could be further broken down into sub-criteria.

Specifically for the hierarchical analysis in this research, the criteria chosen are:

- **Going concern:** in addition to being in a postulate to be obeyed in the survey of financial statements (CPC 2011), it is a major factor in company valuation. In this regard, the valuation of the business is biased by future cash prospects as decisive for the choice of the model for valuation and calculation of goodwill (Assaf Neto, 2006; Damodaran, 2005; Iudícibus, 2000).
- **Profitability:** Laro and Pratt (2005) consider profitability as a differential in company valuation, mainly if confronting valuations using billing multiples as a proxy to compare valuations using other methods.
- **Revenues:** according to Martins et al. (2001, p.271), revenues are used in the valuation of companies without bookkeeping or, if it exists, which cannot be trusted. One option, although not the most scientific (Tiburcio Silva, 2008), is valuation by multiples or relative valuation. In this method, the revenues or turnover of the company are used as a determining factor of company value.

- **Indebtedness**: according to Laro and Pratt (2005), in approaches based on asset valuation, company liabilities that are not properly disclosed are also investigated, such as contingent liabilities and leasing contracts.
- **Property:** if, on the one hand, going concern serves as a premise for the choice of the valuation method, Iudícibus (2000) points out that, in entities whose operations are being discontinued, assets have to be valued at their settlement value. It appears that, in these circumstances, the inventory of assets, in contrast to the survey of liabilities, will be a relevant procedure for company valuation.
- **Bookkeeping**: Montandon (2006) considers that the obstacles to assess micro and small companies involved in court cases include the lack of bookkeeping. The same consideration was found in Paulo *et al.* (2006), which evidenced that one of the main difficulties of forensic accountants in asset inventory expertise is the lack of bookkeeping.
- **Alternatives = Special Balance Sheet with Discounted Cash Flow, Book Value and Special Balance Sheet with Goodwill**: these alternatives should be chosen based on criteria. Specifically in this research, these alternatives represent the combination of the Special Balance Sheet with the valuation methods to be applied: Discounted Cash Flow, book value and goodwill (specific calculation formulae).

Even in the Special Balance Sheet with Discounted Cash Flow, the goodwill can be verified through the difference between the amount verified by the cash flow minus the amount of all assets at market value. Nevertheless, the alternative Special Balance Sheet with Goodwill represents the assets valued at market value plus the Goodwill calculated through specific methods.

8.2 Analysis of Results

To apply the AHP, the open software Open Decision Maker version 1.0.1 was used, licensed by GPL (General Public License), available from http://sourceforge.net/projects/opendecisionmak/. This software determines the Global Priority (GP) represented by the verification of the ranking of alternatives. It calculates the Average Local Priority (ALP) in relation to the criteria being compared, generally represented in the software by the matrix *alternative - main criterion - matrix*. It also determines the priority of the criteria, also presenting their hierarchy.

8.2.1 matrices of preferred order and verification of global priority

After defining the purpose, criteria and alternatives (company valuation methods in asset inventory lawsuits) interviews were held with the forensic accountants in order to assemble the matrices of these experts' preferences through judgment scales. Comparisons were made pairwise, in a linear manner, as determined by AHP. It is noteworthy that the judgment scale ranges from 1 to 9.

The first step was the development of the performance matrix of the alternatives: Valuation by Special Balance Sheet with Discounted Cash Flow (ABDFC), Valuation by Book Value (ABV) and Valuation by Special Balance Sheet with Goodwill (ABDG), based on each criterion. The criteria chosen were: Going Concern (CC) Profitability (CL), Revenues (CR) Indebtedness (EC), Property (CI) and Bookkeeping (CES).

Eight matrices of importance of the criteria were prepared, corresponding to each accounting expert interviewed. After the construction of these matrices, we calculated the arithmetic mean of the priorities the forensic accountants identified and determined the standard comparison matrix referring to the average calculated. The following shows the matrix prepared through this procedure, as shown in Table 1.

Table 1
Matrix of importance of criteria

Criteria	CC	CL	CR	CE	CI	CES
CC	**1,0**	5,0	5,0	6,0	5,0	2,0
CL	1/5	**1,0**	2,0	1,0	3,0	2,0
CR	1/5	1/2	**1,0**	1,0	2,0	2,0
CE	1/6	1,0	1,0	**1,0**	2,0	2,0
CI	1/5	1/3	1/2	1/2	**1,0**	2,0
CES	1/2	1/2	1/2	1/2	1/2	**1,0**

Source: research data.

According to Table 1, the judgment criteria are considered equal and, on the main diagonal, a priority equal to 1 is determined, as a variable compared to itself will have the same priority level, below the main diagonal, the elements will be a reciprocal function of the elements above that diagonal so that, if $a_{ij} > 0$, then $a_{ji} = 1 / a_{ij}$. To understand this importance matrix, one can analyze the Going Concern criterion (CC) which, compared to the Profitability (CL), Revenue (CR) and Property (CI) criteria has weight 5 while, in the Bookkeeping quality criterion (CES), the weight was only 2. These figures show that the importance of the Going Concern is strong or essential when compared to Profitability, Revenue, Property and moderate when compared to the quality of Bookkeeping.

After the construction of the priority matrix of the criteria, it was standardized, determining the following vector of Average Local Priorities (ALP).

Table 2
Average Local Priority verified

Continuidade	46,13%
Lucratividade	16,54%
Receita	10,83%
Endividamento	10,60%
Escrituração Contábil	8,29%
Imobilizado	7,61%

Source: research data.

According to Table 2, the average local priorities calculated indicate that the main criterion for the accounting experts, among those presented for the preparation of the matrices of priorities, was the going concern, which scored 46.13%. These preferences reinforce the contributions of Iudícibus (2000), Martins et al. (2001), Damodaran (2005) and Assaf Neto (2006), when establishing the enterprise's going concern as a prerequisite for the valuation of assets based on the prospects of future benefits or the settlement value of these assets in the event of termination or non-feasibility of the business. Next come the profitability, revenue and debt criteria, scoring less than 20%, and the criteria Bookkeeping and Property, which showed a percentage lower than 10%. Note that, for the professionals interviewed, aspects like profitability of the company and revenues received a weight higher than the quality of bookkeeping. Such disclosure indicates that, even in lawsuits, aspects like the company's capacity to generate value for shareholders and the ability to generate resources deriving from the enterprise's business are given greater weight than the quality of bookkeeping.

The Property criterion, despite being considered relevant when valuing entities using the goodwill calculation approach by means of specific formulas, and also when valuing companies based on the settlement value of the assets, received lower priority, with a percentage of 7.61%.

The next step was the elaboration of the preferred matrices for each criterion. Tables 3 to 5 show the matrices of importance of the criteria chosen in relation to the alternatives Valuation by Special Balance Sheet with Discounted Cash Flow (ABDFC), Valuation by Book Value (ABV), and Valuation for Special Balance Sheet with Goodwill (ABDG).

Table 3
Matrices of importance of Going Concern and Profitability criteria

Going Concern Criterion				Profitability Criterion			
CC	ABDFC	ABV	ABDG	CL	ABDFC	ABV	ABDG
ABDFC	1,00	8,0	4,0	ABDFC	1,0	7,0	3,0
ABV	1/8	1,0	1/5	ABV	1/7	1,0	1/6
ABDG	1/4	5,0	1,0	ABDG	1/3	6,0	1,0

Source: research data.

Table 4
Matrices of importance of Revenue and Indebtedness criteria

Revenue Criterion				Indebtedness Criterion			
CR	ABDFC	ABV	ABDG	CE	ABDFC	ABV	ABDG
ABDFC	1,0	5,00	2,0	ABDFC	1,0	4,00	2,0
ABV	1/5	1,0	1/6	ABV	1/4	1,0	1/3
ABDG	1/2	6,0	1,0	ABDG	1/2	3,0	1,0

Source: research data.

Table 5
Matrices of importance of Property and Bookkeeping criteria

Property Criterion				Bookkeeping Criterion			
CI	ABDFC	ABV	ABDG	CES	ABDFC	ABV	ABDG
ABDFC	1,00	4,0	2,0	ABDFC	1,00	4,0	1,0
ABV	1/4	1,0	1/4	ABV	1/4	1,0	1/3
ABDG	1/2	4,0	1,0	ABDG	1,00	3,0	1,0

Source: research data.

Table 6 shows the calculated average local properties according to AHP. In the Going Concern criterion, the alternative that achieved the highest score was valuation through the Special Balance Sheet with Discounted Cash Flow (ABDFC), obtaining 69.87% of importance, followed by valuation by the Special Balance Sheet with Goodwill (ABDG), with 23.70 %, and valuation by the Book Value (ABV), with 6.43%. Alternative Valuation using Special Balance Sheet with Discounted Cash Flow (ABDFC) also received the highest degree of importance among other criteria: Profitability (64.06%), income (54.98%), debt (55.84%), Property (54.69%) and Bookkeeping (45.79%). Second in the ranking of degree of importance, according to the experts' judgment scale and the AHP calculation procedures, came alternative valuation using the Special Balance Sheet with Goodwill (ABDG).

Table 6

Average Local Priorities (ALPs) criteria and alternatives

	CC	CL	CR	CE	CI	CES
ABFCD	69,87%	64,06%	54,98%	55,84%	54,69%	45,79%
ABV	6,43%	6,68%	8,21%	12,20%	10,86%	12,60%
ABDG	23,70%	29,26%	36,81%	31,96%	34,45%	41,61%

Source: research data.

As evidenced in Figure 4, the alternative Valuation using the Special Balance Sheet with Discounted Cash Flow (ABDFC), based on the criteria Going Concern, Profitability, Revenue, Indebtedness, Property and Bookkeeping obtained the highest weight and importance in all judgments.

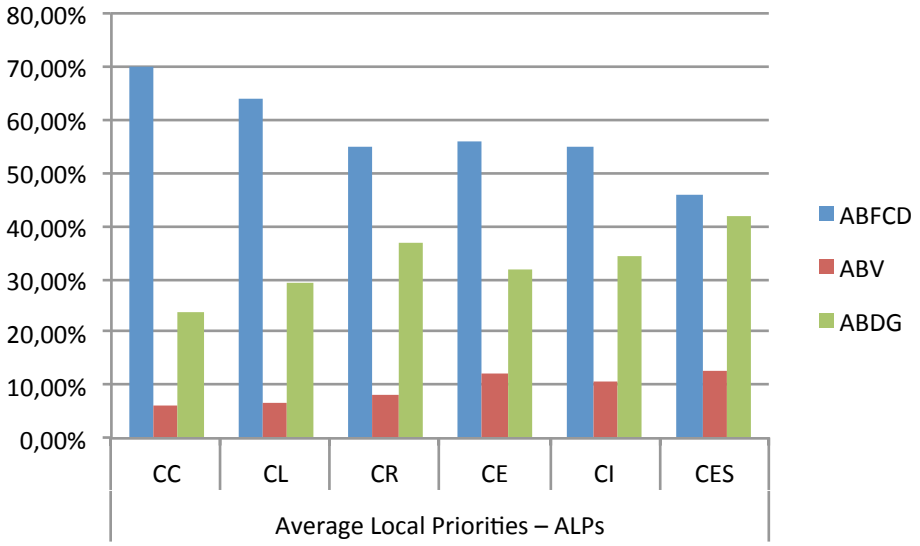

Figure 4. Average Local Priorities of criteria in relation to the alternatives

Source: Research data

The software Open Decision Maker also calculates the Consistency Ratio, as appointed by Saaty when he developed AHP. This algorithm, according to Saaty (1987), is intended to evidence the consistency of the matrices elaborated and their validity. Hence, to validate the vectors of preference verified, the Consistency Ratios (RC) should correspond to 0.10 at most. The Consistency Ratios verified in the matrices of each criterion were:

Table 7

Consistency Ratios

Criteria	RC
Going Concern	0,08
Profitability	0,09
Revenues	0,07
Indebtedness	0,02
Bookkeeping	0,01
Property	0,05

Source: research data.

8.2.2 Verification of Global Priority

The final phase is to verify the Global Priority (GP) which, according to Costa (2002), represents the vector that has stored the priority of each alternative in relation to the main focus or the general objective. The elements of the GP express the performances of the alternatives in the light of the general objective or main focus. Thus, the vectors of the Average Local Priorities (ALPs) verified for each criterion are combined with the vector of the General Objective (OG) (Santos, 2008).

Table 8
Verification of Global Priority (GP)

Alternative	PG
ABFCD	62,66%
ABV	8,12%
ABDG	29,22%

Source: research data.

According to Table 8 and Figure 5, the alternative with the largest attributes according to the interviewed accounting experts' ranking of priorities was Valuation based on the Special Balance Sheet with Discounted Cash Flow (ABFCD) (Global Priority = 0.6266).

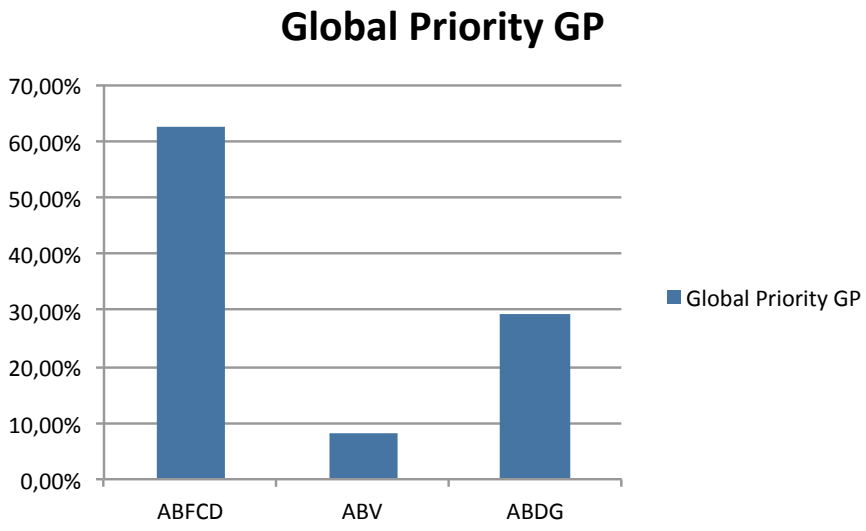

Figure 5. Global Priority

Source: Research data

9. Final considerations

The aim in this article was to identify, through the application of AHP, the preferences of forensic accountants regarding the use of different company valuation methods and/or procedures in asset inventory lawsuits.

The company valuation methods were discussed and the Special Balance Sheet was explained as a tool for the inventory of assets from the deceased or excluded partner, incorporating the goodwill, when evidenced, as well as the assets at market value and liabilities at present value.

Although the preferences of the forensic accountants could be verified only by the interviews, the merit of using the AHP derives from the possibility to quantify the criteria used for company valuation in lawsuits, thus permitting a measure of the degree of these preferences. This procedure provides a more objective and positivist measure.

The use of AHP showed that criteria such as revenue, property and indebtedness, for almost all of the interviewed accounting experts, are not decisive for the choice of the corporate valuation method to be employed in asset inventory expertise, nor is the quality of Bookkeeping. According to the average priorities determined, these criteria obtained the following percentages: Revenue, 10.83%; Debt, 10.60%; Bookkeeping, 8.29%; and Property, 7.61%. However, it should be highlighted that, when the accounting experts' perceptions on Bookkeeping are analyzed through the interviews held, five experts approved this criterion, as it may be a determining factor in the choice of the corporate valuation method to be employed in asset inventory expertise.

On the other hand, based on the Average Local Priorities verified, for the forensic accountants, the main criterion, among those presented for the preparation of the matrix of priorities, was the going concern with 46.13%. Profitability, Revenue and Debt presented a percentage less than 20% and Bookkeeping Property less than 10%. It is inferred that, for the professionals interviewed, profitability and revenue were higher priorities than the quality of bookkeeping. This disclosure leads to the conclusion that, for the accounting experts, the ability of the company to generate value for shareholders and generate inflows of resources received greater weight than the quality of Bookkeeping, although most forensic accountants agree on the importance of bookkeeping for asset inventories. This finding may be considered appropriate, taking into account the fact that, in asset inventory expertise, the information asymmetry problem is very common.

Noteworthy are also limitations pointed out by Ornelas (2010), based on legal determinations on the issue, arguing that future equity events do not affect the inventory of assets, defending that the Discounted Cash Flow would be inappropriate for asset inventory expertise and that this method does not disclose the surplus of profits or super-profits, which are the basis for the calculation of goodwill.

The use of AHP based on the criteria presented and alternatives proposed, however, appointed that the forensic accountants preferred, as the method that received the highest priority, the alternative Valuation using the Special Balance Sheet with Discounted Cash Flow (ABFCD), with a global priority (PG) of 62.66%. The Special Balance Sheet with Goodwill (ABDG) showed 29.22% and Valuation at Book Value (ABV) 8.12%.

Thus, one may consider the utility of AHP as a tool for determining the best alternative in terms of company valuation methods in legal asset inventory expertise, as well as for quantifying the degree of importance of the criteria used to select these methods.

As research limitations, the geographic establishment of the population in a single state is highlighted, thus limiting the generalizability of the results; as well as the subjective nature of the AHP, not the method itself, but rather the subjective judgments of each respondent to set up the matrix of priorities and thus subsequently determine the Average Local Priorities and the Global Priority. Another limitation for the better use of AHP is the non-elaboration of a data sensitivity analysis through the software used to construct the matrices and apply the analytical hierarchy process.

For future research, we suggest the analysis of new judgments on the jurisprudence in asset inventories, either in the Supreme Court or even in state courts, with regard to the company valuation methods employed, especially regarding the use of the discounted cash flow.

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