How do Auditors Issue Going Concern Opinions? A Dynamic model using Belief Functions; Evidence from 2004 to 2015

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The purpose of this paper is to develop an GCO assessment model that explicitly models the "OR" relationship between the auditor's decision to issue a GCO and three financial statement factors: net operating loss, negative cash flows from operations, and negative working capital. For purpose of simplicity, the model is based on three factors identified by prior research but is dynamic enough to incorporate additional factors. We develop an analytical expression of the model using the belief function framework. By using this framework, we provide insights about how auditors revise their beliefs to issue a going concern opinion when more than one factor is present. We calculate the revised beliefs using empirical data of going concern opinions from 2004 to 2015. The results of our analysis revealed that the "OR" relationship is effective in measuring the auditor's decision to issue a going concern opinion. The analysis showed that when more than one corroborating factor is present, the auditors inflate their beliefs for the individual factors before arriving at their overall belief to issue a going concern opinion. We find that Big Four auditors exhibit better judgment than Non-Big Four auditors in belief revisions of the individual factors to arrive at a decision to issue a GCO. Finally , we derive a cost-benefit function of the GCO decision by auditors to study the effect of litigation costs on the auditor's decision to issue a GCO using GCO model beliefs . The cost-benefit analysis reveals that Non-Big Four audit have a very low tolerance for litigation costs as compared to Big-Four audit firms and hence are more likely to issue GCOs' even when their belief to issue a GCO is very low.

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I. Introduction

Audit reporting of going-concern uncertainties has long remained an issue of concern to legislators, regulators, and the auditing profession. Standard-setters have reacted to such concerns by strengthening auditing and accounting standards related to going-concern reporting (AICPA 1988, 1995, 2017; FASB 2014), and going-concern reporting is one of the current issues on the agenda of the PCAOB. Under U.S. audit standards, the auditor is required to evaluate the going concern assumption. The auditor's evaluation is based on his or her knowledge of relevant conditions and events that exist at or have occurred prior to the date of the auditor's report (AICPA Statement on Auditing Standards 341, formerly SAS No. 59 ; AICPA 1988). However, Mckeown (2011) asks "why are the criteria so imprecise that auditors can have significant doubt, year after year, that a company can survive the next twelve months only to be proven wrong, over and over again?" Many prior studies have examined a variety of issues related to going concern opinions (GCO hereafter), including (a) factors associated with GCOs' and (b) the association between GCOs' and subsequent failures.[1] In general, prior research shows that a variety of both financial and non-financial factors are associated with the issuance of GCOs (Carson et al. 2013). However, prior research has not examined how the auditors use the financial statement factors to issue a GCO to the client, and there is no evidence of any structured model being used by auditors to arrive at their GCO opinion. Carson et al. (2013), in their synthesis of GCO research, call for alternative research approaches noting that little extant research solely addresses the auditor's process of arriving at a decision to issue a GCO.

[1] See Carson et al. (2013) for a detailed summary of prior research related to GCOs.

The purpose of this paper is to address this gap in the auditing literature by developing a GCO assessment model (GCO model hereafter) using belief functions. Because coming up with a GCO entails a process of gathering and aggregating uncertain items of evidence pertaining to each factor, we develop the GCO model using the evidential reasoning approach of Srivastava et al. (2006) under the Dempster-Shafer theory (hereafter DS) of belief functions[2] (Shafer 1976). As discussed later, DS theory is a better framework for representing uncertainties associated with the items of evidence than the probability framework (Shafer and Srivastava 1990, see also Krishnamoorthy 1993). Further, Shafer (1976) argue that decion makers may alter their judgments when they are faced with corroborating or conflicting items of evidence. Accordingly, they may inflate or discount their beliefs for certain factors which are influencing their decision. In a situation where two pieces of evidence are supporting a particular decision , decision makers inflate[3] the value of m(true) and deflate m(false) the same amount before arriving at an overall belief to make a decision. In the current paper, we study the belief revision process of auditors to issue a GCO using empirical data. The data for the three financial statement factors, and the corresponding audit opinions associated with these factors, are extracted from 36,405 financial statements of financially distressed companies spanning the years 2004 to 2015.

The GCO model incorporates the following features. First, it explicitly models the auditor's decision to issue a GCO using three financial statement factors: net operating loss (NOL), negative cash flows from operations (NCFO), and negative working capital[4] (NWC)

[2] See Srivastava and Shafer 1992 for an introduction, also see Shafer and Srivastava 1990, Srivastava 1993, Srivastava and Mock 2005.

[3] In a situation, where we expect the judgment to decrease the value of m(true) then we decrease m(true) and increase m(false) the same amount. That is, revised m(true) = x – dx = (1-d)x, and revised m(false) = 1 – (1-d)x, where d is the deflation parameter, with values $1 \geq d \geq 0$. A value of d = 0 means no deflation, and d= 1 means 100% deflation.

[4] For the purpose of simplicity, the initial model uses only three main factors which have been documented in prior research to have contributed to the auditor's decision to issue a GCO opinion. The model developed in the paper is dynamic, so auditors can incorporate additional factors in to the model as they deem fit.

(Desai et al 2017; Carson et al. 2013). Next, using belief functions, we explicitly model the "OR " relationship between the three factors and the auditor's decision to issue a GCO. The "OR" relationship implies that the auditor will give a GCO when any one, or any two or all the three financial factors are present, and the auditor will not give a GCO if and only if all the three factors are not present. Third, the model provides a structured approach to gather and aggregate items of evidence pertaining to the three financial statement factors that finally yield an overall judgment concerning the decision to issue a GCO. Fourth, the model examines how auditors revise their beliefs for the individual factors before arriving at their decision to issue a GCO when more than one factor is present using the Shafer (1976) method or revision of beliefs. We do this by comparing the GCO model predicted beliefs for the auditor's decision to issue a GCO with empirical data of GCO opinions and calculating the revised beliefs by conducting simulations on the GCO model. We run the model separately for Big Four auditors and Non-Big four auditors because prior research has documented an association between auditor size and audit opinions (Reichelt and Wang 2010; DeFond et al. 2011; DeFond and Lennox 2011; Numan and Willekens 2011). Also, audit quality and client characteristics vary widely for Big Four auditors and Non-Big Four auditors (Deangelo, 1981; Defond et al, 2016). Specifically, we examine whether belief revisions in the presence of one or more of the three factors is different for Big Four and Non-Big Four auditors.

The paper makes several contributions to the stream of research for GCOs'. The paper is the first attempt to explicitly model the "OR" relationship between financial statement factors and auditor's decision to issue a GCO using the evidential reasoning method. The results of our analysis reveal that modelling the "OR" relationship between the three financial statement factors is very effective in measuring the auditor's decision to issue a GCO. Second, measuring

belief revisions by auditors when more than one factor is present using empirical data of actual GCOs' issued by auditors enables us to "open up the black box regarding what auditors actually do in practice when they are assessing ''substantial doubt'' and in their final determination of whether to issue a GCO" (Carson et al, 2013, pp 21). To illustrate, we find that when both NWC and NCFO are present, auditors inflate their beliefs for NWC by 19% percent and their belief for NCFO by 23% to arrive at their overall belief to issue a GCO[5]. Next, the current paper specifically identifies and differentiates the judgment behavior of Big Four auditors and Non-Big Four auditors in the presence/absence of one or more of the three important financial statement factors. Our results reveal that Big Four auditors exhibit better judgment than Non-Big Four auditors in belief revisions of the individual factors to issue a GCO. This is evidenced by the fact that when companies have all the three corroborating factors present (NOL, NWC, and NCFO), BIg Four audit Firms inflate[6] their beliefs for the individual three factors (NOL; 60%, NWC: 60% ; NCFO: 41%) to arrive at an overall belief to issue a GCO. In the same scenario , counterintuitively, Non-Big four auditors discount their beliefs for the three factors by 32 percent. This finding might expain the higher incidences of Type I and Type II errors among Non-Big Four audit firms as opposed to Big Four audit firms.

The model developed in this paper can be effectively used by external auditors to determine whether to issue a GCO. For example, the external auditor can use the evidential diagram of the model to add more factors or vary the level of belief for a specific factor in a structured way, as appropriate in the specific situation. Finally, we derive a cost-benefit function of the GCO decision by auditors to study the effect of litigation costs on the auditor's decision to

[5] Detailed findings of belief revisions are discussed in the Results section of the paper. As stated earlier, it is to be noted that the model can measure belief revisions even if additional factors are added to the model.

[6] The calculation of these inflated beliefs and the rationale for inflation of beliefs in the presence of two or more factors is elaborated in Section 3.

issue a GCO using the beliefs derived from the GCO model . We demonstrate this cost benefit analysis separately for Big Four auditors and Non-Big Four auditors as their expected costs and benefits are different from each other. We use average empirical audit fees for both Big Four auditors and Non-Big Four auditors from our sample to validate our results The cost-benefit analysis reveals that Non-Big Four audit have a very low tolerance for litigation costs as compared to Big-Four audit firms and hence are more likely to issue GCOs' even when their belief to issue a GCO is very low. Lower tolerance for litigation costs among Non-Big Four auditors, which is due to lower audit fees and lack of financial resources, might cause them to issue GCOs' even when they are not warranted and lead to more Type II errors.

The rest of the paper is organized as follows. The next section provides the background and motivation for our analytical study. Section III describes the GCO Assessment model and its extensions relative to the key frameworks in prior research as an evidential network and development of hypotheses. Section IV describes the sample selection and the results of the analyses ,Section V presents the cost benefit analysis, and Section VI presents the conclusions.

II. BACKGROUND AND MOTIVATION

Regulators have been recently concerned with the auditors' assessment of the going concern assumption. The PCAOB Investors Sub Advisory Group's recommendation states that "going concern reports have failed to show up sufficiently early to warn investors" (PCAOBa 2012, p. 3). The Sub Advisory Group suggested several issues with the Audit Standard AU 341, including: (1) lack of specific objectives that the auditor should achieve; (2) the auditor is not required to design their audit specifically to look for evidence with respect to going concerns. There is a need for increased understanding about how the auditor arrives at a decision to issue a GCO and the factors which influence the auditor in

this regard (Carson et al. 2013). This in turn will enable us to provide the auditor with a structured model to assist the auditor in issuing a GCO.

The overwhelming majority of the published research related to GCOs has used different types of empirical approaches, with the archival approach being the dominant paradigm. However, Carcello et al. (2011, 19) note, in the context of summarizing research related to corporate governance, that "archival methods are not well suited for analyzing processes—that is, how does a board and/or board committee discharge its responsibilities? The same argument can be applied to the decision process of an auditor to issue a GCO. Our attempt to create a GCO model using the evidential reasoning approach of Srivastava et al. (2006) under the DS theory of belief functions can answer the above question. The DS theory of belief functions provides a broader framework for representing uncertainties in evidence (see, e.g., Akresh et al. 1988; Gordon and Shortliffe 1990; Shafer and Srivastava 1990). Moreover, unlike the Bayesian framework, the DS theory does not require the estimation of conditional probabilities. Krishnamoorthy (2002), in his discussion of a Bayesian approach to assessing the strength of the internal audit function, recognizes this limitation stating that, "it might be extremely difficult for external auditors to articulate their beliefs as conditional probabilities." (pp. 102). Under DS theory, these judgments do not require conditionals; decision makers assess the strength of evidence, on a scale 0-1, whether the evidence supports or negates the hypothesis or assertion under investigation. In addition, there is empirical evidence both in auditing (Harrison et al. 2002) and in psychology (Curley and Golden 1994) that decision makers think in terms of belief functions. For example, Harrison et al. (2002) could model 100 percent of auditors' (seniors and managers) judgments of uncertainty using belief functions whereas only 20 percent of these judgments could be modelled using a probability framework. The Bayesian framework is a

special case of the belief-function framework (Shafer and Srivastava 1990). Therefore, judgments which can be modelled in the Bayesian framework can always be modelled in the belief-function framework, but not vice versa. For example, Curley and Golden (1994) find that business students serving as jurors, who in the setting analyse a case with four possible suspects and up to four pieces of evidence pertaining to the suspects, assign belief masses to subsets that are logically consistent with the DS theory of belief functions.

Our paper explicitly models and tests the "OR" relationship between the three financial statement factors (NOL, NWC, and NCFO) and the auditor's decision to issue a GCO. Under the 'OR' relationship, the auditor will give a GCO when any one, or any two or all the three financial factors are present, and the auditor will not give a GCO if and only if all the three factors are not present. The "OR" relationship is ideal for the GCO decision. since it has been documented in prior research that the auditor's decision to issue a GCO gets stronger in the presence of multiple adverse financial statement factors (Lasalle and Anandrajan 1996). To our knowledge, no prior study has attempted to provide a structured model to understand the interrelationships between the factors using the evidential reasoning approach to arrive at a decision to issue a GCO. Such a model can be effectively used by external auditors to arrive at a decision to issue a GCO or not. Carson et al (2013) stressed that as the audit environment changes, there is an ongoing need to update evidence on the decision process of issuing GCOs' by auditors.

Next, we examine the belief revisions made by auditors to issue a GCO in the presence of more than one factors using empirical data. Shafer (1976) argued that when decision makers are faced with additional items of evidence which lend additional support to the stated objective, they can alter their beliefs and transfer their belief from ignorance or the negation of the

objective to the assertion of the objective. The decision maker then uses the altered beliefs for the pieces of evidences to arrive at an overall belief for the objective. In terms of the current GCO model, we measure the belief revisions of the auditors in three steps. First, we calculate the overall beliefs of auditors to issue a GCO using the GCO model developed in the paper in the presence of one or more factors. Next we compare the model-calculated beliefs with GCOs' using actual data of the firms from 2004 to 2015. Finally, using the process of simulation[7] on the GCO model, we are able to estimate the belief revisions made by auditors to issue a GCO in the presence of more than one factor. As stated earlier, the nature of the GCO decision lends itself to the "OR" relationship between the factors and auditor's propensity to issue a GCO. However, the process of formation and the revision of beliefs by the auditors cannot be confirmed without comparing the model predicted beliefs with actual empirical GCO decisions made by auditors in the real world. When more than one of the three factors are present which strengthen the auditor's decision to issue a GCO, rational auditors are more likely to issue GCOs' by revising their beliefs for the individual factors upwards (i.e. inflating their beliefs) before arriving at a decision to issue a GCO (Shafer 1976). Under the belief function framework, we model this inflation by adjusting the corresponding m-values similar to Shafer's approach of discounting of beliefs (Shafer 1976). The exact percentage of belief inflation depends on the subjective assessment of the auditor and can only be calculated by comparing the model predicted beliefs with actual empirical GCO decisions made by auditors in the real world. Accordingly, using the GCO model and actual GCO decisions made by auditors from 2004 to 2015, we conduct simulations to calculate the marginal belief revisions by the auditors for the individual factors. This measurement of belief revisions is an important step towards understanding the assessment of GCOs' by auditors.

[7] The method of simulation on the GCO model to measure the revised beliefs is explained in the next section

Finally, our paper specifically examines the differences between Big Four auditors and Non-Big Four auditors in their propensities to issue GCOs, and also investigates whether any differences in belief revisions exist between Big Four and Non-Big Four auditors. Specifically using the process described above, our model calculates and compares the percentage of belief revision for the individual factors made by Big Four and Non-Big four auditors when two or more of the three financial statement factors are present. Many studies investigate the association between auditor size and audit opinions, but the results are rather mixed. Mutchler et al. (1997) find no significant difference in GCO rates between Big 6 and Non-Big 6 auditors. More recent studies however find that Big 4 clients are significantly less likely to receive GCOs (Reichelt and Wang 2010; DeFond et al. 2011; DeFond and Lennox 2011; Numan and Willekens 2011). These later studies attribute the negative relationship to the fact that Big 4 clients are in better financial condition and are therefore less likely to warrant a GCO. Australian research examining the global financial crisis finds that Big 4 auditors respond earlier than non-Big 4 auditors to the crisis by issuing GCOs more conservatively (Xu et al. 2014). Francis and Yu (2009) find that larger offices are more likely to issue GCOs, consistent with their argument that larger offices are better able to detect and issue a GCO. In the light of the above, Carson et al. (2013) stress the need for alternative research methods to better understand the differences in the propensity to issue a GCO between Big Four and Non-Big Four audit Firms.

III. GCO ASESSESEMENT MODEL AND HYPOTHESIS DEVELOPMENT

In this section, we first develop a conceptual model for the GCO decision based on the three financial statement factors (NOL, NWC, and NCFO) described in prior research as contributing to the auditor's decision to issue a GCO or not (Carson et al. 2013). Next, we develop an analytical model based on this conceptual framework under the DS theory of belief

functions. Figure 1 depicts this conceptual framework where the rounded boxes represent the factors or variables that determine whether the decision to issue a GCO is yes or no, i.e., GCO_Y or GCO_N. We use the following three financial statement factors to model the auditor's decision to issue a GCO: Net Operating Loss (NOL), Negative Working Capital (NWC), and Negative Cash Flow from Operations (NCFO). These factors (or variables) are depicted as oval shaped objects in Figure 1 towards the right. The impact of these factors on GCO decisions are represented by the relationships expressed as hexagonal objects labelled R1, R2, and R3, in Figure 1, which are connected to the intermediate decision variables, GCO based on NOL, GCO based on NWC, and GCO based on NCFO. These intermediate variables are then connected to the final decision variable GCO through an 'OR' relationship, which implies that the auditor will give a GCO when any one, or any two or all the three financial factors are present, and the auditor will not give a GCO if and only if all the three factors are not present.

Analytical Model of GCO

Under DS theory of belief functions, presence or absence of various financial factors are represented by the following m-values (see Srivastava and Shafer 1992 for the basics):

Net Operating Loss: m_{NOL}(Yes), m_{NOL}(No), m_{NOL}({Yes, No}),
Negative Working Capital: m_{NWC}(Yes), m_{NWC}(No), m_{NWC}({Yes, No}),
Negative Cash Flow from Operation: m_{NCFO}(Yes), m_{NCFO} (No), m_{NCFO}({yes, No}).

A factor is present when the corresponding m-value for 'Yes' is 1, and for 'No' is zero. For example, the factor NOL is present implying that m_{NOL}(Yes) = 1, and m_{NOL}(No) = 0. Similarly, when NOL is absent, implying that m_{NOL}(Yes) = 0, and m_{NOL}(No) = 1.

The m-values for the three relationships, R1, R2, and R3, representing the impacts of various financial factors on GCO are expressed in terms of m-values on the joint space of GCO

and the financial factors are based on empirical data about the auditors' decision to issue a GCO based on the three financial factors, NOL, NWC, and NCFO. We collect the corresponding audit opinions associated with financially distressed companies spanning the years 2004 to 2015. Table 1 presents the empirical data for the three financial statement factors and their corresponding audit opinions from 2004 to 2015. In general, when only one financial factor is present, the auditor gives a GCO only x% of the time and the remaining (1-x)% gives no GCO. On the other hand, when the factors are not present then the auditor gives no GCO. Thus, based on this argument, we define the following m-values representing the three impact relationships:

R1-Impact of NOL on GCO:

$m_{R1}(\{(GCO_Y, NOL_Y), (GCO_N, NOL_N)\} = x_1,$

$m_{R1}(\{(GCO_N, NOL_Y), (GCO_N, NOL_N)\} = (1 - x_1).$

R2-Impact of NWC on GCO:

$m_{R2}(\{(GCO_Y, NWC_Y), (GCO_N, NWC_N)\} = x_2,$

$m_{R2}(GCO_N, NWC_Y), (GCO_N, NWC_N)\} = (1 - x_2).$

R3-Impact of NCFO on GCO:

$m_{R3}(\{(GCO_Y, NCFO_Y), (GCO_N, NCFO_N)\}) = x_3,$

$m_{R3}(GCO_N, NCFO_Y), (GCO_N, NCFO_N)\} = (1 - x_3).$

Next step in the model development process is to propagate the information in terms of m-values from the three intermediate variables to the variable GCO through the 'OR' relationship. Srivastava, Shenoy and Shafer (1995) have developed a general formula to propagate m-values from the sub-objectives to the main objective through an 'AND' or 'OR' relationship. We use their Proposition 1 to obtain the following m-values as a result of this combination:

$$m(GCO_Y) = 1 - (1 - x_1 * m_{NOL}(Yes)) * (1 - x_2 * m_{NWC}(Yes)) * (1 - x_3 * m_{NCFO}(Yes))$$

$$m(GCO_N) = [(1-x_1)*m_{NOL}(Yes) + m_{NOL}(No)]*[(1 - x_2)m_{NWC}(Yes) + m_{NWC}(No)]*[(1 - x_3)m_{NCFO}(Yes) + m_{NCFO}(No)]$$

and

$$m(\{GCO_Y, GCO_N\}) = 1 - m(GCO_Y) - m(GCO_N)$$

The above m-values yield the following beliefs for GCO_Y and non GCO_N.

$$Bel(GCO_Y) = 1 - (1 - x_1 * m_{NOL}(Yes)) * (1 - x_2 * m_{NWC}(Yes)) * (1 - x_3 * m_{NCFO}(Yes)) \quad (1)$$

$$Bel(GCO_N) = [(1 - x_1)*m_{NOL}(Yes) + m_{NOL}(No)]*[(1 - x_2)m_{NWC}(Yes) + m_{NWC}(No)]* [(1 - x_3)m_{NCFO}(Yes) + m_{NCFO}(No)] \quad (2)$$

Equations (1) and (2) represent the general model for GCO decisions by the auditor when the auditor has knowledge of the presence or absence of various combination of the three financial factors.

Testing the "OR" relationship to model the auditor's decision to issue a GCO

Case 1: Only One Financial Factor Present

As one can see, when only one factor, say NOL, is present, i.e., for $m_{NOL}(Yes) = 1$, and $m_{NOL}(No) = 0$, and $m_{NWC}(Yes) = 0$, $m_{NWC}(No) = 1$, $m_{NCFO}(Yes) = 0$, and $m_{NCFO}(Yes) = 1$, one obtains the following beliefs from Equations (1) and (2):

$$Bel(GCO_Y) = x_1, \text{ and } Bel(GCO_N) = (1 - x_1).$$

In the situation where only NWC is present, Equations (1) and (2) will yield the following beliefs that the auditor will give a GCO and a non GCO:

$$Bel(GCO_Y) = x_2, \text{ and } Bel(GCO_N) = (1 - x_2).$$

Similarly, in the situation where only NCFO is present, Equations (1) and (2) will yield the following beliefs that the auditor will give a GCO and a non GCO:

$$Bel(GCO_Y) = x_3, \text{ and } Bel(GCO_N) = (1 - x_3).$$

Case 2: Any Two Financial Factors Present

Let us consider first the presence of NOL and NWC by setting $m_{NOL}(Yes) = 1$, $m_{NOL}(No) = 0$, and $m_{NWC}(Yes) = 1$, $m_{NWC}(No) = 0$, and $m_{NCFO}(Yes) = 0$, and $m_{NCFO}(No) = 1$. These values yield the following beliefs from Equations (1) and (2):

$$Bel(GCO_Y) = 1 - (1 - x_1)(1 - x_2), \tag{3}$$

$$Bel(GCO_N) = (1 - x_1)(1 - x_2). \tag{4}$$

In order to test the "OR" relationship between the three factors and GCO decision, we examine the influence of the presence of more than one factor at the same time on the GCO decision. If the "OR" relationship holds, the overall belief to issue a GCO predicted by the GCO model when more than one factor is present will be higher than the belief to issue a GCO when only one factor is present . The reason is that auditors are expected to issue more GCOs' to companies which have two corroborating factors present than to companies which have only one factor present. In the same way, the overall belief to issue a GCO predicted by the GCO model when all the three factors are present will be higher than the belief to issue a GCO when only two factors are present.

As stated in the earlier section, the presence of more than one factor could be either enhancing or decreasing the individual impacts. Under the belief function framework, we model this influence by adjusting the corresponding m-values similar to Shafer's approach of discounting of beliefs (Shafer 1976). In a situation where the influence is enhancing, we inflate[8]

[8] In a situation, where we expect the judgment to decrease the value of m(true) then we decrease m(true) and increase m(false) the same amount. That is, revised m(true) = x – dx = (1-d)x, and revised m(false) = 1 – (1-

the value of m(true) and deflate m(false) the same amount. In case of the current GCO model, all the three financial statement factors are corroborating factors and therefore strengthen the auditor's decision to issue a GCO. For instance, when companies have both NOL and NWC, we argue that audiors are likely to enchance the impacts of both NOL and NWC before arriving at an overall belief to issue a GCO. In term of the belief function framework, auditors are likely to inflate the value of $m_{R1}(\{(GCO_Y, NOL_Y), (GCO_N, NOL_N)\}$ and are likely to inflate the value of $m_{R2}(\{(GCO_Y, NWC_Y), (GCO_N, NWC_N)\}$ before arriving at an overall belief to issue a GCO. Hence, it is most likely that auditors will inflate their belief when more than one factor is present. Assume that θ ($1 \geq \theta \geq 0$) represents the enhancement parameter. Then θ% of m(false) will be added to m(true) and the same amount will be subtracted from m(false). For example, if m(true) = x, and m(false) = 1- x, then the new m-values after enhancement would be:

New m(true) = $x + \theta(1 - x) = 1 - (1 - \theta)(1 - x)$, and

New m(false) = $1 - x - \theta(1 - x) = (1 - \theta)(1 - x)$.

$\theta = 1$ implies that influence is so strong that all the belief from m(false) has been transferred to m(true) making m(true) = 1 and m(false) = 0, whereas $\theta = 0$ means no influence, i.e., m(true) and m(false) are unchanged. Thus, considering the enhancement effect with parameter θ, we get the following m-values for the intermediate variables representing the impact of various factors on GCO:

Enhanced R1-Impact of NOL on GCO:

$$m_{R1}(\{(GCO_Y, NOL_Y), (GCO_N, NOL_N)\} = 1 - (1- \theta)(1 - x_1), \quad (5a)$$

$$m_{R1}(\{(GCO_N, NOL_Y), (GCO_N, NOL_N)\} = (1 - \theta)(1 - x_1) \quad (5b)$$

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d)x, where d is the deflation parameter, with values $1 \geq d \geq 0$. A value of d = 0 means no deflation, and d= 1 means 100% deflation.

Enhanced R2-Impact of NWC on GCO:

$$m_{R2}(\{(GCO_Y, NWC_Y), (GCO_N, NWC_N)\} = 1 - (1- \theta)(1 - x_2), \quad (6a)$$

$$m_{R2}(\{(GCO_N, NWC_Y), (GCO_N, NWC_N)\} = (1 - \theta)(1 - x_2) \quad (6b)$$

Enhanced R3-Impact of NCFO on GCO:

$$m_{R1}(\{(GCO_Y, NCFO_Y), (GCO_N, NCFO_N)\} = 1 - (1- \theta)(1 - x_3), \quad (7a)$$

$$m_{R1}(\{(GCO_N, NCFO_Y), (GCO_N, NCFO_N)\} = (1 - \theta)(1 - x_3) \quad (7b)$$

Considering the presence of the two factors, NOL and NWC, we obtain the belief for GCO with the enhancement parameter θ using Equations (3), (5a), (5b), (6a), and (6b) as:

$$Bel(GCO_Y) = 1 - (1 - \theta)^2(1 - x_1)(1 - x_2) \quad (8)$$

The above expression is obtained by replacing x_1 with the enhanced value $x_1 + \theta(1- x_1)$ as in Equation (5a) and x_2 by $x_2 + \theta(1 - x_2)$ in Equation (3).

In general, one can show[9] that $Bel(GCO_Y)$ in Equation (8) when the two factors, say NOL and NWC, are present, is always greater than the belief $Bel(GCO_Y)$ when only one factor is present.

This finding holds true for any combination of two of the three factors. This finding implies that the "OR" relationship is very effective in measuring the auditor's decision to issue a GCO. Also, when more than one factor is present, auditors are likely to revise their beliefs for

[9] Let us show that $Bel(GCO_Y)$ in (8) is greater than $Bel(GCO_Y)$ with only one factor, say NOL, which is expressed as $Bel(GCO_Y) = x_1 + \theta(1 - x_1)$. That is, in general, for any value of θ, x_1, and x_2, between zero and one, the following inequality must be true for the above proposition to be true:

$$1 - (1 - \theta)^2(1 - x_1)(1 - x_2) \geq x_1 + \theta(1 - x_1),$$

which can be re-written as:

$$(1 - \theta)(1 - x_1)(1 - (1 - \theta)(1 - x_2)) \geq 0.$$

As we can see that the left-hand side of this equation is always positive, i.e., greater than zero for any value of θ, x_1, and x_2, between zero and one, which proves the proposition that the belief in GCO_Y when NOL and NWC are present is greater than the belief, $Bel(GCO_Y)$, when only NOL is present. Similarly, one can show that $Bel(GCO_Y)$ in (8) is always larger than $Bel(GCO_Y)$ when only NWC factor is present.

the individual factors upwards (i.e. inflate their beliefs) before arriving at an overall belief to issue a GCO. Hence, we posit:

H1a: Overall belief to issue a GCO to companies which have two of the three factors present will be highter than Overall belief to issue a GCO to companies which have only one factor present.

H1b: Auditors are more likely to inflate their beliefs for the individual factors when more than one factor is present.

Case 3: All Three Factors Present

In the case when all the factors are present, i.e., when $m_{NOL}(Yes) = 1$, $m_{NOL}(No) = 0$, $m_{NWC}(Yes) = 1$, $m_{NWC}(No) = 0$, and $m_{NCFO}(Yes) = 1$, $m_{NCFO}(No) = 0$, we obtain the following beliefs for GCO and no GCO from Equations (1) and (2):

$$Bel(GCO_Y) = 1 - (1 - x_1)(1 - x_2)(1 - x_3), \tag{9}$$

$$Bel(GCO_N) = (1 - x_1)(1 - x_2)(1 - x_3) \tag{10}$$

Under the condition when all the three factors are present at the same time, impact of these factors on GCO_Y are enhanced. Thus, the belief that the auditor will give GCO, i.e., $Bel(GCO_Y)$, can be expressed in the following form using Equation (9) and the enhanced impacts from Equations (5a – 7b):

$$Bel(GCO_Y) = 1 - (1 - \theta)^3(1 - x_1)(1 - x_2)(1 - x_3) \tag{11}$$

In general, one can show[10] that $Bel(GCO_Y)$ in Equation (11), when all the three factors, NOL, NWC, and NCFO, are present, is always greater than the belief $Bel(GCO_Y)$ when only two

[10] Let us show that $Bel(GCO_Y)$ in (11) is greater than $Bel(GCO_Y)$ with only two factors, say NOL, and NWC, which is given in (8) as: $Bel(GCO_Y) = 1 - (1 - \theta)^2(1 - x_1)(1 - x_2)$. That is, in general, for any value of θ, x_1, x_2, and x_3, between zero and one, the following inequality has to be true for the above proposition to be true:

$$1 - (1 - \theta)^3(1 - x_1)(1 - x_2)(1 - x_3) \geq 1 - (1 - \theta)^2(1 - x_1)(1 - x_2),$$

which can be re-written as:

$$(1 - \theta)^2(1 - x_1)\,(1 - x_2)(1 - (1 - \theta)(1 - x_3)) \geq 0.$$

factors are present and greater than Bel(GCO_Y) when only one factor is present for any value of θ, x_1, x_2, and x_3, between zero and one. This result lends strength to the "OR" relationship. Also, when all the three corroborating factors are present which strengthen the auditor's belief to issue a GCO, auditors are expected to place more weight on the individual factors (i.e. inflate the beliefs) for the individual factors before arriving at an overall decision to issue a GCO.

Hence, we posit:

H2a: Overall belief to issue a GCO to companies which have all the three factors present will be higher than Overall belief to issue a GCO to companies which have only two factors present or which have only factor present.

H2b: Auditors are likely to inflate their beliefs for the individual factors when all the three factors are present.

Impact of Auditor Size on Auditor's decision to issue a GCO

Prior research has attempted to improve our understanding of how reporting accuracy and consequently the quality of going concern reporting varies across auditors. There are mixed findings on the association between size of the audit firm and audit opinions (Carson et al, 2013). There are two competing theories whether Big Four auditors are more conservative in audit reporting compared with Non-Big Four auditors. The prevailing theory indicates Big Four auditors have higher reputation costs (Dye, 1993) and 'deeper pockets' (DeAngelo, 1981) and hence have more to lose in the case of audit failure. As a result, Big Four audit firms are likely to adopt more conservative audit reporting strategies relative to Non-Big Four audit firms. In contrast, Craswell et al. (2002) argue that smaller firms do not have as many resources as Big

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As we can see, the left-hand side of the above equation is always positive, i.e., greater than zero for any value of θ, x_1, x_2 and x_3, between zero and one, which proves the proposition that the belief in GCO_Y when all the three factors are present is greater than the belief, Bel(GCO_Y), when only two factors, say NOL and NWC, are present. Similarly, one can show that Bel(GCO_Y) in (11) is always larger than Bel(GCO_Y) when any two factors are present. Also, as shown earlier, since the Bel(GCO_Y) when only two factors are present is greater than the belief Bel(GCO_Y) when only one factor is present, it is, in general, true then that the belief Bel(GCO_Y) when all three factors are present is greater than the belief Bel(GCO_Y) when only one factor is present.

Four auditors, so they are less competent in detecting errors compared to Big Four auditors. Hence, Non-Big N audit firms may issue GCOs' more frequently to compensate for less competence in a risky environment. Xu et al (2013) found that Big Four firm react more appropriately to crises as opposed to Non-Big Four auditors.

For the GCO decision, recent studies find that Big Four clients are significantly less likely to receive GCOs (Reichelt and Wang 2010; DeFond et al. 2011; DeFond and Lennox 2011; Numan and Willekens 2011) compared to Non-Big Four clients. These later studies attribute the negative relationship to the fact that Big Four clients are in better financial condition and are therefore less likely to warrant a GCO. Hence, we posit:

H3a: Non-Big Four auditors are likely to issue more GCOs' as compared to Big Four auditors when two or more factors are present.

However, the quality of audit judgement is not necessarily related to conservatism. Geiger and Rama (2006) found that Big Four auditors have lower going concern misclassification rates as compared to Non Big Four auditors. Likewise, an earlier study by Lennox (1999c) of auditors in the U.K. finds that the Big Four auditors have lower misclassification error rates than those of Non-Big Four auditors, after controlling for the different client characteristics of large and small auditors.

Recently, Defond et al (2018) also found that Non Big Four auditors might overestimate the risk of litigation and SEC enforcement and consequently issue conservatively biased audit reports. However, rather than improving reporting accuracy, this leads to a higher rate of Type I errors (GCOs' not followed by bankruptcy). Further they observed that Big Four audit firm improve going concern reporting when they are faced with threat of SEC investigations and therefore reduce the number of Type II errors (clean opinions followed by bankruptcy). In light of the above arguments, we should find that Big Four auditors are much more likely to inflate

their beliefs for the individual factors when more than one factor is present as compared to Non Big Four auditors. Expressed in terms of the belief function framework, θ for Big Four auditors will be much higher than θ for Non Big Four auditors. Let θ for Big Four auditors be θ_1 and let θ for Non Big Four auditors be θ_2. Hence we posit that: $\theta_1 \geq \theta_2$.

Hence, we posit:

H3b: Big Four auditors are more likely to inflate their beliefs for the individual factors when two or more factors are present as compared to Non-Big Four auditors.

IV. SAMPLE SELECTION AND RESULTS

Sample

We use Compustat to identify 36,405 financially distressed companies with either net operating loss or negative working capital or negative cash flow from operations from June 1, 2004 to May 31, 2015. Hopwood et al. (1994) emphasize the importance of client financial distress for the auditor's going-concern decision because auditors issue going-concern disclosures only to clients experiencing difficulties and an apparent lack of financial stress may be due to management's manipulations. From the companies selected, we create six sub samples: (1) companies which have only NOL, (2) companies which have only NWC, (3) companies which have only NCFO, (4) companies which have only NOL & NWC, (4) companies which have only NWC & NCFO, (5) companies which have only NCFO and NOL, and (6) companies which have all three factors: NOL, NWC, and NCFO. We divide the aforementioned sub samples in to two additional sub samples: (a) companies audited by BIg Four audit firms, and (b) companies audited by Non-Big Four audit firms. For all the sub samples, we use Audit Analytics to identify companies which received GCOs' and clean opinions. The fiscal year-ends of the companies in our sample span the period from June 1, 2004 to May 31, 2015. We then calculate the frequency ratios for GCOs' and Non GCOs' for all the sub samples by dividing the

companies which received GCOs' by the total number of companies and by dividing the companies which did not receive GCOs' by the total number of companies in the sub sample. Table 1 presents the method to calculate the frequency ratio for each sub-sample. For example, in Panel A of Table 1, the total number of companies which only had negative operating loss is 28,543. Out of these companies, 7,348 companies received GCOs' and 21,195 companies did not receive GCOs'. Therefore, the frequency ratio of companies with only negative operating loss and received GCOs is 0.26 (7,348/21,195). Panel B (C) shows the frequency ratio of companies who are audited by Big Four (Non-Big Four) auditors.

---------Insert Table 1 here-------

Results

Panel A of Table 1 provides empirical evidence about the frequency ratios of all the financially distressed companies which received GCOs and clean opinions from all the audit firms. The table shows that 7348 (26 %) of the companies which had only NOL received GCOs' from all the audit firms, 5656 (37 %) of the companies which had only NWC received GCOs' from all the audit firms, 6847 (32%) of the companies which had only NCFO received GCOs from all the audit firms. The difference in proportions is statistically significant. The corresponding numbers for companies which did not receive GCOs' are: 21195 (74%), 9591 (63%), and 14703 (68%) respectively. As expected, the table also shows that the numbers increase significantly when two or more of the factors are present. For instance, 4686 (66%) of the companies which had all three factors: NOL, NWC, and NCFO received GCOs' from all the audit firms, whereas only 2362 (34%) of the companies which had all the three factors present did not receive GCOs'.

Panel B of Table 1 provides empirical evidence about the frequency ratios of all the companies which received GCOs' and clean opinions from Big Four audit firms. Panel C of Table 1 provides empirical evidence about the frequency ratios of all the companies which received GCOs' and clean opinions from Non-Big Four audit firms. Interestingly, the results show that Big Four audit firms issued GCOs' to only 281(33 %) of the companies which had experienced NOL, NWC, and NCFO, whereas the corresponding number for the Non-Big Four audit firms is 4,405 (71%). This is in line with the findings of prior research (Reichelt and Wang 2010; DeFond et al. 2011; DeFond and Lennox 2011; Numan and Willekens 2011) which document that Big 4 clients are in better financial condition and are therefore less likely to warrant a GCO.

Presence of Two Factors:

In order to test the "OR" relationship between the three factors, we test hypothesis H1a. We test the effect of the presence of any two of the three factors (NOL, NWC, and NCFO) on the auditor's belief to issue a GCO. In order to test the presence of NOL and NWC, we set $m_{NOL}(Yes) = 1$, $m_{NOL}(No) = 0$, and $m_{NWC}(Yes) = 1$, $m_{NWC}(No) = 0$, and $m_{NCFO}(Yes) = 0$, and $m_{NCFO}(No) = 1$. We do a similar exercise for the combinations of all the other factors (NWC & NCFO, NOL and NCFO). Next, we input the frequency ratios of the individual factors (NOL, NWC, and NCFO) from Panel A of Table 1 for all the companies in the sample into the model. Thus, we set:

R1-Impact of NOL on GCO:

$$m_{R1}(\{(GCO_Y, NOL_Y), (GCO_N, NOL_N)\} = x_1 = 0.26,$$

$$m_{R1}(\{(GCO_N, NOL_Y), (GCO_N, NOL_N)\} = 1 - x_1 = 0.74$$

R2-Impact of NWC on GCO:

$m_{R2}(\{(GCO_Y, NWC_Y), (GCO_N, NWC_N)\} = x_2 = 0.37,$

$m_{R2}(GCO_N, NWC_Y), (GCO_N, NWC_N)\} = 1 - x_2 = 0.63.$

R3-Impact of NCFO on GCO:

$m_{R3}(\{(GCO_Y, NCFO_Y), (GCO_N, NCFO_N)\}) = x_3 = 0.32$

$m_{R3}(GCO_N, NCFO_Y), (GCO_N, NCFO_N)\} = 1 - x_3 = 0.68$

As stated earlier, we model the influence of the presence of more than one factor at the same time on the GCO decision. Since all the three factors (NOL, NWC, and NCFO) are corroborating factors and strengthen the auditor's decision to issue a GCO, this influence (θ) is likely to increase or enhance the individual impacts. Initially we set $\theta = 0$[11]

Considering the presence of any two of the three factors, NOL, NWC and NCFO, we obtain the following beliefs for GCO with no enhancement parameter, i.e., $\theta = 0$, using Equations (3) and (8), and the values of x_1, x_2, and x_3 as determined empirically above, :

$Bel\ (GCO_Y, NOL_Y NWC_Y NCFO_N) = 1 - (1 - \theta)^2(1 - x_1)(1 - x_2) = 0.53,$

$Bel\ (GCO_Y, NOL_N NWC_Y NCFO_Y) = 1 - (1 - \theta)^2(1 - x_2)(1 - x_3) = 0.57,$

$Bel\ (GCO_Y, NOL_Y NWC_N NCFO_Y) = 1 - (1 - \theta)^2(1 - x_1)(1 - x_3) = 0.50,$

The auditor's belief to issue a GCO when only NOL or only NWC is present, as determined earlier are:

$Bel(GCO_Y) = x_1 = 0.26$ (NOL),

$Bel(GCO_Y) = x_2 = 0.37$ (NWC),

[11] The percentage of revision, θ, which the auditors will apply to the individual beliefs when two or more factors are present is an empirical question. Hence, we will derive the value of θ from the empirical data.

$Bel(GCO_Y) = x_3 = 0.32$ (NCFO).

Hence, H1a is supported. When two of the three factors are present, the overall belief that the auditor will issue a GCO is much higher than the belief when the only of the three factors is present. This finding leads us to believe that the "OR" relationship of the GCO model accurately measures the propensity of auditors to issue GCOs'. In order to test H1b, we have to calculate θ by comparing the predicted beliefs of our model to empirical results. Table 2 presents the results of the GCO model for all the companies audited by all the audit firms irrespective of size of the audit firm.

……. Insert Table 2 here……..

The empirical frequency ratio of auditors issuing a GCO for financially distressed companies when two of the three factors (NOL & NWC) are present is 0.55, whereas the overall belief to issue a GCO when companies have NOL and NWC which is predicted by the model is 0.53.

The corresponding numbers when (NWC and NCFO) are present are: predicted beliefs (0.57), empirical frequency ratio (0.66); and when (NOL and NCFO) are present are: predicted beliefs (0.5), empirical frequency ratio (0.35). It seems therefore that when two of the three factors (NOL & NWC) , and (NWC & NCFO) are present, as predicted by H1b, auditors are inflating their beliefs for NWC and NCFO with θ in order to arrive at their overall belief to issue a GCO. Through the process of simulations on the model, we determine the value of θ to be around 0.018 when NOL and NWC are present. Thus, when we inflate the original individual beliefs of 0.26 for NOL and 0.37 for NWC to 0.34 (5%) for NOL and 0.44 (3%) for NWC, the overall belief of the auditors to issue a GCO equals the empirical frequency ratio of companies

which had NOL and NWC and received GCOs' from auditors, which is 0.55. In terms of the belief function framework, we derive this as:

$Bel(GCO_Y) = 1- (1-\theta)^2(1-x1)(1-x2) = 0.53$ ($\theta = 0$) when NOL and NWC are present

$Bel(GCO_Y) = 1- (1-\theta)^2(1-x1)(1-x2) = 0.55$ ($\theta = .018$) when NOL and NWC are present

In a similar fashion, we calculate the value of θ to be around 0.11 when NWC and NCFO are present. Thus, when we inflate the original individual beliefs of 0.37 for NWC and 0.32 for NCFO to 0.44 (19%) for NWC and 0.39 (23%) for NCFO, the overall belief of the auditors to issue a GCO equals the empirical frequency ratio of companies which had NOL and NWC and received GCOs' from auditors, which is 0.66. In terms of the belief function framework, we derive this as:

$Bel(GCO_Y) = 1- (1-\theta)^2(1-x1)(1-x2) = 0.57$ ($\theta = 0$) when NWC and NCFO are present

$Bel(GCO_Y) = 1- (1-\theta)^2(1-x1)(1-x2) = 0.66$ ($\theta = 0.11$) when NWC and NCFO are present

However, when NOL and NCFO are present, we find that the auditors are discounting the beliefs rather than inflating them. The deflation of belief is modelled by decreasing the belief mass in support of the GCO related to a influencing factor, say NOL, by a fraction d ($1 \geq d \geq 0$), and increasing the belief mass for its negation by the same amount. As discussed in Footnote 6, we will have the revised belief masses in the deflation as:

Deflated $m(GCO_Y$ for NOL) = $x1 – d*x1 = (1-d)*x1$

Deflated m(GCON for NWC) = $1-x1 + d*x1 = 1 – (1-d)*x1$

Similarly, if belief masses are deflated for NCFO then the corresponding belief masses can be expressed as:

Deflated $m(GCO_Y$ for NCFO) = $x3 – d*x3 = (1-d)*x3$

Deflated m(GCON for NCFO) = $1-x3 + d*x3 = 1 – (1-d)*x3$

Thus, with the deflated beliefs, the belief that the auditor will give a GCO when NOL and NCFO, both factors, are present can be written as (using Equations 1 and 2, m_{NOL}(Yes) = 1, m_{NOL}(No) = 0, and m_{NWC}(Yes) = 0, m_{NWC}(No) = 1, and m_{NCFO}(Yes) = 1, and m_{NCFO}(No) = 0).

$$Bel(GCO_Y) = (1-d)*x1 + (1-d)*x3 - (1-d)^2*x2*x3$$

Thus, it seems that auditors are discounting their beliefs for NOL and NCFO with θ in order to arrive at their overall belief to issue a GCO. Hence, H1b is not supported since both NOL and NCFO are corroborating factors and hence auditors are expected to inflate their beliefs for NOL and NCFO and not discount them before arriving at an overall belief to issue a GCO. Through the process of simulations on the model, we determine the value of θ to be 0.34 . Thus, when we discount the original individual beliefs of 0.26 for NOL and 0.32 for NCFO to 0.17 (-34%) for NOL and 0.21(-34%) for NCFO, the overall belief of the auditors to issue a GCO equals the historical frequency ratio of companies which had NOL and NCFO and received GCOs' from auditors, which is 0.35.

Thus, when companies have negative working capital and negative cash flows from operations or when companies have net operating loss and negative working capital, auditors inflate their beliefs in the individual factors (NWC , NOL, NCFO) before arriving at an overall belief for the decision to issue a GCO. On the other hand, when companies have net operating loss and negative cash flows from operations, auditors seem to discount their beliefs in the individual factors (NOL and NCFO) while arriving at an overall belief for the decision to issue a GCO. The implications of these findings are discussed in the Section VI.

Presence of Three Factors:

In order to test our hypothesis H2a, we test the presence of all the three factors (NOL, NWC, and NCFO). To do this , we set m_{NOL}(Yes) = 1, m_{NOL}(No) = 0, and m_{NWC}(Yes) = 1, m_{NWC}(No) = 0, and m_{NCFO}(Yes) = 1, and m_{NCFO}(No) = 0. Next we input the frequency ratios of the individual factors (NOL , NWC, and NCFO) from Panel A of Table 1 for all the companies in the sample into the model . Initially we set $\theta = 0$. Thus we set :

R1-Impact of NOL on GCO:

$m_{R1}(\{(GCO_Y, NOL_Y), (GCO_N, NOL_N)\} = x_1 = 0.26,$

$m_{R1}(\{(GCO_N, NOL_Y), (GCO_N, NOL_N)\} = (1 - x_1) = (1- 0.26) = 0.74$

R2-Impact of NWC on GCO:

$m_{R2}(\{(GCO_Y, NWC_Y), (GCO_N, NWC_N)\} = x_2 = 0.37$

$m_{R2}(GCO_N, NWC_Y), (GCO_N, NWC_N)\} = (1 - x_2) = 0.63$

R3-Impact of NCFO on GCO:

$m_{R3}(\{(GCO_Y, NCFO_Y), (GCO_N, NCFO_N)\}) = (x_3 + \theta) = 0.32$

$m_{R3}(GCO_N, NCFO_Y), (GCO_N, NCFO_N)\} = [1 - (x_3 + \theta)] = 0.68$

Thus, the auditor's belief to issue a GCO when all the three factors are present:

$Bel(GCO_Y) = 1 - (1 - \theta)^3(1 - x_1)(1 - x_2)(1 - x_3) = 0.68$

Whereas, the auditor's belief to issue a GCO when any two of the three factors are present is:

$Bel\ (GCO_Y,\ NOL_Y NWC_Y NCFO_N) = 1 - (1 - \theta)^2(1 - x_1)(1 - x_2) = 0.53\ (\theta = 0)$

$Bel\ (GCO_Y, NOL_N NWC_Y NCFO_Y) = 1 - (1 - \theta)^2(1 - x_2)(1 - x_3) = 0.57\ (\theta = 0)$

$Bel\ (GCO_Y, NOL_Y NWC_N NCFO_Y) = 1 - (1 - \theta)^2(1 - x_1)(1 - x_3) = 0.50\ (\theta = 0)$

And , the auditor's belief to issue a GCO when any one of the three factors are present is:

$Bel(GCO_Y) = x_1 = 0.26$ (NOL); $Bel(GCO_Y) = x_2 = 0.36$ (NWC); $Bel(GCO_Y) = x_2 = 0.32$ (NCFO)

Hence, H2a is supported. When all the three factors are present, the overall belief that the auditor will issue a GCO is much higher than the belief when only two of the three factors is present and when only one of the three factors is present. Next, we compare the findings of our model to empirical results. The empirical frequency ratio of auditors issuing a GCO for financially distressed companies when all the three factors (NOL & NWC) are present is 0.67. This finding leads us to believe that the auditors are aggregating the individual beliefs for NOL, NWC, and NCFO without any belief revision when all the three factors are present and in the same manner as the model. While this finding is consistent with the model prediction, it is inconsistent with the Shafer (1976) assertion of belief inflation in the presence of two or more corroborating factors. Hence H2b is not supported.

One of the reasons for inconsistent findings of belief inflation by auditors in the presence of all the three factors could be the difference in audit judgments and client characteristics of Big four auditors and Non-Big Four auditors while issuing a GCO (Carson et al, 2013). The next section deals with the association between the propensity to issue a GCO based on auditor size.

Auditor Size and GCOs'

Recent research has documented an association between auditor size and audit opinions (Reichelt and Wang 2010; DeFond et al. 2011; DeFond and Lennox 2011; Numan and Willekens 2011). These studies have argued that Big Four clients are significantly less likely to receive GCOs' and they tend to be larger in size and are in much better financial conditions. Therefore,

we run the GCO model separately for the empirical data of GCOs' issued by Big Four audit firms and Non-Big Four audit firms. This analysis helps us to better understand the differences in the auditor judgments of Big Four auditors and Non-Big Four auditors while deciding whether to issue a GCO. Further, such an analysis may shed light on the absence belief inflation by auditors when all the three factors are present. It is possible that Big Four auditors are appropriately inflating their beliefs for the individual factors when all the three factors are present, however Non-Big Four auditors are not.

In order to test Hypothesis 3a, we test the effect of the presence of any two of the three factors (NOL, NWC, and NCFO) on Big Four auditor's propensity to issue GCOs' and compare it with the effect of the presence of any two of the three factors (NOL, NWC, and NCFO) on Non-Big Four auditor's propensity to issue GCOs'. For example, to test the presence of NOL and NWC, we set $m_{NOL}(Yes) = 1$, $m_{NOL}(No) = 0$, and $m_{NWC}(Yes) = 1$, $m_{NWC}(No) = 0$, and $m_{NCFO}(Yes) = 0$, and $m_{NCFO}(No) = 1$ for Big Four auditors and Non-Big four auditors separately. We do a similar exercise for the combinations of all the other factors for Big four auditors and Non-Big four auditors. Next we input the frequency ratios of the individual factors (NOL, NWC, and NCFO) from Panel B and C of Table 1 for the companies audited by Big Four auditors and Non-Big four auditors in the sample into the model. Thus, we set:

Big Four Auditors:

R1-Impact of NOL on GCO:

$$m_{R1}(\{(GCO_Y, NOL_Y), (GCO_N, NOL_N)\} = x_1 = 0.07,$$

$$m_{R1}(\{(GCO_N, NOL_Y), (GCO_N, NOL_N)\} = (1 - x_1) = (1- 0.26) = 0.93$$

R2-Impact of NWC on GCO:

$m_{R2}(\{(GCO_Y, NWC_Y), (GCO_N, NWC_N)\} = x_2 = 0.07$

$m_{R2}(GCO_N, NWC_Y), (GCO_N, NWC_N)\} = (1 - x_2) = 0.93$

R3-Impact of NCFO on GCO:

$m_{R3}(\{(GCO_Y, NCFO_Y), (GCO_N, NCFO_N)\}) = (x_3 + \theta) = 0.10$

$m_{R3}(GCO_N, NCFO_Y), (GCO_N, NCFO_N)\} = [1 – (x_3 + \theta)] = 0.90$

Non-Big Four Auditors:

R1-Impact of NOL on GCO:

$m_{R1}(\{(GCO_Y, NOL_Y), (GCO_N, NOL_N)\} = x_1 = 0.42,$

$m_{R1}(\{(GCO_N, NOL_Y), (GCO_N, NOL_N)\} = (1 - x_1) = (1- 0.26) = 0.58$

R2-Impact of NWC on GCO:

$m_{R2}(\{(GCO_Y, NWC_Y), (GCO_N, NWC_N)\} = x_2 = 0.60$

$m_{R2}(GCO_N, NWC_Y), (GCO_N, NWC_N)\} = (1 - x_2) = 0.40$

R3-Impact of NCFO on GCO:

$m_{R3}(\{(GCO_Y, NCFO_Y), (GCO_N, NCFO_N)\}) = (x_3 + \theta) = 0.45$

$m_{R3}(GCO_N, NCFO_Y), (GCO_N, NCFO_N)\} = [1 – (x_3 + \theta)] = 0.55$

Initially we set θ1 and θ2 =0. Tables 3 and 4 presents the results of the GCO model for all the companies audited by Big Four auditors and Non-Big Four auditors.

……. Insert Table 3 here…….

……. Insert Table 4 here…….

Thus, the Big Four auditor's belief to issue a GCO when two of the three factors are present:

$$\text{Bel}\ (GCO_Y, NOL_Y\ NWC_Y\ NCFO_N) = 1 - (1-\theta)^2(1-x_1)(1-x_2) = 0.14\ (\theta_1 = 0) \qquad (12a)$$

$$\text{Bel}\ (GCO_Y, NOL_N\ NWC_Y\ NCFO_Y) = 1 - (1-\theta)^2(1-x_2)(1-x_3) = 0.16\ (\theta_1 = 0) \qquad (12b)$$

$$\text{Bel}\ (GCO_Y, NOL_Y\ NWC_N\ NCFO_Y) = 1 - (1-\theta)^2(1-x_1)(1-x_3) = 0.16\ (\theta_1 = 0) \qquad (12c)$$

And the Big Four auditor's belief to issue a GCO when all the three factors are present:

$$\text{Bel}(GCO_Y) = \text{Bel}(GCO_Y) = 1 - (1-\theta)^3(1-x_1)(1-x_2)(1-x_3) = 0.22 \qquad (13)$$

Also, the Non-Big Four auditor's belief to issue a GCO when two of the three factors are present:

$$\text{Bel}\ (GCO_Y, NOL_Y\ NWC_Y\ NCFO_N) = 1 - (1-\theta)^2(1-x_1)(1-x_2) = 0.77\ (\theta_2 = 0) \qquad (14a)$$

$$\text{Bel}\ (GCO_Y, NOL_N\ NWC_Y\ NCFO_Y) = 1 - (1-\theta)^2(1-x_2)(1-x_3) = 0.78\ (\theta_2 = 0) \qquad (14b)$$

$$\text{Bel}\ (GCO_Y, NOL_Y\ NWC_N\ NCFO_Y) = 1 - (1-\theta)^2(1-x_1)(1-x_3) = 0.68\ (\theta_2 = 0) \qquad (14c)$$

And the Non Big Four auditor's belief to issue a GCO when all the three factors are present:

$$\text{Bel}(GCO_Y) = \text{Bel}(GCO_Y) = 1 - (1-\theta)^3(1-x_1)(1-x_2)(1-x_3) = 0.87 \qquad (15)$$

Hence, H1a and H2a are supported even when the model is run separately for Big Four auditors and Non-Big Four auditors. When two of the three factors are present, the overall belief that the auditor will issue a GCO is much higher than the belief when the only of the three factors is present. H3a is supported as well. The overall beliefs to issue a GCO by Non-Big Four audit firms in the presence of two or more factors are much higher than the overall beliefs to issue a GCO by Big Four auditors in the presence of two or more factors [(12a< 14a), (12b < 14b), (12c < 14c), & (13 < 15)].

In order to test H3b, we have to estimate θ1 and θ2 in situations where two or more factors are present by comparing the model predicted beliefs (where θ1 and θ2 =0) with the empirical frequency ratios of the GCOs' issued by Big Four auditors and Non-Big auditors.

Table 3 presents the results of the GCO model for all the companies audited by all Big Four audit firms compared to the empirical frequency ratios of GCOs' issued by all Big Four audit firms. Table 4 presents the results of the GCO model for all the companies audited by all the Non-Big Four audit firms compared to the historical frequency ratios of GCOs' issued by all the Non-Big Four audit firms. Tables 3 and 4 show that when NOL and NWC are present, the predicted belief to issue a GCO by Big Four auditors is 0.14 whereas the empirical frequency ratio of GCOs' issued by Big Four auditors when NOL and NWC are present is 0.19. It seems therefore that when NOL and NWC are present, Big Four auditors are appropriately inflating their beliefs for NOL (43%) and NWC (43%) in order to arrive at their overall belief to issue a GCO. Through the process of simulations on the model, we determine the value of θ_1 to be 0.03. On the other hand, when NOL and NWC are present, the predicted belief to issue a GCO by Non-Big Four auditors is 0.77 whereas the empirical frequency ratio of GCOs' issued by Non-Big Four auditors when NOL and NWC are present is 0.66. It seems therefore that when NOL and NWC are present, Non-Big Four auditors are discounting their beliefs for NOL (-20%) and NWC (-20%) with θ_2 in order to arrive at their overall belief to issue a GCO. Through the process of simulations on the model, we determine the value of θ_2 to be 0.2. Thus, H3b is supported.

The corresponding numbers for Big Four auditors when (NWC and NCFO) are present are: predicted beliefs (0.16), empirical frequency ratio (0.31); when (NOL and NCFO) are present are: predicted beliefs (0.16), empirical frequency ratio (0.11); and when all the three

factors (NOL, NWC, and NCFO) are present: predicted beliefs (0.22), empirical frequency ratio (0.32). The corresponding numbers for Non-Big Four auditors when (NWC and NCFO) are present are: predicted beliefs (0.78), empirical frequency ratio (0.71); when (NOL and NCFO) are present are: predicted beliefs (0.68), empirical frequency ratio (0.48); and when all the three factors (NOL, NWC, NCFO) are present: predicted beliefs (0.87), empirical frequency ratio (0.71). In all the cases, $\theta 1$ is greater than or equal to $\theta 2$ [12]

The findings show that in almost all the cases, Big Four auditors inflate their beliefs for the individual factors when two or more factors are present and Non-Big Four auditors discount their beliefs for the individual factors when two or more factors are present[13]. Thus, H3b is supported. Specifically, when all the three factors are present, Big Four auditors inflate their beliefs in the individual factors by more than fifty percent before aggregating the beliefs to arrive at an overall belief to issue a GCO. In the same situation, Non-Big Four auditors discount their beliefs for the individual factors by thirty percent before aggregating the beliefs to arrive at an overall belief to issue a GCO. This finding clearly indicates that Big Four auditors are appropriately revising their beliefs upwards in the presence of corroborating factors whereas Non-Big Four auditors are revising their belief downwards although there are more than one corroborating factors. These findings shed some light on the mixed results for associations between auditor size and auditor opinions as far as GCOs' are concerned. While the Non-Big Four auditors are much more likely to issue GCOs to their clients as compared to Big Four auditors (See Table 1), their propensity to issue GCOs' does not increase as significantly when two or more factors are present as compared to the Big Four auditors. Prior research has

[12] For actual values of $\theta 1$ & $\theta 2$, please see Tables 3 and 4.

[13] The only exception to this finding is when NOL and NCFO are present, Big Four auditor also discount their beliefs for the two factors by 30% before arriving at an overall belief to issue a GCO.

documented that Big Four audit firms react much more appropriately to crisis as compared to Non-Big Four auditors (Xu et al. 2014). This behavior could result in much more Type 1 and Type 2 errors for Non-Big Four audit firms as compared to Big Four audit firms. The estimations of θ_1 and θ_2 for all the other combinations of the three factors are shown in Tables 3 and 4.

V. COST BENEFIT ANALYSIS

In this section, we present a theoretical cost and benefit analysis and discuss the behaviour of audit firms under various scenarios, especially the behaviour under various levels of litigation cost and belief that the client will go bankrupt within a year. The final GCO decision by an external auditor depends on the cost of the audit, audit fees obtained, and litigation and regulatory costs. For example, if there were no litigation costs to the external auditor, then issuing a clean opinion would not be problematic for the external auditor. Let us define the following symbols for our analysis.

AF = Audit Fee charged by the external Auditor, assume 'p' to be the profit margin, i.e. AF = (1+p)*AC

AC = Audit Cost of external auditor.

FB = Future benefits computed as the present value of the next five years annual cash flow of (AF -AC) discounted at 'r'.

L = Litigation Cost and regulatory costs when the auditor has given no GCO (Clean opinion) but the company did go bankrupt within a year.

Bel(B) = belief of the auditor after analysing the GCO factors that the auditor should issue a GCO

The auditor's decision to give a GCO or not and the corresponding benefit under various decisions are described in Table 5. The auditor will give a clean opinion if the expected benefit in Action A2 in Table 5 is larger than the expected benefit in Action A1.

……. Insert Table 5 here……

This condition yields the following expression for giving a clean opinion even though the auditor has assessed a belief, Bel(B), that the client would go bankrupt within a year:

$$(L + FB)*Bel(B) < FB \quad (C1)$$

i.e.,

$$Bel(B) < FB/(L+FB) \quad (C2)$$

Equation (C2), in general, describes the auditor's behaviour. Let us consider the following scenarios to describe the auditor's behaviour under various situations.

Case 1: No Litigation Cost

Consider the situation where there is no litigation cost when the auditor issued a clean opinion and the client went bankrupt within a year, i.e., L = 0. Under this condition, Equation (C2) yields Bel(B) <1. This condition is always true. This means that the auditor will always issue a clean opinion no matter what the value is for the belief, Bel(B), that the client will go bankrupt within a year. This result makes logical sense; in audit markets where there is no litigation cost (i.e., L = 0) to the auditor for issuing a clean opinion even though the client went bankrupt, why would the auditor issue a GCO?

Case 2 - High Litigation Cost

Consider another situation where the litigation cost, L, is very large, say it is 19 times the future benefit of the auditor, i.e., L = 19FB. In such a situation, Equation (C2) yields Bel(B) < 0.05. This means that the auditor would issue a clean opinion only when Bel(B) < 0.05. In all other situations where Bel(B) > 0.05, the auditor will issue a GCO. In other words, if the litigation cost L is equal to or greater than 19 times the future benefit (FB) of the auditor, the

auditor will issue a clean opinion only when Bel(B) is less than 0.05 and issue a GCO whenever Bel(B) is greater than 0.05. This result again makes logical sense.

Case 3 – Big versus Non-Big Audit Firms with Different L in Relation to FB:

In this section, we want to explore the behaviour of Big Four audit firms versus Non-Big audit firms in issuing a clean opinion or GCO where litigation cost L_B of a Big audit firm is not as high in relation to its future benefit, FB_B, compared to the litigation cost L_N for Non-Big audit firms in relation to its future benefits, FB_N. Suppose that the litigation cost for a Big audit firm is four times its future benefits, i.e., $L_B = 4FB_B$ and the litigation cost for Non-Big audit firm is 7 times its future benefits, i.e., $L_N = 7FB_N$. These values yield the following conditions for Big and Non-Big audit firms for issuing a clean opinion:

$$\text{For Big Audit Firm: } Bel(B) < 1/5 = 0.20, \tag{C3}$$

$$\text{For Non-Big Audit Firm: } Bel(B) < 1/8 = 0.125. \tag{C4}$$

Equations (C3) and (C4) demonstrate that Big Audit firms are willing to take more risk in issuing a clean opinion compared to Non-Big audit firms. That is, under the above condition, the Big audit firm is willing to give a clean opinion when the belief of the client going bankrupt within a year is as high as Bel(B) = 0.20, whereas a Non-Big audit firm is going to issue a clean opinion only for a much lower belief of 0.125 that the client is going to be bankrupt within a year. This finding again makes logical sense because Big audit firms have much higher wealth and can bear a much higher cost of litigation than the Non-Big audit firms. Thus, Big audit firms can take more risk whereas Non-Big audit firms are not relatively as high in wealth and thus cannot bear large litigation costs and thus will be more careful in deciding the kind of opinion to issue.

In order to further test the proposition that Big Four audit firms are willing to tolerate a much higher cost of litigation as compared to Non-Big Four audit firms when it comes to issuing GCOs', we calculated the average audit fees charged by Big Four audit firm and Non Big Four audit firms from our sample. The average audit fees charged by Big Four audit Firms in our sample is $ 21,113,993 whereas the average audit fees charged by Non Big Four audit firms in our sample is $ 278,626 . We used the empirical audit fees to calculate the net expected value of the decision (NEV hereafter) for auditors to issue a clean opinion for different levels of beliefs of the company going bankrupt. Next, we plot the NEVs' against different levels of litigation costs likely to be faced by auditors in the audit market. This exercise is done for Big Four as well as Non Big Four audit firms in Figures 2 and 3 respectively.

……..Insert Figure 2 here…..

…….Insert Figure 3 here…..

Figure 2 and Figure 3 reveal interesting observations about the behavior of Big Four audit firms and Non-Big Four audit firms, specially when it comes to issuing clean opinions when faced with different levels of litigation costs. Figure 2 shows when Big Four auditors are motivated to issue clean opinion. If NEV is negative, they will issue GCOs because there is a penalty to issue clean opinions. NEV of Big Four auditors are positive in most cases, which implies that they are more likely to issue "clean" opinions. NEV is negative only when Bel(B) is 0.25 and litigation cost is greater than 2,500,000. When the level of belief of the auditor that the company is going to go bankrupt within a year is very low [Bel (B) =0.25] , Big Four audit firms are willing to tolerate very high litigation costs before issuing a GCO, even if their decision is proved wrong . For instance, even when the anticipated litigation costs are as high as ten million dollars, Big Four audit firms are willing to issue a clean opinion to their clients. On the other hand, Figure 3 shows that Non-Big Four audit firms are more likely to issue a GCO even when the level of belief is very low [Bel (B) =0.25] that the company is going to go bankrupt within a year, if the litigation costs are moderately high. For instance, if the anticipated litigation costs exceed two million dollars, Non-Big Four audit firms are more likely to issue a GCO when Bel (B) is as low as 0.25.

In other scenarios, when the level of belief of the auditor that the company is going to go bankrupt within a year is very high [Bel (B) =0.95], Non-Big Four audit firms are more likely to issue GCOs' even when the anticipated litigation costs are as low as $ 500,000. In the same scenario, even when the level of belief of the auditor that the company is going to go bankrupt within a year is very high [Bel (B) =0.95], Big Four audit firms are willing to tolerate litigation costs as high as two and a half million dollars before issuing a GCO. The differences in tolerance of litigation costs between Big Four audit firms and Non-Big Four audit firms is significant. Big

Four audit firms enjoy a very high audit fee premium in the audit market and consequently their future expected benefits are also very high compared to the Non-Big Four audit firms.

VI. CONCLUSIONS

In this paper, we developed an analytical model for the auditor's decision to issue a GCO using the belief function framework based on the conceptual framework depicted in Figure 1. This approach uses three main factors identified by prior research for providing a theoretical model of the decision process of an auditor while issuing a GCO. One of the contributions of this paper is that it models and tests the "OR" relationship between the three financial statement factors and the auditor's decision to issue a GCO, and it analyzes the sensitivity of the auditor's decision to issue a GCO in the presence of one or more of the three factors and the combinations of one or more of the three factors. Most importantly, this analysis is supported by empirical data from 2004 to 2015. We believe that this evaluation approach can clarify and aid in auditors' assessment of whether to issue a GCO.

The results of our analysis reveal that the "OR" relationship between the financial statement factors is effective in representing the behaviors of auditors while issuing a GCO. When two or more corroborating factors are present, the overall belief to issue a GCO is much higher than the overall belief to issue a GCO when only one factor is present. Further, when all the three factors are present, the overall belief to issue a GCO is much higher than the overall belief to issue a GCO when two of the three factors are present or when only one factors is present. These results hold true irrespective of the size of the audit firm.

Significantly, as far as belief revisions are concerned, our analysis shows that when two or more factors are present, auditors are more likely to inflate their beliefs for the individual factors before arriving at an overall belief to issue a GCO. The results also documents stark

differences in the judgment behavior of Big Four auditors and Non-Big Four auditors as far as GCOs' are concerned. Non-Big Four audit firms are much more conservative while issuing GCOs' as compared ot Big Four audit firms. However Big Four audit firms appropriately inflate their beliefs when two or more factors are concerned , whereas Non-Big Four audit firms behave counterintuitively and actually deflate their beliefs for the individual factors before arriving at an overall belief to issue a GCO. This difference in belief revision behavior might explain the higher rates of Type I and Type II errors among Non-Big Four audit firms as compared to Big Four audit firms. These findings are strengthened by the results of our cost- benefit analysis. The Cost Benefit analysis represent that Big Four audit firms are willing to tolerate much higher litigation costs as compared to Non-Big Four audit firms. Even when the belief of the auditor is very low that the client is going to go bankrupt within a year, Non-Big Four firms are more likely to issue GCOs in order to avoid even moderate level of litigation costs. Such behavior of Non-Big Four auditors could potentially lead to more Type II errors.

In addition to the usual limitations that accompany similar studies, the first major limitation of the study is that for simplicity, we consider only three financial statement factors which have been documented in prior research to contribute to auditor's decision to issue a GCO. As stated earlier, the findings of the model would not be affected by the inclusion of additional factors in the model. Such an analytical model is not easily derivable if we assume that some items of evidence pertain to more than one factor; one would need to use computer software such as Auditor's Assistant developed by Shafer, Shenoy and Srivastava (1988).

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Table 1. Panel A. Frequency Ratios of Companies with GCOs' for all Audit Firms

Size of Audit Firm	ALL				
Factor	**Companies which received GCOs'(D)**	**Companies which did not receive GCOs'(E)**	**Total(F)**	**Frequency ratio for companies with GCOs(D/F)**	**Frequency ratio for companies with No GCOs(D/F)**
Net/Operating Loss (A)	7348	21195	28543	0.26	0.74
Negative Working Capital(B)	5656	9591	15247	0.37	0.63
Negative Cash-flow from Operations (C)	6847	14703	21550	0.32	0.68
A & B	5312	4307	9619	0.55	0.45
B&C	4890	2574	7464	0.66	0.34
A&C	6546	12354	18900	0.35	0.65
A&B&C	4686	2362	7048	0.66	0.34

Table 1. Panel B. Frequency Ratios of Companies with GCOs' for Big Four Audit Firms

Size of Audit Firm	Big Four audit firms				
Factor	**Companies which received GCOs'(D)**	**Companies which did not receive GCOs'(E)**	**Total(F)**	**Frequency ratio for companies with GCOs(D/F)**	**Frequency ratio for companies with No GCOs(D/F)**
Net/Operating Loss (A)	995	12321	13316	0.07	0.93
Negative Working Capital(B)	450	6111	6561	0.07	0.93
Negative Cash-flow from Operations (C)	802	7240	8042	0.10	0.90
A&B	421	1740	2161	0.19	0.81
B&C	293	651	944	0.31	0.69
A&C	776	6145	6921	0.11	0.89
A&B&C	281	572	853	0.33	0.67

Table 1. Panel C. Frequency Ratios of Companies with GCOs' for Non-Big Four Audit Firms

Size of Audit Firm	Non Big Four audit firms				
Factor	**Companies which received GCOs'(D)**	**Companies which did not receive GCOs'(E)**	**Total(F)**	**Frequency ratio for companies with GCOs(D/F)**	**Frequency ratio for companies with No GCOs(D/F)**
Net/Operating Loss (A)	6353	8874	15227	0.42	0.58
Negative Working Capital(B)	5206	3480	8686	0.60	0.40
Negative Cash-flow from Operations (C)	6045	7463	13508	0.45	0.55
A&B	4891	2567	7458	0.66	0.34
B&C	4597	1923	6520	0.71	0.29
A&C	5770	6209	11979	0.48	0.52
A&B&C	4405	1790	6195	0.71	0.29

Table 2. Comprehensive GCO Model for all Audit Firms

Size of Audit Firm			**Belief Inflation /(Discount)Parameter Value (θ)**	**Belief Inflation (Deflation) For $m(GCO_Y)$**		
Issue	**Frequency ratio for companies with GCOs**	**Aggregated Predicted Beliefs for GCOs [Bel GCO_Y]**		**Net Operating Loss (NOL)**	**Negative Working Capital (NWC)**	**Negative Cash Flows From Operations (NCFO)**
Net/Operating Loss (A)	0.26	0.26	NA	NA	NA	NA
Negative Working Capital(B)	0.37	0.36	NA	NA	NA	NA
Negative Cash-flow from Operations (C)	0.32	0.32	NA	NA	NA	NA
A&B	0.55	0.53	0.018	5%	3%	NA
B&C	0.66	0.57	0.11	NA	19%	23%

A&C	0.35	0.50	(0.34)	(34%)	NA	(34%)
A&B&C	0.67	0.68	0	0%[14]	0%	0%

[14] The difference between the predicted beliefs and empirical frequency ratios of GCOS' was statistically insignificant when all the three factors are present. Hence, there is no inflation or deflation of factor beliefs by the auditors.

Table 3. GCO Model for Big Four Audit Firms

Size of Audit Firm			**Belief Inflation /(Discount)Parameter Value (θ)**	**Belief Inflation (Deflation) For m(GCO_Y)**		
Issue	**Frequency ratio for companies with GCOs**	**Aggregated Predicted Beliefs for GCOs [Bel GCO_Y]**		**Net Operating Loss (NOL)**	**Negative Working Capital (NWC)**	**Negative Cash Flows From Operations (NCFO)**
Net/Operating Loss (A)	0.07	0.07	NA	NA	NA	NA
Negative Working Capital(B)	0.07	0.07	NA	NA	NA	NA
Negative Cash-flow from Operations (C)	0.10	0.10	NA	NA	NA	NA
A&B	0.19	0.14	0.03	43%	43%	NA
B&C	0.31	0.16	0.09	NA	122%	83%
A&C	0.11	0.16	(0.34)	(34%)	NA	(34%)
A&B&C	0.32	0.22	0.05	60%	60%	41%

Table 4. GCO Model for Non-Big Four Audit Firms

Size of Audit Firm			**Belief Inflation /(Discount)Parameter Value (θ)**	**Belief Inflation (Deflation) For m(GCO_Y)**		
Issue	**Frequency ratio for companies with GCOs**	**Aggregated Predicted Beliefs for GCOs [Bel GCO_Y]**		**Net Operating Loss (NOL)**	**Negative Working Capital (NWC)**	**Negative Cash Flows From Operations (NCFO)**
Net/Operating Loss (A)	0.42	0.42	NA	NA	NA	NA
Negative Working capital(B)	0.60	0.60	NA	NA	NA	NA
Negative Cash-flow from operations (C)	0.45	0.45	NA	NA	NA	NA
A&B	0.66	0.77	(0.20)	(20%)	(20%)	NA
B&C	0.71	0.78	(0.15)	NA	(15%)	(15%)
A&C	0.48	0.68	(0.36)	(36%)	NA	(36%)
A&B&C	0.71	0.87	(0.32	(32%)	(32%)	(32%)

Table 5. Going Concern Cost Benefit Function

Action	**Assessment Based on Auditor's Judgment that Company will go Bankrupt within a Year, Bel(B)**	**Assessment Based on Auditor's Judgment that Company will not go Bankrupt within a Year, [1 - Bel(B)]**	**Expected Benefit**
Action A1: Give GCO	(1) Correct Decision: Benefit = AF – AC	(2) Wrong Decision: Benefit = AF - AC	(AF–AC)
Action A2: Give No GCO	(3) Wrong Decision: Benefit = AF – AC – L	(4) Correct Decision: Benefit = AF - AC + FB	(AF-AC - L)*Bel(B)+(AF-AC+FB)*(1-Bel(B))

Figure 1: Evidential Diagram for Going Concern Opinion (GCO) based on three Factors: Net Operating Loss (NOL), Negative Working Capital (NWC), and Negative Cash Flow from Operation (NCFO)

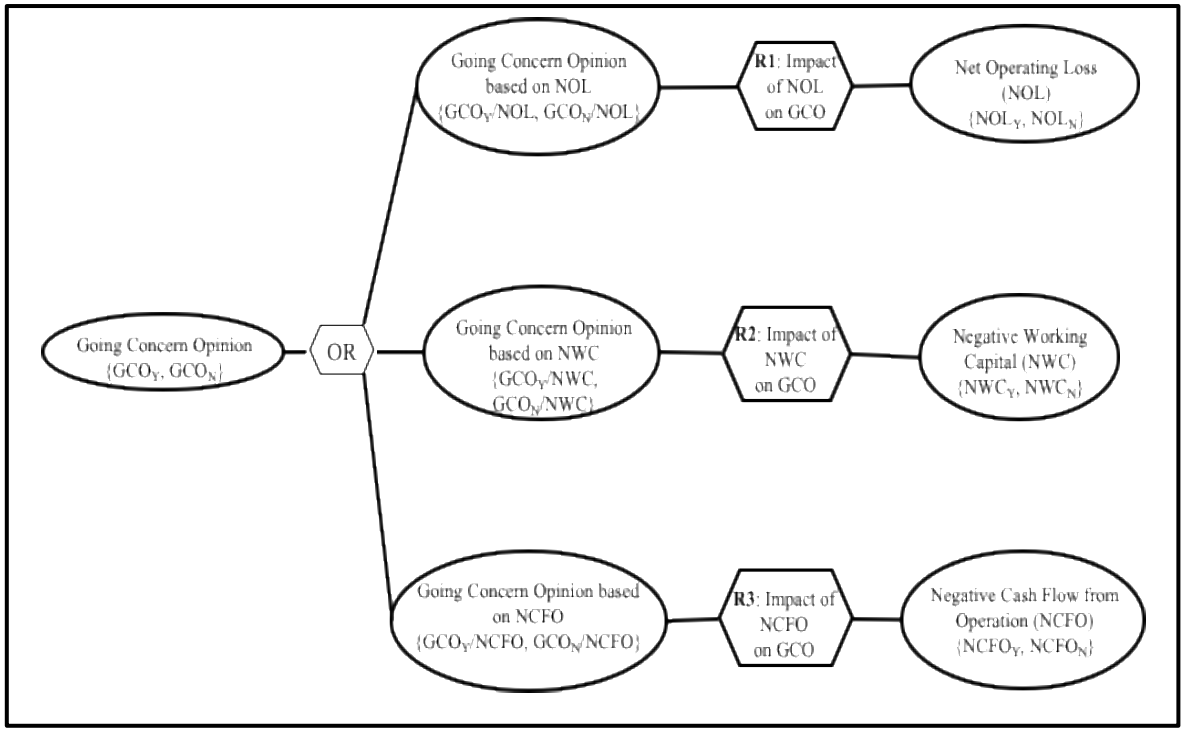

Figure 2. Benefit to Big Four Auditor for Giving Clean Opinion instead of GCO as a Function of Litigation Cost for a given Belief, Bel(B), that Client Will Go Bankrupt.

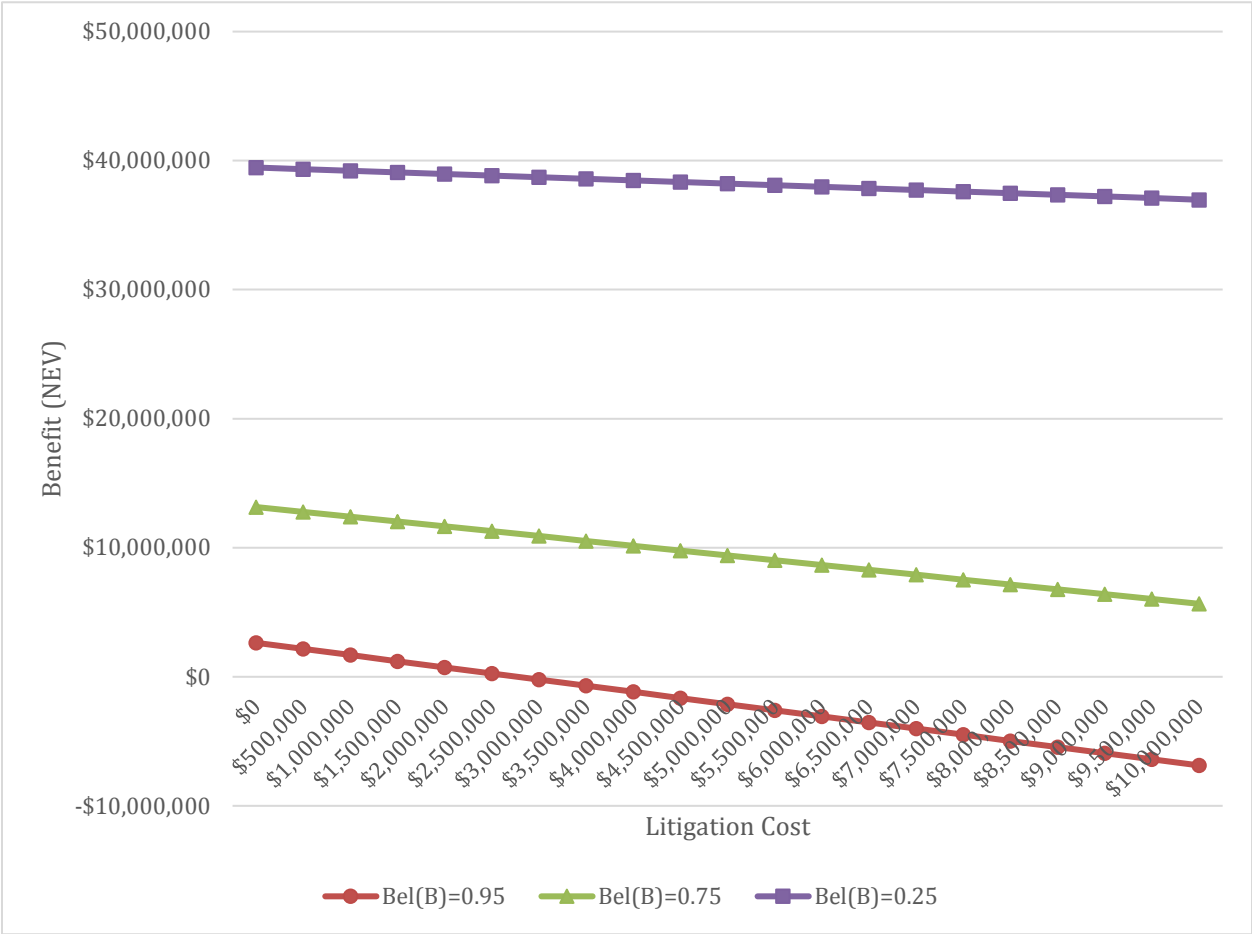

Figure 3. Benefit to Non-Big Four Auditor for Giving Clean Opinion instead of GCO as a Function of Litigation Cost for a given Belief, Bel(B), that Client Will Go Bankrupt.