THE ECONOMIC COST OF MYOPIC GOING CONCERN PRACTICE

By

Ren-Raw Chen*
Department of Finance
Fordham University
1790 Broadway, Room 1319
New York, NY 10019

Hsuan-Chu Lin
The Department of Accountancy and Graduate Institute
of Finance and Banking
National Cheng Kung University
No.1, University Road,
Tainan City 701,
Taiwan (R.O.C.)

and

Michael Long
Department of Finance and Economics
Rutgers Business School - Newark & New Brunswick
1 Washington Park
Newark, NJ 07102

September 18, 2009

*Contact author at rchen@fordham.edu

THE ECONOMIC COST OF MYOPIC GOING CONCERN PRACTICE

Abstract

Myopic going concern practice refers to the current audit going concern opinion that a firm is rewarded a favorable going concern opinion as long as it has the capability to satisfy its debt obligation in the following year. We show, via a *structural agency problem* we develop in the paper, that such a practice has a potential economic cost to the firm. We study Lucent Technologies Inc in details for its loss in economic value and also measure the magnitude of this impact with S&P 500 companies. We find that Lucent should have lost its going concern status in 2002 as it had to sell off its assets to meet debt obligations and nearly 18% of the S&P 500 firms suffer some degree of economic loss due to the agency problem.

THE ECONOMIC COST OF MYOPIC GOING CONCERN PRACTICE

1 Introduction

This paper studies the economic cost of the current myopic going concern rules. A myopic going concern audit refers to an audit decision that determines if a firm can survive in a short run of not more than a year by looking at the firm's short term liquidity. For a firm to survive in a short run, the only concern is the firm's ability to meet its immediate cash flow obligations. Such a liquidity-driven audit process ignores the economic nuance of the firm and can come to a different conclusion from an economically-driven default. In a crisis situation as the one we have been experiencing, such a myopic point of view is more conservative as if a firm cannot survive the liquidity squeeze, the firm should default even though it is profitable.[1] However, in a more normal situation where the liquidity squeeze is less eminent, such a myopic audit is less conservative, which is against accounting's Convervatism Principle. We show in this paper via a structural agency theory that such a viewpoint has potentially a significant economic impact on the value of the firm. An in-depth case analysis shows that a firm that is subject to "economic default" and yet passes the myopic going concern audit will ultimately default[2] and then results in a greater loss of economic value. In this paper, via a compound option framework, for the first time in the literature, we can further quantify such an economic loss.

When a firm is subject to economic default, it has difficulty to raise capital (equity or debt) and yet it may still have enough cash to pay its near term obligations. Furthermore, to survive in the short run, a firm may liquidate valuable assets (and keep poorer ones) to meet its immediate obligations. Our structural agency theory studies the default problem in a situation where a firm has enough cash (or liquid assets) to pay for its short term debt obligations and yet would have difficulty raising equity capital. In our model, we categorize this situation as *economic default*. The firm will continue to survive and receive a favorable going concern audit for the short run and yet in the long

[1] Readers are reminded that prior to its default (or merged into JP Morgan) on March 16, 2008, Bear Stern reported $0.86 EPS quarterly earnings (2008Q1).

[2] We should note that the definition of "default" in this paper is looser than bankruptcy. We regard debt restructuring and firm reorganization (e.g. merger) as failure of current operation and should satisfy by the definition of default.

run the firm will ultimately default and suffer an economic cost as the debt holders' value is lost.

We present two empirical analyses. The first is an empirical case study of Lucent Technologies Inc. and the second is an estimate the economic cost of S&P 500 companies to show the problems' overall magnitude. Lucent Technologies Inc. is analyzed in depth as a large, well-known firm. The data show that it should have lost its going concern status in 2002 as it had to sell off its assets to meet debt obligations. This situation developed from a large decline in the demand for Lucent's products. While it survived for a few years with these techniques, the firm eventually went through restructuring (i.e. default). Finally, it re-surfaced as a much smaller valued business. Much of the debt holder's value had been lost. As the Lucent example shows, the problem that we present can be addressed and corrected with a simple, objective measure in reporting non going-concerns in audit opinions. In addition to the case study, we also calculate the potential economic cost of S&P 500 companies. We find that surprisingly 18% of the 500 world's largest firms show some degree of potential economic loss and the magnitude reaches an average number of $16 million in a period of 1996 ~ 2006.

Our paper proceeds to first review the requirements and importance of correctly reporting a firm's going concern status (Section 2). We then proceed to review agency theory with particular emphasis on the claim dilution problem (Section 3). This is followed with our structural agency theory and how we solve the agency problem (Sections 4 and 5). We finish with our empirical analyses that show the magnitude of this problem (Sections 6 and 7).

2 Going Concern Status

The importance of a going concern status cannot be over emphasized. Accounting makes the going concern principle the basis for most measurement and valuation concepts such as the historical cost and revenue recognition assumptions. The entire double entry system using historical cost is predicated on the firm being a going concern where the assets' value eventually flows through the income statement to measure performance. Without going concern status, a firm's values are reported basically at their liquidation value. When firms obtain an unexpected qualified going concern opinion, the security markets react with negative abnormal returns (see, Fleck and Wilson, 1994). Further for firms already having qualified opinions, the market reaction to bankruptcy is much smaller (see, Chen and Church, 1996).

This brings up the questions of what determines whether a firm should be considered a going concern. The most recent pronouncements on what constitutes a

going concern are found in the Statement on Auditing Standards, No. 59 (April, 1988). This authoritative reference provides guidance to the auditor conducting an audit of financial statements in accordance with generally accepted auditing standards (GAAS). It posits, in the second paragraph, that the auditor has "…responsibility to evaluate whether there is substantial doubt about the entity's ability to continue as a going concern for a reasonable period of time, not to exceed one year beyond the date of the financial statements being audited." It notes in paragraph 4, "…the auditor is not responsible for predicting future conditions or events." This safe harbor provision protects the auditor in noting that evaluation of the going concern status is not the primary goal or objective of the audit. The same provision also lays the theoretical basis for liquidity-driven, or myopic, going concern audit.

What we offer is an economic examination of such a practice and provide a dollar measure of the economic cost of such a practice using a compound option framework. Our model is objective in that it makes no *ad hoc* assumptions on accounting information and it takes into account market information (e.g. market cap). Consider paragraph 6 in SAS 59 "Consideration of Conditions and Events," the usual problems that can cause a firm to discontinue operating due to poor performance are presented as factors to consider in determining a going concern status. However, it presents no specific criteria to determine a qualified going-concern.

The implication of these vague statements in defining going concern comes out in empirical studies. For firms that obtain going-concern modified reports, the now Big 4 auditing firms are better at prediction. Geiger *et al* (2006) find these large auditing firms have both a lower rate of Type I errors where modified opinions are rendered to subsequent viable clients and higher rate of Type II errors where clean opinions are given to subsequent firms that enter bankruptcy as compared to non-Big 4 firms. Further, they found no differences in performance between national second tier and smaller regional firms. With our objective measure hopefully these differences can be eliminated.

Accounting literature has long acknowledged the concept of *economic default*. One of the earliest attempts to determine whether a firm should maintain a going concern status is Altman and McGough (1974).[3] Improving the going concern decision process will increase market efficiency. Under current going concern rules, it provides an early, negative warning signal for firms that obtain qualified opinions on the going concern

[3] They use Altman's Z-score (Altman, 1968) to determine which firms should still receive a going concern opinion in viewing firms in apparent financial distress. Their model predicted 85% correctly. Their approach never made it into the mainline accounting decision process. This possibly results as firms can easily manipulate their accounting ratios that Altman's Z-score uses as its predictors.

status. Louwers (1998) considers many factors that might influence a going concern opinion and concludes that traditional financial factors form the basis of auditors' decisions. Hopwood, McKeown and Mutchler (1989) find that the qualified going concern opinion provides incremental explanatory power in the context of a bankruptcy prediction model. Kennedy and Shaw (1991) report that the qualified opinion is a significant variable in explaining bankruptcy resolution (i.e., whether a company that files for bankruptcy eventually liquidates or reorganizes).

Another aspect in this area investigates possible reasons that underlie the auditor's error "on the other side." These studies consider the decision to issue a going concern opinion for a company that ultimately files for bankruptcy (McKeown, Mutchler and Hopwood, 1991). Using this approach in a later article, Hopwood, McKeown and Mutchler (1994) find no evidence that auditor's qualified going concern opinions are inferior predictors of bankruptcy compared to traditional statistical models.

Nogler (1995) follows companies that receive qualified opinions through their resolution in terms of bankruptcy, liquidation, merger or subsequent receipt of an unqualified opinion. He concludes the error rate quoted in the literature that results from incorrectly giving firms' qualified opinions is too high. More recently in the times of Sarbines-Oxley, Geiger, Raghunandan and Dasaratha (2005) find auditors have grown more cautious and are issuing more modified going-concern audits even after adjusting for economic conditions of the firms. We feel our objective approach can provide auditors the protection to issue non-biased reports in the current political climate.

Closely akin to the going concern decision is whether the firm is legally solvent. While the going concern decision traditionally focused on whether the firm would continue to operate and hence could use accrual based accounting, the solvency test is directed towards whether the firm is able to pay its debts. As with other factors in business law such as private firm valuation, the law currently requires multiple factors be considered in the solvency decision. Heaton (2006) identifies these as "ability to pay test" which is similar to our measurement, a "balance sheet solvency test" where assets are grater than liabilities, and a "capital adequacy test" where positive book equity exists.

While Heaton (2006) views the "ability to pay test" as probably the best measure of solvency, he never actually defines how it should be determined. Our test provides that measurement. What we require to determine going concern status also requires the ability to pay test is met. Similarly, our approach also measures his "balance sheet solvency test" though slightly modified where the market value of the firm's assets must exceed the value of debt payments due. As to the "capital adequacy solvency test," we can only state that the conceptual capital value is positive when the conditions for our test

are met. We feel that our measure is ideal for solvency measures also as it collapse the three tests to a simple single measure.

3 Economic Default and the Structural Agency Problem

3.1 Background

Under the perfect market assumption, Modigliani and Miller (1958) showed financing choices should have no impact on the value of the firm. Stiglitz (1974) later generalized this concept. However, the irrelevancy theorem seems unable to consistently explain the complicated capital structures observed in reality. When the perfect capital market assumption is relaxed, various theorems emerge to explain the determinants of the optimal capital structure. This in turn leads to our structural agency problem and its solution to determine the firm's going concern status.

The inconsistencies in maximizing both equity holders and debt holders' values form the basis for our structural agency theory. In the finance literature, Stiglitz (1972) first noted that maximizing firm value and shareholder value are not the same in the presence of possible bankruptcy. Jensen and Meckling (1976) popularized and named these conflicts as agency problems. Viewing the corporate structure as "nexuses of contracts", Jensen and Meckling (1976) relaxed Modigliani and Miller (1958) assumption of a fixed investment policy where financing choices have no impact on the value of the firm under perfect markets. This creates incentive problems for firm managers resulting in agency costs. Jensen and Meckling argued the existence of optimal capital structure is where the firm minimizes the total agency costs of the firm in trading-off between the agency costs of outside equity and the agency costs of outside debt.

However, relaxing the fixed investment assumption is not a necessary condition to create adverse incentives between equity and debt holders. Black and Scholes (1973 on page 651) noted that the firm could sell its assets and pay a liquidating dividend to its shareholders. However, Fama and Miller (1972) on page 152 stated that bondholders "…could easily have protected against such infringements by a 'me-first' rule…" that basically requires their payment first. Kim, McConnell and Greenwood (1977) empirically tested whether these rules exist in practice using the establishment of captive finance companies as their potential dilution. Their tests showed 'me-first' rules did not exist. Several years later, Malitz (1989) redid their study with more refined empirical techniques. She found firms undertook financial subsidiaries as value increasing investments and not as a claim dilution as this agency problem had come to be known.

Straight claim dilution assumes that the asset base stays constant but debts are increased. The original debt holders see their claim diluted with additional debt being incurred with the same claim on a fixed asset base. This occurs whenever bankruptcy is possible **and** perfect 'me-first' protection is not present. Ho and Sanger (1982) were the first to point out the problem exists with debts of different maturities. However, they never formally valued the effect.

What we introduce is a new approach to claim dilution that we will refer to as the *structural agency problem*. Now, instead of borrowing additional funds to dilute the original debt holders' claims, the firm sells assets to meet debt requirements diluting the claim of debts still outstanding. The dilution switches to a multi period situation where different debts are due at different time periods. The reason assets are sold to meet debt payments is that it is the only way the poor performing firm can raise funds to meet its immediate debts. Firms in this situation we feel should receive modified going concern opinions.

While we propose a specific measure for this cut-off, auditing firms are found to empirically follow our idea as Behn, Kaplan and Krumwiede (2001) reported. They looked at publicly available management plans. They found firms planning to issue equity or increase borrowing had a strong link with receiving an unqualified opinion. Firms planning to reduce spending or sell off assets were more likely to receive qualified audits. This practice is consistent with our proposed measures to obtain a clean or unqualified audit.

3.2 An Illustration

We first start the formal investigation of the agency problem under credit risk in a multi-period setting. This is crucial to whether a firm is judged as a going concern. Such an agency problem occurs when the firm should have defaulted as its assets are worth less than its debt outstanding, but the shareholders still have the capability to make the next periodic debt payment continuing to control of the company. We feel that these firms should not receive an unqualified audit since they can no longer issue new equity or new debt even though they might have the cash to pay immediate debt obligations. Firms in this position now usually escape default because the debt holders lack the power to audit and re-evaluate the firm on a current market value basis.

To undertake this measurement, we must first establish an economy where firms operate without the *structural agency* problem. In such an economy, debt and equity holders behave rationally, information flows efficiently, and no arbitrage opportunities exist. As a consequence, defaults in the economy occur optimally at the best interest of

both equity and bond holders. Geske (1977, 1979), among others, derived a multi-period capital structure model under the Black-Scholes assumptions that he later expanded. One key implication in the Geske analysis is that debt or interest payments of the firm must be financed by newly raised equity.[4] Lack of the capability to raise equity is equivalent of default.[5]

Unfortunately this ideal economy differs from the reality where "under investment" and "asset substitution" problems exist. Hence, we derive a theory to cope with the structural agency problem under credit risk that exists even without information asymmetry. Furthermore, by comparing with the ideal economy that is free from the structural agency problem, we can quantify the agency problem and estimate the agency cost. This allows us to empirically test the significance of this agency problem and whether a firm should qualify as a going concern.

The agency problem we measure to determine going concern status is the situation where the agents who represent the equity holders (managers of the company) continue to operate the company when they can no longer issue equity or debt in rational, well functioning capital markets. When the company cannot issue equity, the existing equity must have a null valuable because the new and old equity shares must bear the same price. However, the fact that the existing equity continues to trade in the marketplace with a positive price indicates that the equity holders successfully have escaped default and have transferred value from the debt holders to themselves. This condition, we will show is equivalent to the call value of the firm being larger than the debt payment (coupon and principal) due at the next payment date, but not as large as the value of all future debts owed. However, in reality, many companies continue to operate as long as the asset value is greater than the debt payments due since the debt holders lack the ability to audit and force re-evaluation of the firm and traditional auditors continuing to view firm in this situation as going concerns.

Our simple numerical example demonstrates the multi-period agency problem. Suppose a company has two zero coupon debts, one and two years to maturity and each has $100 face value. Also suppose the assets are currently worth $400 and the debts are

[4] The no-default condition adopted in the Geske model is similar to the safe covenant in debts. Note that the effect that the safe covenant can alleviate the agency problem is similar to accepting Geske's assumption of no default.

[5] One should remember that if the firm can borrow additional money than at least conceptually, it is in a position to raise new equity. The fact that most debt is replaced with new debt does **not** mean that the firm is in default but rather is an indication that it is a going concern.

together worth \$170 on present value basis. This is graphically represented by the following balance sheet:[6]

Balance Sheet
as of year 0

assets	400	Maturity $t = 1$ debt	90
		Maturity $t = 2$ debt	80
		Equity	130
total	400	Total	400

note: both debts have face values of \$100

First, assume that one year later, the asset grows to \$450 and the firm faces the first debt payment of \$100. The firm at this time should raise equity to pay for the first debt so that the asset value will not have to be decreased. The asset value after paying off the first debt is still \$450. Assume that at this time ($t = 1$), the second debt, now only a year from maturity, has a value of \$90. As a result, the equity should be \$360 (= \$450 – \$90) that includes \$100 new equity and \$260 old equity. The balance sheet becomes:

Balance Sheet
as of year 1 before payment of first debt

assets	450	Maturity $t = 1$ debt	100
		Maturity $t = 2$ debt	90
		Equity	260
total	450	Total	450

Balance Sheet
at year 1 after payment of first debt

assets	450	maturity $t = 2$ debt	90
		old equity	260
		new equity	100
total	450	Total	450

note: issue new equity to pay for the first debt

Now, instead of the assets being worth \$450, suppose that the firm made some bad investment decisions and the asset's value drops to \$150. A bad economy and lower asset value imposes a higher default risk on the second debt so it is priced lower at \$75 due to its higher risk. Hence, the resulting equity value of old equity and of the "should

[6] We assume the risk free rate to be about 10%. Since the company is extremely solvent, both debts are roughly priced at the risk free rate.

be raised" equity, or debt due plus net equity, drops to \$75 (150 – \$75 = \$100 – \$25)[7]. The firm, as in the previous case, would like to raise equity to pay off the first debt. But the new equity value needs to be \$100 to retire the debt due which creates a clear contradiction. This means that the new equity owner pays \$100 in cash but in return receives a portion of \$75. No rational investor would invest equity in this firm.

Since the firm cannot raise equity capital to continue its operation, it should not be considered a going concern. There is point where the potential new equity owner is indifferent and this is the going concern breakeven point for the company. Suppose the (break-even) asset value in one year is falls to \$186.01. At this asset value, the second debt is worth \$86. Consequently, the new equity owner has \$100 and the old equity has \$0.01. And we know that the default point is \$186.[8]

Balance Sheet
as of year 1 before payment of first debt

assets	186.01	one-year debt	100
		two-year debt	86
		Equity	0.01
total	186.01	Total	186.01

Balance Sheet
as of year 1 after payment of first debt

assets	186.01	two-year debt	86
		old equity	0.01
		new equity	100
total	186.01	Total	186.01

note: issue new equity to pay for the first debt

[7] Actually, the balance sheet before the payment of first debt should be:

Balance Sheet
as of year 1 before payment of first debt

assets	150	maturity $t = 1$ debt	100
		maturity $t = 2$ debt	75
		old equity	-25
total	150	total	150

[8] This value is precisely the "implied strike price" in the Geske model. We should notice that \$186.01 ≈ \$186 in this example. We leave a minor amount, \$0.01, to old equity holders in order to make this example more reasonable.

Figure 1 shows the relationships between the market value of debt (two-year debt at year 1) and market value of equity in previous examples.

Place Figure 1 Here

We can clearly see that any asset value lower than $186 will cause default and should require other than a going concern opinion. However, with $186 of assets, the company can pay the first debt due and continue to operate. One could also consider selling assets to pay off the first debt without raising any new equity. However, this approach to claim dilution would cause the second debt to drop significantly in value as the following chart demonstrates:

Balance Sheet
as of year 1 before payment of first debt

Assets	186	one-year debt	100
		two-year debt	86
		Equity	0
total	186	Total	186

Balance Sheet
as of year 1 after payment of first debt

assets	86	two-year debt	76
		old equity	10
total	86	Total	86

note: selling asset to pay for the first debt

The reason is that the equity immediately has an option value at the cost of the remaining debt. In the above hypothetical tables, we assume $10 is transferred from debt to equity. At $t = 0$, the debt holders know about this even when there is no information asymmetry. As a result, they will pay less for the debt.

Usually, the company will roll over old debt to new debt instead of issuing equity. In the case of extreme solvency, this is not a problem. But in the case of near default, as described above, we have:

Balance Sheet
as of year 1 before payment of first debt

assets	186.01	one-year debt	100
		two-year debt	86
		Equity	0.01
total	186.01	Total	186.01

Balance Sheet
as of year 1 after payment of first debt

assets	186.01	two-year debt	86
		new debt	100
		old equity	0.01
total	186.01	Total	186.01

note: issue new debt to pay for the first debt

The principal of the new debt can be extremely high to reflect the very risky situation in order to get a $100 to retire the first issue. Because the existing debt matures earlier (and hence has a higher seniority) its value should be the same whether there is new equity or debt. The equity will give a different claim whether new equity is raised or new debt is issued. With new equity the original equity will return a small portion after the second debt issue is repaid. With new debt, the original equity will get the entire return if the asset value increases after both debt issues are repaid. In the equilibrium, the original equity value should return to 0.01. It should not matter if the funds come from new equity or new debt at just over break-even point. Either way, the result holds and the old equity holders have a $0.01 value.

Under the current measurement for going concern status, companies will usually receive a going concern opinion at $186 and probably at $150. The company continues to survive and operate. Now at $150 value, the company is not able to raise capital, but it is certainly able to pay the debt with its assets and leave the second debt with $50. Under this condition, the junior debt will be worth less than $50, possibly very little since debt holders do not have the safe covenant to prevent managers/shareholders from selling assets to pay the senior debt. The transferring of wealth from debt owner to equity owner is what we define as the agency problem. As long as the company spends assets to pay the earlier maturing debt, the later maturing debt holders will be hurt and shareholders will benefit.

The general plot of the equity value and asset value is shown below in Figure 2. Using our previous example, the going concern break point is $186. Now, Figure 3 is an expanded Figure 2 to show how the agency problem is caused.

Place Figure 2 Here

Place Figure 3 Here

We note that at the due date of the first debt, the company faces a decision whether to pay the debt obligation. This is a compound option question in that if the company decides to pay, the company continues to survive much like exercising the compound option to keep the option alive. The company's survival criterion relies upon whether the company can raise new equity capital. In this analysis, the technical condition of staying solvent (paying the coupon) is that the company must use new equity to pay for the coupon. If such new equity conceptually cannot be raised, then the company should go bankrupt. Interestingly, this condition translates into another equivalent condition that the market value of the assets of the company must stay above the market value of the liabilities at the moment of the coupon. This condition is regarded as the no-arbitrage condition and should be the breakeven point in value for receiving a clean going concern audit.

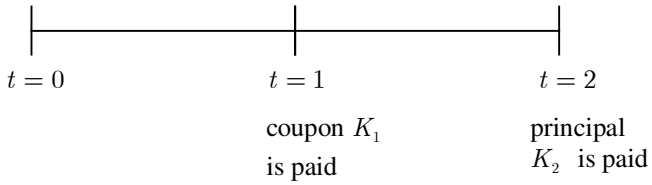
The agency problem is measured to determine the going concern status resulting from the structural difference of debt. It is the difference between the definitions of default to force immediate bankruptcy versus the usually larger value required here that we address as the *structural agency problem*. The character of the structural agency problem from credit risk gives us a new perspective to determine when a firm has sufficient value to be considered a going concern.

4 The Agency Cost – Solved and Measured

We now derive a model of *the structural agency problem* in a two-period framework. The resulting model in an option framework shows when the firm has "worthless" equity. In this situation, the only way that immediate debt payments can be paid is through drawing down its assets. These can be either excess liquidity or selling assets. Under our proposed going concern criteria, a firm in this situation should not receive a clean going-concern opinion. It is no longer a going-concern but rather a slowly liquidating firm and should be reported as such.

We first will develop our model in a two period setting that shows the intuition behind our model and then expand it to a more general multi period framework. Consider

the following two-period setting: $t = 0,1,2$ where $t = 0$ is the current time, as the following diagram demonstrates:



The company owes a coupon bond where K_1 is the coupon at $t = 1$ and K_2 is the bond redemption value at $t = 2$. The total asset value at both times is represented by A_1 and A_2 respectively.

At $t = 1$, the company faces an exercise decision. The company will pay the coupon to stay alive only if new equity can be raised. If the company survives, then it must be true that under the Black-Scholes and Merton theory, the equity is an exercised call option. If we adopt the log normal process for the asset value in a risk neutral world:

$$(1) \qquad \frac{dA_t}{A_t} = rdt + \sigma dW_t$$

where r is the risk free rate, σ is the volatility, and W_t is the Wiener process.[9] This assumption is roughly realistic and can be easily generalized. The above assumption leads to a Black-Scholes-Merton result for the equity:

$$\begin{aligned} E_1 &= C(A_1, K_2, r, \sigma, h) \\ &= e^{-rh}\mathbb{E}_1[\max\{A_2 - K_2, 0\}] \\ &= A_1 N(d + \sigma\sqrt{h}) - e^{-rh} K_2 N(d) \end{aligned} \qquad (2)$$

where

$$d = \frac{\ln A_1 - \ln K_2 + (r - \frac{1}{2}\sigma^2)h}{\sigma\sqrt{h}},$$

and $\mathbb{E}_1[\cdot]$ is the risk neutral expectation conditional on information available at time $t = 1$, A_1 is the asset price at time $t = 1$, and h is the time distance between time $t = 1$ and $t = 2$ which is also assumed to be the same time distance between $t = 1$ and $t = 0$.

The debt value after the coupon is therefore:

[9] This is known as the risk neutral process of the stock price. Note that the expected return of the stock does not appear in the equation.

(3)
$$\begin{aligned} D_1 &= A_1 - E_1 \\ &= A_1[1 - N(d + \sigma\sqrt{h})] + e^{-rh} K_2 N(d) \end{aligned}$$

If the new equity is raised to pay for the coupon, then there is no reduction in asset value. In the balance sheet, it is simply a transfer from debt to equity by the amount of coupon. The total asset value should not be changed. The following table helps to understand the before/after- coupon condition more clearly:

	Before Paying K_1	After Paying K_1
Equity	$E_1 - K_1$	E_1
Debt	$D_1 + K_1 = A_1 - E_1 + K_1$	$D_1 = A_1 - E_1$
Total Asset	A_1	A_1

Note that, as explained in the previous section, if the firm is solvent, it must be that K_1 is financed by new equity and E_1 is the total of new and old equity. The default condition is $E_1 - K_1 > 0$ which can be re-written as:

$$\begin{cases} E_1 - K_1 > 0 \\ A_1 - D_1 - K_1 > 0 \\ A_1 - K_1 > D_1 \end{cases}$$

or the asset value, after paying K_1, should be greater than the debt value. But note the debt value is a fraction of the asset value. Hence, it is never possible that the asset value can be lower than the remaining debt after paying K_1. The only way to allow for this condition is to pay the debt obligation with new equity so that the asset value is unchanged. This is the brilliant insight of the equivalent condition used in Geske (1977) that provides the no-arbitrage condition for default.

The value of assets at time $t = 1$, A_1, determines the value of the existing equity. If A_1 is large enough to avoid default, then the equity value E_1 after coupon being paid must equal the call value. As A_1 drops, E_1 drops. If A_1 is too small due to poor prior period investments, and the call option value is less than the coupon amount, i.e. $E_1 < K_1$, then it implies that the old equity value is *negative*, and the company must declare bankruptcy. In that situation, the company cannot raise new equity. If the company cannot raise new equity, it must be the result of the old equity having no value since the old and new equity must be valued on the same basis.

Note that there exists a critical asset value, $\overline{A}_1$, such that $E_1 - K_1 = 0$. This is the default point for the firm. The firm should not receive going concern audit if its asset value drops below this critical value.

In the case of no safe covenant on regulating managers/shareholders from selling assets to meet debt obligations, a firm only defaults when it lacks enough assets[10] to make the coupon payment, or a firm defaults when $A_1 < K_1$. Since $A_1 > E_1$ by definition, it is perceivable that a firm can continue to operate when $E_1 < K_1 < A_1$. Under such a situation, the *conceptual* equity value is negative as we have shown in the previous section. This creates the agency problem that we now study.

If there is no such safe covenant and the default condition of a firm is $A_1 < K_1$, the equity value under this situation can be computed as (compared with equation (2)):

$$
\begin{aligned}
E_1^* &= C((A_1 - K_1)^+, K_2, r, \sigma, h) \\
&= \begin{cases} e^{-rh}\mathbb{E}_1[((A_1 - K_1)e^{(r-0.5\sigma^2)h+\sigma\sqrt{h}z} - K_2)^+] & A_1 > K_1 \\ 0 & A_1 \le K_1 \end{cases} \\
&= \begin{cases} (A_1 - K_1)N(d^* + \sigma\sqrt{h}) - e^{-rh}K_2 N(d^*) & A_1 > K_1 \\ 0 & A_1 \le K_1 \end{cases}
\end{aligned} \tag{4}
$$

where

$$d^* = \frac{\ln(A_1 - K_1) - \ln K_2 + (r - \frac{1}{2}\sigma^2)h}{\sigma\sqrt{h}}.$$

The agency cost (AC) in our model is measured as $AC = E_1^* - E_1$ and is shown in Figure 4.

Place Figure 4 Here

5 The Going Concern Decision

Before understanding how the structural agency theory can be applied on the going concern decision, we need to understand an important characteristic of this model. As shown in Figure 4, the structural agency problem results from the difference of two distinct default points, K_1 and $\overline{A}_1$, and the agency cost is measured as the difference of two measures of equity values, E_1^* and E_1. $\overline{A}_1$ is defined as the "should be correct default point" in our model. Any firm with its asset value lower than $\overline{A}_1$ should considered in default. The equity measure E_1^* is always larger than E_1 because E_1 is the equity value when a firm is facing a stricter default condition $\overline{A}_1$ where the firm is

[10] We assume perfect liquidity so all assets can be regarded as cash.

prohibited from selling its assets to meet debt obligations. However, as the asset value increases, E_1^* and E_1 converges and AC approaches zero (shown as Z in Figure 4) since increasing firm solvency decrease its agency costs. Therefore, the maximum agency cost will always happen at $\overline{A}_1$ since the agency cost is a decreasing function of asset value starting from the right hand side of $\overline{A}_1$.

Consequently, when a firm has no solvency problem from being solvent enough and facing no default risk, the agency cost will not exist and the structural agency problem can be totally ignored. However, if solvency is a problem for a firm, the agency cost appears. It is this situation our model provides an objective measure to determine going concern status.

Our decision criterion for a firm to obtain a going concern opinion is that the asset value of the firm A is greater than $\overline{A}$ which is the model implied default barrier. Only in this situation can the firm be sure to have enough value to make its payments over the next year through either issuing new equity or raising additional debt to retire the debt coming due. Any lower firm value (lower than $\overline{A}$) will require the firm either to sell off its assets to the determinant of other debts outstanding or substitute its assets to riskier investments and be lucky that a positive outcome occurs, or undertake a combination of both activities. This keeps us within the current guidelines on a going concern opinion looking out over the next year.

Many firms have managed to successfully exit from not having a going concern status. Our rule does not say the firm is facing immediate legal bankruptcy, but only that it cannot pay its bills and debts through the normal operating procedures. It is a conservative, objective measure of when a firm must sell its assets to survive. This is why we view firms in this situation as not going concerns.

If the going concern rules are modified to allow qualifications or warnings in going concern opinions, our $E^* - E$ term quantifies the structural agency cost providing an objective measure. It gives the default probability in dollar terms that is similar to the function of Z-score to determine the probability of default over the next year. Furthermore, we can transfer the structural agency cost into a more objective ratio for measuring the default probability as well. According to our model, an implied unique maximum agency cost can be obtained in each condition. Then the "going concern index" can be defined as:

$$(5) \qquad GCI = \frac{E^* - E}{\max(E^* - E)} = \frac{AC}{MAC}.$$

As shown in Figure 4, AC is the incurred agency cost and MAC, the maximum agency cost, appears at the default point $\overline{A}$. Dividing the agency cost by MAC informs us how close the current financial condition of a firm is to its default point. The higher that the ratio becomes gives a higher default probability facing the firm. In summary, this ratio would provide helpful information to the users of financial statements as to the chances that the firm can continue indefinitely as it is currently structured.

6 Case Study: Lucent Technologies Inc.

Lucent Technologies Inc. provides a good example of a firm that should have lost its going concern status. We will review their financial position across time and observe a firm that faces an increasing structural agency cost. Their problems start in late 1999. As an attempt to continue their huge price appreciation of 1997 and 1998, the then CEO, Richard McGinn, and their board of directors embarked on a series of inappropriate business practices to inflate their equity price. When this undertaking become public in 2000, it also coincided with the burst of high-tech bubble. Lucent's equity value fell from over $120 per share to near 50 cents. At this time, Lucent engaged in a series of activities to prevent default. In our case study, we will display their structural agency problem under credit risk, compute their corresponding costs, and show Lucent would not have received a going concern opinion under our rules.[11]

It is important to note that our model will not pick up actual fraud situations unless the market is efficient in the Strong sense in which case the market sees through management manipulations and/or fraud. If markets are efficient in only a Semi-strong sense that most studies show as more consistent with actual behavior, the market is fooled and firms are incorrectly valued at least until the fraud becomes public. Our model uses market data to estimate risk and establish value and cannot identify fraud situations.

6.1 Background

Lucent's trouble began in late 1999 as their stock price fell sharply and debt mounted. As the Lucent scandal coincided with the internet burst in 2000, we must try to separate Lucent from the market in general in order to see the agency problem caused by Lucent's management and board of directors. As Figure 5 using Nasdaq and Figure 6

[11] For an example of a firm that self liquidated for years before entering bankruptcy, see DeAngelo, DeAngelo and Wruck (2002). Their thorough case study of L.A. Gear covers the entire history of the firm with an emphasis on traditional agency theory.

using the broader S&P 500 index both show, the overall market losses were less than Lucent's losses after the burst of the internet bubble.

Place Figure 5 Here

Place Figure 6 Here

Under pressure to meet revenue goals, Lucent in 1999 began to give large discounts to meet projected sales numbers and began extending more credit to service providers to win their business. As Figure 7 shows, this practice by Lucent's management with their board's approval inflated the revenues and earnings bringing them to peaks in the second quarter of 2000. By then, the company could no longer artificially inflate its earnings, and the company started to crumble. The board took action and fired CEO Richard McGinn in October 2000 though it gave him a golden parachute of more than $12 million as a parting gift.

Place Figure 7 Here

Moreover as related to our agency costs, from 2001 to 2003 Lucent started to sell their assets and cut their work force to avoid default. The price-volatility picture in Figure 8 demonstrates that the structural agency problem of Lucent deteriorated as its equity became increasingly volatile as it tried to improve its position. The fact that Lucent's market price moved up slightly while the book value equity was still negative shows the size of their agency cost.

Place Figure 8 Here

6.2 Data and Results

In order to see Lucent's structural agency problem under credit risk, we use our model to quantify its severity. We know cash obligations due within the coming year and also total future debts. We simplify and use the two period model where all future debts are due in upcoming period or two periods in the future. Weekly close equity prices are collected from Yahoo Finance website. Annual financial reports from 1997 to 2005 are obtained from Mergent Online Database. For the risk free rate, we use CMT (Constant

Maturity Treasury) 1-year rates that are obtained from the Federal Reserve Bank of St. Louis web site. From this data, we measure the agency costs and the Going Concern Index (GCI) across time for Lucent. These results are shown in Figure 9 and Figure 10 respectively.

Place Figure 9 Here

Place Figure 10 Here

The diagrams show that agency problems with Lucent are not significant from 1997 to 2000. Then, their agency problem starts to grow as their financial situation deteriorates sharply in 2001, roughly one year after the scandal broke out. In Figure 9 and Figure 10, the agency costs are bars and corresponding default probability ratios are illustrated as dash-line bars. In 2002 the asset values are all below the implied default point $\bar{A}$ making the equity measure E equals to 0. However, the other equity measures E^* are still positive. According to the default rule in our model, this is the time when the company should not receive a going concern audit. Yet the company continues to operate receiving going concern audits on its financial statements in 2002 though our measure has them not qualifying for a going concern status.

Further, we should notice that in the third quarter of 2002, the book value of Lucent's equity is negative that corresponds to our result as well. In 2003, although our model does not show that Lucent should be under default, the warning sign still points to a severe agency problem (the agency cost is $761.21 millions and the default probability ratio is 49.03%). Nevertheless, the severity of the agency problem of Lucent decreases thereafter. A possible explanation for the decreasing severity of the agency problem after 2002 is the effect of Lucent's business restructuring gamble between 2001 and 2002 came into Lucent's benefit. However, from an *ex-ante* point of view, Lucent's bondholders already severely suffered from the agency cost in 2003 and their subsidy to the equity holders.

7 Empirical Result on S&P 500 Firms

In this section, we quantify the magnitude of structural agency costs for the S&P 500 firms. Since our model claims that even under no information asymmetry the nontraditional agency costs still exist, we use S&P 500 companies as firms facing minimal asymmetric information. These firms are so closely followed by analysts and

the general public that they should have little or no asymmetric information making them an appropriate sample for our model.

We collect annual data for S&P 500 firms from 1996 to 2006 from COMPUSTAT and compute the agency cost for each observation as shown in Table 1 with the summary statistics. Although 5,500 year-firm observations are supposed to obtained during our sample period (500 firms × 11 years), eventually we only obtain 4,032 useable observations because financial institutions are excluded and the data of several companies are either incomplete or unavailable. For the risk free rate, CMT (Constant Maturity Treasury) 1-year rates are obtained from the Federal Reserve Bank of St. Louis web site. Monthly stock prices are collected from CRSP.

For the 4,032 observations, we compute the structural agency costs using our model and show the descriptive statistics of the total data in Part A of Table 1. We find that out of 4,032 total observations, 3,297 observations (82%) have trivial agency cost values that are insignificantly different from 0. In this paper we define that the agency costs to be trivially insignificant if the values are less than $0.01 million ($10,000). Take the extreme case of the minimal equivalent debt in Part A of Table 1 ($1.08 million) for example, it is reasonable to view the $0.01 million of nontraditional agency cost as zero because it is trivial, only about 1% of the minimal equivalent debt in our whole sample. However, 735 (18%) observations show the existence of significant agency costs confirming the existence of structural agency problem in the real market.

Next, we divide the whole sample period into 3 sub-periods: Period 1 (1996 - 1999), Period 2 (2000 - 2002), and Period 3 (2003 - 2006) showing the statistics of these three periods in parts B to D of Table 1 respectively. The data show that relatively more S&P 500 firm-year observations in Period 2 suffer from the structural agency problem (28%) than those in Period 1 and 3 (18% and 12% respectively). The finance stress caused by the burst of the dot com bubble around 2000 was detrimental to many firms as a good explanation for this phenomenon. Moreover, we can find the support for this explanation by checking the ratio of mean agency cost diving by mean equivalent debt in each sub-period. This ratio gives us a general idea how severe that debt holders suffer from loss of the structural agency problem in a certain period. In Period 2, the ratio of mean agency cost dividing by mean equivalent debt is around 0.46% if the observations

with zero agency costs are included and 1.04% if the observations with zero agency costs are excluded. The two ratios are higher than those in Period 1 (0.21% if the observations with zero agency costs are included and 0.58% if the observations with zero agency costs are excluded) and Period 3 (0.15% if the observations with zero agency costs are included and 0.83% if the observations with zero agency costs are excluded). In summary, the empirical results in Table 1 not only exhibits the existence of structural agency costs for the S&P 500 firms in the real market but also proves that the firms suffer from more severe structural agency problem when the financial stress problem deteriorates in a certain period.

8 Conclusion

In this paper, we derive a theory for measuring the economic cost of the current myopic going concern practice. The myopic going concern decision that is motivated by liquidity-driven default is not consistent with accounting's Conservatism Principle. This paper defines *economic default* via a structural agency problem that follows the compound option framework. We present an objective measure (Going Concern Index, or GCI) for those firms that we feel should **not** receive a clean audit per their going concern status. While they might have assets available to make currently due debt payments, there is almost no chance of them making all their future required payments. We study Lucent Technology's fall in value from $120 to $0.50 as an example of a firm that would have not received a going concern audit under our rule.

Given that our model can quantitatively measure the potential economic loss due to the structural agency problem, we, using the S&P 500 firms as an example, compute the potential economic cost. We find that near 18% of the S&P 500 firms have some degree of potential economic cost. For those that show such potential economic cost, the magnitude is $68 million on average per year per firm.

References

Altman, E. I. (1968), "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *The Journal of Finance* 23, 589-609.

Altman, E. I. And T. McGough (1974), "Evaluation of a Company as a Going Concern," *Journal of Accountancy* 138, 50-57.

Behn, B. K., S. E. Kaplan, and K. R. Krunwiede (2001), "Further Evidence on the Auditor's Going-Concern Report: The Influence of Management Plans," *Auditing* 20, 13-29.

Black, F. and M. Scholes (1973), "The Pricing of Options and Corporate Liabilities", *Journal of Political Economy* 81, 637-654.

Chen, K. and B. Church (1996), "Going Concern Opinions and the Market Reaction to Bankruptcy Filings," *The Accounting Review* 71, 117-128.

Crosbie, P. and J. Bohn, 2003, Modeling default risk, Moody's KMV Working Paper.

DeAngelo, H., L. DeAngelo, and K. Wruck (2002), "Asset Liquidity, Debt Covenants, and Managerial Discretion in Financial Distress: The Collapse of L.A. Gear," *Journal of Financial Economics* 64, 3-34.

Fama, E. and M. Miller (1972), *The Theory of Finance,* Holt, Rhinehart and Winston.

Fleck, S. and E. Wilson (1994), "The Incremental Information Content of the Going-Concern Opinion," *Journal of Accounting, Auditing, and Finance* 9, 149-166.

Geiger, M. A., K. Raghunandan, and D. V. Dasaratha (2005), "Recent Changes in the Association between Bankruptcy and Prior Audit Opinions," *Auditing* 24, 21-35.

Geiger, M. A., K. Raghunandan, D. V. Dasaratha (2006), "Audit Firm Size and Going-Concern Reporting Accuracy," *Accounting Horizons* 20, 1-17.

Geske, R. (1977), "The Valuation of Corporate Liabilities as Compound Options", *Journal of Financial and Quantitative Analysis* 12, 541-552.

Geske, R. (1979), "The Valuation of Compound Options", *Journal of Financial Economics* 7, 63-81.

Heaton, J., (2006), "Solvency Tests," Working Paper.

Ho, T. and R. Sanger (1982), "Bond Indenture Provisions and the Risk of Corporate Debt," *Journal of Financial Economics* 10, 375-406.

Hopwood, W., J. McKeown and J. Mutchler (1989), "A Test of the Incremental Explanatory Power of Opinions Qualified for Consistency and Uncertainty," *Accounting Review* 64, 28-48.

Hopwood, W., J. McKeown and J. Mutchler (1994), "A Reexamination of Auditor Versus Model Accuracy with the Context of the Going-Concern Opinion Decison," *Contemporary Accounting Research* 11, 409-431.

Jensen, M. C. and W. H. Meckling (1976), "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure", *Journal of Financial Economics* 3, 305-360.

Kennedy, D. and W. Shaw (1991), " Evaluating Financial Distress Resolution Using Prior Period Audit Opinions," *Contemporary Accounting Research* ??, 97-114.

Kim, E. H., J. J. McConnell and P. R. Greenwood (1977), "Capital Structure Rearrangements and Me-First Rules In Efficient Capital Markets," *Journal of Finance* 32, 789-810.

Louwers, T.J. (1998), "The Relationship between Going-Concern Opinions and the Auditor's Loss Function," *Journal of Accounting Research* 36, 143-156.

Malitz, I. (1989), "A Re-Examination of the Wealth Expropriation Hypothesis: The Case of Captive Finance Subsidiaries," *Journal of Finance* 44, 1039-1047.

McKeown, J., J. Mutchler, and W. Hopwood (1991), "Towards an Explanation of Auditor Failure to Modify the Audit Opinion of Bankrupt Companies," *Auditing: A Journal of Practice and Theory* (Supplement) 10, 1-13.

Merton, R.C. (1974), "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates", *Journal of Finance* 29, 449-470.

Modigliani, F. and M. Miller (1958), "The Cost of Capital, Corporation Finance, and the Theory of Investment", *American Economic Review* 48, 261-297.

Nogler, G. (1995), "The Resolution of Auditor Going Concern Opinions," *Auditing: A Journal of Practice and Theory* 14, 54-73.

Stiglitz, J. E. (1972), "Some Aspects of the Pure Theory of Corporate Finance: Bankrupties and Takeovers," *Bell Journal of Economics and Management Science* 3, 458-482.

Stiglitz, J. E. (1974), "On the Irrelevance of Corporate Financial Policy", *American Economic Review* 64, 784-793.

Appendix

This appendix explains how we calculate the agency cost. The agency cost of our model is defined as the difference of the two equity (option) measures. The first is the measure of equity value when the firm is allowed to sell assets to meet debt obligations of current period (E^*) and the second is the measure of equity value when the firm is prohibited from selling assets to meet debt obligations of current period (E). These option values are a function of the following six variables:

$$E^*(A_1, K_1, K_2, r, \sigma, h) - E(A_1, K_1, K_2, r, \sigma, h),$$

where A is the asset value of the firm, K_1 is the debt and expense payouts of current period, K_2 is the equivalent debt, r is the risk-free rate, σ is the volatility of asset value, and h is the measure time period.

The specific definitions of six variables are defined as the following. The debt and expense payouts of current period, K_1, is defined as K_1 = Interest Expenses at current period + Total Current Liabilities at last period. Here we assume that the firms will immediately face the interest payment at current period and total current liabilities due from last period at the beginning of this period. Data of interest expenses and total current liabilities are collected from the annual financial statements of Lucent Technologies Inc. in Mergent Online Database.

The measurement of equivalent debt K_2 is

$$K_2 = ED = SD + OD \times 0.75 + LD \times 0.5,$$

where ED is the equivalent debt, SD is short term debts, OD is other debts, and LD is long term debts. Total Current Liabilities, Other Liabilities, and Long Term Debt obtained from the annual balance sheet of Lucent Technologies Inc. in Mergent Online Database are used respectively for SD, OD, and LD in our computation of ED. The definition of equivalent debt in our paper is modified from the definition of equivalent debt in KMV formula, which ED is originally defined as $SD + LD \times 0.5$. Since the portion of OD among total liabilities of Lucent Technologies Inc. is surprisingly significant, we include OD in our definition of ED and give them an in between weight of 0.75 between 1 of SD and 0.5 of LD which are defined in the original KMV formula (see, Crosbie and Bohn, 2003).

The asset value A and asset volatility σ are estimated from Black-Scholes-Merton equation and Ito's lemma by using the market capital and equity volatility data. The market capital, market value of equity (ME), is defined as ME = Stock Price × Outstanding Shares. As for the computation of the equity standard deviation, we first collect weekly stock prices from Yahoo Finance website. Then, we calculate the stock

return standard deviation for the past 51 observations and annualize it. Using two equations (Black-Scholes-Merton equation and equity-asset relation equation from Ito's lemma), we are able to solve for two unknowns, asset value A and asset volatility σ. Stock prices are collected from Yahoo Finance website and outstanding shares are obtained from the annual balance sheet of Lucent Technologies Inc. in Mergent Online Database.

Finally, we use CMT (Constant Maturity Treasury) 1-year rates that are obtained from the Federal Reserve Bank of St. Louis web site for interest rate r, and the measure time period h is 1 year since the going concern decision is made every year.

Figure 1: Market Value of Debt vs. Market Value of Asset

Figure 1 shows the relationships between the market value of the due in two years at year 1 just prior the paying of the other debt due for increasing market values of equity. An equity value of $186 is the cut-off default value.

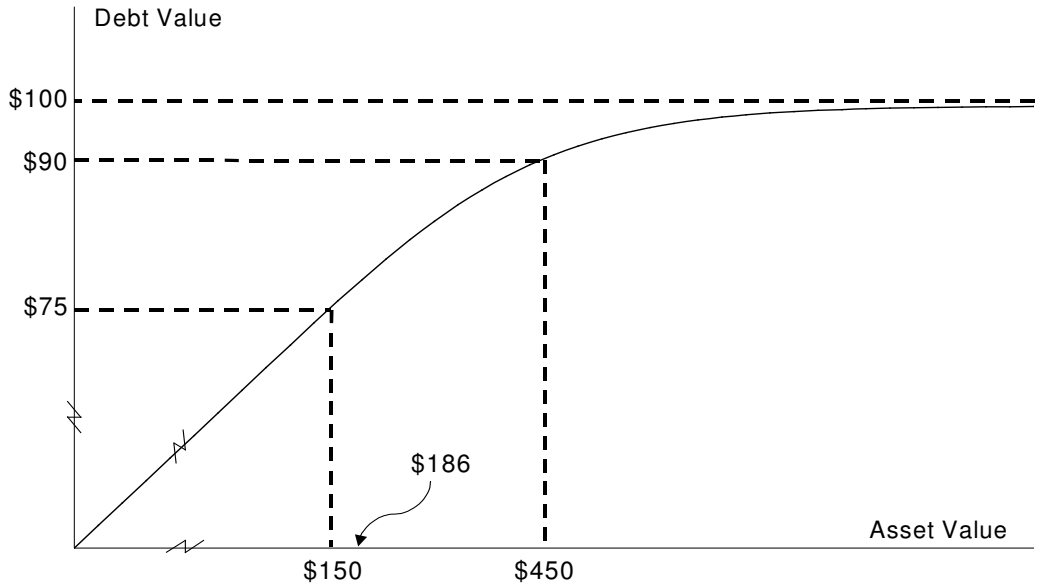


Figure 2: Equity Value vs. Asset Value in Geske Model (1977)

Figure 2 gives a plot of the equity value versus asset value for the example of a breakeven point at time 1 of $186 using the Geske Model (1977).

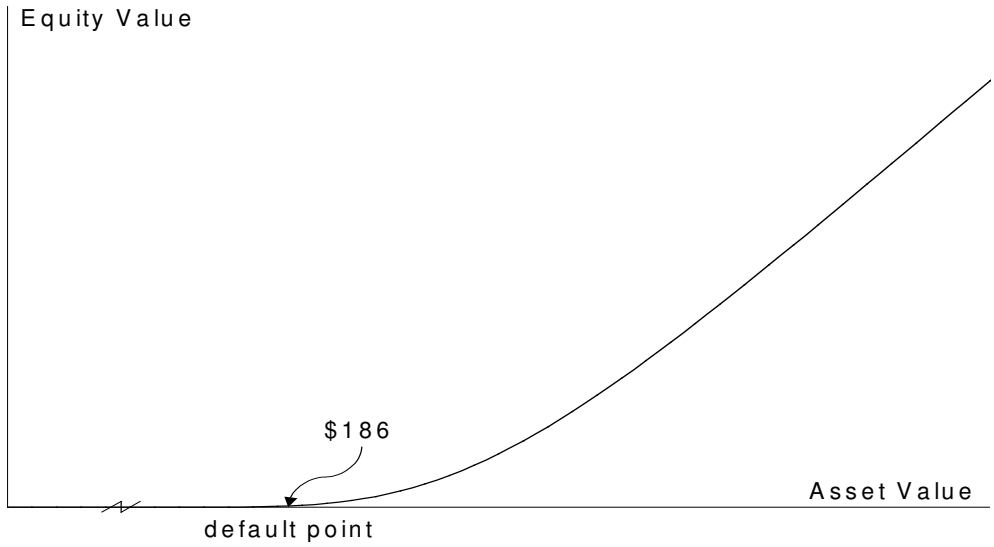


Figure 3: Default Difference and the Cause of Agency Problem

Figure 3 gives a plot of the equity value versus asset value for the example with a breakeven point at time 1 of $186 using the Geske Model (1977) that is expanded to show how the agency problem is caused. At extremely low values of value the firm cannot make payment due at time 1 and will default. At high levels of value, both survive, and it does not face a structural agency problem. In the intermediate range of values, the firm faces the agency problem having enough value to pay off the maturing debt, but value is less than the total amount owed.

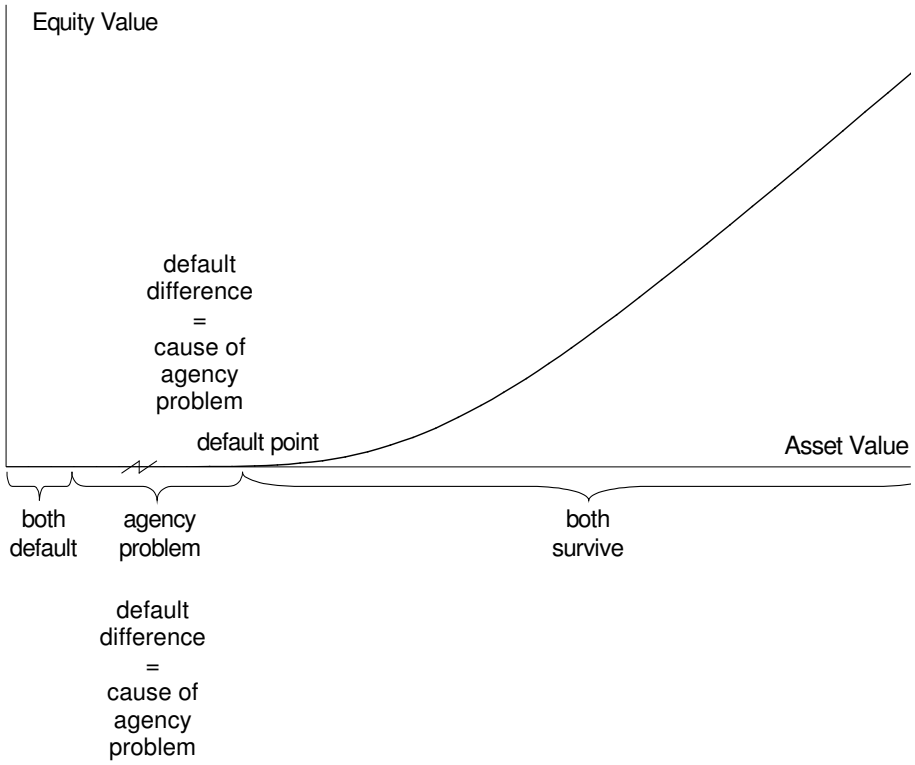


Figure 4: The Agency Cost under Credit Risk

Figure 4 plots the agency cost of our model. The agency cost (AC) in our model is measured as $AC = E_1^* - E_1$ which is defined in Equations (3) and (4) respectively.

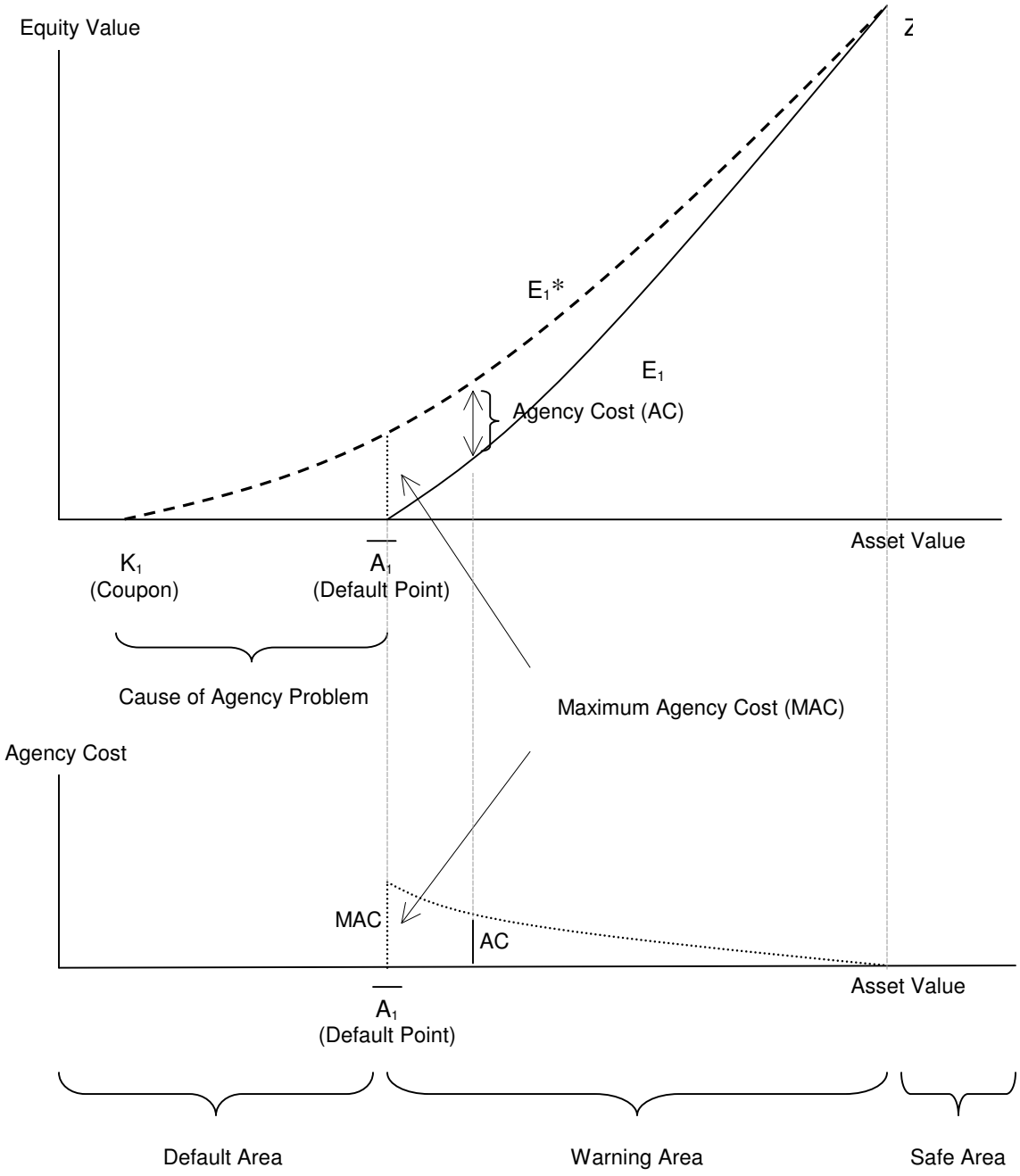


Figure 5: Lucent vs. Nasdaq

Figure 5 plots the historical Lucent stock prices and NASDAQ index series. The purpose of this graph is to separate Lucent from the market in general in order to see the agency problem caused by Lucent's management and board of directors.

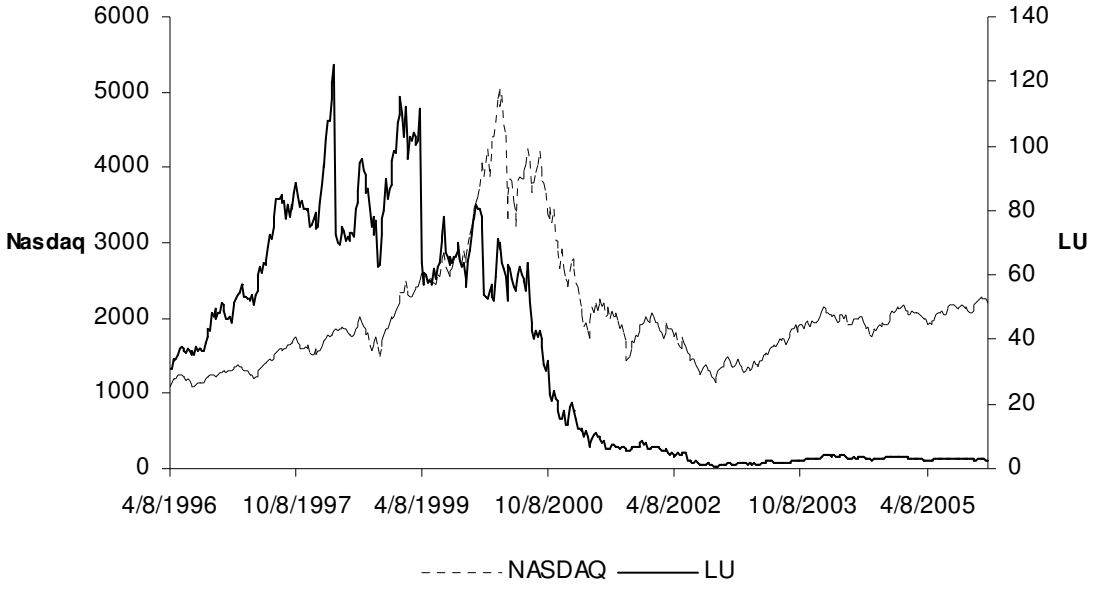


Figure 6: Lucent vs. S&P500

Figure 6 plots the historical Lucent stock prices and S&P 500 index series. The purpose of this graph is to separate Lucent from the market in general in order to see the agency problem caused by Lucent's management and board of directors.

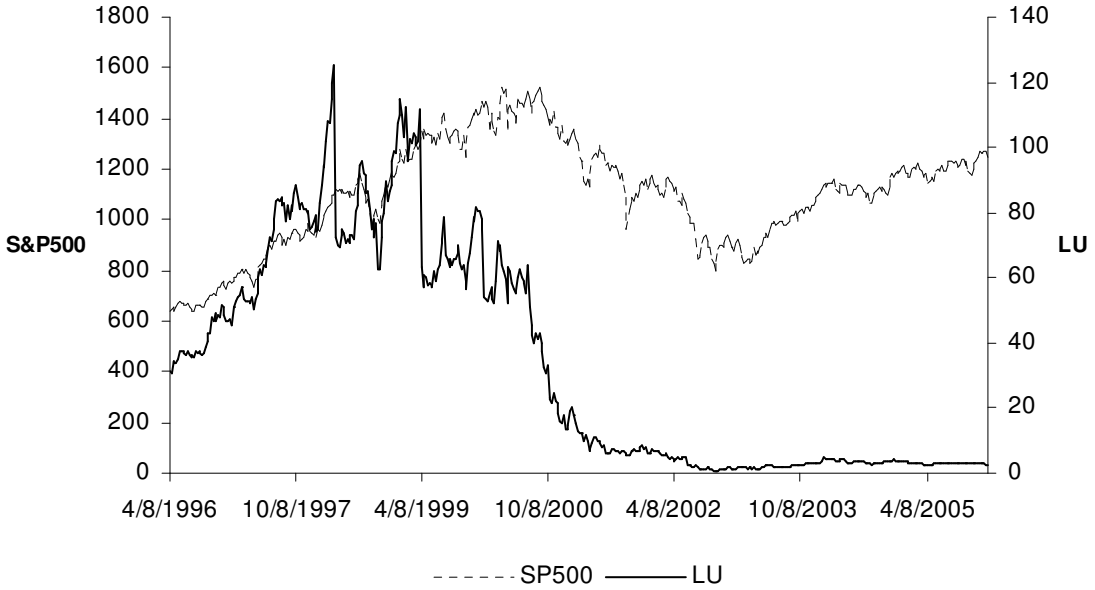


Figure 7: Changing of Capital Structure of Lucent Technologies Inc.

Figure 7 plots the Total Asset value, Total Liabilities value, and the Equity value of Lucent. As the figure shows, Lucent's book value equity became negative near the end of 2002.

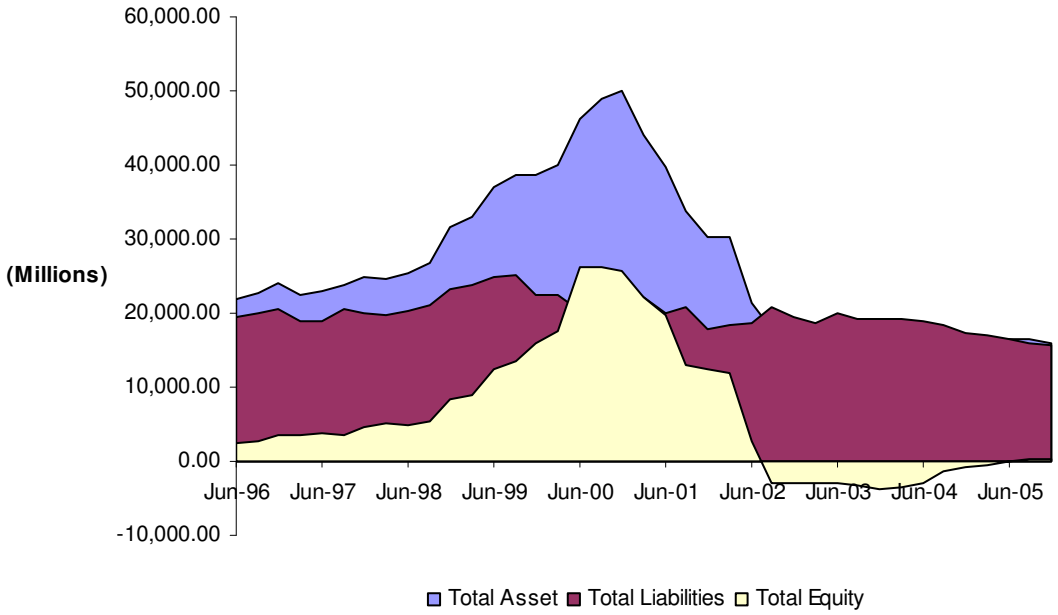


Figure 8: Price vs. Volatility – Lucent Technologies Inc.

Figure 8 plots the historical return volatilities of the Lucent stock and prices. It demonstrates that the structural agency problem of Lucent deteriorated as its equity became increasingly volatile as it tried to improve its position.

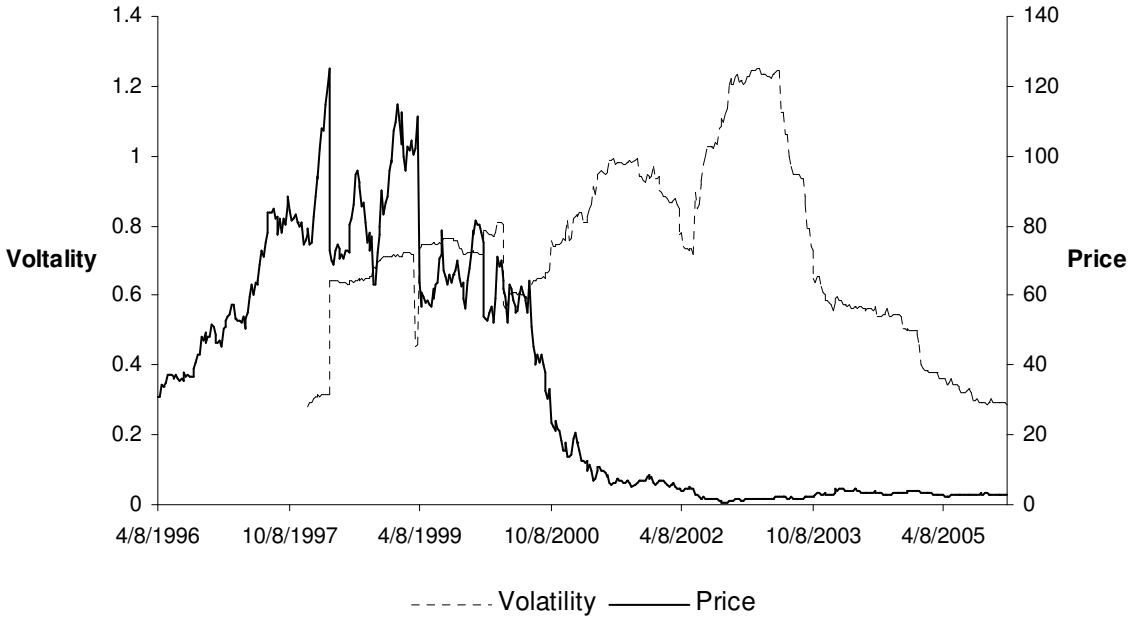


Figure 9: Agency Costs: Lucent Technologies Inc.

In Figures 9 the agency cost bars are illustrated, and in Figure 10 the corresponding default probability ratio bars are presented. For 2001 and 2002, these are illustrated as dash-line bars. In these two years the asset values are all below the implied default point $\overline{A}$ (defined in Equation (3)) making the equity measures E (defined in Equation (3)) all equal to 0. However, the other equity measures E^* (defined in Equation (4)) are still positive. According to the default rule in our model, this is the time when the company should be under default

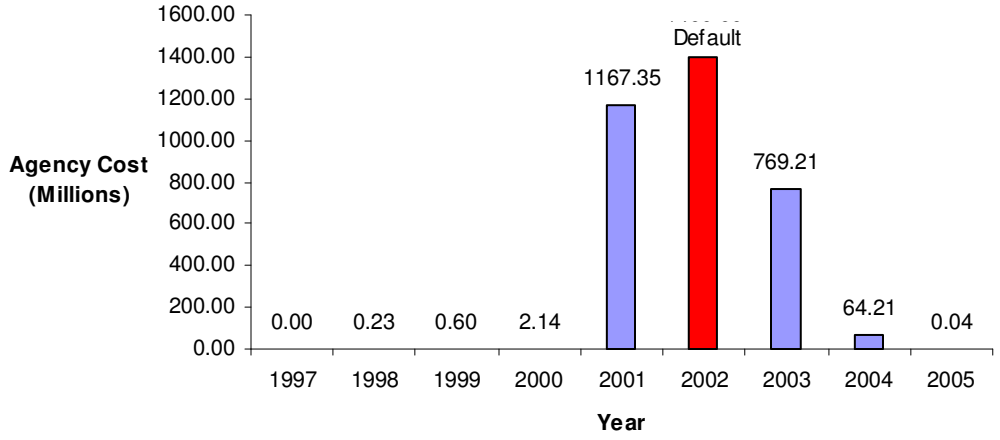


Figure 10: Going Concern Index (GCI): Lucent Technologies Inc.

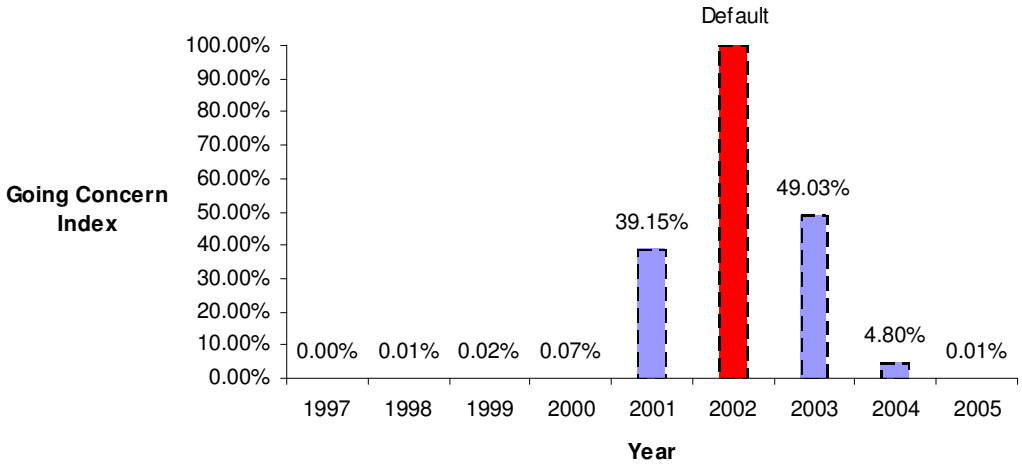


Table 1
Descriptive Statistics of the Data from S&P 500 Firms

Part A: Total Data (1996 - 2006)					
	Agency Cost	Market Capital	Equivalent Debt	Asset Value	Volatility
(Millions)	Data with Zero Agency Costs (4032 observations)				
Mean	15.59	19725.77	6434.38	25883.70	0.18
Median	0.00	7694.65	2534.58	10665.16	0.14
Std. Dev.	127.43	40743.58	12917.83	48678.48	0.13
Max	3750.48	508329.45	305965.50	626145.19	3.39
Min	0.00	115.36	1.08	121.46	0.02
	Data without Zero Agency Costs (735 observations)				
Mean	85.54	10691.77	10240.00	20351.71	0.25
Median	3.80	5206.12	5211.00	10334.65	0.21
Std. Dev.	288.42	21080.57	17909.05	35522.97	0.20
Max	3750.48	267593.70	262598.50	487962.53	3.39
Min	0.01	218.03	145.80	355.87	0.04
Part B: Period 1 (1996 - 1999)					
	Agency Cost	Market Capital	Equivalent Debt	Asset Value	Volatility
(Millions)	Data with Zero Agency Costs (1405 observations)				
Mean	9.86	15864.99	4794.02	20360.30	0.20
Median	0.00	5068.29	1687.78	7469.90	0.16
Std. Dev.	114.16	36086.00	14390.29	44463.44	0.13
Max	3750.48	508329.45	305965.50	626145.19	2.43
Min	0.00	115.36	1.08	121.46	0.04
	Data without Zero Agency Costs (247 observations)				
Mean	56.06	10832.82	9614.24	19661.48	0.27
Median	3.04	4078.13	3835.38	7912.95	0.22
Std. Dev.	267.91	24858.36	24532.93	45887.95	0.20
Max	3750.48	239539.44	262598.50	487962.53	2.43
Min	0.01	218.03	145.80	355.87	0.07
Part C: Period 2 (2000 - 2002)					
	Agency Cost	Market Capital	Equivalent Debt	Asset Value	Volatility
(Millions)	Data with Zero Agency Costs (1095 observations)				
Mean	28.28	20615.60	6212.43	26595.81	0.22
Median	0.00	7183.20	2455.50	10295.69	0.18
Std. Dev.	160.60	45889.85	10707.57	51846.64	0.16
Max	2500.61	476115.54	100053.25	509165.48	3.39
Min	0.00	502.35	33.94	710.73	0.04
	Data without Zero Agency Costs (309 observations)				
Mean	100.20	10552.37	9597.69	19661.02	0.27
Median	4.65	5028.85	4883.03	10087.38	0.22
Std. Dev.	290.48	21633.73	13600.66	32129.55	0.23
Max	2500.61	267593.70	95503.25	326581.21	3.39
Min	0.01	502.35	314.29	1313.11	0.08

Part D: Period 3 (2003 - 2006)					
	Agency Cost	Market Capital	Equivalent Debt	Asset Value	Volatility
(Millions)	Data with Zero Agency Costs (1532 observations)				
Mean	11.79	22630.49	8097.40	30440.23	0.12
Median	0.00	10406.30	3498.09	15005.57	0.10
Std. Dev.	110.52	40609.03	12737.95	49558.16	0.09
Max	3200.77	439013.27	125509.50	530071.65	1.02
Min	0.00	1066.26	60.80	1673.44	0.02
	Data without Zero Agency Costs (179 observations)				
Mean	100.89	10737.77	12212.29	22496.47	0.20
Median	4.53	7459.83	7696.08	15808.78	0.16
Std. Dev.	309.86	12984.16	12866.29	22383.04	0.15
Max	3200.77	110644.87	72636.75	151316.61	1.02
Min	0.01	1066.26	579.73	2064.19	0.04