The Audit Integrity Multi-Factor Restatement Model:

A Leading Indicator of Financial Restatement

Audit Integrity measures the trustworthiness of financial reporting and corporate governance. This key risk measure, encapsulated in the Audit Integrity Accounting & Governance Risk (AGR®) rating, is used by investors, auditors, insurance firms and others as a valuable risk management tool to identify the risk in corporate behavior – can you trust the numbers?

The Audit Integrity AGR® rating (and related AGR® score) goes well beyond earnings quality models that have become increasingly common in measuring financial reporting risk. Aggressive, misleading or fraudulent behavior takes many forms. The AGR® rating encompasses a comprehensive set of accounting and governance metrics to provide a unique indicator of risk.

Audit Integrity produces objective ratings and reports on 9,000 publicly traded corporations. The AGR® score is determined through the analysis of an extensive set of accounting and governance metrics, which identifies the metrics most highly associated with fraud. The AGR® was developed to predict potential fraud, and has proven to be a significant indicator of negative events such as securities-related litigation and financial restatements.

This white paper summarizes the Audit Integrity Restatement Model, which utilizes AGR® scores and other factors to identify firms at high risk of material financial restatements. AGR® scores were found to be highly effective at identifying high risk companies during the study period (1996-2004). The predictiveness of this model is considerably higher and far more consistent than a well-known but less comprehensive alternative based on operating accruals alone. The worst scoring 10% of companies from the model have ***eighteen times*** the restatement incidence as the highest scoring 10%.

Audit Integrity publishes restatement probabilities based on the Restatement Model through a subscription web service and via data feeds.

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Los Angeles
11111 Santa Monica Blvd, Suite 350
Los Angeles, CA 90025
(310) 444-8820

New York
350 Fifth Ave, 59th Floor
New York, NY 10118
(212) 601-263

Overview

Corporate stakeholders have been increasingly focusing on the integrity of management and in turn on the transparency and reliability of financial statements. Recent corporate fraud and malfeasance has taken a severe toll on all types of stakeholders – from investors to insurers, from banks to auditing firms. Look no further than the daily business headlines to find the latest Enron, WorldCom, Tyco, etc. roiling the markets. The impact is swift and severe, with corporate stakeholders paying the price.

Nor is the risk from a lack of corporate integrity a recent or short-term phenomenon. Regulators have attempted to address accounting fraud and the resulting scandals for decades – from the 1930's formation of the SEC through the recent Sarbanes-Oxley legislation. In the real world, however, the incidence of fraud and financial misrepresentation continues unabated by any measure – SEC enforcement actions, class-action litigation, financial restatements and, more prominently lately, criminal prosecution.

Regulatory reforms have not and can not address the complexity and variety of accounting practices. Within fairly broad limitations, public companies can legally manipulate financial statements. GAAP accounting is based on literally thousands of standards, or "pronouncements," providing a confusing set of guidance for corporations to follow. Combined with the ever-greater rewards for short-term gains, and the ever-shrinking tenure of CEOs, the opportunity and means for financial manipulation remains high. Corporate stakeholders must continue to be vigilant about the risks from the lack of corporate integrity.

Various tools and statistical models exist to measure the quality of earnings – the sustainability and predictability of future earnings – and fundamental analysis continues to interrogate the financial statements for signs of corporate strengths and weaknesses. When identifying potential fraud and attempting to avoid the severe ramifications of misreported financials, however, these methods fall short for one simple reason – an assumption that the reported financials are accurate and reliable; in short, that the numbers can be trusted.

About Audit Integrity

Audit Integrity is a leading provider of accounting and governance research on public corporations, with ratings and reports on over 9,000 companies. Audit Integrity's analysis is based on forensic accounting and corporate governance tests designed to identify fraudulent patterns of behavior. While behavior that matches past patterns of fraud is not a guarantee of current fraudulent or misleading behavior, the Audit Integrity ratings and risk scores have proven to be a strong predictor of fraud and related negative events.

The proprietary **Accounting and Governance Risk (AGR®) rating** is an assessment of financial statement risk – the risk that financial statements do not accurately reflect a company's true financial condition due to fraud or misrepresentation. The AGR® was developed to predict potential fraud, and has proven to be a significant indicator of negative events such as securities-related litigation and financial restatements. Recent studies have shown that the AGR® is a highly effective and independent variable in determining investment returns and stock price volatility.

The risks identified by Audit Integrity's AGR® analysis are classified under a proprietary organization, or taxonomy. This taxonomy provides transparency in understanding the risks driving the AGR® and is summarized by the following five categories.

- **Revenue Recognition** – accelerating top-line growth through premature, non-recurring or fictitious revenue activity
- **Expense Recognition** – deferring/delaying expenses to improve margins by capitalizing or amortizing expenses
- **Asset-Liability Valuation** – over-valuing assets (receivables), under-stating liabilities (payables), manipulating reserves (pensions)
- **High-risk Events** – M&A, divestitures, restructurings, share repurchases, equity financing and other events associated with fraud
- **Corporate Governance** – management changes, compensation, financial reporting, insider trading and other governance issues are key fraud indicators

The AGR® ratings are based on a comprehensive review of all types of accounting and governance risk. Measures of earnings quality intended to identify financial reporting risk focus primarily on accruals – effectively comparing cash flows to net income. The AGR® methodology encompasses accruals, and also recognizes that financial manipulation can take many other forms. Beyond accounting-related risk, Audit Integrity has identified corporate governance practices that are also predictive of fraud. It is the depth of the metrics which comprise the AGR® model that create a differentiated measure of risk – the risk that the reported numbers cannot be relied upon.

The table on the following page illustrates the approach the AGR® methodology takes to identify fraud or misrepresentation in all forms – using measures of earnings quality (accruals), forensic accounting and corporate governance to determine the best measure of risk.

Table 1: Earnings Quality, Forensic Accounting and Corporate Governance measures of risk as compared to AGR® methodology

Metric	Earnings Quality	Forensic Accounting	Corporate Governance	AGR
Receivables	x	x		x
Inventory	x	x		x
Deferred Charges	x	x		x
Deferred Taxes	x	x		x
Depreciation	x	x		x
Amortization	x	x		x
Plant, Property & Equipment	x	x		x
Accrued Expenses	x	x		x
Payables	x	x		x
Prepaid Expenses	x	x		x
Reserves	x	x		x
Operating Revenue (Operating Margin)		x		x
Cost of Goods Sold (Gross Margin)		x		x
Sales, General & Administrative		x		x
Research & Development		x		x
In-Process R&D		x		x
Goodwill		x		x
Intangibles		x		x
Asset Gains/Losses		x		x
Operating Leases		x		x
Pension Plan Accounting		x		x
Unusually Classified Assets		x		x
Unusually Classified Liabilities		x		x
Extraordinary Expenses		x		x
Non-Salary Compensation		x	x	x
Short-Term Compensation		x	x	x
Option Exercise		x	x	x
Equity Financing		x	x	x[1]
Debt Financing		x	x	x[1]
Share Repurchases		x	x	x[1]
Audit Fees			x	
Auditor Change			x	x[1]
Auditor Opinion			x	x[1]
Amended Filings			x	x
Late Filings			x	x
Material Restatements			x	x
Board Composition			x	x[1]
Board Performance			x	
Related Party Transactions			x	
Chairman/CEO Separation			x	x[1]
Officer Turnover			x	x
Insider Trading			x	x
Stock Ownership			x	
Merger & Acquisition Activity			x	x
Divestitures/Spin-offs			x	x
Restructurings			x	x
Discontinued Operations			x	x

[1] Metrics in these areas were tested in AGR and were *not* found to be predictive of fraud

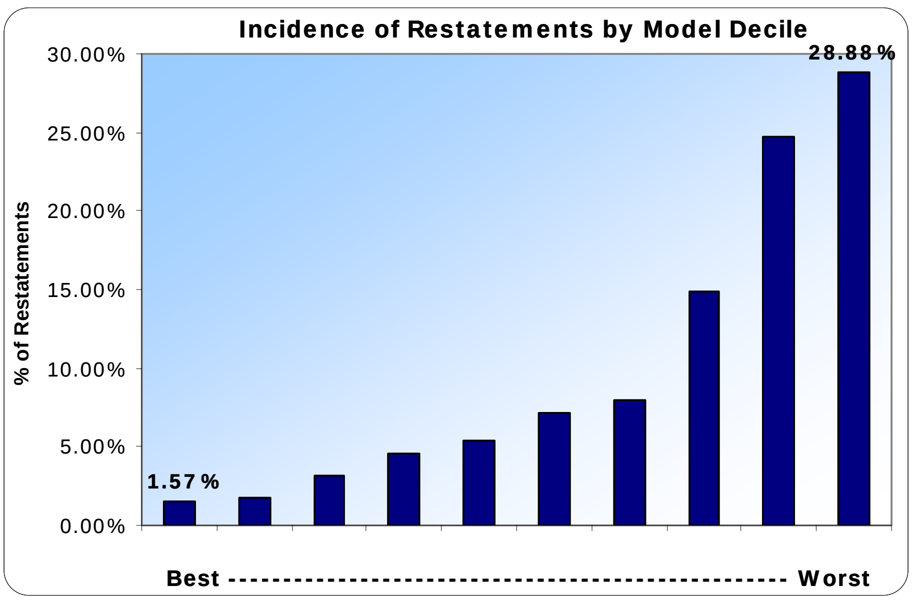
Overview of the Model

Audit Integrity studied restatement predictors along with a sample set of material restatements. For the years 1997 – 2002 the restatements were provided by the Government Accountability Office (GAO). For the years 1996, 2003 and 2004, Audit Integrity used the same methodology that was used by the GAO to collect additional data on restatements associated with accounting irregularities. The restatements included one or more fiscal periods of alleged violations. Combining AGR® Scores and other restatement predictors evaluated in the study, we split the quarterly observations into 10 equal sized groups (deciles) in which the 1st decile had the 10% of companies with the highest risk and the 10th decile had the 10% of companies with the lowest risk.

AGR® and Restatements

Graph 1 shows a strong relationship between the AGR® based restatement model and restatement probability. This chart illustrates the probability of a restatement occurring in the future based on current-period activities – segmented by decile of model predictions, from best to worst. Here the worst decile had *18 times the incidence of restatements* as the best decile of scores. Additionally, the incidence of restatements decreased as the AGR® Score increased, creating a consistent pattern over the range.[2]

Graph 1: Strong Relationship Between AGR® Restatement Model and Financial Restatement



The 'best decile' (the 10% of companies with lowest risk as predicted by the model) accounted for only 1.57% of restatements over the study period, while the 'worst decile' (the 10% of companies with the highest risk as predicted by the model) accounted for almost 29.0% of the restatements in the same time period.

Factors that Drive the Restatement Model

Variables based on AGR® Scores and market capitalization are the dominant factors in the Restatement Model. These include the 2-Year Mean AGR® and four market capitalization groups. The model also includes industry.

- **2-Year Mean AGR® Score**: This variable represents the level of aggressiveness in the company's accounting and governance practices over the last eight reporting periods. As expected, the lower the 2-Year Mean AGR® Score, the higher the probability of financial restatement.

- **Market Capitalization Indicator**: The Restatement Model divided companies into five market capitalization groups. More specifically, larger cap companies are more likely to face restatements than smaller cap companies. The five indicators are as follows:

    - Mid Cap (Market cap between $1 billion and $4.99 billion): We designated mid cap companies as the default value of the Market Capitalization Variable. This particular default value has no effect on the outputs of the AGR® Restatement Model. Since this variable is centered on mid cap stocks, the mid cap indicator has a model coefficient of 0.

    - Large Cap (Market cap of $5 billion and greater): Large cap companies had significantly higher restatement probabilities compared to mid cap companies; the coefficient was positive in sign.

    - Small Cap (Market cap between $250 million and $999 million): The restatement probability of small cap companies was not statistically different than that of the mid caps. The coefficient for this predictor is therefore zero.

    - Micro Cap (Market cap between $50 million and $249 million): Micro cap companies had lower restatement rates than mid cap companies; the coefficient was negative in sign.

    - Nano Cap (Market cap less than $50 million): Nano cap companies had strikingly lower restatement rates than mid cap companies; the coefficient was negative in sign.

- **Industry Indicator**: This variable segments the sample set of over 10,000 companies (including defunct companies) into 12 industries (according to the 4-Digit Reuters Industrial Classification System). It represents the premise that accounting and governance aggressiveness varies by industry. The more aggressive industries included Technology, Utilities, Conglomerates, Consumer Non-Cyclical, Healthcare and Services. The Energy industry proved to be lower risk. Of these twelve industries, only the six aggressive industries and one lower risk industry had a statistically significant impact on the probability of restatement:

    - Technology: The technology indicator had the single greatest impact on restatement risk of all the industry variables. Because this industry is higher risk, the coefficient is positive.

    - Conglomerates: The conglomerates indicator had the second greatest impact on restatement risk of all the industry variables.

    - Services: The services indicator was very close to the conglomerates indicator in size – the coefficient was positive, but smaller than the prior two heightened risk industries.

- Consumer Non-Cyclical: The consumer non-cyclical indicator had the fourth greatest impact of all the industries.

- Healthcare: The healthcare indicator was the fifth riskiest industry.

- Utilities: The utilities indicator was found to be the last industry which showed heightened restatement risk.

- Energy: The energy indicator was found to be an indicator of lessened restatement risk. In this case, the coefficient was negative.

- Other: The remaining five industries, Basic Materials, Capital Goods, Consumer Cyclical, Financial and Transportation make up the final industry grouping and have a coefficient of zero. The companies within these industries, after accounting for the other factors – 2-Year Mean AGR® and market cap - do not have statistically different restatement rates based on industry.

Significant Variable Effects

Each variable contributed to the Restatement Model's predictiveness. We compared each variable's predictiveness by using a standard unit of measure called 'odds ratio.' The odds ratio reflects the difference in restatement rates between the best and the worst values of each variable. More specifically, odds ratio is equal to the restatement probability of the worst decile of variable values over the probability of the best decile. For example, for a variable showing a 10% restatement probability for the worst decile firms and a 1% probability for the best decile firms, the odds ratio would be 10 (10% / 1%)[3]. The odds ratio is one of the generally accepted measures for evaluating predictive models such as this.

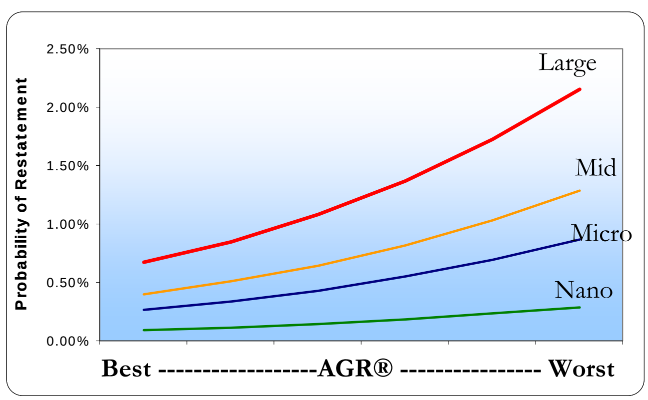
The Impact of AGR®

The Current Quarter AGR® Score had a statistically significant impact on restatement probability – namely, the better the AGR® score, the less the risk of restatement. See the bottom row in **Table 1** labeled 'AGR® Odds Ratio.' This row shows the odds ratios (restatement probability of worst to best AGR® decile) for various sized firms. Notice the odds ratio is not only large but highly consistent across market cap categories (AGR® odds ratio varies only from 3.24 to 3.20). Also notice that for any given AGR® score decile, restatement probabilities increase as market cap increases.

Table 1: Strong Relationship Between AGR® Score, Market Cap and Restatement Risk

AGR®	Nano	Micro	Mid	Large	Market Cap Odds Ratio
1	0.29%	0.87%	1.28%	2.15%	7.45
20	0.23%	0.69%	1.03%	1.72%	7.47
40	0.18%	0.55%	0.81%	1.36%	7.50
60	0.14%	0.43%	0.64%	1.08%	7.52
80	0.11%	0.34%	0.51%	0.85%	7.53
100	0.09%	0.27%	0.40%	0.67%	7.54
AGR® Odds Ratio	3.24	3.23	3.22	3.20	

Figure 1: Graphical View of Table; The Effect of AGR® and Market Cap on Restatement Risk



The Impact of Market Cap

The Market Cap Indicator Variable is also highly predictive in our Restatement Model. This makes sense since, as described previously, restatement rates rise with company size. See the right-hand column labeled 'Market Cap Odds ratio' in **Table 1**. The odds ratios for this variable are also large and consistent. Note that the restatement probabilities for any market cap indicator (e.g., 'Large') increase for lower (worse) AGR® Score deciles.

See **Figure 1** for a graphical depiction of the relationships between 2-Year Mean AGR® Score and Market Cap Indicator versus restatement probabilities.

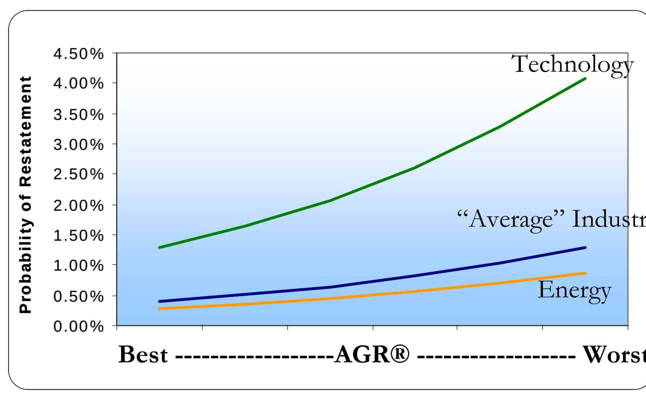
The Impact of Industry

The Industry Indicator variable showed predictive power for selected industries. In particular, the variable was predictive for the Technology, Utilities, Conglomerates, Consumer Non-Cyclical, Healthcare, Services and Energy industries. All other industries have neither a positive nor negative effect on the risk of material restatement. **Table 2** shows the effect of the riskiest industry (technology), lowest risk industry (energy) and the five unaffected industries. In order to draw a less cluttered chart, only the technology industry (highest risk), the energy industry (low risk) and the five other "average risk" industries are included[3].

Table 2: Restatement Probabilities by Selected Industries

AGR®	Technology	"Average" Industry	Energy	Industry Odds Ratio
1	4.07%	1.28%	0.88%	4.63
20	3.27%	1.03%	0.70%	4.66
40	2.60%	0.81%	0.55%	4.69
60	2.06%	0.64%	0.44%	4.71
80	1.63%	0.51%	0.35%	4.72
100	1.29%	0.40%	0.27%	4.74

Figure 2: Graphical View of Table; The Effect of Industry on Restatement Risk



Delivery of Model Results

Audit Integrity has begun publishing the quarter-by-quarter restatement probabilities on each firm in our database of public corporations. We cover approximately 9,000 currently active public companies (and approximately 12,000 defunct companies). Since the Restatement Model includes variables for both market cap and industry, each company's restatement probabilities can be displayed relative to both market cap and industry peers. See **Table 3** for an example of such a probability matrix.

Table 3: Example of a Hypothetical Company's Restatement Probability Matrix

ABC, Inc.	Future
Probability of Restatement	4.68%
Overall Percentile for US Companies	Higher than 88%
Industry Comparison Percentile	Higher than 78%
Market Cap Comparison Percentile	Higher than 92%

Statistical Reliability and Validation of the Model

Validating the statistical model was accomplished using five separate common measures.

- Independence of Data Sample
- Separation
- Overall Accuracy and Error Rates
- Magnitude
- Comparison to Existing Models

Validation Test #1: Independence of Data Sample

The Restatement Model is robust; it was constructed using a large data set of more than 250,000 financial statement quarters. Moreover, each factor used in the model passed the chi-squared goodness-of-fit test to the 5% level as did the overall model goodness of fit.

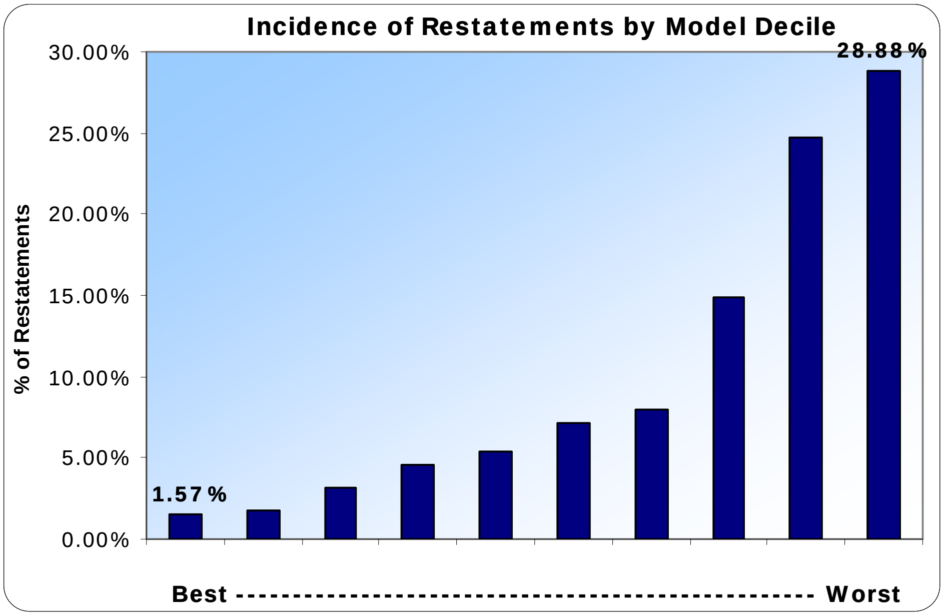
In order to avoid data dependency and over-fitting, the dataset of restatements was randomly divided into two equal buckets (each containing half of the restatements covering about half of the restatement quarters). The data from bucket 1 was tested and from it the predictive variables and their coefficients were determined.

The model calibrated on the first subset of data was then applied to the remaining data set and was predictive of restatement cases in the out-of-sample data over all time horizons with a very high degree of accuracy. In fact, the charts in the second and fourth validation tests below (separation and magnitude respectively), which show the *actual* incidence of restatement against the predicted incidence, use out-of-sample restatement cases as the *actual* incidence. In other words, the model which was built on one half of the restatement cases, predicts with a very high degree of accuracy, the other half of the restatements through time.

Validation Test #2: The Model's Predictive Power Creates Separation

The measure of separation is the ability of the Restatement Model to distinguish firms at low risk of restatement versus firms at high risk. Separation is validated by ordering all companies from best to worst - grouping them into deciles – and charting the actual incidence of restatement. A robust model will show steadily increasing restatement rates as risk deciles defined by the model worsen. **Figure 3** below demonstrates the separation created across deciles for the Audit Integrity Restatement Model using out of sample results.

Figure 3: The Model Creates Separation



Actual restatement occurrence increased consistently as the model's risk measure increased.

The model demonstrates strong separation between the lowest risk and highest risk companies – specifically, high risk companies are ***18 times*** as likely to make a material restatement than low risk companies.

Validation Test #3: Overall Accuracy and Error Rates

Another measure of a model's ability to distinguish between high and low risk companies can be illustrated by way of a Cumulative Accuracy Profile (CAP), which provides a view of a model's performance along the entire range of risk. Accuracy can be defined along the four possible outcomes:

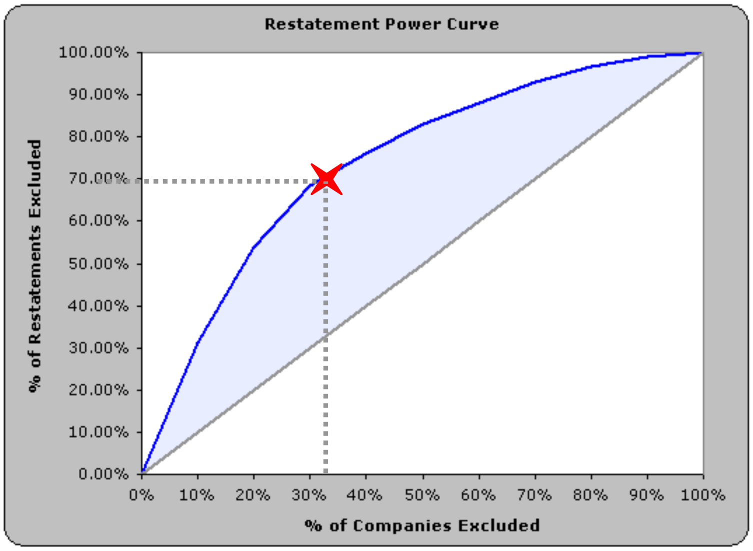
- **True Positive**: A company is identified as high risk by the model, and in fact does restate.
- **True Negative**: A company is identified as low risk, and in fact does not restate.
- **Type I Error**: The statistical model predicts a *low* risk of restatement but the company does restate (also called false negative).
- **Type II Error**: The statistical model predicts a *high* risk of restatement but the company does not restate (also called false positive).

		Actual	
		Sued	Not
Model	High Risk	True Positive	Type
	Low Risk	Type I Error	True

Because the boundary between "low risk" and "high risk" is somewhat arbitrary and subjective, it is best to observe a model's performance along the entire range of risk through a CAP. The y-axis (vertical axis) charts the percent of restated companies identified by the model (true positives; the companies the model got "right"), while the x-axis (horizontal axis) of the curve charts the percent of the population of all companies ordered by AGR® score from worst to best. The straight diagonal line represents the random model with no predictive power. The steeper the power curve, the more predictive the model.

Figure 4 below illustrates the CAP curve for the AGR®-based multi-factor restatement model. Also included in the chart is the diagonal line representing a model with zero predictive power. On the blue curve, the 33% point on the x-axis corresponds to the 70% point on the y-axis (see the red star). Using this model, a stakeholder could have avoided 70% of the material restatements by avoiding just the 33% riskiest companies.

Figure 4: Restatement Model CAP Curve



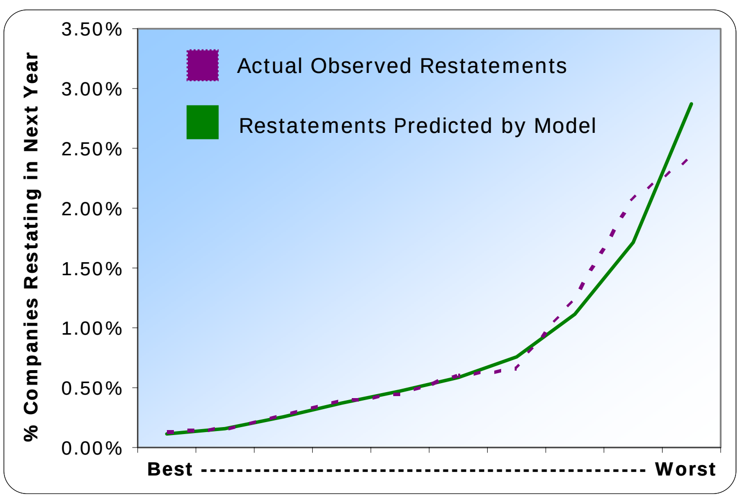
The space above the black line and underneath the blue curve represents the added predictability of the Restatement Model over a random model.

Using this model, a stakeholder could have avoided 70% of the material restatements by avoiding just the 33% riskiest companies.

Validation Test #4: Magnitude

A model's magnitude measures how well the model predicts accurate relative risk. In particular, it is important that the model not over or under-state the level of risk associated with a company or set of companies. In order to validate the magnitude, one must examine the incidence of restatement predicted by the model (predicted restatement) versus the *actual* incidence of restatement (actual restatement). **Figure 5** below illustrates this test.

Figure 5: Out of Sample Validation for Model



The dotted line charts the *actual* incidence of restatements (restatements that actually occurred – out of sample). The solid line charts the Restatement Model's prediction (what the model predicted would happen).

The figure indicates that the model is accurate - the solid line lies on top of the dotted line. Not only are the high risk companies substantially more likely to face a restatement than the low risk firms, but the estimated probabilities neither understate nor overstate the actual likelihood of the restatement.

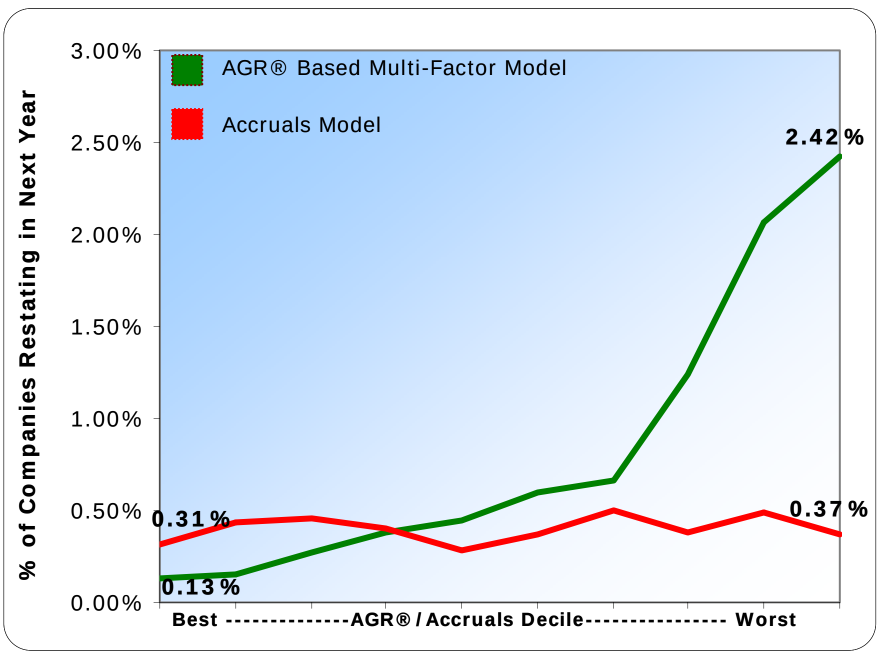
Validation Test #5: The Model's Predictive Power Far Exceeds that of Accruals
Another well known restatement model is a single factor model using the level of operating accounting accruals as the predictor.

Figure 6 charts the AGR®-based Restatement Model on the same graph as the Accruals based model. The chart illustrates a marked out-performance of the Restatement Model when compared to accruals.

The Restatement Model outperforms accruals by incorporating basic financial market truisms: (1) many accounts, including accruals and beyond, signal valuable information (like operating revenues), (2) broad based accounting and governance risk can only be captured by analyzing information beyond the financial statements, including MD&A and footnotes and (3) certain industries are inherently more risky with respect to restatements than others.

For the AGR®-based Restatement Model, the likelihood of restatement is more than 18 times higher for the highest risk companies when compared to the lowest. Additionally, as AGR® worsens the probability of restatement increases for every decile. In contrast, the likelihood of restatement is only 1.2 times higher for the worst accruals when compared to the best. Further, the accruals model has no predictive power for the first eight deciles – demonstrating initially *declining probability as accruals worsen*, before finally demonstrating some limited predictive power through the final two deciles.

Figure 6: AGR®-based Multi Factor Model vs. Accruals Single Factor Model



What is referred to as the 'dish-shaped' quality of the Operating Accruals model shown in this graph (in red) is characteristic of all accruals models. This reflects the companies that are substantially <u>under</u>-accruing in comparison to theirs peers as well as those <u>over</u>-accruing are subject to high rates of financial restatements (and other oversight actions). The models do not produce consistent results.

Conclusion

Material financial restatements can have a tremendously negative impact on a corporation and its stakeholders. Beyond the financial impact, the toll can also be high on the company's reputation and even threaten its survival. Understanding the potential for financial restatement is a critical component of managing risk for all stakeholders. Various approaches are being developed to measure the probability and impact of restatement, and are being put to use by auditors, insurers, investors and others to identify high-risk companies.

This paper has reviewed the methodology and validation of the Audit Integrity Financial Restatement Model. Key findings from this paper:

- ***Misreported or fraudulent financial reporting is a leading cause of financial restatement.*** Accounting abuse can occur in many ways, and a comprehensive approach is needed to determine the risk that financial statements cannot be trusted. Audit Integrity uses such an approach, encapsulated in the Accounting & Governance Risk (AGR®) rating.
- ***A multi-factor model is needed to best predict financial restatements.*** An accurate predictor of material financial restatement must include multiple factors in order to consistently detect the range of financial irregularities in the restatements. The Audit Integrity AGR®-based model incorporates:
  - 2-Year Mean AGR® (the AGR® itself is a multi-factor model)
  - Market capitalization
  - Industry classification

- ***The Audit Integrity Restatement Model has superior predictive power.*** The worst scoring 10% of companies had more than ***eighteen times*** the restatement incidence as the highest scoring 10%. Compared to an alternative approach – operating accruals – the Audit Integrity Restatement Model shows vastly better predictive power.
- ***The Model was validated through five distinct, relevant tests*** – Independence of Data Sample, Separation, Overall Accuracy and Error Rates, Magnitude and Comparison to Existing Models.

There is no sure-fire way to predict fraud or financial restatement. A comprehensive approach is needed to identify the potential for risk and the probability of restatement. The Audit Integrity Restatement Model has proven to be an effective approach to more proactively managing restatement risk.

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[1] *Audit Integrity is the leading provider of Accounting & Governance Risk (AGR®) ratings of public companies. Leading financial institutions, government agencies and oversight bodies, public corporations, and media organizations use our ratings and detailed diagnostics on over 9,000 public companies. Audit Integrity is a regular provider for Forbes Magazine, publishes ratings on the Institutional Investor Web site, and has been highlighted in many other leading publications.*

[2] *Restatement incidence is calculated as a percentage: number of quarterly observations with restatements divided by total number of observations.*

[3] *Note that In order to best illustrate the effect of each variable on the model, we vary below each variable's values while holding all other variables constant. For these purposes, we set the Industrial Sector variables to zero and the market cap indicator to mid cap.*