A Study on Use of Algorithmic Audit Sampling in Big 4 Companies

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Abstract
Test checking is an accepted audit technique that involves testing less than 100 % of the transaction by selecting sample transactions and using analytical procedures on them with an objective to give an opinion whether the financial statements show a true and fair view. It is effective in nature that most times it is possible to give an appropriate opinion on the whole population by studying a well-selected sample representative of the population. This increases the cost benefit of the process making it financially optimized, efficient and reducing the work involved without compromising on the quality of the opinion. Test checking is adopted also since it is practically not possible to check all transactions like in the case of big, listed companies whose number of transactions run in millions. But test checking can only reduce the workload of an auditor, not his liability. Auditor cannot claim that he couldn't trace frauds since the misleading transactions were not a part of the selected sample. So, the success of the process is highly dependent on proper audit sampling. All the big four companies prominently conducting statutory audit of listed companies do sample selection incorporating variety of sampling techniques coded in an algorithm created inhouse using variety of conditions. This paper studies the Impact of algorithms used in audit sampling by big 4 companies namely PWC, Deloitte, EY, KPMG while conducting statutory audits of listed companies.
Keywords: Audit Sampling. Algorithm, Listed Company, Statutory Audit, Test Checking.

Introduction

Test checking is an accepted audit technique that involves testing less than 100 % of the transaction by selecting sample transactions and using analytical procedures on them with an objective to give an opinion whether the financial statements show a true and fair view.

It is effective in nature that most times it is possible to give an appropriate opinion on the whole population by studying a well-selected sample representative of the population. This increases the cost benefit of the process making it financially optimized, efficient and reducing the work involved without compromising on the quality of the opinion. Test checking is adopted also since it is practically not possible to check all transactions like in the case of big, listed companies whose number of transactions run in millions. But test checking can only reduce the workload of an auditor, not his liability. Auditor cannot claim that he couldn't trace frauds since the misleading transactions were not a part of the selected sample. So, the success of the process is highly dependent on proper audit sampling. All the big four companies prominently conducting statutory audit of listed companies do sample selection

incorporating variety of sampling techniques coded in an algorithm created inhouse using variety of conditions.

To support these sampling techniques, each Big Four firm uses advanced audit technology. Deloitte works with platforms like Omnia and Argus, PwC uses Aura and Halo, EY leverages Canvas and Helix, and KPMG uses Clara along with tools within KPMG Ignite. Additionally, they make extensive use of data analytics tools such as IDEA, ACL (Galvanize/HighBond), Power BI, Tableau, and enhanced Excel solutions. With the help of these technologies, auditors increasingly perform full-population testing, especially for large datasets such as journal entries, revenue transactions, and payroll records. Instead of relying solely on samples, they can analyze 100% of transactions to identify anomalies, strengthen audit evidence, and improve overall audit quality.

The Big Four audit firms use a combination of statistical, non-statistical, and risk-based sampling techniques to evaluate financial data efficiently and accurately. Statistical sampling includes methods such as random sampling, where every item in the population has an equal chance of being selected, and systematic sampling, in which auditors choose every nth item from an ordered listing. They also use stratified sampling, which divides the population into meaningful groups—such as high-value and low-value transactions—to increase precision, and Monetary Unit Sampling (MUS) or PPS, where items are selected based on their monetary value, giving larger items a higher probability of selection. Non-statistical sampling relies more on professional judgment and includes judgmental sampling, where auditors intentionally pick items they believe carry higher risk; haphazard sampling, where items are chosen without a structured technique but still avoid bias; and block sampling, which involves selecting a continuous

block of transactions, though this is used less often due to limitations in representativeness. Auditors also apply risk-based sampling, focusing on high-value, unusual, complex, related-party, or high fraud-risk transactions, ensuring critical areas receive the most attention.

Objectives

1. To Understand how the Internal Control evaluation is done using Algorithmic programming by Big 4.
2. To Understand how the audit sample is selected using Algorithmic programming by Big 4.

Data Collection

Before any kind of audit sampling is conducted the internal control system review is done to determine whether the data that is received from the company is accurate, reliable and of high quality. Thus, ensuring that the samples studied based on this data give a high-quality opinion.

Deloitte performs its internal control review through the Omnia platform, which leverages extensive automation, AI, and data-driven risk assessment to evaluate the design, implementation, and operating effectiveness of controls. Omnia is built to bring clarity to control testing by allowing auditors to continuously monitor audit progress and analyze control-relevant data through centralized coordination tools. Deloitte highlights that Omnia enables auditors to "experience an efficient audit of your internal controls," providing streamlined, digitized oversight of controls and data flows across key processes. AI agents embedded into Omnia perform tasks such as documentation review, data extraction, and risk identification—reducing the manual burden and helping auditors quickly pinpoint control failures or unusual patterns requiring deeper review. These AI capabilities also assist in navigating financial statements, enhancing tie-out procedures, and summarizing documents, all of which directly support internal control walkthroughs and testing. By integrating these intelligent tools with auditor judgment, Deloitte ensures a more transparent and higher-quality internal control review, aligning the digital capabilities of Omnia with professional skepticism and regulatory expectations.

PwC conducts internal control reviews through a combination of Aura, Halo, and Connect, each playing a specific role in evaluating how controls are designed and function throughout the reporting cycle. Aura serves as the backbone of PwC's internal control documentation and testing, offering standardized walkthrough functionality that allows auditors to understand and verify end-to-end business processes. PwC explicitly emphasizes that Aura's standardized walkthrough features help teams understand control design, data flows, and potential control gaps early in the audit. Meanwhile, Halo provides deep insights into internal controls by analyzing full populations of journal entries and general ledger activity. By processing millions—even billions—of records, Halo identifies unusual patterns, risky transactions, ineffective journal-entry controls, and operational anomalies that reveal control weaknesses across financial cycles. The analytics dashboards in Halo allow auditors to quickly visualize trends, deviations, and control failures, creating a data-driven lens through which the operating effectiveness of controls is evaluated. Connect complements this by streamlining evidence collection, making internal control testing more efficient and reducing delays that typically hinder walkthroughs and control validation. Together, these technologies shape PwC's internal control review into a process grounded in data, transparency, and standardized methodology.

EY uses its global audit platform EY Canvas, integrated with the analytics suite EY Helix, to perform robust internal control reviews. Canvas provides the structural foundation for documenting process understanding walkthroughs, control testing, deficiency evaluation, and global coordination. Its online environment centralizes the audit plan, ensures consistent methodology application, and provides real-time visibility into internal control testing status across teams. EY Helix enhances this framework by embedding analytics into every stage of control evaluation. Helix analyzers—such as GL Analyzer, Revenue Analyzer, or Payables Analyzer—review entire data sets to identify control-relevant anomalies, such as unusual sales trends, atypical credit memo behavior, or inconsistent settling patterns. This gives auditors a detailed understanding of whether controls operated effectively throughout the period and where exceptions indicate control design flaws or execution failures. EY emphasizes that Helix enables analysis "at scale," allowing auditors to evaluate control operation across full populations rather than small samples, and equipping them to interpret analytic signals with heightened professional skepticism. In addition, walkthrough procedures within EY's methodology emphasize verifying "what could go wrong" points using document inspection, observation, and inquiry, all of which are housed and managed within Canvas. Together, Canvas and Helix enable EY to deliver a digitally enhanced, risk-focused internal control review.

KPMG executes its internal control review through the KPMG Clara smart audit platform, which integrates AI agents, advanced analytics, collaboration tools, and a dedicated Financial Report Analyzer (FRA) engine. Clara's analytics enable auditors to assess whether controls designed to mitigate material misstatement risks are functioning as intended by examining entire data sets for unusual patterns, exceptions, or control failures. The platform's AI agents automate labor-intensive internal control procedures such as expense vouching, searches for unrecorded liabilities, and evaluation of accrued expenses—activities that traditionally consume significant audit time. These AI agents enhance operating effectiveness testing by rapidly processing supporting evidence, highlighting inconsistencies, and producing insights that auditors can investigate using professional judgment. The FRA engine further supports internal control over financial reporting by helping auditors complete disclosure checklists, ensuring that entity-level reporting controls and financial statement close controls are thoroughly evaluated. Clara's collaboration module gives clients and audit teams real-time transparency into the status of control testing, evidence requests, and issues identified, increasing the speed and accuracy of walkthroughs and remediation tracking.

This human-in-the-loop, AI-supported model results in an internal control review process that is data-rich, highly automated, and deeply aligned with risk-responsive auditing.

Modern Big Four audits increasingly rely on algorithmic and data-driven sampling methods, all powered by their proprietary platforms—Deloitte's Omnia, PwC's Aura and Halo, EY's Canvas and Helix, and KPMG's Clara—supported by analytics tools like IDEA, ACL (HighBond), Power BI, and Tableau. Across all firms, the sampling process begins with data ingestion and normalization, where large volumes of ERP data are extracted and standardized into the audit platform. Tools such as PwC's Extract feeding into Halo, EY's Helix data pipelines, and KPMG Clara's ingestion modules allow auditors to access complete, clean datasets before any sampling method is applied. These platforms routinely perform full-population profiling, analyzing journal entries, ledgers, and entire transaction cycles to identify patterns, anomalies, and red flags. This step ensures that auditors rely not only on sampling, but also on advanced analytics to guide where sampling is necessary.

Once the population is processed, the audit tools apply risk-scoring algorithms that evaluate transactions using techniques such as trend and ratio analysis, cluster detection, outlier identification, and even digit-pattern tests like Benford's Law. These analytics reveal abnormal activity—such as unusual journal entries, off-hours postings, or suspicious dollar patterns—which helps auditors decide whether to apply statistical sampling or move to full-population testing. Platforms such as PwC's Halo and KPMG's Clara use these analytics extensively to highlight items requiring detailed examination, enabling auditors to perform more targeted procedures.

After risk analysis, the firms select an appropriate sampling technique. The most common statistical method is Monetary Unit Sampling (MUS) or Probability Proportional to Size (PPS), which treats each dollar as a sampling unit. MUS gives higher-value items a greater chance of selection, making it ideal for detecting overstatements in accounts like receivables, revenue, inventory, or fixed asset additions. Audit software calculates the sampling interval based on total population value, tolerable misstatement, expected misstatement, and desired confidence levels. This interval is combined with a random starting point to generate a reproducible sample, allowing auditors to project any misstatements back to the entire population. Tools like ACL and IDEA also support MUS and similar selection algorithms. In addition to MUS, auditors employ other statistical approaches such as systematic sampling, which selects every nth item, and stratified sampling, where populations are grouped into meaningful bands (e.g., by value or risk). These methods are especially relevant for internal control testing or when populations vary widely.

Deloitte — Omnia

Deloitte's Omnia platform integrates cloud capabilities, advanced analytics, and increasingly Generative AI and agentic AI to transform the audit process. Omnia performs comprehensive data analysis to identify anomalies and tailor testing procedures. When sampling is required, Omnia allows auditors to execute MUS, systematic, or random sampling based on the risk characteristics of a population. Deloitte's AI agents automate time-consuming tasks such as documentation review and risk identification, enabling auditors to focus on interpreting results and performing judgment-heavy audit tasks. In practice, Deloitte frequently begins with full-population analytics, then applies PPS/MUS or exception-based testing depending on what the analytics reveal.

PwC — Aura, Halo, Connect

PwC's Aura serves as the global audit backbone, integrating methodology, risk assessment, and audit documentation. Halo, on the other hand, is PwC's powerful analytics engine capable of processing entire populations—in fact, Halo for Journals can handle over one billion records per

instance. Halo analyzes complete transaction sets, identifies unusual journal entries or relationships, and automatically generates risk insights through more than 40 visual dashboards. Based on these analytics, auditors determine whether to test exceptions directly or apply statistical sampling. PwC often relies heavily on full-population journal testing, using exception identification as a substitute for traditional sampling. Remaining transactions may then undergo MUS or systematic sampling as appropriate. PwC is also transitioning toward its Next Generation Audit (NGA) platform, which promises even stronger automation and integration.

EY — Canvas and Helix

EY's audit workflow is driven by EY Canvas, a global online audit platform, while EY Helix provides embedded analytics across the entire audit lifecycle. Helix includes specialized analyzers such as the GL Analyzer, P2P Analyzer, and Revenue Analyzer, which can handle extremely large datasets. These analyzers allow EY auditors to review entire cycles—such as sales, receivables, or payables—and identify patterns that inform their sampling decisions. EY emphasizes an analytics-driven mindset where auditors are trained to interpret analytic results rather than rely solely on automated suggestions. Helix frequently performs full-population testing, especially in journal entry analysis, and then auditors apply MUS or systematic sampling only where statistical projection is needed. EY also incorporates machine learning and robotic process automation for tasks like contract reviews and complex transaction analysis.

KPMG — Clara and Ignite

KPMG's Clara platform is a cloud-based smart audit system that integrates advanced analytics, collaboration tools, and increasingly agentic AI capabilities. Clara enables auditors to analyze entire datasets, moving the firm beyond traditional sampling when full-population testing is practical. AI agents within Clara automate key substantive procedures such as expense vouching, searching for unrecorded liabilities, and evaluating accrued expenses. When sampling is required, Clara supports MUS, systematic sampling, and stratified methods, all guided by analytics-driven risk scoring. The platform also includes a Financial Report Analyzer, which helps auditors complete disclosure checklists through AI-generated insights. KPMG emphasizes transparency and collaboration through its Clara Collaboration module, ensuring that sampling decisions are tied directly to real-time risk analytics. Across all firms, the common trend is a shift from traditional sampling toward data-driven, full-population analytics, with statistical sampling applied more selectively and strategically. Algorithmic sampling—particularly MUS/PPS—remains essential for projecting misstatements, but platforms now use advanced analytics and AI to determine where sampling matters most. Journal testing, revenue analysis, and payroll reviews are often performed on 100% of transactions, while other areas still use statistical sampling for efficiency and audit evidence. As the Big Four continue adopting AI and automation, we will see even more precise, risk-focused sampling techniques integrated seamlessly into end-to-end audit workflows.

Conclusion

The rapid integration of artificial intelligence into the audit methodologies of the Big Four has fundamentally transformed both internal control evaluations and audit sampling practices. Modern platforms such as Deloitte's Omnia, PwC's Aura and Halo, EY's Canvas and Helix, and KPMG's Clara have shifted auditing from traditional, sample-restricted procedures toward data-driven, analytics-enhanced, and increasingly automated workflows. These systems enable auditors to analyze entire populations of transactions, identify anomalies with unprecedented precision, and assess control effectiveness through continuous, high-quality insights generated by embedded AI agents and advanced analytics engines.

By automating labor-intensive tasks—such as documentation review, risk scoring, journal entry testing, and exception identification—AI augments auditor judgment rather than replacing it, allowing professionals to devote greater attention to high-risk areas and complex areas requiring human skepticism. This blend of technological intelligence and auditor expertise strengthens audit quality, enhances transparency, and supports more robust assurance outcomes across large and complex financial environments.

Moreover, algorithmic sampling techniques, including MUS/PPS, stratification, and systematic selection, now operate within AI-supported ecosystems capable of full-population analysis, digitized evidence collection, and real-time risk visualization. As a result, sampling is no longer a standalone procedure but part of a broader, integrated analytical framework. This evolution has not only improved efficiency and accuracy but has also aligned audit processes with the increasing regulatory expectations for data integrity, reliability, and fraud detection.

In essence, AI is redefining the audit landscape—shifting it toward a future where insights are deeper, decisions are more informed, risks are identified earlier, and audit evidence is stronger. As these technologies continue to mature, the audit profession stands at the threshold of a new era: one characterized by intelligent automation, continuous assurance, and unprecedented analytical capability, ultimately elevating the credibility and relevance of the audit function in a digitally driven world.

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