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Pricing Risk in Thin African Equity Markets: A Systematic Review of Models, Measurement and Nigerian Evidence

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Abstract

We examine African listed-equity pricing models in settings where returns, benchmarks and investable universes are subject to consequential measurement error. We systematically review the models tested, assess how thin-market measurement choices shape findings and derive requirements for a Nigeria-adapted research design. Searches identified 2,249 records; after deduplication and screening, we included 154 reports representing 143 study families and 163 analyses, of which 54 contain Nigerian evidence. CAPM and conditional variants account for 66 analyses and characteristic factor models for 39, with preferred specifications varying across markets, periods and samples. Measurement weaknesses are pervasive: only 20 analyses clearly use total returns; 138 score weakly on non-trading or stale-price treatment; 113 score weakly on stability and validation; and one reports a formal out-of-sample test. Thirteen analyses meet a pre-specified measurement-and-inference sensitivity floor, including six with Nigerian evidence. Model rankings vary across markets, periods and samples. Benchmark choice, trading continuity, survivorship, factor construction and investability materially alter reported performance. We therefore, propose a review-derived, nested research architecture for Nigeria: construct survivorship-aware total returns; estimate a corrected local benchmark; add mechanism-based characteristic, liquidity and external-risk candidates; and require pricing-error, stability, investability and holdout tests. Our review treats market-data construction as part of identification and sets minimum standards for future African asset-pricing studies.

Keywords: African equity markets, Asset pricing, Liquidity, Nigeria; thin trading, Systematic review.

1. Introduction

Modern asset pricing asks what compensation investors require for bearing non-diversifiable risk. The capital asset pricing model (CAPM) specifies one market factor and a linear beta-return relation (Sharpe, 1964). Arbitrage pricing theory (APT) permits several pervasive sources of risk (Ross, 1976). Empirical models then add size and value (Fama & French, 1993), momentum (Carhart, 1997), liquidity (Liu, 2006), and profitability and investment (Fama & French, 2015). These developments supply tools for valuation, portfolio construction and performance measurement. They also widen the empirical question: an observed premium may reflect priced risk, persistent mispricing, trading frictions or data construction.

Thin-market conditions make that identification problem especially important in African equity markets. Trading can be concentrated in a small group of firms, zero returns may indicate stale prices, and liquidity screens can materially change samples and estimated cost of equity (Hearn & Piesse, 2009; Hearn, 2011; Hikouatcha et al., 2023). Our appraisal accordingly records name changes, suspensions, reorganisations, entry, exit and delisting treatment. Daily beta estimates can reflect trade timing alongside systematic risk, while liquidity screens can create easier-to-price test assets by narrowing the investable universe (Scholes & Williams, 1977; Dimson, 1979; Hearn, 2011).

Our completed corpus contains 54 analyses with Nigerian evidence across market-, sector- and firm-level designs. This coverage makes Nigeria a useful focal case for examining asset-pricing design under thin-market conditions. A market index has a beta of one against itself by construction. Stock-level beta estimates vary with the benchmark, return frequency, sample window, corporate-action convention and treatment of non-synchronous trading (Scholes & Williams, 1977; Dimson, 1979; Hearn, 2011). We therefore, treat the measurement protocol as part of every Nigerian beta estimate.

Existing reviews map African financial-market research and compare pricing models across the region (Adeabah et al., 2023; Hearn et al., 2025; Paseda et al., 2026). Nigerian evidence includes CAPM, liquidity and

multifactor specifications (Hearn & Piesse, 2009; Ayadi & Paseda, 2023; Hearn et al., 2025), while our evidence map also identifies macroeconomic, international and cost-of-equity designs. We assess which conclusions remain credible after accounting for local trading and data conditions, then use that audit to specify a falsifiable methodological agenda for Nigerian asset-pricing research.

We organise the review around three research questions:

- RQ1. Which asset-pricing models and candidate factors have been tested across African markets, and what Nigeria-specific evidence is available?
- RQ2. How have researchers constructed returns, factors, samples and benchmarks, and how have they treated thin trading, zero returns, corporate actions, delistings, foreign-exchange risk and time variation?
- RQ3. Which findings are credible enough to motivate a Nigeria-adapted model, and what minimum data and validation design would be required?

We contribute in three ways. First, we connect model evolution to thin-market measurement restrictions and analyse African evidence as a distinct identification setting. Second, we apply a claim-specific appraisal and a measurement-and-inference sensitivity floor to the included corpus. Third, we translate the synthesis into a review-derived, falsifiable research architecture for Nigeria. These contributions place market-data construction within identification and separate evidence that motivates a factor from evidence that supplies a transferable parameter.

2. Asset-Pricing Evolution Under Thin-Market Restrictions

2.1. CAPM: Benchmark and Measurement Protocol

Following Sharpe (1964), the expected excess return on asset i is proportional to its covariance with the market portfolio:

$$E(R_i) - R_f = \beta_i[E(R_m) - R_f], \quad \beta_i = \frac{Cov(R_i, R_m)}{Var(R_m)}.$$

where E(Ri) is the expected return on asset i; Rf is the risk-free rate; E(Rm) is the expected market return; βi is asset i's market beta; Cov(Ri, Rm) is the covariance of asset and market returns; and Var(Rm) is the variance of market returns.

CAPM provides a transparent, parsimonious benchmark (Sharpe, 1964). Its implementation requires choices about the risk-free proxy, market risk premium, historical or peer beta, benchmark, frequency and estimation window. African applications show that benchmark, liquidity-screen and measurement choices can affect cost-of-equity and factor estimates (Hearn & Piesse, 2009; Hearn, 2011; Hearn et al., 2025). We therefore, require Nigerian applications to report the benchmark, dividend convention, currency, compounding convention and estimation regime. In our design, CAPM is both a model and a measurement protocol.

Non-synchronous trading creates a direct econometric problem: when a security and its benchmark record price changes at different times, contemporaneous covariance can be attenuated or shifted into leads and lags (Scholes & Williams, 1977; Dimson, 1979). Monthly aggregation can reduce timing mismatch while discarding observations. Our design evaluates contemporaneous and lead-lag estimators, multiple frequencies, return construction, survivorship and investability in separate robustness checks.

2.2. APT and Characteristic Factor Models

APT permits several systematic sources of return and leaves the systematic factors to empirical specification (Ross, 1976). The Fama-French three-factor model adds size and book-to-market portfolios (Fama & French, 1993); Carhart adds momentum (Carhart, 1997); and the five-factor model adds profitability and investment (Fama & French, 2015). These factors may represent risk, mispricing or compact summaries of common variation. Their usefulness depends on release-date lags, breakpoints, microcap influence, weighting, rebalancing and the treatment of firms entering or leaving the sample.

Factor transportability is empirical. In frontier-market applications, breakpoints, microcap influence, weighting and dated accounting inputs affect portfolio construction and investability (Hearn et al., 2025). Hence, we specify local breakpoints, dated information, reproducible construction and investability tests and evaluate economic mechanisms independently from mechanical recipes.

2.3. Liquidity, Information and Market Microstructure

Liquidity is both a candidate priced state variable and a precondition for measuring returns. African applications use zero-volume measures, turnover, quoted spreads and price impact (Hearn & Piesse, 2009; Hearn, 2011). Other studies examine probability of informed trading and nonlinear microstructure effects (Bouchaddekh et al., 2015; Hikouatcha et al., 2023). Liquidity proxies capture different dimensions: turnover may be concentrated in a few active days, closing price multiplied by volume approximates value traded, and quoted spreads can be unavailable when the order book is thin (Hearn & Piesse, 2009; Hearn, 2011; Hikouatcha et al., 2023).

Our synthesis uses liquidity in two stages. The first stage diagnoses whether returns and betas are measurable. The second tests whether a liquidity factor adds explanatory power after return-series correction. Separate measurement and factor-formation variables reduce mechanical overlap. We require Nigerian studies to report zero-return and zero-volume incidence, turnover, price impact and, where available, spread or order-book measures before evaluating pricing errors.

2.4. Integration, Foreign Exchange and Conditional Risk

International CAPM variants test whether global covariance prices local assets. In emerging markets, local information and segmentation can dominate world-beta pricing (Harvey, 1995). Currency risk can operate as a priced risk, conditioning state or firm-level exposure with regime-varying premia (Molele, 2018; Bonga-Bonga & Mpoha, 2025). In Nigeria, imported inputs, foreign-currency liabilities, export revenues, inflation and repatriation constraints provide pre-specified channels through which naira movements may affect firms.

Conditional models allow betas or premia to vary with information, monetary regimes or market stress. We treat oil prices, inflation, policy rates and foreign-exchange changes as pre-specified conditioning candidates and require cross-sectional, stability and holdout tests. South African evidence shows that macro and commodity signals vary across periods and specifications (Van Rensburg, 2000; Obadire, 2022; Salisu & Gupta, 2022).

3. Method

3.1. Scope, Eligibility and Protocol

We designed a systematic review and evidence map covering listed ordinary equities and equity portfolios in African markets from database inception to 9 January 2026. Eligible reports estimate expected returns, systematic risk, factor exposures, pricing errors, model performance or cost of equity. The scope includes CAPM and conditional variants; APT and macro-factor models; Fama-French, momentum and related characteristic models; liquidity and information models; international specifications; machine-learning return models; and behavioural or anomaly designs that make a direct pricing or return-prediction contribution. Nigeria is coded separately whenever its result is identifiable.

We exclude derivative-only, fixed-income-only and purely descriptive efficiency or volatility studies unless they identify a directly usable pricing result. Peer-reviewed articles form the main corpus; working papers, theses and other assessable reports are retained with publication type recorded. The workflow follows PRISMA 2020 principles for transparent identification, screening and reporting (Page et al., 2021). Model, test-asset, frequency and outcome heterogeneity preclude a pooled meta-analytic effect; our synthesis is structured, directional and method-weighted.

3.2. Search, Retrieval and Verification

The executed search combined broad African, Nigeria-specific and validation queries in OpenAlex with backward and forward citation chasing from nine locked anchors. A targeted indexed-web RePEc supplement added one unique record, and Crossref supplied metadata verification. Scopus, Web of Science, EconLit, Dimensions and native RePEc export were unavailable in this cycle.

The searches identified 2,249 records. Deduplication removed 339, leaving 1,910 records for title-and-abstract screening. All 1,910 were screened in 20 batches: 1,292 were excluded and 618 advanced. Every advanced report received documented retrieval attempts. Of these, 174 were assessable, 154 were included and 20 were excluded; 444 remained unassessable through the available public routes. The 154 included report records map conservatively to 143 provisional study families.

3.3. Extraction and Appraisal

Each distinct market, frequency, model family or test-asset design receives an analysis identifier. The 154 included reports yielded 163 analysis records. We extracted 50 fields covering sample and market, return construction, price field, corporate actions, entry and exit, non-trading diagnostics, factor definitions, breakpoints, weighting, accounting lags, benchmark, risk-free series, currency, estimator, inference, stability and out-of-sample tests. One hundred and two analyses are Complete. Sixty-one retain a Needs query label for unresolved core fields or market-specific splits in accessible sources. The label records source incompleteness and preserves the verified review decision.

We appraised ten domains on a 0-2 scale: data provenance; universe and survivorship; returns and corporate actions; non-trading and stale prices; factor construction; benchmark, risk-free rate and currency; estimation and inference; model tests and economic meaning; stability and validation; and reproducibility. Scores form a claim-specific profile, with critical concerns governing interpretation.

3.4. Synthesis and Sensitivity Rules

We first map models, markets, frequencies and Nigerian coverage, then interpret findings within model families. We report appraisal-domain distributions and retain authors' claims separately from our interpretation. To test whether broad conclusions survive a minimum credibility restriction, we define a measurement-and-inference sensitivity floor: an analysis must score at least partial (1) on universe/survivorship, returns/corporate actions, non-trading/stale prices, benchmark/risk-free/currency, and estimation/inference. A validation-extended floor additionally requires at least partial evidence on stability or temporal validation. These floors provide transparent sensitivity analyses, and all eligible analyses remain in the main synthesis.

4. Results

4.1. Selection and Composition of the Evidence Base

Table 1 and Figure 1 summarise the completed flow. The included corpus comprises 139 journal articles, six working papers, five theses or dissertations and four other reports. Publication increased sharply: 77 reports appeared from 2020 to 2026 and 65 from 2010 to 2019, compared with 12 before 2010. Thus, the evidence combines a small historical base with a much larger recent literature.

Table 1. Review selection and synthesis counts.

Stage	Count	Interpretation
Records identified	2,249	Executed OpenAlex searches, citation chasing and one RePEc supplement
Duplicates removed	339	Cross-source and within-source deduplication
Titles/abstracts screened	1,910	All retained formal records
Titles/abstracts excluded	1,292	Excluded at title-and-abstract screening
Reports sought	618	All advanced records received documented attempts
Reports not retrieved	444	Not assessable through available public routes
Reports assessed	174	Full-text decision recorded
Included reports	154	Mapped to 143 provisional study families
Analysis records	163	54 include Nigerian evidence

Note: Report records and analysis records differ because one report may contain more than one market, frequency or model design.

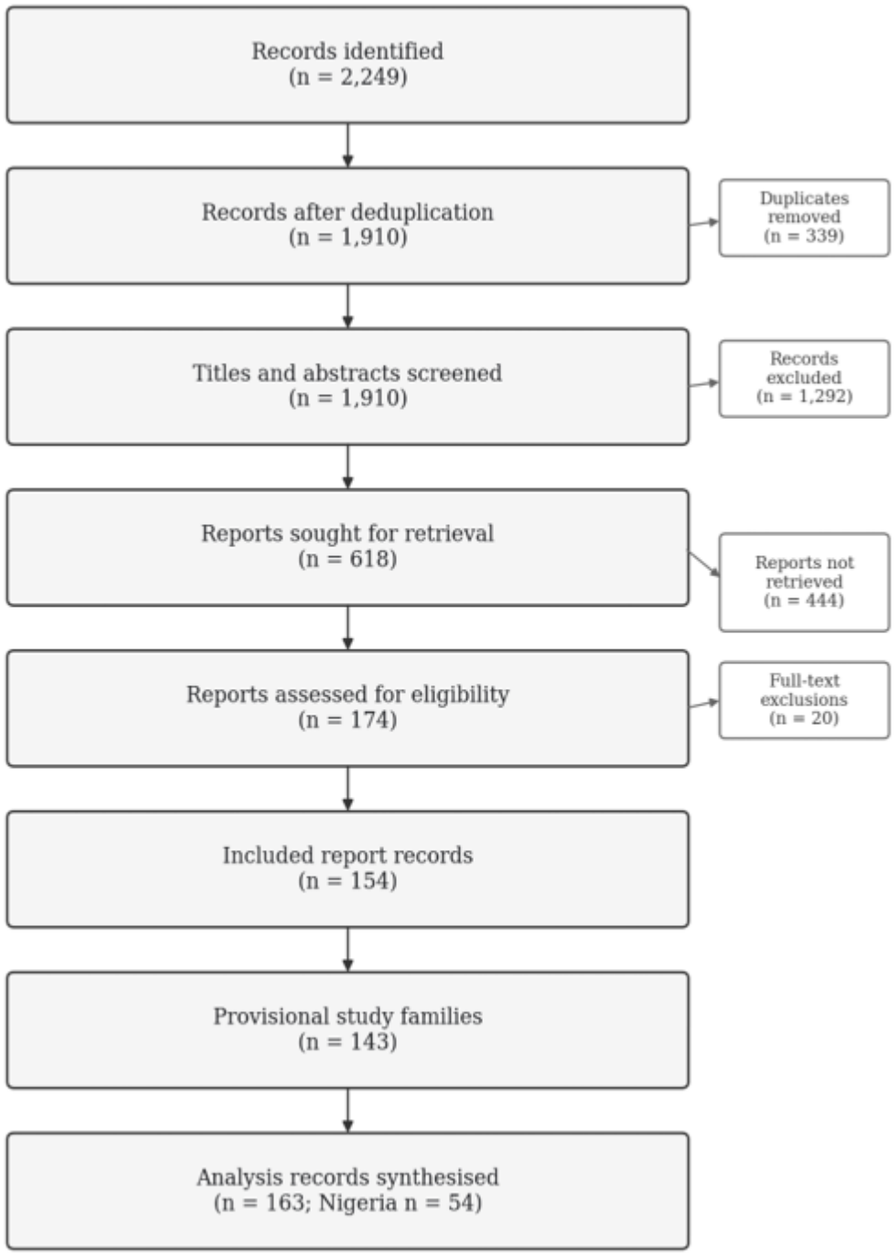

Figure 1.
PRISMA-style flow of the review evidence.
Note: The final analysis count permits multiple analysis records within one included report.

4.2. Market, Frequency and Model Coverage

Nigeria appears in 54 analysis records drawn from 51 report records; 50 analyses are Nigeria-specific and four are regional designs with a separable Nigerian component. South Africa appears in 36 analyses, Egypt and Kenya in 18 each, Tunisia in 17, Morocco in 12, Ghana in seven and the BRVM in five. Monthly returns are reported in 57 analyses and daily returns in 11, while 45 do not clearly report frequency. This uneven geography and reporting density limits simple country-level vote counting.

CAPM and conditional variants dominate the corpus with 66 analyses. Characteristic factor models contribute 39, while liquidity-augmented designs, APT and macro factors, conditional risk-return models, cost-of-equity determinants and newer machine-learning approaches form smaller strands. Table II groups minor naming differences within broad theory families.

Table 2. Broad model families in the 163 analysis records.

Model family	Analyses	Nigeria	High/moderate	Synthesis
CAPM and conditional variants	66	27	28	Frequent rejection or instability; thin-trading correction and pricing-error inference are uncommon.
Characteristic factor models	39	8	18	Better fit in several liquid samples; preferred factors and market-factor relevance vary by test assets and market.
Other pricing designs	19	5	2	Heterogeneous event, anomaly and return designs define multiple estimands.
Cost-of-equity determinants	11	8	2	Governance and disclosure correlates appear, but benchmark and return conventions are often incomplete.
Liquidity-augmented models	8	3	8	Liquidity and sample investability matter; local versus regional benchmarks can reverse interpretation.
Conditional volatility/risk-return	8	1	1	Signs and significance vary; thin-market return timing is rarely resolved.
APT and macro-factor models	7	1	3	Macro factors are market- and regime-specific, with limited regional stability.
Machine-learning return models	3	0	0	Emerging strand with limited evidence for a Nigeria-adapted specification.
Integrated/regional pricing	1	1	1	Directly demonstrates benchmark and segmentation risk.
Behavioural/sentiment	1	0	1	South African commodity predictors show the corpus's only formal holdout test.

Note: High/moderate denotes the descriptive appraisal profile; critical concerns govern credibility.

4.3. Findings by Model Family

Model performance varies across markets, periods and samples. CAPM remains a useful benchmark, and many Nigerian and other African applications reject its exact predictions or report unstable beta-return relations. Several sector-level Nigerian studies conclude that CAPM forecasts fail because realised returns differ from plug-in required returns (Nwude, 2013a, 2013b). Those comparisons document historical calculation practice; joint pricing or forecast inference requires a separate test. A Cameroon application similarly illustrates how simple CAPM claims can outrun their estimation design (Offiong et al., 2020).

Characteristic models improve explanation in selected settings and yield market-specific rankings. In an eight-market blue-chip sample, five- and six-factor specifications generated smaller pricing errors than simpler alternatives, while the sample excluded severely illiquid firms and represented Nigeria through the NGX 30 (Hearn et al., 2025). South African evidence rejects the five-factor model for several portfolio sets and finds little incremental role for the market factor after other characteristics enter (Mosoeu & Kodongo, 2022). Egyptian comparisons support three-factor models in some anomaly portfolios and report marginal or portfolio-dependent gains from five factors (El-Masry & Mekhaimer, 2009; Shaker & Elgiziry, 2014; Ragab et al., 2020). Moroccan fundamental anomalies also vary by characteristic and specification (Benfeddoul & Alaoui Taib, 2024).

Liquidity is the most persistent mechanism-specific signal and appears through multiple dimensions and proxies. Regional and sector studies show that liquidity screens can change fit and model-implied cost of equity (Hearn & Piesse, 2009). In North Africa, a domestic benchmark often dominates a regional benchmark and liquidity exposures shift around crisis periods, with severe zero-return incidence receiving partial correction (Hearn, 2011). Tunisian information-based trading results and African nonlinear microstructure evidence suggest an expected-return channel; report access and proxy differences limit coefficient comparison (Bouchaddekh et al., 2015; Hikouatcha et al., 2023).

Macro, integration and conditional evidence chiefly informs mechanism selection and supports market-specific parameter estimation. Historical world betas fail where local segmentation and variance dominate (Harvey, 1995). JSE macro factors change across periods (Van Rensburg, 2000), while commodity predictors improve South African forecasts in the corpus's sole formal out-of-sample design (Salisu & Gupta, 2022). Exchange-rate, inflation and equity-premium results remain market-specific (Obadire, 2022; Bonga-Bonga & Mpoha, 2025). Governance, ownership and disclosure studies provide cost-of-equity correlates that can complement an auditable market-risk model (Dakhlaoui & Gana, 2020; Missaoui et al., 2025).

4.4. Measurement and Validation Audit

The measurement audit changes the interpretation of the model results. Only 20 analyses clearly use total returns; 57 use price returns and 86 are unclear. Entry, exit or delisting treatment is absent or unclear in 120 analyses. Only 27 report a non-trading diagnostic, and only seven implement an identifiable correction or screening response: four use a lead-lag or trade-timing correction, two use a liquidity screen and one relies on frequency sensitivity. Formal out-of-sample evaluation appears once, with two additional partial forecasting exercises.

The appraisal profiles are nine High, 55 Moderate and 99 Low, and the domain distribution gives the more detailed account. Non-trading and stale prices is the weakest domain: 138 of 163 analyses score zero. Stability and validation is weak in 113, and estimation and inference in 108. Factor construction and model-test interpretation are reported more clearly. Only 13 analyses meet the measurement-and-inference sensitivity floor; 10 of those also meet the validation-extended floor. Six floor-qualified analyses contain Nigerian evidence, and three also satisfy the validation extension. The sensitivity counts indicate that measurement and inference limitations remain entangled with model performance in most analyses.

Table 3. Claim-specific appraisal across 163 analysis records.

Domain	Adequate (2)	Partial (1)	Weak (0)	Nigeria-design implication
D1 Data provenance	80	12	71	Archive exact vendor, source and extraction vintage.
D2 Universe/survivorship	12	93	58	Use point-in-time membership, entries, exits and dead firms.
D3 Returns/corporate actions	22	98	43	Rebuild adjusted total returns from an event ledger.
D4 Non-trading/stale prices	6	19	138	Diagnose zero trades and compare lead-lag and frequency corrections.
D5 Factor construction	96	56	11	Pre-specify lags, breakpoints, weighting and rebalancing.
D6 Benchmark/risk-free/currency	38	84	41	Match local cash flows, benchmark, currency and tenor.
D7 Estimation/inference	29	26	108	Use joint pricing-error and cross-sectional tests.
D8 Model tests/economic meaning	94	59	10	Report alphas, dispersion, turnover and economic value.
D9 Stability/validation	8	42	113	Reserve holdout data and test rolling and regime stability.
D10 Reproducibility	40	95	28	Publish definitions, code, decisions and permissible outputs.

Note: Domain totals describe reporting and design adequacy for the stated claim; interpretation follows claim-specific domain profiles.

4.5. Nigerian Evidence

The completed corpus establishes a substantial Nigerian evidence base: 51 report records yield 54 analyses with a Nigerian component. The principal issue is uneven identification. Twenty-seven analyses use CAPM or conditional variants, eight use characteristic factor models, eight study cost-of-equity determinants, three are liquidity-augmented and the remainder cover macro, microstructure or other return-pricing designs. Three analyses have a High profile, 26 Moderate and 25 Low.

The most informative Nigerian results form a coherent but qualified pattern. Historical international evidence indicates that local variance and segmentation matter when world beta fails (Harvey, 1995). A regional liquidity-augmented study reports an aggregate model-implied Nigerian cost of equity of 63.82%, falling to 32.90% in the liquid subset; the historical, model-specific halving directly illustrates sample-selection risk (Hearn & Piesse, 2009). In the modern NGX 30, reported required returns range from 2.67% under CAPM to 18.91% under a six-factor specification, a spread exceeding 16 percentage points (Hearn et al., 2025). The spread measures specification sensitivity; contemporaneous valuation requires current inputs and a defined investable sample.

Aggregate liquidity evidence is frequency-sensitive: monthly data do not support liquidity-based return predictability, while annual data over a different span do (Ayadi & Paseda, 2023). Nonlinear microstructure evidence suggests that liquidity and trading frequency enter expected-return relations, but inaccessible market-specific tables prevent quantitative use (Hikouatcha et al., 2023). The numerous sector-level CAPM rejections and newer cost-of-equity determinants enlarge topical coverage, yet most omit non-synchronous-trading correction or reproducible benchmark conventions. Table 4 therefore, distinguishes research signals from parameter uses.

Table 4. Nigerian evidence by broad model family.

Family	Analyses	H / M / L	Research signal	Critical boundary
CAPM and conditional variants	27	1 / 16 / 10	Beta instability, segmentation and frequent CAPM rejection.	Non-synchronous-trading correction and joint pricing tests are rare.
Characteristic factor models	8	2 / 4 / 2	Multifactor fit and required returns differ sharply by specification.	Strongest evidence is confined to an NGX 30/blue-chip sample.
Cost-of-equity determinants	8	0 / 2 / 6	Disclosure, governance and firm attributes correlate with estimated cost of equity.	Dependent-measure reproducibility is often weak.
Other pricing designs	7	0 / 1 / 6	Microstructure and alternative risk measures may be nonlinear.	Core fields or market-specific coefficients are frequently unresolved.
Liquidity-augmented	3	0 / 3 / 0	Liquidity screens and frequency materially change outputs.	Regional benchmarks and different sample spans limit direct comparison.
APT and macro factors	1	0 / 0 / 1	Macroeconomic variables are plausible conditioning information.	Nigeria-specific factor-pricing evidence remains preliminary.

Note: H/M/L denotes descriptive High, Moderate and Low appraisal profiles.

5. A Review-Derived Asset-Pricing Research Architecture for Nigeria

5.1. Measurement First, Factors Second

Figure 2 converts the review findings into a sequence of falsifiable decisions. The measurement layer establishes what a return observation represents. The benchmark layer estimates a corrected local excess return. Candidate firm, liquidity and external-risk factors enter only after those stages. A limited number of policy, inflation, foreign-exchange, oil and market-stress states may then condition exposures. The final layer compares pricing errors, rolling stability, holdout performance, investability and reproducibility. This order prevents factor sophistication from masking weak inputs.

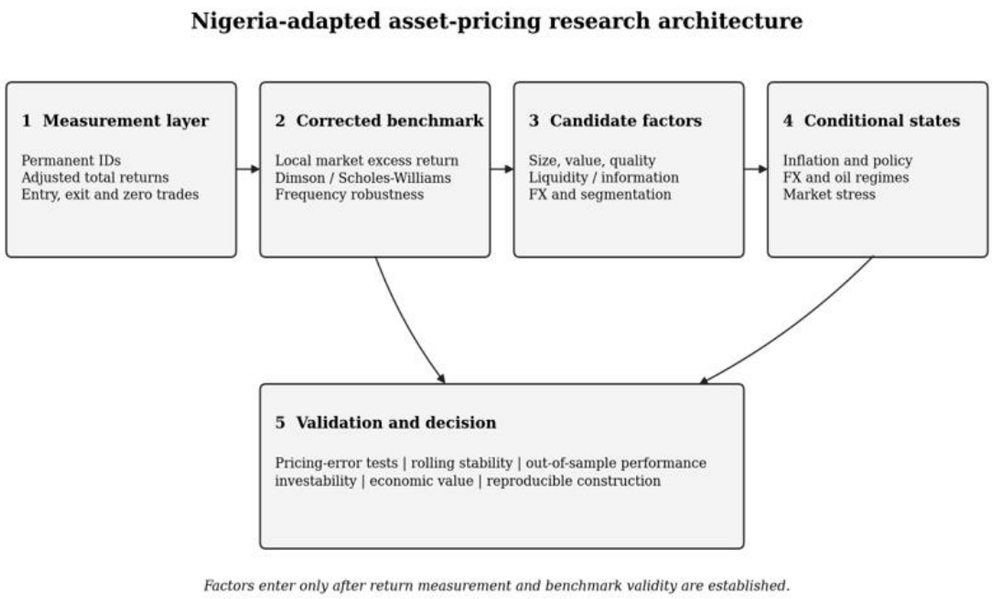

Figure 2. Nigeria-adapted asset-pricing research architecture.
Note: Candidate factors enter only after return construction and benchmark correction.

5.2. Minimum Data and Acceptance Tests

A permanent identifier must connect ticker, company, predecessor, successor and listing status through time. The event ledger must record announcement, ex-date, record date, payment date and adjustment terms for dividends, splits, bonuses, rights, consolidations and reorganisations. Daily market fields should be retained even when pricing tests use weekly or monthly returns because the higher-frequency layer identifies zero-trade periods and permits auditable aggregation. Delistings, suspensions and terminal outcomes require explicit status codes and retained terminal records.

Table 5. Minimum dataset and pre-estimation acceptance criteria.

Block	Minimum content	Acceptance test
Security master	Permanent ID; ticker/name history; listing, suspension and delisting dates; predecessor/successor links.	Random continuity checks across events; unique live IDs; dead firms retained.
Daily market panel	Open, high, low, close, official value and volume, trade status, shares outstanding, index membership.	Reconcile random security-days to source; diagnose zero returns, zero volume and missingness.
Corporate-action ledger	Dividend, split, bonus, rights, consolidation, merger and reorganisation terms with dated events.	Recalculate sampled adjusted returns and explain extreme jumps before modelling.
Point-in-time accounting	Statement and public-release dates, restatements, fiscal year end, book equity, profitability, investment and shares.	Formation-date availability; documented lags; independent reproduction of formation inputs.
Benchmarks and macro	NGX indices, liquid benchmark, Treasury series, naira FX, inflation vintages, policy rate, oil and global benchmark.	Common calendar, currency, tenor and compounding; archived vintages and regime dates.
Validation controls	Development/holdout flag, portfolio recipes, transaction-cost inputs, short-sale rules and code/version metadata.	Locked holdout; rolling and regime tests; turnover and investability reported with pricing errors.

Note: The criteria convert recurrent measurement and validation weaknesses in the reviewed studies into pre-estimation tests.

5.3. Estimation and Validation Sequence

Estimation should begin with market diagnostics: eligible-security counts, trading concentration, zero-return and zero-volume distributions, missingness, dividend contribution and sample attrition. Beta estimation should compare ordinary slopes with Scholes-Williams and Dimson lead-lag estimators and with weekly and monthly aggregation (Scholes & Williams, 1977; Dimson, 1979). We evaluate shrinkage forecasts in a separate specification from non-synchronous-trading correction. Every published beta should carry its benchmark, frequency, window, total-return convention, correction, standard error and stability range.

Factor tests should use several independent families of test assets, including portfolios constructed independently from the candidate factors. Time-series intercept and joint pricing-error tests can assess model fit; two-pass cross-sectional regressions with dependence-aware errors can estimate premia; and spanning tests can assess the incremental information in a local factor. Model comparison should report mean and maximum absolute alpha, joint rejection, implied cost-of-equity dispersion, turnover, net investability and sensitivity across broad and liquid universes.

We pre-specify validation before model ranking, using a development period, a locked holdout period and rolling re-estimation. Observable exchange, banking, monetary and foreign-exchange regimes define subperiods. Acceptance requires more consistent reductions in pricing errors using tradeable securities and information available at portfolio formation.

6. Discussion

6.1. Model Coverage and Nigerian Evidence

Our review maps 66 analyses of CAPM or conditional variants, 39 characteristic factor models, eight liquidity-augmented models, eight conditional risk-return designs, seven APT or macro-factor models, 11 cost-of-equity determinants and smaller integrated, behavioural and machine-learning strands. Nigeria is represented in 54 analyses from 51 report records, covering historical segmentation, sector CAPM, aggregate liquidity, multifactor comparison, microstructure, governance and cost-of-equity determinants. Model performance varies by sample and specification. The strongest Nigerian multifactor result applies to the NGX 30 (Hearn et al., 2025), while the largest sector-CAPM strand uses limited trading-timing and joint pricing inference (Nwude, 2013a, 2013b).

6.2. Measurement Choices and Model Conclusions

Our measurement audit shows that return construction, entry and exit treatment, non-trading correction, inference and validation shape the interpretation of model performance. Only 20 analyses clearly use total returns; 120 have absent or unclear entry, exit or delisting treatment; 138 score weakly on non-trading and stale prices; 108 score weakly on estimation and inference; and three include at least partial forecasting evaluation, of which one uses a formal out-of-sample test. Thirteen analyses meet the measurement-and-inference sensitivity floor. Across the corpus, benchmark choice, trading continuity, factor construction and investability materially affect conclusions. These effects align with the known bias from non-synchronous trading and with evidence that liquidity screens change African cost-of-equity estimates (Scholes & Williams, 1977; Dimson, 1979; Hearn & Piesse, 2009).

6.3. Requirements For a Nigeria-Adapted Design

Our synthesis supports a layered Nigeria-adapted design. It begins with a corrected local market factor, then evaluates locally formed size, value, profitability, investment and momentum candidates, an explicit liquidity and information layer, and conditional foreign-exchange, oil, inflation or segmentation exposures. The data foundation is a point-in-time permanent-ID panel with adjusted total returns, a complete event ledger, dead firms, actual trading measures, dated accounting inputs, matched benchmarks and archived macro vintages. The validation standard combines nested pricing-error comparison, non-synchronous-trading robustness, rolling and regime stability, investability and a locked holdout. Scholes and Williams (1977) and Dimson (1979) supply the methodological foundation for the trading-timing corrections.

6.4. Theoretical, Practical and Policy Implications

Market microstructure forms part of identification when zero returns, trade timing and sample investability affect beta and factor formation (Scholes & Williams, 1977; Dimson, 1979; Hearn, 2011). We therefore, correct return series before evaluating liquidity as a priced factor. Partial integration enters as a changing exposure because currency and global shocks can vary across firms and regimes (Harvey, 1995; Molele, 2018; Bonga-Bonga & Mpoha, 2025).

For practitioners, every Nigerian beta table should disclose its context. A market index has a beta of one against itself by definition; a stock beta is dated and conditional on measurement choices (Scholes & Williams, 1977; Dimson, 1979; Hearn, 2011). Valuation can triangulate a corrected historical beta, a peer or fundamental beta and a model-sensitivity range. Risk-free and currency conventions must match the cash flows. Developed-market factor premia require a documented transportability test, together with evidence that securities trade sufficiently at the chosen frequency (Hearn & Piesse, 2009; Hearn et al., 2025).

For the NGX, regulators and data providers, a point-in-time security master, standard corporate-action feed, adjusted total-return history and documented delisting outcomes would permit researchers and practitioners to separate priced risk from return-construction error more credibly. We infer from the appraisal results that common identifiers, archived event terms and reproducible benchmark conventions would also improve independent replication, valuation practice, index transparency and market surveillance.

7. Limitations

Three limitations define the strength of the conclusions. First, the search covered OpenAlex, citation chasing and the RePEc routes available in this cycle. Subscription exports from Scopus, Web of Science and EconLit were outside the executed search, and 444 of the 618 sought reports remained unassessable through available public routes. The corpus therefore, represents assessable evidence from those routes, with likely underrepresentation of older, local and paywalled outlets.

Second, 61 analysis records retain a Needs query label because at least one method or market-specific field is unresolved. Quantitative synthesis uses resolved fields only, and source incompleteness still reduces comparability. Third, model, test-asset, frequency and outcome heterogeneity define multiple estimands. The claim-specific appraisal, domain counts and sensitivity floors make the basis of the structured, directional synthesis explicit.

8. Conclusion

Our review supports a nested interpretation of African asset-pricing evidence. CAPM remains a benchmark; corrected market covariance matters; characteristic factors can improve explanation in selected liquid samples; liquidity and information frictions affect expected returns and measurement; and external risks vary with integration and regime. Across the 163 analyses, model sophistication commonly exceeds return-construction, trading and validation discipline.

Future Nigerian tests should build a survivorship-aware total-return panel, establish a corrected local benchmark, admit mechanism-based and investable candidates, and subject the final specification to pricing-error, regime and holdout tests. Our systematic review identifies these requirements through evidence appraisal and sensitivity analysis. Empirical testing then determines which layers survive credible measurement and validation.

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