

Building Material Cost Escalation and Residential Development Viability in Nigeria

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Abstract

This paper develops a context-sensitive conceptual framework to explain how building material price escalation affects the feasibility and financial viability of formal residential property development in Nigeria. It addresses the gap between studies documenting material cost pressures and appraisal research translating costs, revenues, development timelines, and required returns into investment decisions. The study adopts an integrative critical synthesis of Nigerian research on material costs and development uncertainty, international literature, and professional guidance on residual valuation, cash flow appraisal, and conceptual framework development. The review is selective rather than a registered systematic review.

The framework proposes that the effects of material price shocks depend on outstanding procurement requirements, expenditure timing, land acquisition status, revenue flexibility, procurement arrangements, and financing conditions. It distinguishes residual land value, representing the maximum land payment a scheme can support, from the remaining development surplus available to developers who have already acquired land. By integrating material cost exposure, appraisal outcomes, and conditional adjustment mechanisms, the framework establishes a unified transmission model and derives five propositions for empirical testing.

The framework supports developers, valuers and lenders in conducting scenario analyses, disclosing appraisal assumptions, and distinguishing liquidity pressures from underlying economic viability. As a conceptual study, it reports no original empirical estimates. Future research should test the framework using project appraisals, procurement records, material price histories, and financing cash flow data.

Keywords: building material cost; residential development; development viability; residual land value; investment uncertainty

1 Introduction

Residential property development is a capital intensive process in which substantial expenditure is committed before the complete property generates its expected revenue. Developers must coordinate land acquisition, design, construction, infrastructure, finance and marketing while operating under uncertainty about future costs and market conditions. A project that appears viable at appraisal may become financially unattractive before completion if its costs increase, its revenue assumptions weaken or its financing arrangements become less favourable.

These risks are particularly relevant to formal residential development in Nigeria, where housing provision operates alongside constraints involving land administration, infrastructure, construction finance, household purchasing power and the cost of building inputs. The Federal Ministry of Housing and Urban Development has identified the need to expand housing delivery and improve the conditions supporting housing investment. However, the scale of the national housing deficit varies across

estimates because definitions, data coverage and assessment methods differ. Consequently, the housing challenge should be discussed using clearly attributed and appropriately dated estimates rather than a single unqualified figure.

Building material costs matter because they directly affect the expenditure required to deliver a specified development. Cement, reinforcement steel, aggregates, blocks, roofing products and finishing materials represent important components of many residential construction budgets. Their individual prices may respond differently to currency movements, energy costs, transport conditions, supply disruptions and market structure. As a result, a general inflation measure may not accurately reflect the exposure of a particular project.

The financial consequences extend beyond the construction budget. If materials become more expensive after an appraisal has been prepared, the developer must determine whether the additional expenditure can be accommodated within the original financing arrangement, recovered through selling prices, offset by design changes or absorbed through a reduction in profit. The answer depends on the project's cost structure, remaining construction period, land-acquisition status, revenue flexibility and access to additional capital.

Development appraisal provides the analytical setting in which these decisions can be examined. Residual valuation relates the value of a proposed development to its expected completed value, development costs and required return. Discounted cash flow analysis adds an explicit treatment of the timing of receipts and expenditure. Both methods depend on assumptions that may become inaccurate as market conditions change. Professional guidance recognizes that development valuation is particularly sensitive to assumptions about costs, revenue, finance, time and risk ([Royal Institution of Chartered Surveyors, 2019](#)).

Research on development uncertainty in Nigeria reinforces the importance of this wider perspective. [Ayodele and Olaleye \(2022\)](#), for example, examine sources of uncertainty in real estate development and the measures adopted to manage them. [Ogunba et al. \(2024\)](#) discuss the limitations of deterministic pre development appraisals in volatile African markets and the potential contribution of risk and uncertainty analysis. These studies provide a basis for examining materials price escalation as part of a broader system of interacting development risks rather than as an isolated cost management problem.

Despite the relevance of these issues, an important conceptual question remains: through which mechanism does a building material price shock affect the financial appraisal and subsequent decisions associated with a residential development, and under what conditions does its burden fall on the developer, the land owner, the purchaser or the project itself? This paper addresses that question by integrating construction cost exposure, development appraisal and institutional adjustment into a single conceptual framework.

1.1 Statement of the problem

The central problem is the absence of a sufficiently integrated explanation of how materials price escalation is transmitted into the financial appraisal and subsequent decisions associated with formal residential development in Nigeria.

Construction cost increases may produce budget overruns, but a budget overrun is not itself a complete explanation of financial viability. The same cost increase may have different consequences depending on whether the land has already been acquired, the selling price can be revised, the

construction contract transfers price risk, or the developer can obtain additional finance. Construction delays may further increase finance and holding costs, while changes in specifications may reduce expenditure but also affect the value and quality of the completed property.

The treatment of land presents a related conceptual difficulty. Residual land value (RLV) is the amount a proposed scheme can support as a land payment after anticipated development costs and the required developer return have been deducted from expected development value, subject to appropriate treatment of timing and finance. It is not the same as the historic price already paid for a site or the current market value of that site. When land has already been acquired, a material cost shock may reduce the developer's remaining surplus; it does not automatically reduce the historic acquisition cost. When land remains uncommitted, the shock may instead reduce the residual amount that can be bid for the site.

The distinction is consequential. A theoretical explanation that treats land value as a universally flexible buffer may misrepresent the exposure of a developer who has already committed capital to land. Conversely, an explanation that assumes developer profit must always absorb the entire shock ignores the potential adjustment of selling prices, procurement arrangements, project scope and financing.

The paper therefore treats cost shock allocation as a conditional process. Its objective is to explain the possible adjustment channels and identify the circumstances in which each is likely to matter.

1.2 Aims and objectives

The aim is to develop a theoretically grounded conceptual framework for explaining how rising building materials costs affect the financial feasibility and viability of formal residential property development in Nigeria

The objectives are to:

1. integrate relevant perspectives on construction costs, investment uncertainty, residual valuation and institutional market adjustment;
2. formalize the relationship between material price escalation, total development cost, residual land value, developer profit, internal rate of return and loan to cost;
3. explain how land acquisition timing, selling price flexibility and financing arrangements influence the allocation of cost shocks ; and
4. develop testable propositions and specify the data and analytical procedures needed for subsequent empirical research.

1.3 Research questions

The framework addresses four questions:

1. How does material price escalation affect the expenditure and cash flows associated with formal residential development?
2. Through which appraisal measures can these effects be identified?
3. Under what conditions are cost increases likely to be reflected in developer returns, residual land value, selling prices or project scope?
4. How might financing and procurement flexibility moderate the relationship between material price escalation and project viability?

1.4 Conceptual contribution

The paper makes three contributions. First, it connects material price escalation to development appraisal through an explicit sequence linking input costs, project cash flows, financial indicators and developer decisions. Second, it distinguishes historical land acquisition cost from current market value and residual land value. This distinction clarifies why a lower residual land value does not automatically protect the margin of a developer who has already purchased the site. Third, it introduces a conditional cost shock allocation framework. Instead of predicting that one variable always absorbs a cost increase, the framework identifies the project and institutional conditions that determine how the adjustment occurs.

These contributions are intended as a theoretically motivated refinement of existing approaches. Their novelty must be assessed against a comprehensive review of the international and Nigerian literature, and the paper does not claim to have established universal theoretical novelty or to have empirically verified its propositions.

1.5 Scope and structure

The paper focuses on formal, developer led residential schemes assessed through development appraisals and financed through identifiable combinations of equity, debt or pre-sale revenue. It does not directly model incremental owner building, informal housing production or public housing procurement, although some of its mechanisms may be relevant to those settings. The paper next explains the conceptual development approach and synthesizes the relevant literature, establishes the theoretical foundations and formalizes the conceptual model. It then develops propositions and a future research design, presents numerical demonstrations, discusses implications and concludes.

2 Conceptual development approach and literature synthesis

2.1 Review approach and organizing logic

This paper employs an integrative critical literature synthesis to develop a conceptual explanation of how material price escalation will affect residential development feasibility and viability in Nigeria. The synthesis is organized around four strands: Nigerian empirical research on rising material costs; Nigerian research on uncertainty in property development; international and professional work on residual appraisal and sensitivity; and scholarship on conceptual research design. The studies are compared by research question, data and method, outcome measured, analytical reach and limitations, rather than summarized in sequence. The review is selective rather than a formally registered systematic review. It draws on identifiable peer reviewed articles, a conference paper and professional or institutional guidance relevant to the framework.

2.2 Nigerian empirical studies of rising building material costs

Akanni et al. (2014) provide an important empirical starting point in their study of the implications of rising building-material costs in Lagos State. Their analysis combines questionnaire evidence from construction sector participants with historical material-price information and price index calculations. Respondents have identified exchange-rate movements, fuel and power costs, and government policy changes as the leading factors associated with rising prices. The study also considers implications such as construction-cost fluctuations, reduced construction output and

project abandonment risk. Its strength is that it links stakeholder perceptions to a historical price series rather than relying only on general claims about inflation.

The study nevertheless has boundaries relevant to the present paper. Its price observations largely cover the period from 2003 to 2011, with field information gathered in 2012, and its central focus is the construction industry and broader economic implications rather than a project level model of residential development appraisal. It identifies relevant drivers and consequences, but it does not establish a general rule for how a specific price shock changes residual land value, profit on cost, IRR or loan-to-cost under different land acquisition and financing conditions. The present framework builds on its evidence about cost drivers while focusing more narrowly on the financial transmission mechanism.

[Adeyemo and Aruleba \(2015\)](#) also examine rising building-material prices and real estate development, using a Lagos State case study. Their questionnaire survey reports demand-and-supply conditions as important influences and discusses possible consequences for rental value and construction quality, including the risk that cost pressure will encourage the use of substandard materials. The study usefully broadens the discussion beyond the cost ledger by recognizing that developers may respond to cost pressure through changes that affect the quality of the completed asset.

However, the study's questionnaire and ranking approach primarily captures reported views and perceived effects. It does not, on the information available in the publication record, provide a longitudinal project-level analysis linking observed material-price movements to actual cost overruns, completed values, financing costs and realized returns. Its discussion of rental values and material prices also requires careful interpretation: a change in material costs does not automatically produce a corresponding change in rents, because rental outcomes are mediated by location, demand, supply, household income and the type of property. The present paper treats rental and sale-price adjustment as a possible channel, not as an automatic pass-through.

A more recent study by [Obineme et al. \(2026\)](#) examines perceived effects of material-price increases on property-development activity in Enugu Metropolis. The published abstract reports a questionnaire-based correlation design and a strong positive association between perceived material-cost impacts and reported declines in development activity. It also identifies transportation costs, inflation, manufacturing costs and exchange rate fluctuations as prominent reported drivers. This work is directly relevant because it extends the geographical and temporal discussion beyond Lagos and covers the 2021–2025 periods. Taken together, these Nigerian studies indicate that construction material price escalation is not a purely technical procurement issue. It is linked in the literature to macroeconomic conditions, transport and energy costs, development activity and potential quality compromises. Yet the studies differ in time period, location, sample and outcome measures. Much of the evidence is based on stakeholder responses, rankings or perceived effects, rather than linked records of project budgets, actual procurement prices, development values and financing cash flows. This limits the ability to compare the magnitude of effects or determine how costs are allocated among developers, landowners and purchasers.

2.3 Uncertainty and appraisal in Nigerian real estate development

[Ayodele and Olaleye \(2022\)](#) examine sources of uncertainty in Nigerian real estate development using questionnaire data from property development and appraisal firms, analyzed through descriptive statistics and principal component analysis. They identify four broad groups of uncertainty:

influences associated with firms and stakeholders, project-team capability, economic and market data, and project information. Their results support the view that appraisal outcomes depend on more than a single construction-cost estimate. The reliability of the information available to the development team, the quality of market data and the relationships among project participants can all affect the advice provided to investors.

This study is important to the present framework because it situates material-price risk within the wider uncertainty of development decisions. However, it does not specifically estimate how material price changes flow through to residential project profitability or compare the effect of cost escalation across projects with different procurement schedules and land acquisition positions. Its contribution is therefore explanatory and contextual rather than a direct estimate of the material-cost/viability relationship. [Ogunba et al. \(2024\)](#) argue that deterministic pre-development appraisals can give misleading advice in volatile markets if they report a positive expected return without adequately representing risk and uncertainty. Their conference paper illustrates the argument using a seven-storey commercial development in Victoria Island, Lagos, and applies risk and options analysis to examine alternatives to continuing with the original scheme. The case demonstrates the practical value of sensitivity and risk analysis when market variables may change during development. The study strengthens the case for moving beyond a single-point appraisal. Its example, however, concerns a commercial development and does not directly establish the size or distribution of material price effects in residential projects. Nor should a single case be treated as a universal estimate of risk across Nigeria. Its relevance here is methodological: material price changes should be modeled as uncertain inputs and examined alongside the timing of expenditure, alternative development choices and the possibility of changing project scope.

2.4 Conceptual research and theory building

A conceptual paper must build more than a summary of previous findings. [MacInnis \(2011\)](#) states that conceptual contributions can comprise diverse theoretical work, including integrating, differentiating, explicating and relating constructs. [Jaakkola \(2020\)](#) also outlines approaches to conceptual article design and emphasizes the need for a clear purpose, a coherent conceptual logic and an explicit contribution. These perspectives are useful for the present manuscript, as its intended contribution is not a new statistical estimate; it is an integrated explanation of the conditions under which materials cost shocks affect development appraisal and decisions.

Accordingly, the review is used to identify both established insights and unresolved connections. The Nigerian material cost studies identify reported drivers and consequences; the Nigerian uncertainty research explains why appraisal information and project conditions matter; residual valuation literature clarifies the relationship between cost, land value and return; and conceptual methodology literature provides a basis for making the integration explicit. The framework should be judged on whether it defines constructs clearly, specifies causal mechanisms and boundary conditions, and generates propositions that can be tested with appropriate data.

2.5 Comparative synthesis of key studies

- [Akanni et al. \(2014\)](#) — Lagos; questionnaire plus historical price information; identifies price drivers and industry implications; limitation: not linked to project cash flows or appraisal returns.
- [Adeyemo and Aruleba \(2015\)](#) — Lagos; questionnaire based perceptions; highlights demand/supply and quality implications; limitation: perceived effects do not establish project-level financial transmission.

- [Ayodele and Olaleye \(2022\)](#) — Nigeria; questionnaire and principal component analysis; maps broader development uncertainty; limitation: does not isolate material-price shocks or residential appraisal outcomes.
- [Ogunba et al. \(2024\)](#) — Lagos commercial case; risk and options analysis; shows why deterministic appraisal can mislead; limitation: single commercial case, not a residential-sector estimate.
- Residual-appraisal studies (e.g., [Crosby et al., 2018](#); [Abdulai, 2025](#)) — clarify return rules, timing and residual sensitivity; limitation: not specifically organized around Nigerian material procurement exposure.
- Synthesis — existing work explains cost drivers, uncertainty or appraisal mechanics separately; this paper connects them through procurement exposure, land commitment, revenue/finance flexibility and project decisions. The comparison is analytical, not a claim that these studies are directly comparable statistically.

2.6 Critical synthesis of the literature

Three findings emerge from the reviewed literature. First, Nigerian studies consistently treat material price escalation as a multi causal problem involving economic conditions, transport and energy costs, supply and demand conditions and policy related influences. Second, the literature recognizes that development decisions are made under uncertainty and that deterministic appraisals can be misleading when key assumptions change. Third, residual valuation and investment appraisal research shows that development outcomes are sensitive to cost, revenue, and timing and return assumptions.

The literature is less integrated on the precise route from a materials-price change to a project's final financial position. Studies focused on material prices often measure perceived effects on development activity or construction practice, while appraisal studies focus on uncertainty and valuation methods without isolating residential material price exposure. This leaves an analytical gap between the reported existence of rising material costs and the specific appraisal mechanisms through which the shock affects project feasibility and viability.

A second gap concerns the distinction between projects that have already acquired land and projects that have not. If land is unacquired, higher development costs can reduce the residual land value that the scheme can support, all else equal. If land has already been purchased, the historic land payment is committed and the same cost increase may reduce the remaining developer surplus. A third gap concerns the amount of materials still exposed to price changes: the same percentage price increase will not have the same project effect when one developer has already procured most materials and another has not.

A fourth gap concerns the distinction between financial measures. Cost escalation can affect nominal profit, profit on cost, IRR and loan-to-cost in different ways. The direction and magnitude depend on the definition of the cost base, the timing of cash flows, the financing contract and any adjustment in completed value. A conceptual account that treats these indicators as interchangeable risks obscuring the mechanism it seeks to explain.

The research gap is analytical, not an assertion that prior work has ignored material costs. The Nigerian studies differ in location, period, evidence and dependent variable: [Akanni et al. \(2014\)](#) combine stakeholder evidence with historical price information but focus on industry-level implications; [Adeyemo and Aruleba \(2015\)](#) illuminate perceived market and quality effects but do not establish a project-level causal relationship; and [Obineme et al. \(2026\)](#) extend the discussion to

Enugu and recent conditions, yet their reported association concerns perceived impacts and development activity rather than a reconciled project cash-flow series. Ayodele and Olaleye (2022) explain broader sources of development uncertainty, while Ogunba et al. (2024) demonstrate the value of risk and options analysis in a commercial case. Neither isolates the residential material-cost transmission mechanism. Residual-appraisal studies, in turn, clarify sensitivity to cost, value, and timing and return assumptions, but are not designed specifically around Nigeria's material-price exposure. These strands are complementary, but their findings cannot simply be pooled: they examine different settings, methods and outcomes.

Across the reviewed studies, three evidence limitations recur. First, the periods and locations differ, so reported drivers and effects cannot be treated as a single national time series. Second, questionnaire rankings and perceived impacts are informative about practitioners' experience but do not, by themselves, identify the realized financial effect of a specific material-price shock. Third, construction-sector outcomes such as delay, abandonment or quality compromise are not interchangeable with project-level viability measures such as residual profit, profit on cost, net present value or internal rate of return. These distinctions limit direct comparison across studies and motivate a framework that specifies both the transmission mechanism and the outcome being explained.

2.7 Positioning and contribution of the present paper

The present paper addresses this gap through a conditional transmission framework linking;

1. material specific price exposure and outstanding procurement quantities,
2. resulting development-cost and cash-flow changes,
3. appraisal outcomes on residual land value, residual profit, profit on cost, net present value, internal rate of return and loan-to-cost and
4. adjustment conditions, including land acquisition status, selling price flexibility, contract allocation, finance and project duration.

The proposed theoretical contribution is a boundary conditioned explanation of how a common external shock may be distributed across the developer's surplus, supportable land payment, and purchaser price and project scope. This is an integration and clarification contribution, not a claim that the component theories are new.

The framework's central claim is conditional rather than universal. A price shock is expected to have a larger direct effect on remaining project cost when a high share of material quantities remains unprocured and when contracts or suppliers do not protect the developer from price changes. The effect on viability is then mediated by the ability to adjust completed values, renegotiate procurement, obtain finance or revise project scope. Land acquisition status changes the interpretation of the residual: before acquisition, the shock can reduce the land payment the scheme can support; after acquisition, the historical land payment is committed and the shock may instead reduce the developer's remaining surplus. These mechanisms generate testable propositions and make the model falsifiable rather than merely descriptive.

The contribution should therefore be understood as integration and clarification of mechanisms rather than a claim that the underlying concepts are entirely new.

3 Theoretical frameworks

3.1 Production cost theory

Production Cost reasoning establishes the relationship between the prices of construction inputs and the expenditure required to deliver a specified building. If material quantities remain unchanged, higher prices increase construction expenditure.

The framework extends this basic relationship by considering the subsequent adjustment of revenue, land value, financing and project scope. Production cost reasoning alone cannot determine which of these variables will absorb the shock.

3.2 Investment under uncertainty

Investment theory explains why changes in expected returns and uncertainty influence capital commitment. If material price escalation reduces expected returns or increases downside risk, developers may reconsider whether to proceed with the project.

The response depends on the project stage and the availability of alternatives. A developer who has already purchased land and committed to construction may face different incentives from one who has not yet acquired the site. This distinction motivates the inclusion of acquisition status and project timing in the conceptual model.

3.3 Residual valuation theory

Residual valuation provides the financial relationship between development value, development expenditure, required return and land value. Its central implication is conditional: if completed value and required developer return remain fixed, an increase in costs reduces the residual amount available for land.

Where land is already acquired, the relevant measure is the remaining project surplus after accounting for the actual land payment. This distinction explains why cost escalation may reduce profit even when the price supportable by a new appraisal has fallen.

The framework consequently treats land acquisition timing as a condition influencing adjustment, rather than presenting a categorical rejection of residual valuation theory.

3.4 Institutional and market adjustment perspective

Institutional conditions influence the capacity to adjust project costs, selling prices, finance and commitments. They may strengthen or weaken the effect of material price escalation on viability.

This perspective provides the contextual element of the framework. It recognizes that the transmission mechanism may differ across locations, housing segments and financing arrangements, and that the Nigerian setting requires analysis rather than assumption.

3.5 Theoretical integration

The four perspectives are integrated into the following sequence:

1. an external or supply side change affects material prices
2. the change alters expected expenditure according to the project's material requirements and procurement timing;

3. revised expenditure affects appraisal measures and cash flows, conditional on adjustments in revenue, land, scope and finance;
4. developers and lenders reassess whether the project remains acceptable; and
5. the resulting decisions influence completion, delay, redesign, investment and housing delivery.

The central theoretical contribution is therefore a conditional transmission and adjustment model. It explains not merely that rising costs can reduce viability, but why the magnitude and distribution of the effects depends on the structure and circumstances of each development.

4 Conceptual model

4.1 Principal constructs

The model comprises five groups of constructs. Initiating shocks include changes in material supply prices associated with exchange rates, energy, transport, production costs and supply conditions. Project exposure includes material quantities, material shares of construction expenditure, procurement timing, outstanding work and contractual allocation of price risk. Appraisal outcomes include revised total development cost, residual land value, development profit, IRR and LTC. Moderating conditions include land acquisition status, selling price flexibility, finance access, procurement flexibility and project duration. Developer responses include continuation, delay, redesign, specification changes, additional financing or abandonment.

These constructs distinguish the price movement from the amount of expenditure actually affected and from the financial outcome that follows.

4.2 Formalization of material cost exposure

Let the materials required for a project be indexed by i . Let q_i denote the quantity of material i still to be procured and Δp_i the change in its relevant price. The estimated additional material expenditure resulting from a price change is given by Equation (1):

$$\Delta C_m = \sum_{i=1}^n q_i \Delta p_i \quad (1)$$

This expression assumes that the relevant quantities are fixed over the calculation period. If the design or materials mix changes, the quantities must be updated and the effects of price and quantity changes separated.

The expression also concerns the materials still exposed to procurement price changes. It does not imply that every material in the original bill of quantities is purchased at the revised price.

The total development cost effect is broader:

$$\Delta C_d = \Delta C_m + \Delta C_o \quad (2)$$

where ΔC_d is the change in total development cost and ΔC_o represents changes in other cost categories, including labour, equipment, professional fees, finance and other relevant expenditure. In an empirical application, the two components must be measured separately to avoid attributing all cost growth to materials.

4.3 Residual land value and development profit

Let GDV denote gross development value, C_b building and other development costs excluding land, L land acquisition cost, P_r the required developer profit allowance and C_t total development cost including land and all other relevant costs.

For a proposed development where the land has not been purchased, residual land value may be expressed as:

$$RLV = GDV - C_b - P_r \quad (3)$$

This simplified expression assumes that C_b includes all relevant costs other than land and that the required profit allowance is treated separately. The calculation must be adapted if taxes, finance or other items are defined differently.

For a project in which land has already been acquired, the residual project surplus may be expressed as:

$$P = GDV - C_t \quad (4)$$

where P is the residual surplus under the stated cost and revenue assumptions. These equations show why land acquisition status matters. In the first calculation, the land value is the unknown residual. In the second, the historic land payment forms part of the cost base, so an increase in other costs reduces the remaining surplus if revenue and all other costs remain unchanged.

A discounted cash flow appraisal may be needed when timing materially affects the result. In that case, the relevant outcome is determined by the sequence of dated cash flows rather than by the nominal residual alone.

4.4 Profit on cost, IRR and LTC

Profit on cost is defined for this framework as:

$$PoC = \frac{P}{C_t} \times 100 \quad (5)$$

where P is the defined development surplus and C_t is total development cost under the same accounting convention. The treatment of finance costs, tax and contingency must be stated consistently.

IRR is defined by the cash-flow equation:

$$0 = \sum_{t=0}^T \frac{CF_t}{(1+r)^t} \quad (6)$$

where CF_t represents the project's net cash flow at time t , T is the final period, and r is the internal rate of return. This formulation assumes conventional period-based cash flows; irregularly dated cash flows require a corresponding dated cash flow calculation.

LTC is defined as:

$$LTC = \frac{D}{C_e} \times 100 \quad (7)$$

where D is the specified loan amount and C_e is the eligible development cost base defined by the lender. If the loan amount remains unchanged and eligible costs rise, LTC declines. If the lender

increases the loan, changes the cost definition or alters the breakdown structure, the observed result may differ.

4.5 Proposed causal sequence

The conceptual model proposes that material price escalation affects development viability through revised expenditure and cash flows. The resulting financial effects are conditional on revenue adjustment, land acquisition, financing, procurement and construction timing.

The relationship is not assumed to be deterministic. A project can absorb some of the shock through advance procurement or design changes, while another project with the same initial materials share may experience a larger reduction in profit because its remaining expenditure is greater or its selling price is constrained.

Construction delays may also generate feedback. Delayed completion can increase finance and holding costs, leaving more expenditure exposed to later price movements. The framework therefore recognizes the possibility of interacting effects rather than treating all variables as independent.

4.6 Boundary conditions

The framework is most directly applicable to formal residential development with an identifiable appraisal, cost plan, financing arrangements and completion objective. Its predictions require adaptation where construction is incremental, financing is predominantly informal, materials are purchased in small quantities over a period, or the project is not intended to generate a conventional developer profit.

The model is also conditional on the quality of the underlying cost and revenue data. Where project records do not distinguish material expenditure from other costs, the material specific transmission mechanism cannot be identified reliably.

5 Testable propositions and future research design

The framework generates five propositions. Each is intended to guide future empirical research and is not presented as an established finding.

5.1 Proposition 1: Material price escalation and cost overruns

P1: Greater material price escalation is positively associated with total development cost overruns in formal residential projects, controlling for project characteristics, procurement timing, scope changes and other cost movements.

This proposition requires matched original and revised project budgets, together with material specific procurement information. Total cost overruns should be separated into materials, labour, equipment, finance and other relevant components.

5.2 Proposition 2: Material price escalation and developer returns

P2: Holding completed development value and other relevant assumptions constant, greater material expenditure reduces the residual surplus available to the developer and may reduce IRR when the timing and magnitude of project cash flows are adversely affected.

The conditional formulation matters. Selling price increases, cost saving redesign or favourable financing may offset part of the effect. IRR must be calculated from dated cash flows rather than inferred from a change in total expenditure alone.

5.3 Proposition 3: Land acquisition status and cost shock allocation

P3: The relationship between material price escalation and realized developer profit differs according to whether land was acquired before the cost shock or remained uncommitted, after accounting for project characteristics and market conditions.

Testing the proposition requires separate measures of historical acquisition cost, current market land value and residual land value. The analysis must not treat these quantities as interchangeable

5.4 Proposition 4: Finance and project resilience

P4: More favourable development finance terms moderate the relationship between material price escalation and selected project viability outcomes, with the magnitude of the moderation depending on the amount, timing and conditions of finance.

Finance may reduce liquidity pressure and prevent delays without restoring an inadequate underlying development surplus. The outcome should therefore be defined precisely, such as project profit, completion delay or IRR.

5.5 Proposition 5: Construction duration and cumulative exposure

P5: The association between material price escalation and development cost overruns is stronger where a larger proportion of the project's material requirements remain unprocured and exposed to subsequent price changes after controlling for project characteristics and other cost movements.

This proposition focuses on the mechanism through which procurement timing and remaining construction work affect exposure. Construction duration alone is not a sufficient measure: a longer project may have lower exposure if its materials were secured early, while a shorter project may face substantial exposure if procurement remains outstanding.

5.6 Required data

Testing the propositions requires project level observations rather than perceptions of cost escalation alone. The preferred dataset should contain: project location, type, size, specification, construction method and planned duration; original and revised cost plans, including treatment of land, finance, contingency and professional fees, material quantities, procurement dates, prices paid and outstanding material requirements, original and realized development value, where available, land acquisition dates, contractual commitments and relevant market value information, construction start and completion dates, delays, redesigns and changes in specification, loan commitments, actual borrowing, financing terms and disbursement dates, and project outcomes, including completion, delay, redesign or abandonment.

The sample should include projects that experienced different outcomes. A dataset containing only completed development could under represent projects most affected by cost escalation.

5.7 Analytical approach

The research should begin with descriptive analysis of material price changes, procurement exposure, total cost overruns and revised appraisal outcomes. Projects should be compared across relevant characteristics, including location, housing segment project scale, land acquisition status and construction duration.

P1 may be investigated using a regression model with total cost overrun as the outcome and material price escalation as a principal explanatory variable. Other cost movements, procurement arrangements, scope changes and project characteristics should be included where data permit.

P2 requires separate analysis of development profit, residual land value and IRR. The definitions must remain consistent across projects, and the research should distinguish appraisal stage expectations from realized outcomes. Sensitivity analysis should examine alternative assumptions about completed value, finance and project timing.

P3 requires comparison of projects according to land acquisition status and timing. The analysis should control for differences in project type, location and market conditions. Where current market land values cannot be established reliably, the limitation should be acknowledged rather than addressed through assumed values.

P4 may be investigated through an interaction between material price exposure and a clearly measured financing variable. The study should distinguish access to concessionary finance from the actual terms, amount and timing of the funding.

P5 requires a measure of outstanding material procurement exposure rather than project duration alone. Where possible, the research should use the quantity or value of materials remaining to be purchased at the time of the price change.

Across the analysis, researchers should report model assumptions, missing data procedures, uncertainty intervals, sensitivity checks and diagnostic results. Regression coefficients should not automatically be interpreted as causal effects. Causal claims require a defensible identification strategy and evidence that the observed relationship is not primarily explained by omitted variables or selection into particular project and financing arrangements.

5.8 Methodological limitations

Project level data may be commercially sensitive, incomplete or inconsistent. Historical cost plans may use different accounting conventions, while material prices may not be recorded at the same frequency or level of detail.

Selection bias is another concern. Developers may be more likely to retain records for completed projects than for abandoned schemes. Price changes may also coincide with changes in scope, finance and construction schedules, making it difficult to isolate the independent contribution of materials.

These challenges do not invalidate the framework, but they limit the conclusions that can be drawn from a poorly specified empirical test. Future studies should document the limitations and avoid claiming that a relationship is causal when the evidence supports only an association.

6 Numerical demonstrations and sensitivity analysis

6.1 Base illustration

Consider a hypothetical residential development with an initial total development cost of 100 monetary units. Assume that construction accounts for 55 units and materials represent 60% of construction expenditure. The initial materials component is therefore 33 units.

If the prices of the relevant materials rise by 40%, and all the materials required for the calculation remain exposed to the increase, additional materials expenditure is:

$$\Delta C_m = 33 \times 0.40 = 13.2$$

Revised total development costs become 113.2 units, assuming no other cost changes.

Suppose the initial gross development value is 122 units, initial development profit is 22 units, giving a profit on cost ratio of 22%. If gross development value remains fixed at 122 units, revised profit is:

$$P_1 = 122 - 113.2 = 8.8$$

The revised profit on cost ratio is:

$$PoC_1 = (8.8 / 113.2) \times 100 = 7.77\%$$

The example illustrates the potential sensitivity of a development's margin to a material price shock. It is a hypothetical calculation, not evidence of an observed price increase or actual Nigerian project performance.

6.2 Sensitivity to revenue adjustment

The effect changes if completed development value can increase. In the same illustration, suppose completed value rises by 5% from 122 units to 128.1 units, while total cost remains 113.2 units. The revised surplus would be 14.9 units, giving a profit on cost ratio of approximately 13.16%.

This second scenario does not imply that a 5% selling price increase is achievable in any particular Nigerian market. It demonstrates that the effect of material escalation depends partly on revenue flexibility.

6.3 Sensitivity to the timing of procurement

The initial calculation assumes that all 33 units of materials expenditure remain exposed to the 40% increase. If only half the materials expenditure remains unprocured, the additional cost under the same price assumption would be:

$$\Delta C_m = 33 \times 0.50 \times 0.40 = 6.6$$

Revised total development cost would then be 106.6 units, assuming other costs remain unchanged. With gross development value fixed at 122 units, the remaining surplus would be 15.4 units.

This scenario demonstrates why procurement timing and the amount of outstanding work are central to the conceptual framework. A project specific analysis must use actual outstanding quantities and relevant purchase price rather than assume that all materials experience the same exposure.

6.4 Interpretation

The illustrations demonstrate three points. First, the effect of materials-price escalation depends on the materials share of the cost base. Second, the amount of material expenditure still exposed to the price change affects the additional cost. Third, the effect on profitability depends on whether completed value and other project variables can adjust.

The calculations do not establish actual Nigerian price movements, profit thresholds or project outcomes. They clarify the proposed mechanism and provide a transparent basis for future sensitivity analysis.

7 Implications for appraisal, finance and housing policy

7.1 Development appraisal

Appraisers should avoid relying exclusively on a single estimate of construction cost when material prices are volatile and the construction period is extended. A more informative appraisal would identify the principal material exposures, estimate the timing of procurement and test alternative cost and revenue assumptions.

Residual valuation and discounted cash flow analysis should be used according to their respective purposes. Residual land value is useful for estimating the land price that a scheme can support, while cash flow analysis is necessary when timing, financing and phased expenditure materially affect returns.

Appraisal reports should distinguish profit on cost, profit on gross development value and IRR. They should also disclose the treatment of finance, contingency, taxes and other costs. Without consistent definitions, comparisons between projects may be misleading.

The use of scenario analysis should not be confused with predicting future prices precisely. Its purpose is to make uncertainty visible and show how the appraisal changes under stated assumptions.

7.2 Cost monitoring and information quality

The framework supports the development of transparent building materials price monitoring systems. A useful system would distinguish material categories, locations, product specifications and relevant procurement periods. It would also document the methodology, coverage weighting, base period and revision policy.

A construction materials index would not, by itself, measure all development cost inflation; labour, equipment, transport, finance and other costs should be treated separately where they materially affect the project.

Reliable price information could improve appraisal consistency, public procurement and future research. It could also help developers distinguish price changes attributable to materials from changes caused by project scope, wastage or delays.

7.3 Development finance

Finance may help developers manage temporary cash flow pressures, but it cannot automatically restore the economic viability of every project. Additional borrowing may introduce repayment

obligations and further interest costs. The outcome depends on the cost of finance, the amount available, the timing of disbursement and the revenue expected from the completed scheme.

Lenders could consider construction cost sensitivity alongside conventional loan to cost and collateral measures. Contingency arrangements and monitoring requirements may improve transparency, provided that they are consistent with the lending contract and do not create uncontrolled additional borrowing.

Any concessionary finance programme should be assessed against measurable outcomes, including project completion, affordability, financing costs and the extent to which support reaches the intended housing segment

7.4 Land development policy

Land policy should recognize the distinction between historical acquisition cost, current market value and residual land value. These measures answer different questions and should not be used interchangeably in appraisals or policy analysis.

When land has not been acquired, higher development costs may reduce the residual amount that a scheme can support as a land payment. Where the site has already been acquired, the same cost increase may reduce the developer's remaining surplus. The resulting burden depends on market adjustment and the flexibility of other project variables.

This distinction is particularly relevant to the design of land and development interventions. Policies that improve land administration or infrastructure may influence land supply and development costs, but their effects should be assessed in relation to the full project economics rather than assumed to produce a particular distribution of benefits.

7.5 Housing affordability and supply

Higher development costs may affect housing affordability through selling prices, product specification, profit margin or the quantity of housing delivered. The relative importance of these channels will vary with household purchasing power, competition, finance and project characteristics.

The framework therefore cautions against treating cost pass-through as inevitable. A developer may increase selling prices where demand permits, but may instead revise the scheme or defer construction where affordability is constrained. These responses can have different consequences for housing quality, the income groups served and the pace of delivery.

Future empirical research should assess these outcomes separately rather than infer them from changes in material prices alone.

8 Conclusion

This paper has developed a conceptual framework for explaining how rising building materials costs may affect the financial feasibility and viability of formal residential property development in Nigeria. The framework integrated production cost reasoning, investment under uncertainty, residual land valuation and institutional market adjustment to explain the relationship between input price shocks, appraisal outcomes and developer decisions.

Its principal contribution is the treatment of cost shock allocation as a conditional process. Higher materials expenditure may reduce development profit, lower residual land value, affect IRR or change

financing requirements. The relative importance of these effects depends on procurement timing, land acquisition status, selling price flexibility, financing terms and capacity to alter project scope.

The framework also clarified an important distinction in development appraisal. A lower residual land value does not automatically protect the profit of a developer who has already acquired land at fixed price, it describes a revised land bid under the appraisal assumptions, not retrospective reduction in the amount paid. Conversely, developer profit is not necessarily the only adjustment mechanism; selling prices, procurement, finance and project scope may also change, but each response is constrained by market demand, contracts, funding availability and technical requirements.

Five propositions have been developed for future empirical testing. Their evaluation requires matched appraisal stage and completion stage project data, material price histories, financing information and consistent definitions of development returns. The proposed numerical demonstrations clarify the model's mechanics but do not constitute evidence of actual market outcomes.

For practitioners, the framework supports transparent cost assumptions, sensitivity analysis and consistent appraisal definitions. For policy makers and lenders, it highlights the importance of reliable cost information and interventions tailored to the financial constraints of specific residential markets.

The paper does not claim that one mechanism explains every Nigerian development or that its propositions have already been empirically established. Its contribution is to provide an integrated explanatory structure through which these relationships can be examined systematically. The next step is a source verified empirical investigation capable of determining how strongly the proposed mechanisms operate across locations, housing segments and stages of development.

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