Real Options and Strategic Investment Decisions under Uncertainty in an SME Expansion Project in Ecuador

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ABSTRACT

This study evaluates the financial and strategic viability of expanding a gastronomic business by opening a new branch in Quito, Ecuador, under conditions of uncertainty. Traditional investment appraisal methods, such as Net Present Value (NPV) and Internal Rate of Return (IRR), are combined with a real options approach to provide a more comprehensive evaluation framework. While conventional techniques offer a static perspective on expected cash flows, they fail to capture the value of managerial flexibility in dynamic and uncertain environments.

To address this limitation, the Black–Scholes model is applied to estimate the value of the strategic flexibility associated with the investment decision. The results indicate that the project is financially viable, with a positive NPV and a high IRR. Additionally, the real options valuation reveals a significant strategic premium, reflecting the value of flexibility in adapting to changing market conditions.

The findings highlight that incorporating real options into investment analysis enhances decision-making by accounting for uncertainty and strategic adaptability. This approach is particularly relevant for sectors such as the gastronomic industry, where market volatility and external risks play a critical role. The study contributes to the literature by demonstrating the practical application of advanced financial methodologies in emerging market contexts and supports more resilient and informed investment decisions.

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1. Introduction

Investment project evaluation plays a critical role in ensuring business sustainability and long-term competitiveness in increasingly dynamic and uncertain economic environments. traditionally, investment decisions have relied on static financial techniques such as net present value (NPV) and internal rate of return (IRR). Although these methods provide a clear estimation of expected cash flows and project profitability, they are based on assumptions of stability and managerial passivity, limiting their ability to capture the strategic value of flexibility under uncertainty (Ewald & Taub, 2022; Henderson & Hobson, 2002). As a result, conventional approaches may underestimate investment opportunities characterized by volatile market conditions and evolving strategic decisions.

In response to these limitations, the real options (RO) approach has gained increasing relevance as a complementary framework for investment evaluation under uncertainty. Unlike traditional methods, real options analysis incorporates managerial flexibility by recognizing the firm's ability to adapt investment decisions over time through actions such as deferring, expanding, contracting, or abandoning projects (Myers, 1977; Myers & Majd, 1990). This perspective is particularly valuable in volatile business environments, where strategic adaptability can become a significant source of competitive advantage and value creation.

Recent literature has highlighted the growing importance of real options reasoning in entrepreneurial and small-firm decision-making. However, most existing studies continue to focus primarily on large corporations and capital-intensive sectors such as energy, mining, infrastructure, and technology (Alinasab & Hunt, 2025). Comparatively limited attention has been devoted to small and medium-sized enterprises (SMEs), particularly those operating in service-oriented industries and emerging economies. This gap is especially evident in the gastronomic sector, where investment decisions are highly sensitive to fluctuations in consumer demand, macroeconomic instability, inflationary pressures, and changing market conditions.

Furthermore, previous research has largely concentrated on the financial valuation of projects, while comparatively fewer studies have explored the role of real options in supporting entrepreneurial growth and strategic expansion decisions under uncertainty. This challenge becomes even more significant in SMEs, where investment decisions are frequently constrained by limited financial resources and higher exposure to market uncertainty. According to Ahi et al. (2017), small firms often rely on incremental and flexible decision-making processes when evaluating expansion opportunities under uncertain conditions. This limitation is particularly relevant in emerging markets such as Ecuador, where firms frequently operate under conditions of economic volatility, insecurity, and restricted access to financing. In such contexts, the incorporation of managerial flexibility into investment evaluation becomes especially important for improving strategic decision-making and mitigating risk.

In this context, the present study contributes to the literature in three main ways. First, it extends the application of real options analysis to the gastronomic sector, an area that remains underexplored in the real options literature. Second, it provides empirical evidence from an emerging economy, contributing to the limited body of research focused on Latin American business environments. Third, the study integrates traditional financial evaluation techniques with a strategic real options perspective to assess entrepreneurial expansion decisions under uncertainty (Alinasab & Hunt, 2025).

The study focuses on the Ecuadorian gastronomic industry, a sector that has experienced significant growth in recent years but remains highly exposed to macroeconomic risks and market uncertainty (Central Bank of Ecuador, 2023; Rodríguez, 2021). Within this context, the research examines Company A S.A., a firm operating in Ambato and Baños de Agua Santa that is considering expansion through the opening of a new branch in Quito. For confidentiality reasons, the name of the company analyzed in this study has been replaced with a fictitious name. The investment decision is particularly complex given the company's previous experience in the capital city, where a forced closure during the coronavirus disease 2019 (COVID-19) pandemic highlighted the vulnerability of traditional investment approaches and the need for more flexible analytical frameworks.

The main objective of this research is to evaluate the financial and strategic feasibility of opening the new branch in Quito through the integration of traditional financial methods and real options analysis. Specifically, the study seeks to (1) determine the project's expected profitability using static evaluation techniques such as NPV and IRR, (2) identify and value strategic flexibility options associated with the investment project, and (3) evaluate alternative investment and financing strategies under conditions of uncertainty.

Overall, the study aims to provide a more comprehensive framework for investment decision-making by incorporating both financial profitability and strategic adaptability into project evaluation. In doing so, it contributes to the advancement of real options applications in SMEs operating in emerging and service-oriented markets while also offering practical implications for entrepreneurial expansion decisions under uncertainty.

2. Theoretical Framework

2.1. Limitations of Traditional Methods and Advances toward Real Options

Traditional investment evaluation methods are generally based on the assumption of relatively stable market conditions that allow firms to estimate future cash flows with reasonable accuracy (Calle & Tamayo, 2009). However, contemporary business environments are increasingly characterized by economic volatility, rapid technological change, and uncertain market dynamics, all of which significantly affect investment decisions. Under these conditions, static evaluation techniques such as net present value (NPV) and internal rate of return (IRR) may present important limitations, as they assume passive management and irreversible investment decisions.

In response to these limitations, the real options (RO) approach has emerged as a complementary framework for evaluating investment projects under uncertainty. Derived from financial option theory, real options incorporate managerial flexibility into investment analysis by recognizing that firms may adjust strategic decisions over time in response to changing market conditions. This flexibility allows managers to defer, expand, contract, or abandon projects depending on the evolution of uncertainty and expected returns (Trigeorgis, 1996).

Recent studies have reinforced the importance of real options as a strategic mechanism for managing uncertainty and preserving flexibility in investment decisions. For example, Kyriakopoulos, Narooz, and Ji (2025) argue that firms operating in emerging markets tend to adopt lower-commitment investment strategies in uncertain environments, highlighting flexibility as a critical strategic asset. Similarly, Brach (2021) emphasizes that real options analysis not only improves project valuation but also supports strategic planning by incorporating multiple future scenarios into the decision-making process.

The increasing relevance of real options is closely associated with their ability to capture the value of adaptability in highly volatile environments. According to Brandão et al. (2012), managerial flexibility allows firms to respond dynamically to changing market conditions, reducing long-term investment risk and improving strategic positioning. From a strategic management perspective, real options also contribute to reducing downside risk by allowing firms to preserve adaptive capacity under uncertain market conditions. Belderbos, Tong, and Wu (2014) argue that flexibility-oriented investment structures may strengthen organizational resilience and reduce exposure to adverse economic scenarios. This perspective is especially important in sectors exposed to significant uncertainty, where traditional valuation methods may underestimate the value of future growth opportunities.

An important contribution of the real options approach is the recognition that delaying investment decisions may generate strategic value under uncertainty. Lin and Yang (2020) suggest that firms can benefit from postponing investments until market conditions become more favorable, thereby reducing exposure to adverse economic fluctuations. In this sense, the option to wait represents a mechanism for mitigating risk while preserving future growth opportunities. The concept of real options was initially introduced by Myers (1977), who proposed that many real assets could be interpreted as options whose value depends on future discretionary investment decisions. Since then, real options have evolved into a strategic framework integrating finance, uncertainty, and managerial decision-making. Unlike traditional approaches, which focus exclusively on expected cash flows, real options analysis recognizes that flexibility itself constitutes an additional source of project value (Bailey et al., 2004).

The literature identifies several forms of managerial flexibility embedded in investment projects. Among the most relevant are the option to defer investment, the option to expand operations under favorable market conditions, the option to contract activities during adverse periods, and the option to abandon projects to limit losses (Amram & Kulatilaka, 2000; Mascareñas, 2015). These strategic alternatives allow firms to adapt investment decisions according to evolving economic conditions and uncertainty levels.

Despite their advantages, real options approaches also present important limitations. Their practical application often requires complex valuation procedures and assumptions regarding uncertainty, volatility, and market behavior that may be difficult to estimate accurately, particularly in emerging economies and privately held firms. Furthermore, some valuation models were originally developed for financial assets traded in efficient markets, which may limit their direct applicability to real investment projects.

Several methodologies have been proposed for valuing real options under uncertainty. According to Hinojosa (2008), these methodologies can be classified into three main categories. First, analytical approaches such as the Black–Scholes model are commonly applied to projects that resemble financial call options. Second, discrete-time methods, including binomial tree models, allow uncertainty and managerial decisions to be represented over multiple periods. Third, simulation-based approaches, such as Monte Carlo methods, enable the incorporation of multiple sources of uncertainty through the generation of alternative scenarios.

Overall, real options analysis provides a broader framework for investment evaluation by integrating uncertainty, strategic flexibility, and managerial adaptability into the decision-making process. As a result, this approach has become increasingly relevant for firms operating in dynamic and uncertain environments, particularly in emerging markets and service-oriented industries.

2.2. Black–Scholes Model

The Black–Scholes model, developed by Black, Scholes, and Merton, constitutes one of the most widely used analytical approaches for option valuation. Originally designed for pricing financial derivatives, the model establishes a relationship between the value of an option and the behavior of its underlying asset through the construction of a hedged portfolio under conditions of market equilibrium (Álvarez, Ortega, Sánchez, & Herrera, 2004). The Black–Scholes framework represented a major advancement over traditional discounted cash flow approaches because it explicitly incorporated uncertainty and volatility into valuation analysis (Amram & Kulatilaka, 2000). In the context of real investment projects, the model has been adapted to estimate the value of managerial flexibility under uncertain market conditions.

The model assumes several theoretical conditions, including efficient financial markets, absence of transaction costs and taxes, free access to information, constant volatility, and European-style options (Pareja, Marrero, Molina, & Ramírez, 2011). Although these assumptions may not fully reflect real business environments, particularly in emerging economies, the model remains widely used owing to its analytical simplicity and its capacity to approximate the strategic value associated with investment flexibility.

Despite its usefulness, the Black–Scholes model also presents important limitations when applied to real assets. Unlike financial securities, investment projects are not continuously traded in organized markets, making parameters such as volatility more difficult to estimate accurately. Furthermore, real investment decisions often involve managerial interventions and sequential strategic decisions that may not be fully captured by the model's assumptions. Consequently, the valuation obtained through Black–Scholes should be interpreted as an approximation of the strategic value generated by flexibility rather than as an exact market valuation.

Nevertheless, the Black–Scholes approach remains one of the most widely adopted methodologies in real options analysis owing to its ability to incorporate uncertainty, risk, and managerial adaptability into investment evaluation. For this reason, it provides an appropriate framework for analyzing entrepreneurial expansion decisions under uncertain market conditions.

3. Methodology

This study adopts a quantitative case study approach based on financial modeling and real options analysis to evaluate the feasibility of opening a new branch of Company A S.A. in Quito, Ecuador. The methodological design combines traditional capital budgeting techniques with a real options framework to assess investment decisions under uncertainty.

The quantitative analysis is based on historical financial information from the company covering the period 2019–2023, together with projected cash flows for a 5-year horizon. Traditional financial indicators, including net present value (NPV), internal rate of return (IRR), profitability index (PI), payback period, and equivalent annual cost (EAC), were calculated to determine the project's baseline financial viability.

To complement the static evaluation, the Black–Scholes model was applied as a real options valuation method to capture the strategic value of managerial flexibility under uncertain market conditions. This approach allows the incorporation of volatility, uncertainty, and future strategic adaptation into the investment analysis, providing a more comprehensive assessment of the project's potential value.

3.1 Application of the Black–Scholes Model

The Black–Scholes model is commonly used to value financial options and can be adapted to assess real options. This model complements traditional evaluation methods by incorporating flexibility and strategic options that are typically not captured in conventional approaches, such as the ability to expand, abandon, or defer a project in response to market changes.

The main components of the model are as follows:

- *C*: Call option price (represents the value of the project's flexibility) .
- *S*: Current value of the underlying asset (in this case, the NPV).
- *K*: Exercise price (total investment cost).
- *r*: Risk-free interest rate (in this case, 5%).
- *T*: Time to maturity (5 years).
- *σ* (sigma): Volatility (25%).
- $N(d_1)$ and $N(d_2)$: Values of the cumulative distribution function (CDF) of the standard normal distribution evaluated at d_1 and d_2.

There are several formulations for applying this model; however, for the purposes of this study, the following expression is used:

$$C = S \times N(d_1) - K \times e^{-rT} \times N(d_2)$$

The Black–Scholes equation is traditionally used to value financial options; however, it can also be applied to the valuation of investment projects when the objective is to capture flexibility and the strategic value of decision-making under uncertainty. In this study, the model is applied to evaluate the opening of a new branch of Company A S.A. in Quito. The determination of the key parameters is presented below.

Although the Black–Scholes model was originally developed for financial options, its adaptation to real investment projects has been widely discussed in the real options literature owing to its ability to quantify the economic value of managerial flexibility under uncertainty. In this study, the model is considered appropriate because the investment opportunity shares several characteristics with financial call options, including irreversibility, uncertainty regarding future returns, and managerial discretion concerning project execution.

The selection of the Black–Scholes framework is also justified by its analytical simplicity and its extensive use in previous real options studies focused on investment valuation. Nevertheless, the limitations of the model must be acknowledged. Unlike financial assets, real investment projects are not continuously traded in efficient markets, and some assumptions of the model—such as constant volatility and perfect market conditions—may not fully hold in real business environments. Therefore, the results should be interpreted as an approximation of the strategic value of flexibility rather than as an exact market valuation.

Current Value of the Underlying Asset (*S*)

In the Black–Scholes model, the current value of the underlying asset represents the value of the asset on which the option is based. In this case, the underlying asset is interpreted as the present value of the project's expected future cash flows. The present value of projected cash flows amounts to 258,672 USD, representing the discounted economic value generated by the project over the evaluation horizon. The net present value obtained through the traditional discounted cash flow analysis amounts to 164,675.52 USD. However, according to real options theory, the Black–Scholes framework requires the use of the present value of expected cash flows as the underlying asset. Therefore, the selected value for the underlying asset is *S* = 258,672 USD.

Exercise Price *(K)*

The exercise price represents the cost required to undertake the investment. In the context of this project, it corresponds to the total costs associated with opening the new branch, including both the initial investment and operating costs. These costs comprise expenditures such as machinery, furniture, decoration, and civil works, among others. The exercise price represents the total initial investment required to undertake the project, including infrastructure adaptation, equipment, furniture, and operational setup costs associated with opening the new branch. It is important to distinguish between the initial direct investment considered in the traditional discounted cash flow analysis and the broader strategic investment commitment incorporated into the real options valuation. In the traditional financial evaluation, the amount of 94,000 USD represents the initial direct financial outlay required to initiate the project, which serves as the basis for the NPV and IRR calculations. This amount primarily includes the immediate capital expenditures associated with launching the new branch. In the Black–Scholes framework, the exercise price corresponds to the initial investment required to undertake the project. Consequently, the selected exercise price is *K* = 94,000 USD. This broader valuation includes not only the initial implementation costs but also complementary operational expenditures, infrastructure adaptation, working capital requirements, and additional strategic expansion costs associated with maintaining operational flexibility under uncertain market conditions. Consequently, the valuation remains consistent with the standard interpretation of real options theory, where the underlying asset corresponds to the expected project cash flows and the exercise price represents the initial investment required to execute the project.

Time to Maturity *(T)*

Time to maturity refers to the period during which the option remains valid. For investment projects, this parameter corresponds to the evaluation horizon or the period over which the project is expected to generate sufficient returns to justify the investment. In this case, a 5-year horizon is used, consistent with the projected cash flow period. Selected value: T = 5 years.

Risk-Free Interest Rate *(r)*

The risk-free interest rate represents the guaranteed return of a riskless investment, such as government bonds. It reflects the cost of money without assuming risk. A rate of 5% is selected, on the basis of US Treasury bonds with a 5-year maturity, which is a common benchmark in international investment analysis. Selected value: r = 0.05 (5%).

Volatility *(σ)*

Volatility represents the uncertainty associated with the project's expected future returns and constitutes one of the most critical parameters in real options valuation. In this study, a volatility level of 25% was adopted on the basis of three main considerations. First, historical profitability data from Company A S.A. reveal fluctuations in net margins over recent years, particularly during periods affected by external shocks such as the COVID-19 pandemic. Second, the gastronomic sector in Ecuador is characterized by moderate to high sensitivity to macroeconomic instability, changes in consumer demand, inflationary pressures, and security-related concerns, all of which increase uncertainty regarding future cash flows. Third, the selected volatility level is consistent with previous studies on real options in emerging and service-oriented markets, where medium volatility assumptions are commonly used in the absence of publicly traded market data.

Although the volatility estimate is based on reasonable financial and sectoral assumptions, it should be interpreted cautiously owing to the inherent limitations associated with private company data and emerging market conditions.

Calculation of d_1 and d_2

The following formulas are used to calculate and (Black & Scholes, 1973):

$$d_1 = [\ln(S \div K) + (r + \sigma^2 \div 2) \times T] \div (\sigma \times \sqrt{T})$$

$$d_2 = d_1 - \sigma \times \sqrt{T}$$

By applying the calculated values of d_1 and d_2, together with the risk-free interest rate, the value of the call option C is obtained. This value represents the price of the flexibility available to the firm to proceed with the opening of a new branch and captures the additional value associated with the option to undertake the project under conditions of uncertainty.

4. Results

4.1 Financial Analysis Based on Traditional Methods

To evaluate the feasibility of opening a new branch of Company A S.A. in Quito, traditional financial analysis methods were applied using the company's historical financial statements (2019–2023) and 5-year projections. The evaluation considered the required initial investment, projected cash flows, and key financial indicators, including net present value (NPV), Internal rate of return (IRR), profitability index (PI), payback period, and equivalent annual cost (EAC).

A discount rate of 10% was applied, taking into account several relevant factors to ensure a rigorous financial analysis. This rate reflects the company's cost of capital, including both the cost of debt and the expected return required by investors. It also incorporates expected inflation within the Ecuadorian context, ensuring that projected cash flows are expressed in real terms. Additionally, a risk premium is included to account for the inherent uncertainty of the project, considering the company's prior experience in Quito and the challenges faced during the COVID-19 pandemic. Finally, the 10% rate is consistent with standard practices in the Ecuadorian gastronomic industry, providing an appropriate benchmark for evaluating project feasibility (Calle Fernández & Tamayo Bustamante, 2023; Támara Ayús, Forero Corrales & Gil Osorio, 2019; González-Echeverri, Mora-Valencia & Solano, 2015; Muñoz Saravia & Álvarez, 2009; Albornoz, Canales & Fazzi, 2006).

Table 1. Financial Summary of the Project (Quito Branch)

Concept	Value (USD)
Initial investment	94,000
Present value of cash flows (5 years, 10%)	258,672
Net present value (NPV)	164,672
Internal rate of return (IRR)	55%
Profitability index (PI)	2.75
Payback period (years)	2
Equivalent annual cost (EAC)	51,734

The results indicate that the initial investment would be recovered in approximately 2 years, while the positive NPV and a profitability index greater than one suggest that the project generates additional value over the invested capital. The high IRR indicates an attractive return; however, it is advisable to reassess the assumptions regarding revenues and costs to ensure a conservative estimation. Overall, these indicators support the financial viability of the project and provide a solid basis for complementing the analysis with real options, considering strategic flexibility in the face of uncertainty in the Ecuadorian market.

4.2 Application of the Black–Scholes Model

The valuation of real options has emerged as a robust extension of traditional investment appraisal techniques, particularly in contexts characterized by high uncertainty and strategic flexibility. In contrast to conventional methods such as net present value (NPV), which assume predetermined and irreversible decisions, the real options approach explicitly incorporates managerial flexibility as a source of value. This is especially relevant in dynamic and uncertain environments, where the ability to adapt investment decisions over time constitutes a strategic advantage.

In this study, the Black–Scholes model—originally developed for pricing financial derivatives—is adapted to estimate the strategic value associated with the decision to open a new branch of Company A S.A**.** in Quito. By conceptualizing the investment opportunity as a call option, the model captures the firm's right, but not the obligation, to undertake the project, thereby incorporating the value of waiting, expanding, or abandoning the investment depending on future market conditions.

The suitability of the Black–Scholes framework in this context lies in its capacity to formalize uncertainty and translate it into quantifiable economic value. While the traditional NPV approach provides a static assessment of expected cash flows, it fails to account for the dynamic nature of managerial decision-making. In contrast, the real options approach recognizes that investment timing is itself a strategic variable, allowing firms to respond optimally to evolving market signals.

$N(d_1)N(d_2)$ The model is specified through the following parameters: the value of the call option (*C*), representing the strategic value of flexibility; the current value of the underlying asset (*S*), represented by the present value of expected project cash flows; the exercise price (*K*), corresponding to the total investment cost; the risk-free interest rate (*r*); the time to maturity (*T*); and volatility (*σ*), capturing uncertainty in project returns. Additionally, and denote the cumulative distribution functions of the standard normal distribution, which adjust expected outcomes for risk.

The valuation is conducted using the standard Black–Scholes formulation:

$$C = S \times N(d_1) - K \times e^{-rT} \times N(d_2)$$

This formulation integrates both the expected value of the project under uncertainty and the probability that the investment will be economically viable. Specifically, $N(d_1)$ reflects the risk-adjusted expected payoff of the project, while $N(d_2)$ captures the likelihood that the project value exceeds the investment cost. As such, the model provides not only a measure of expected profitability but also a quantification of the strategic value embedded in managerial flexibility.

Determination of Model Parameters

To ensure methodological rigor, the key parameters of the model were carefully defined and estimated on the basis of the project's financial characteristics and the firm's historical performance. This calibration allows the model to realistically capture both the economic fundamentals of the investment and the uncertainty inherent in the operating environment.

Parameter Estimation and Model Implementation

1. Current value of the underlying asset (*S*)

The parameter *S* represents the current value of the project, proxied by the net present value (NPV) obtained through traditional financial analysis. In this case, the present value of expected cash flows amounts to 258,672 USD. This value represents the discounted economic benefits expected from the project and serves as the underlying asset in the Black–Scholes framework.

2. Exercise price (*K*)

The exercise price *K* corresponds to the total investment required to undertake the project, including initial capital expenditures and all associated implementation costs, such as equipment, furniture, physical infrastructure, and setup expenses. The total investment amounts to 188,000 USD, representing the minimum threshold that project returns must exceed for the investment to be considered viable from a real options perspective.

3. Time to maturity (*T*)

The parameter *T* reflects the time horizon over which the firm retains the strategic flexibility to execute the project. A 5-year period is assumed, consistent with the projected cash flow horizon. This timeframe is appropriate given the characteristics of the gastronomic sector and the need for a medium-term evaluation perspective.

4. Risk-free interest rate (*r*)

A risk-free rate of 5% is adopted, on the basis of US Treasury bonds with a 5-year maturity. This benchmark is widely used in international financial analysis owing to its stability and global credibility.

5. Volatility (*σ*)

Volatility (*σ*) captures the uncertainty associated with the project's expected returns and is estimated at 25%. This assumption is based on the firm's historical performance, which has shown relatively stable profitability (20–25%) under normal conditions, while also reflecting exposure to external shocks such as economic fluctuations and crisis periods. This estimate adequately captures the moderate risk profile associated with market expansion.

The parameter values used in the model are summarized as follows:

$$S = 164{,}675.52, K = 188{,}000, r = 0.05, T = 5, \sigma = 0.25$$

Using these inputs, the intermediate parameters are calculated as:

$$d_1 = 0.489762, d_2 = -0.069255$$

The cumulative standard normal distribution values are:

$$N(d_1) = 0.687849, N(d_2) = 0.472393$$

Substituting into the Black–Scholes formula:

$$C = 164{,}675.52 \times 0.687849 - 188{,}000 \times e^{-0.05 \times 5} \times 0.472393 = 44{,}106.61$$

Results Interpretation-

C Based on the estimated parameters and the application of the Black–Scholes model, the value of the investment opportunity under uncertainty is estimated at 185,773.10 USD. This result reflects both the expected profitability of the project and the strategic value associated with managerial flexibility under uncertainty.

The interpretation of this result is particularly relevant. While the traditional analysis already indicates that the project is financially viable due to its positive NPV, the real options approach reveals the presence of a substantial additional strategic value. More specifically, the difference between the value estimated through the Black–Scholes model and the traditional NPV reflects the additional economic value associated with managerial flexibility and the firm's capacity to adapt future investment decisions according to evolving market conditions.

These findings suggest that managerial flexibility and the capacity to adapt to uncertainty constitute critical sources of value, especially in volatile economic environments such as the Ecuadorian market. Consequently, incorporating real options into investment evaluation not only enhances analytical accuracy but also supports more informed and strategically robust decision-making.

Table 2. Parameters used in the Black–Scholes model

Parameter	description	Value
S	Current value of the project (NPV)	164,675.52 USD
K	Total investment cost	188,000 USD
T	Time horizon	5 years
R	Risk-free interest rate	5%
Σ	Project volatility	25%
C	Value of the real option	44,106.61 USD

C The estimated value of the investment opportunity under uncertainty amounts to 185,773.10 USD. This value represents the premium associated with the project's inherent flexibility, capturing the added value of maintaining the option to proceed with the branch expansion depending on future market conditions.

The results suggest that, beyond being financially viable according to the NPV criterion, the project possesses additional strategic value derived from managerial flexibility in future decision-making. This finding reinforces the attractiveness of the investment, as value is generated not only through projected cash flows but also through the firm's capacity to adapt to evolving economic and market conditions.

Furthermore, the evaluation based on the Black–Scholes model indicates that flexibility holds significant value in projects characterized by high uncertainty, such as this case, where economic conditions may change unpredictably. Therefore, the results support the strategic attractiveness of proceeding with the investment under the current market conditions while preserving managerial adaptability in response to uncertainty.

Overall, this approach enhances the robustness of financial analysis by explicitly incorporating uncertainty and strategic adaptability, thereby offering a more comprehensive and reliable basis for investment decision-making.

The findings are consistent with previous studies suggesting that managerial flexibility increases project value under uncertainty (Li & Wang, 2026; Kyriakopoulos et al., 2025). Similar to prior evidence in emerging markets, the results indicate that real options constitute an effective mechanism for mitigating investment risk and preserving strategic adaptability.

5. CONCLUSIONS

This study aimed to evaluate the feasibility of opening a new branch of Company A S.A. in Quito, Ecuador, by integrating traditional financial evaluation methods with a real options approach to enhance strategic investment decision-making and risk management. The main findings provide several relevant theoretical and practical insights.

First, the analysis of traditional investment appraisal techniques confirms their continued relevance in determining baseline financial viability. However, consistent with prior literature, these methods exhibit important limitations in contexts characterized by uncertainty and dynamic market conditions. In such environments, static approaches fail to capture the value of managerial flexibility and the ability to adapt decisions over time. The incorporation of real options addresses this gap by explicitly valuing strategic flexibility, thereby improving the robustness of investment analysis.

Second, the financial evaluation based on net present value (NPV) and internal rate of return (IRR) demonstrates that the project is financially viable. The positive NPV of 164,675.52 USD indicates that the investment not only recovers the initial outlay but also generates significant additional value. Similarly, the IRR of 55% substantially exceeds the 10% discount rate, confirming the project's attractiveness under current economic conditions. These results provide a solid foundation for investment feasibility from a traditional financial perspective.

Third, the application of the Black–Scholes model reveals an additional layer of value that is not captured by conventional methods. The estimated value of the investment opportunity under uncertainty highlights the economic significance of strategic flexibility, reflecting the firm's capacity to adapt investment decisions according to future market conditions and evolving economic scenarios. This finding underscores that investment opportunities should not be evaluated solely on static cash flow projections but also on their embedded flexibility, particularly in uncertain environments such as the Ecuadorian market.

Recent empirical evidence suggests that real options investments contribute positively to firms' long-term performance, particularly under conditions of elevated uncertainty. According to Li and Wang (2026), strategic flexibility derived from real options enables firms to preserve growth opportunities, improve adaptive capacity, and enhance long-term value creation in volatile business environments.

Furthermore, the integration of traditional methods with real options analysis proves to be an effective framework for identifying optimal investment strategies and mitigating risk. The results suggest that flexibility in scaling or adjusting the project constitutes a critical strategic asset, enhancing the firm's capacity to respond to market volatility and external shocks.

Regarding financing strategies, both external financing and internal capital are found to be viable alternatives. External financing may improve the likelihood of project success by reducing liquidity constraints, while internal funding maintains stable profitability levels between 20% and 25% under normal conditions. Overall, the findings confirm that the expansion project of Company A S.A**.** in Quito is both financially viable and strategically sound, supported by a high degree of flexibility that facilitates adaptation to uncertain economic conditions.

Despite these positive results, several limitations must be acknowledged. First, the analysis relies on projected cash flows, which, although based on historical data and current trends, may be affected by unforeseen external factors such as demand fluctuations or cost variations. Second, macroeconomic instability in Ecuador—including price volatility and security concerns—may influence project performance. While the real options approach incorporates flexibility, it cannot fully anticipate extreme or unexpected events, such as the COVID-19 pandemic.

From a theoretical perspective, this study contributes to the growing literature on real options by extending its application to the gastronomic sector within an emerging economy context. The findings reinforce the argument that managerial flexibility constitutes a significant source of strategic value in entrepreneurial expansion decisions, particularly in environments characterized by economic volatility and uncertainty.

From a methodological standpoint, the study demonstrates the usefulness of integrating traditional financial evaluation techniques with real options analysis to obtain a more comprehensive assessment of investment feasibility. This integrated framework may serve as a valuable reference for future studies focused on SMEs and service-oriented industries operating under uncertain market conditions.

Despite its contributions, this study presents several limitations that should be acknowledged. First, the analysis is based on projected financial information and estimated parameters, which may differ from actual future market behavior. Second, the application of the Black–Scholes model to real investment projects involves assumptions that may not fully reflect the complexity of real business environments, particularly in emerging economies characterized by market imperfections and limited financial information.

Additionally, the volatility parameter was estimated using historical and sector-based assumptions rather than market-traded data, which may affect the precision of the option valuation. Future research could strengthen the analysis by incorporating simulation techniques, binomial models, or Monte Carlo approaches to compare alternative real options valuation methodologies.

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