# Competitiveness, Social Networks, and Innovation as Econometric Variables: Their Impact on Managerial Decision-Making

*José Enrique Townsend Valencia[1]* ⓘ,  *Xavier Antonio Mosquera Rodríguez[2]\** ⓘ

**Abstract:** This study examines the growth of internet users, the use of social media, investment in innovation, and competitive capacity in the retail sector, aligning with the uncertainty in the importation of selected goods. It adopts an econometric perspective for decision-making in retail companies, addressing the research question: Does the combination of information contribute to improving managerial decision-making? This inquiry is contrasted with the use of a theoretical model of environmental information by Laudon and Laudon, combined with a constraints approach, to develop an econometric management model. The research is quantitative in nature, and the approach is constructivist-positivist with a correlational analysis of its variables. The hypothesis posits a relationship between importation and the use of new technological information in econometric analysis. The research results highlight that retail companies need to extract knowledge with a sophisticated level to identify business requirements, adapt technological infrastructure, define data sources, and, ultimately, the analysis process to counterbalance Ecuador's development model.

**Keywords:** Social networks, decision, imports, uncertainty, model

## Introduction

One of the significant challenges faced by the retail sector in Ecuador is the effective utilization of available information, both internally within the organization and from market trends. Transforming this information into commercial benefits becomes crucial, especially for achieving and maintaining the necessary competitive level. Therefore, it is essential to explore theoretical management models that allow for the analysis of macroeconomic indicators in the retail sector. This approach serves as a managerial strategy, providing entrepreneurs with the necessary tools for informed decision-making.

The mechanism for reducing imports involves the creation and implementation of tariff barriers aimed at preventing or discouraging the entry of certain goods. However, these rigid measures lead to a loss of confidence, market liberalization with severe economic difficulties, making short- and medium-term decision-making challenging. This scenario raises the research question: How does performance influence managerial decisions based on an econometric model under conditions of uncertainty?

The general objective of the research is to develop a management model in the retail sector that combines macroeconomic and microeconomic indicators with the use of new information, enabling the determination of which managerial decisions should be made under conditions of economic uncertainty.

## Literature Review

### The use of a management model for managerial decision-making

Managerial decision-making in an organization cannot always be structured, as situations are not always repetitive. Instead, it is necessary to establish evaluation criteria for each situation, often with inexact information from external and subjective sources, involving risks and uncertainty. Since it is impossible to control or determine the factors or variables affecting the situation, these variables must be represented in a model (Alvarado et al., 2018).

**Table 1:** Models in Management or Decision-Making Contexts

| Aspect | Goldratt's Model (TOC) | Laudon and Laudon Model |
|---|---|---|
| Definition | Decisions made considering the impact on the system's constraint, where the constraint is the element that limits overall performance. | Decisions made using information systems to solve problems that can support and improve decision-making in organizations. |
| Decision-Making Focus | Oriented towards improving the performance of the constraint, prioritizing actions that maximize the contribution of the constraint to the system. | Oriented towards two approaches, immediate and remote. |
| Identification of the Constraint | Focused on identifying the critical constraint that limits the overall performance of the system. | When decision variables cannot take any value, but are limited by certain conditions such as the political situation, technological changes, society, and economic evolution affected by macroeconomic, fiscal, financial policies, and consumption characteristics. |
| Expected Results | Improvement of the overall system performance by focusing on overcoming key limitations. | Finding the best possible solution given the existing limitations in a system. |

Source: Research Data
Prepared by: Authors

(1) Universidad Tecnológica Empresarial de Guayaquil, Ecuador
(2) Instituto Superior Blue Hill College, Guayaquil, Ecuador
*Corresponding author: xmosquera@bluehill.edu.ec

According to Schragenheim et al. (2019), the management model proposed by Eliyahu M. Goldratt, as presented in Table 1, is not specifically a formal decision-making model but introduces key concepts related to management and decision-making in the field of production and operations. The theory of constraints posits that the system's capacity to achieve its objectives lies in identifying and managing these constraints, which will have a positive impact on the entire system. In other words, decision-making is a part of the information system within the decision-making environment (Herrera-Vidal et al., 2018).

The Laudon and Laudon model presented in Table 1 is based on an information system that defines the competitive resource which captures and absorbs information through two approaches, the immediate environment and the remote environment. The immediate environment comprises elements a company deals with daily, represented by six variables: customers, suppliers, distributors, competitors, financiers, and regulators (authorities). In contrast, the remote environment is formed by elements that must be controlled within the segment or sector in which it operates, including information on the political situation, technological changes, society, and especially economic evolution influenced by macroeconomic policies, fiscal systems, financial systems, and consumption characteristics (Ayala et al., 2013).

## Import substitution model

Grounded in countries replacing the consumption of imported goods with local production, it is necessary to establish tariff barriers through an import substitution model. This model is known as ISI or the Cepalino model due to its dissemination through CEPAL, which was applied in Ecuador and Latin America in the 1970s. Emphasis was placed on the productive structure, distribution, and industrialization processes integrating both the domestic market and the export sector (Naranjo, 2020). According to Ramos (2020), the theory of import substitution as an economic theory was initiated by the Economic Commission for Latin America in a global debate on the most suitable development strategy for third-world countries post-colonization, given their low growth rate from 2.7% to 1.7% in the 1940s and 1950s. The theory of import substitution, according to Ramos (2020), is based on structuralism and state-promoted industrialization. The Cepalino model, formulated by Raúl Prebisch (1901-1986), proposes a mixed economy that combines import substitution with the promotion of new exports. In the retail sector, import substitution aims to reduce dependency on imported products by encouraging local production of consumer goods, thus driving technological development, creating productive linkages, and diversifying the supply in the domestic market. This strategy allows retail companies to make decisions to source national products, thereby strengthening the local industry (Vásquez, 2017).

The local retail sector operates in an environment characterized by high volatility and uncertainty. Like any organization, it must make strategic decisions that adapt to the changing dynamics of technological and competitive environments. Retail strategies are defined by a series of standard elements, including market factors, competitiveness, and constantly evolving regulations. The decisions made by the retail sector need to be responsive to market fluctuations, the influence of social networks, and advances in innovation, which require rigorous analysis of data and trends to optimize decision-making (Fildes et al., 2022).

Economics uses models to represent reality and analyze how variables affect its evolution, but although traditionally these models have been based on data certainty or randomness, difficulties arise when economic relationships are uncertain and information is weak. This has led to the development of stochastic models that project future magnitudes based on past data under assumptions of stability. However, the relevance of a model should not be judged solely by the similarity of its assumptions to observed conditions, but by its predictive capability, as Friedman (1953) suggests. There are also other perspectives, such as Mill's (2007) inductivist method, which advocates evaluating the consistency between the assumptions and empirical behavior, or the alternative of judging a model by its logical consistency and its effectiveness in solving the theoretical problem it is intended for, regardless of the alignment between its assumptions and predictions with the phenomenon being analyzed (Soledispa et al., 2021).

## The Internet and Social Media

The dynamic and demanding market environment drives retail companies to constantly adapt, reviewing and adjusting all processes along their value chain to align with new communication channels, such as the internet. These companies are compelled to respond to consumer behavior, striving to maintain an active presence on social media.

These digital platforms have become essential tools for corporate development, revolutionizing how companies interact with customers and promoting their products or services in the digital environment. In this regard, Hugo, Jiménez, Holovatyi, and Lara (2020) highlight that social media provides businesses with the opportunity to rethink and expand key processes, such as marketing and commercialization, to ensure optimal service quality (Moreano et al., 2024).

From a managerial perspective, the integration of social media into the business sphere has become a key strategic factor for decision-making, directly impacting productivity optimization and increasing competitiveness. Executive decisions must focus on leveraging the widespread use of new information technologies, as these platforms offer opportunities to enhance market positioning, innovate business processes, and strengthen customer relationships (Hugo et al., 2020).

## Competitiveness and innovation

Today's companies operate in a highly competitive environment: […] "It is crucial for businesses to strive for and maintain competitive advantages that allow them to sustain their presence in various markets. In a globalized world, change is an inevitable constant. Therefore, strategic incorporation ensures that the rapid dissemination of information through the Internet and the continuous development of social media continue to transform the current business landscape, compelling companies to adapt to increasingly complex, competitive, and innovative market environments." (Arevalo-Torres et al., 2021).

## Methodology

### Epistemology of Research

The research adopts an empirical inductive epistemology, being positivist and constructivist, as it involves experimental, manipulative, and verification elements. Science is considered positive knowledge—knowledge of facts constructed from positive knowledge, concreteness, and experiential data. Scientific knowledge involves establishing laws based on facts. The Comptean positivism of this research relies on the knowledge from sciences that utilize the methods of exact physical-mathematical sciences, providing explanations for the studied phenomena by indicating their causes (Frausto-Gatica, 2021). It is constructivist because it aligns with the interpretative ideas about knowledge. Initially, systematized knowledge is formal rational knowledge, which in turn leads to the formation of empirical-analytical sciences that form the basis of applied technology.

### Type of research

The research originates from a problematic reality: the need to make better decisions in the retail sector during periods of uncertainty in imports, supported by the internet, social media, and their competitive capacity. This means that from general knowledge and principles, specific facts or phenomena were studied, moving from the general to the particular. It was necessary to establish relationships between each variable without delving into the causes determining this relationship, providing some explanatory information by measuring and analyzing their connection. The type of study is deductive, correlational, and longitudinal, aiming to collect data at multiple points over time to infer changes, their causes, and effects on the observed phenomenon. A quantitative approach was used, collecting and statistically analyzing all required data to test the previously established hypotheses, relying on numerical measurement and counting. Data were gathered at different points in time to make inferences about changes, causes, and their effects on the observed phenomenon.

### Sample selection and mathematical formula

A cross-sectional database with annual series over 11 years was used, with the unit of observation being the retail sector. Primary sources included information from the Superintendence of Companies and Telecommunications, the Central Bank of Ecuador, and the National Institute of Statistics and Censuses (INEC) for the study period. Modeling techniques were employed, allowing for the inclusion of new explanatory variables due to the inherent interconnection in the economy, thus modifying the pre-existing relationships among other variables. The model used in this work was based on the assumption that the possibility frontier for reducing imports involves two products (consumer goods and capital goods) and two factors (labor, capital) as competitive capacities.

### Data processing

For data processing and treatment in the research, inferential statistics and regression analysis techniques were used for the econometric model to describe the relationship between the dependent variable Y and the set of data X. This predictive technique specifies the model for the data based on practical theoretical knowledge derived from economic theory. It was pre-tested before being accepted as valid in the econometric modeling process using a mathematical and statistical model to provide empirical content to economic theories for verification or refutation. Eviews and SPSS software were used for processing, hypothesis testing, and presenting the results.

The construction of the model was based on the selection of variables according to the theoretical approaches of the Cepalino model and the Laudon and Laudon model. Since the available data were cross-sectional with observations across different time series, it was necessary to smooth the series due to the irregularity in their temporal behavior. This step allowed for addressing the evolution, behavior, and future prediction of the key variables: imports, innovation, social networks, and uncertainty.

The next step involved applying the Augmented Dickey-Fuller (ADF) test to check for the presence of unit roots in the time series to verify the existence of stationarity. Then, the coefficients were estimated using the ordinary least squares (OLS) technique, which allowed for capturing the relationship between the independent variables and the elasticity of demand concerning imports, innovations, and the competitive advantage of organizations.

To assess stationarity in the model construction, the unit root test was used, which was key to ensuring the validity of the estimates. Subsequently, the Granger causality test was applied to determine whether there was a causal relationship between the independent variables, which served as the basis for conducting a multiple regression analysis. This analysis allowed for modeling the relationships between the known independent variables and predicting the value of the selected dependent variable, thus establishing the proposed mathematical model. For model validation, a residual test against the variables and the Breusch-Pagan test were performed to detect heteroscedasticity in the regression models.

Data processing, hypothesis testing, and results presentation were carried out using EViews and SPSS software, which facilitated the implementation of econometric techniques and the analysis of results.

## Results

Table 2 presents the dependent and independent variables proposed for the research.

**Table 2**: Indicators of Variables Used in the Research

| Dependent Variable | Indicator |
|---|---|
| Decision Making | Reference framework conditioned by economic, business, and technological indicators |

| Independent Variable | Indicator |
|---|---|
| Imports | Macroeconomic indicator of consumer goods |
| Productivity | Macroeconomic indicator |
| Uncertainty | Country risk level |
| Innovation | Indicator of research development, consumer products, and genuine improvements |
| Competitive Advantage | Business management indicator related to business model, cost, competitive advantage, and differentiation |
| Networks | Indicator of social network trends and the use of new information |
| Internet | Indicator of consumer presence |

Source: Research Data

Prepared by: Authors

## Study conditions

**Relationship of variables:** It was based on the Cepalino model and the Laudon and Laudon model because they provide useful frameworks for analyzing complex econometric variables and the role of social networks in a socioeconomic and digital environment.

**Significance level:** A significance level of $*p < 0.05$ was considered, meaning that if the p-value is less than 0.05, the null hypothesis is rejected. $H_0 : \beta = 0$ $H_1 : \beta \neq 0$

**Proposed hypothesis:** The use of new information in a theoretical management model does influence the quality of managerial decisions in retail companies under conditions of uncertainty.

**Time series:** The time series shown in Figure 1 was smoothed using the Holt-Winters (non-seasonal) technique, which is useful for series without a seasonal component, showing irregular spacing over time due to being cross-sectional data. This explains the evolution, behavior, and forecast of future values for variables such as imports, innovation, social networks, and competitive advantage. The Hodrick-Prescott filter technique was applied to the import variable, as presented in Figure 1, with the new extensions of each variable.

**Augmented Dickey-Fuller test:** This test was applied because it is common for dependent and independent variables to increase or decrease over time due to being stationary series. This stationarity was applied as it is important for estimation; without it, the research could result in false parameter estimates. It was necessary to understand how inflation and its time series influence economic theory because it is difficult to believe that a successful monetary policy can result in a non-stationary inflation rate in a steady state. At this point, the performance of various unit root tests was evaluated, approximating the probability of occurrence or significance $p < 0.05$ for each test to reject the null hypothesis when it is false.

**Figure 1**: Smoothed Variables with Model Improvement
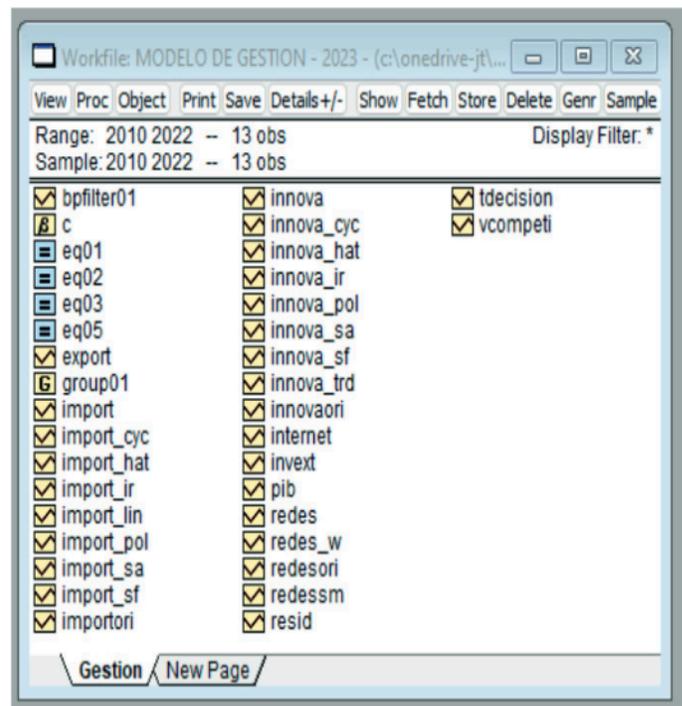


**Unit root test to aid model construction:** Each series of observations was generated based on general specifications with the intercept and trend, given by the following equation: $Y = \alpha_1 t_1 + \alpha_2 t_2 + e_t$ ; where: $e_t = \beta e_{t-1} + \varepsilon_{t-1}, con \varepsilon_{t-1} \approx N(0,1)$ For all the variables in the model, as illustrated in Figure 1, the relationship between import and innovation stands out, which allows for a better understanding of the nature of the time series. This facilitates informed decision-making regarding the construction of appropriate models for the data analyzed.

**Figure 2:** Independent Variables of the Model
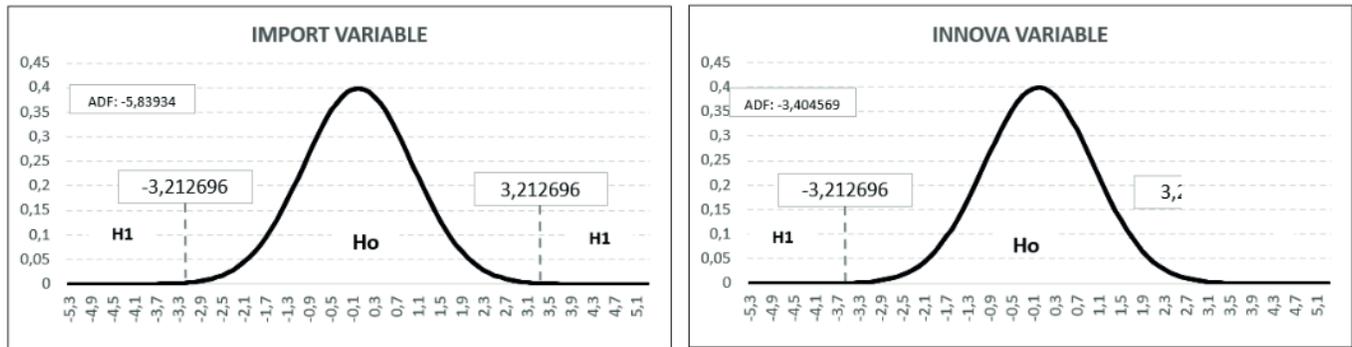


**Granger Causality:** Granger causality introduces greater analytical rigor to the management model by identifying significant relationships between the macro and microeconomic variables included, such as imports with the internet and competitive advantage with the internet. This allows for anticipating relevant patterns, optimizing decision-making, and efficiently combining available data, which is especially useful for strategic planning in contexts of economic uncertainty, as shown in the results in Table 3.

**Table 3:** Granger Causality Results

| Null Hypothesis: | Accept | Prob. | Accept |
|---|---|---|---|
| IMPORT does not Granger Cause INTERNET | h1 | 0.035172579 | h1 |
| IMPORT does not Granger Cause NETWORKS | h1 | 1.56E-05 | h1 |
| INNOVA does not Granger Cause INTERNET | h1 | 0.03664017 | h1 |
| INTERNET does not Granger Cause NETWORKS | h1 | 0.000211248 | h1 |
| VCOMPETI does not Granger Cause NETWORKS | h1 | 0.024588988 | h1 |
| UNCERTAINTY does not Granger Cause IMPORT | h0 | 0.03085609 | h0 |

Source: Research Data

Prepared by: Authors

**Econometric model:** Multiple regression analysis was used with the objective of using independent variables whose values are known to predict the single selected dependent variable, which is decision-making. The linear regression model allows describing the relationship between dependent variables and a set of independent variables X, as presented in Figure 3.

**Figure 3:** Proposed Management Model
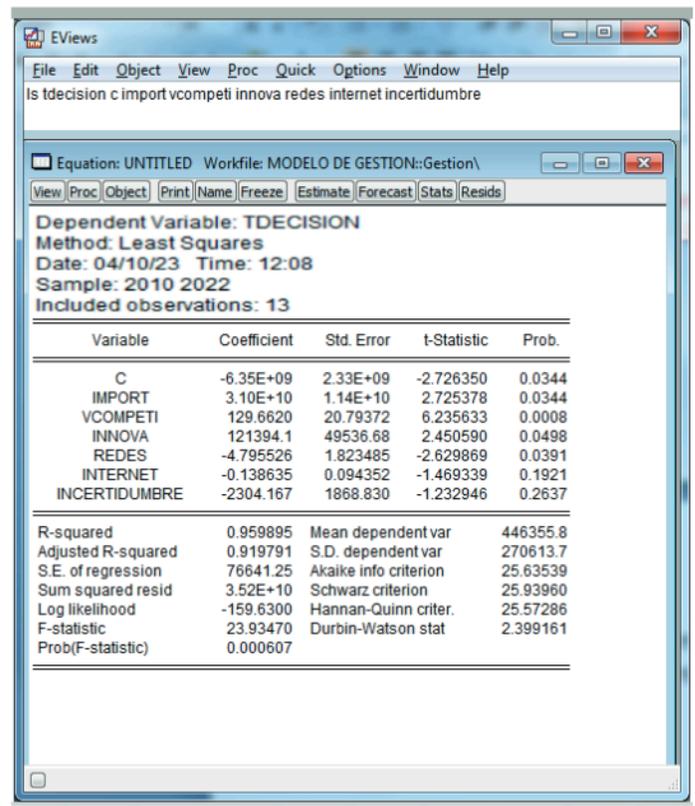


In the execution of the model presented in Figure 4, it is observed that the estimated parameters in the <Prob> column IMPORT, VCOMPETI, INNOVA, and REDES are significantly different from zero at 95% ($p < 0.05$), except for those related to the INTERNET variable, with their joint significance being very high. The equation adjustments span 11 years with a model containing 5 explanatory variables. The R-squared is the coefficient of determination with a value of 0.9598, a statistical measure indicating that the regression can predict the values of the dependent variable within the sample period.

The Adjusted R-squared is the corrected coefficient of determination, with a value of 0.9197, allowing for comparison of the explanatory capacity of the model with different numbers of explanatory variables within the same sample.

The standard deviation of the parameter S.E. of regression is high, but the values of the Schwarz and Akaike criteria are acceptable, at 25.63 and 25.93, indicating good explanatory capacity of the model. The Prob(F-statistic) value of 0.00607 confirms the validity of the model.

**Figure 4:** Model Specification and Estimated Model
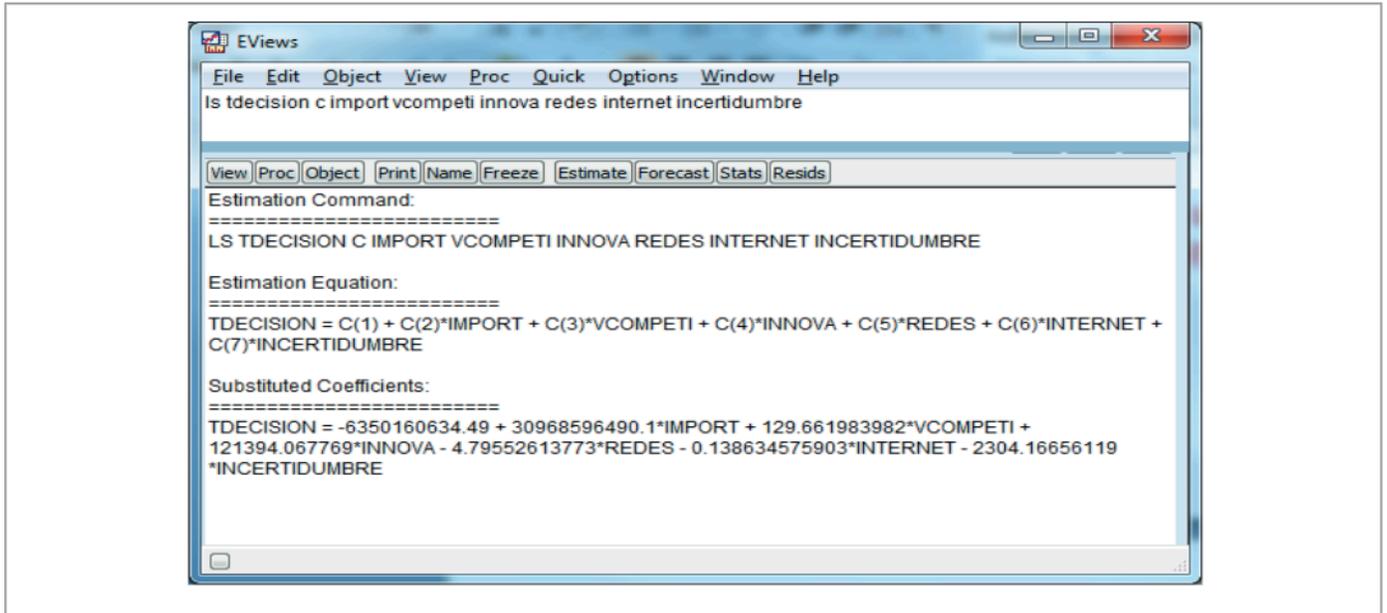


## Discussion

### Model validation

**Residuals test against variables and Breusch-Godfrey test:** The absence of heteroscedasticity for all variables was confirmed, as shown in Figure 5. This means that the variance of the disturbances is constant across observations, meeting the basic hypotheses on which the model is based, with a value of 0.0804, indicating that the probability value is greater than 0.05 in the Breusch-Godfrey test, establishing that the estimators do not present heteroscedasticity.

**Figure 5:** Heteroscedasticity Tests
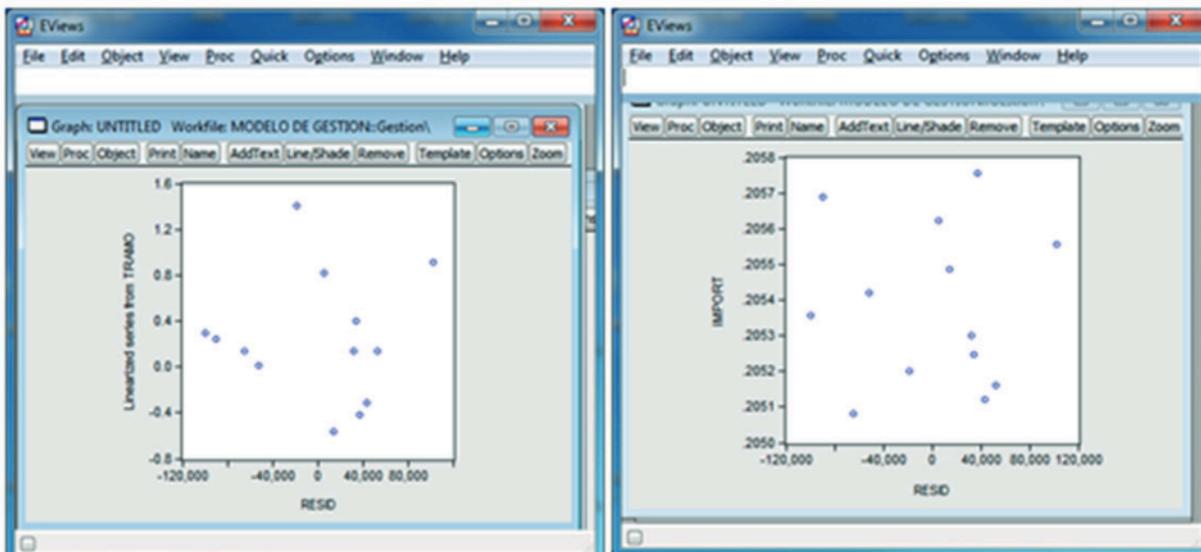
## Hypothesis Testing

Null Hypothesis: The use of new information in a theoretical management model does influence the quality of managerial decisions in retail companies under conditions of uncertainty. $H_0$

Alternative Hypothesis: The use of new information in a theoretical management model does not influence the quality of managerial decisions in retail companies under conditions of uncertainty. $H_1$
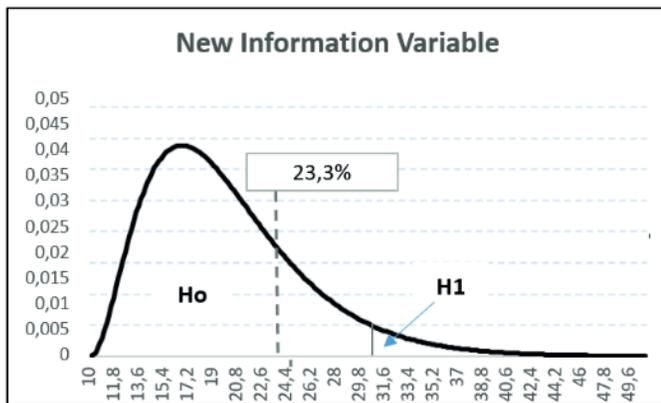
Table 4: Chi-Square Test for New Information Variable

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 56.000 | 42 | 0.233 |
| Likelihood Ratio | 66.689 | 42 | 1.000 |
| Linear-by-Linear Association | 0.001 | 1 | 0.972 |

Source: Research Data

Prepared by: Authors

Figure 6: Distribution Curve of New Information



The probability of the distribution is 0.233 in Figure 6, greater than the threshold significance level of 0.05, thus accepting the null hypothesis Ho, as shown in Graph 2. This means that the use of new information does influence the quality of decisions in retail companies under conditions of uncertainty.

## Conclusions

1. Globalization has gained momentum in recent years and is significantly linked to politics, technology, the economy, and culture. These dimensions generate new forms of risk and uncertainty, especially in the digital economy, which is intrinsically related to innovation. For companies in the commercial sector, effective information management translates into a considerable competitive advantage, especially for those that excel at acquiring knowledge under conditions of uncertainty.

2. In the modeling process, it was necessary to convert nominal variables to real variables using the inflation indicator to generate their growth rate. Subsequently, the time series was smoothed due to its irregularity, as the data were cross-sectional, in order to explain the evolution, behavior, and forecast of future values of the variables of imports, innovation, social networks, and uncertainty. Then, a regression was performed with Eviews software on the variables of decision-making, uncertainty, imports, innovation, and competitive advantage in the retail sector, obtaining the estimated coefficients through the least squares method. This model represents the elasticity of demand in relation to imports, innovations, and competitive advantage of organizations.

3. Based on the results of the model validation through residual tests against variables, the Breusch-Godfrey test, normality tests, and the Chow breakpoint test, the absence of heteroscedasticity was confirmed. This means that the variance of disturbances is constant throughout the observations, thus meeting the basic hypotheses on which the model is based.

4. To answer the research question "if the use of new information in a management model contributes to the quality of managerial decision-making under uncertainty," the chi-square test was used on the model, observing that the probability of the distribution is 0.233, higher than the significance level threshold of 0.05. It is important to highlight that specific hypothesis tests were conducted on the variables of imports, social networks, and innovation, thus accepting the main hypothesis and affirmatively answering the research question.

5. To achieve the study's objective, it was necessary to construct an econometric model using multiple regression analysis to predict the dependent variable. This allowed establishing interactions in decision-making, evaluating their advantages and disadvantages, and carefully defining the variables, quantifying them, and limiting them to the values they can adopt. The resulting model is a simplified representation of the company's reality, considering the fundamental variables that explain the study problem.

6. To strengthen this approach, organizations are recommended to implement robust data analysis systems and promote continuous training in econometrics. For future research, it is suggested to explore the incorporation of new variables that reflect emerging dynamics in the digital economy, as well as the impact of artificial intelligence on business decision-making.

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