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BEHAVIORAL ECONOMICS OF HOUSEHOLD SAVING DECISIONS AMONG LOW-INCOME FAMILIES IN CAIRO: AN ARDL APPROACH

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ABSTRACT

The paper examines the economic and behavioral drivers of the Household Saving Rate (HSR) of low-income families in Cairo based on quarterly data from 2010-2024. Using the Autoregressive Distributed Lag (ARDL) model, the study evaluates both the short-run and long-run correlation between saving behavior and the main macroeconomic variables, such as income, inflation and interest rates, and financial literacy rates. Time-series visualizations and descriptive statistics show that HSR experienced considerable changes during the period of research, being affected by the key economic events and policy changes. The tests of stationarity suggest that there is a combination of I (0) and I (1) variables, which confirms the appropriateness of the ARDL methodology. The findings indicate that income and interest rates have a positive influence on household savings, and their opposite, inflation, has a negative impact. There is a meaningful long-run effect of behavioral factors, in particular, present bias and financial literacy, which implies that psychological drivers have a significant influence on saving decisions. The ARDL model is reliable, stable, and statistically adequate, as is affirmed by the model diagnostics. Moreover, the forecasting exercise anticipates the growth in HSR in 2025, which is an indication of a slow increase in financial stability in the event that the economic situation stays the same. The research contributes to the empirical evidence that policymakers can use in enhancing the financial stability of households by integrating fiscal and behavioral policies to build sustainable saving patterns.

KEYWORDS: Household Saving Rate, ARDL Model, Financial Literacy, Present Bias, Time-Series Forecasting, Cairo Economy, Macroeconomic Determinants.

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INTRODUCTION

The household saving behavior has always been at the center of economic study since it is the core of the fiscal stability, the welfare of the generations, and economic prosperity (Alsubaie, 2025). The traditional economic theory is based on the hypotheses of life-cycle and permanent income and presupposes that rational intertemporal choices are made by individuals in order to maximize lifetime utility through balancing current and future consumption (İnce and Ecevit, 2025). However, these types of models are not able to account for the low-income households' low saving levels that exist in many instances, even in the developing world. When it comes to Egypt, and in particular to the tightly-packed metropolis of Cairo, the saving behavior of low-income families is a complicated phenomenon whose interaction with economic pressure is driven by behavioral disposition. This complexity requires a more analytical approach that goes beyond the traditional models and encompasses behavioral economic approaches (Pignalosa, 2025).

As a field of study, behavioral economics is a combination of psychology and economics knowledge as to the reasons why people tend to behave in ways that do not conform to assumptions of rational decision-making (Corr and Plagnol, 2023). Rather than maximizing, people can be biased, e.g., present bias: short-term satisfaction is valued more than long-term payoff, or loss aversion: people experience the loss much more intensely than the gain. These trends may be strengthened in a low-income household through financial stress, the inability to access formal savings vehicles, and insecurity in the financial stream of income. This makes it hard to save even a modest amount of income for many households, though they realize how saving will pay off in the long run (Bickley and Torgler, 2023).

These dynamics are especially well studied in Cairo. The city with more than 10 million people is a microcosm of socio-economic problems in Egypt, such as an increasing cost of living, inflation problems, and uneven access to financial services (Mahgoob, 2024). Even though the government and non-government efforts have increased financial inclusion by mobile banking, microfinance, and savings cooperatives, the low-income household implications of formal saving schemes are low. Most families still use informal saving methods like rotating savings and credit association (ROSCAs), jewelry investments, or at-home cash storage that can be easily lost and do not offer much or any financial returns (Ashoub, 2023). This poses significant questions to the behavioural basis of saving decisions in the situation where formal opportunities are present yet not exploited.

The macroeconomic environment in Egypt also makes household savings decisions difficult. The periodic depreciation of the Egyptian pound, coupled with inflationary surges, destroys the real worth of savings, and people are usually not encouraged to deposit their money in banks (Raouf et al., 2024). Besides, the variation in interest rates and unemployment, especially in the informal sector where a significant percentage of low-income employees based in Cairo are employed, is a factor that generates unstable saving behaviors. These macroeconomic factors are very important, but they cannot be the sole reason behind the low saving rates of households with the same level of income, though different in their saving habits. Behavioral heterogeneity - variations in cognitive biases, financial literacy, as well as risk attitudes are influential to these outcomes (Emam, 2025).

The behavioral approach implies that people are not passive receivers of income constraints but are active decision-makers whose perceptions, heuristics, and feelings affect their financial behavior (Peón and Antelo, 2021). Its concept, like mental accounting, proposes how people divide money into distinct accounts to use it for various purposes, which are not always very rational because people often value consumption over saving. On the same note, limited rationality suggests the constraint of decision-making ability with access to information, mental capacity, and time. These are the acute constraints to the low-income households in Cairo. Most of them are not well educated and will not have access to good financial advice, due to which they become more prone to framing effects and short-term decision traps (Ahmed and Rura, 2024).

This study aimed to bridge the gap between the behavioral theory and the empirical econometric analysis by using the Autoregressive Distributed Lag (ARDL) analysis and to quantify the short-run and long-run determinants of household saving behavior among low-income families in Cairo. The ARDL model has been specifically appropriate in this study due to the fact that it enables one to estimate both the short-run and long-run relationships between the variables that may exhibit varying orders of integration (Joo and Shawl, 2023). This is essential in an environment where the behavioral and macroeconomic variables, including financial literacy, inflation, income, and interest rates, change at various rates. Through ARDL, the research can measure not only the impact of immediate shocks

such as inflationary surges or sudden changes in income on savings, but also the long-run behavioral patterns and financial education that determine the nature of the equilibrium relationship between savings and its maximizing factors.

2. LITERATURE REVIEW

The household saving behavior has developed significantly, and it can be stated that there has been a shift in the traditional neoclassical theories to models that embody behavioral and psychological aspects (Munien and Telukdarie, 2025). The classical economic theories, including the Life-Cycle Hypothesis developed by Modigliani and Brumberg (1954) and the Permanent Income Hypothesis formulated by Friedman (1957), describe savings as a way of rationally allocating resources across time (Martini and Spataro, 2022). These theories presuppose that people are rational; they will maximize lifetime utility and smooth consumption, that is, to smooth consumption across time, depending on future consumption needs, expected income, and interest rates. However, the empirical evidence of third-world countries has continuously put these assumptions into question and has shown that there are always deviations from the predictions of those models. Saving behavior among the low-income households, particularly in a developing economy such as Egypt, seems to be influenced by the economic constraints as well as by the psychological, social, and institutional factors that restrain rational decision-making (Krishna and Singh, 2025).

Behavioral economics gives a better insight into such deviations by introducing psychological realism in economic models. It implies that people are likely to make choices based on biases, heuristics, and emotions instead of optimal decisions (Mohamed et al., 2025). Among the most critical ideas in this direction is present bias, which is based on hyperbolic discounting models (Mujabi et al., 2025), which suggests that individuals tend to attach a disproportionate importance to present consumption in comparison to future utility. The tendency is especially acute among low-income households, when financial insecurity, uncertainty of future income, and immediate needs enhance short-term decision-making. This is closely connected with loss aversion, the principle of prospect theory, which was proposed by Tversky and Kahneman (1992), which states that the psychological pain of losing money is larger than the pleasure of receiving the amount of money. This may deter saving or investing activities of households, particularly when they view official financial institutions as risky or unreliable (Lejarraga and Hertwig, 2022).

Another concept of behavior presented by Thaler (1990) is mental accounting, which involves classifying and dividing money into various accounts in the minds of individuals to be used for a particular purpose (Mahapatra et al., 2022). An example is that a poor household in Cairo might spend money that they should spend on daily needs in a different manner than money that they should spend in an emergency or on social commitments, although this process of compartmentalization can result in poor outcomes. On the same note, the limited cognitive capacity and the incompleteness of information in individuals, which Simon (1955) initially referred to as bounded rationality, acknowledge the fact that people are limited in their capacity to make fully rational economic choices. Low financial literacy and the unavailability of reliable financial information tend to exacerbate this limitation among low-income families, which supports the behavioral biases and consumption priorities in the short term (Petracca, 2021).

Both developed and developing nations have conducted empirical studies that have supported the role of behavior in the explanation of saving behavior. Ashraf et al. (2006) showed that a commitment savings product, aimed at assisting people to overcome their self-control issues, had a significant effect on increasing their savings rates among women in the Philippines. Dupas and Robinson (2013) have discovered the same in Kenya, where they have seen an increase in savings and investment when there are safe and non-complicated saving schemes, and this implies that the structural and behavioral barriers can be resolved by the right policy measures. Banerjee and Duflo (2011) also held that the low-income households are not infrequently caught in a poverty trap where the short-run consumption prevails over long-run related decisions because of the influence of stress and the load of the mind under the pressure of scarcity.

Financial literacy has been revealed to be very important in determining saving choices as well. Lusardi and Mitchell (2014) have discovered that there is a strong connection between financial knowledge and saving behavior, as people with great financial knowledge are more inclined to save and plan for the future. Lyons and Kass-Hanna (2021) noted that cultural norms, social networks, and informal finance systems play a significant role in household saving decisions in the Middle East and North Africa (MENA) region. The situation of Egypt, especially, is unique since the lack of macroeconomic

stability and institutional trust strengthens behavioral obstacles. Metwally et al. (2021) in their studies state that a significant portion of Egyptian families do not keep their money in banks, indicating both aversion to losses and distrust of the financial system in alternative forms like gold, livestock, or property. The inflationary pressure and the depreciation of the currency further deter the savings in the form of money because the households find themselves in a situation of feeling that these factors are affecting the real value of the deposits.

In addition to behavioral aspects, macroeconomic variables are also important variables that determine household saving behavior. Various reports have been able to show that income growth, interest rates, inflation, and dependency ratios are key factors in influencing the saving rates. Loayza et al. (2000) discovered that the growth in incomes and the development of the financial system promote saving, and inflation has a negative effect as it decreases the purchasing power and increases the uncertainty. In Egypt, low savings, particularly by the lower end of the income scale, have been observed to be caused by continuous inflation coupled with fluctuating interest rates that may not hedge out against economic shocks. Hussein et al. (2017) said that high inflation and uncertainty of employment were some of the highest discouraging factors on formal saving behavior in urban centers in Egypt. However, the heterogeneous nature of household saving behavior cannot be well explained by macroeconomic variables. Behavioral inertia can be a significant issue even in improved economic times since households fail to change their financial behavior, suggesting that one will require combined behavioral-economic models.

The Autoregressive Distributed Lag (ARDL) model, which was formulated by Pesaran et al. (2001), offers a suitable econometric model of the short-run and long-run relationship between variables that can be integrated of varied orders. The recent years have seen it becoming popular in the modeling of financial and economic behavior of small samples, which renders it especially well-suited to the case study of household decision-making. In their study, Adedokun et al. (2020) used the ARDL model to determine the determinants of the saving levels in the private sector of the Nigerian economy and reported that the income growth rates and interest rates positively affected saving in the long run, but the opposite was true of inflation and dependency ratios. The same study by Akingunola et al. (2018) employed ARDL to determine saving and investment behavior in sub-Saharan Africa, which confirmed that macroeconomic stability drove saving in the long run, despite immediate volatility within the environment. Sallam et al. (2025) also used ARDL to examine the association between household saving, income, and inflation in the context of Egypt and found that there is a long-run equilibrium with short-term fluctuations. However, in the majority of ARDL research, the key determinants have been the macroeconomic variables; thus, behavioral variables have not been studied much in this econometric model.

In reviewing the existing literature, it becomes evident that while global research has extensively examined the behavioral aspects of saving, studies specific to Egypt and the wider MENA region remain limited. The majority of existing empirical work in Egypt focuses on aggregate saving trends or financial inclusion metrics, often neglecting the micro-level behavioral factors that influence household decisions. Moreover, very few studies employ the ARDL framework to analyze the joint effects of behavioral and economic determinants on household savings. This research seeks to address these gaps by applying an ARDL approach to examine both short-run and long-run relationships between saving behavior, economic variables, and behavioral factors among low-income families in Cairo.

3. METHODOLOGY

3.1 Research Design

The proposed study used a quantitative, explanatory, and econometric design in order to examine behavioral and economic determinants of household saving decisions among low-income families in Cairo. The methodological framework incorporates the behavioral economic constructs into the dynamic econometric model, i.e., the Autoregressive Distributed Lag (ARDL) approach. Such a design is selected to address both short-run variations and long-run equilibrium between the behavior of saving and its possible determinants. Adding such behavioral elements as present bias, loss aversion, and financial literacy enables us to understand the psychological factors more clearly, which are not taken into account by the traditional economic models.

Considering the socioeconomic heterogeneity and data limitations related to household-based analysis, the ARDL model has a lot of benefits. It enables estimation of relationships between variables that are stationary at level, I(0), and integrated of order one, I(1), and higher order of integration, I(2), are invalid. In addition, it fits well in small and medium sample sizes, which is especially applicable in the case of

household-level surveys. The study discusses the years 2010-24, hence capturing the post-reform economic years in Egypt that have been dominated by inflationary pressures, policy reforms, and changes in household consumption patterns.

3.2 Data Sources and Variables

The research makes use of primary and secondary data. A structured questionnaire was used to gather primary data by asking 450 households that lived in low-income neighborhoods of Cairo, such as Imbaba, Shubra, and Dar El Salam. A stratified random sampling method was used to facilitate representation by household size, employment type, and income brackets. The survey instrument was developed to provide information on income, expenditure, saving behavior, and behavioral attributes, such as risk attitudes, time preference, and self-control. The precise definition and method of calculation for all variables in the final model are detailed in Table 1.

The literature sources that provided credible secondary macroeconomic data included the available data of the Central Bank of Egypt (CBE), World Bank Development Indicators, and the Egyptian Statistical Authority. These are inflation rates, interest rates, consumer price index (CPI), and real GDP growth rates per annum. Financial literacy, present bias, and loss aversion are behavioral indices calculated using primary responses through a standardization procedure using principal component analysis, where the results are based on principal component analysis (PCA) to guarantee validity and comparability with other respondents. These combined data sources provide a comprehensive view of both macro-economic constraints and micro-level behavioral drivers of saving.

Table 1. Definition and Measurement of Variables in the Household Saving Rate (HSR) Model

Variable Type	Variable Name & Abbreviation	Calculation/Measurement/Formula	Notes/Description
Dependent Variable	Household Saving Rate (HSR)	HSR = Household Saving/Disposable Income (Monthly)	The key variable being studied represents the proportion of disposable income saved by households.
Independent Variables	Household Income (INC)	Not explicitly stated; likely measured as the total income received by the household.	Expected to have a positive impact on HSR (in line with life-cycle and permanent income hypotheses).
	Inflation Rate (INF)	Not explicitly stated; likely measured as the year-over-year percentage change in a price index (e.g., CPI).	The expected effect is dubious (may cause precautionary saving or decrease the real value of savings).
	Nominal Interest Rate (IR)	Not explicitly stated; likely measured as a representative market interest rate (e.g., bank deposit rate).	Expected to have a positive correlation with HSR (represents the opportunity cost of consumption).
	Financial Literacy (FL)	Not explicitly stated; likely measured via a score from a survey or questionnaire.	Expected to expand savings power by enhancing financial planning.
	Present Bias (PB)	Not explicitly stated; likely measured via behavioral economics experiments or survey questions.	Expected to adversely affect saving (propensity to prefer immediate consumption).
	Loss Aversion (LA)	Not explicitly stated; likely measured via behavioral economics experiments or survey questions.	Used to measure the degree to which fear of loss will drive saving behavior.
Control Variable	Household Size (HS)	Not explicitly stated; likely measured as the number of individuals in the family unit.	Included to factor in consumption pressure within the family unit.

3.3 Model Specification

The econometric specification is in the general format of ARDL, i.e., the present value of the dependent variable is derived based on the current and past values of the dependent variable and on the current and past values of explanatory variables. The simplest form of the model that functions are as follows in equation 1:

$$HSR_t = f(INC_t, INF_t, IR_t, FL_t, PB_t, LA_t, HS_t) \quad \text{Eq.1}$$

The theoretical basis of the study is the functional relationship, which demonstrates that household saving behavior is affected by economic and behavioral factors. The model presupposes that the Household Saving Rate (HSR) is determined by the Income (INC), Inflation (INF), Interest Rates (IR), Financial Literacy (FL), Present Bias (PB), Loss Aversion (LA), and Household Size (HS). Macro-financial conditions influence the savings capacity and are captured in economic variables, whereas the psychological characteristics influence the financial decisions and are captured in the behavioral variables. This specification presents a theoretical framework of the following econometric specification (in equation 2), which enables the ARDL equation to reflect the short-run adjustments, as well as the long-run equilibrium relationships.

$$HSR_t = \alpha_0 + \sum_{i=1}^{p} \beta_i HSR_{t-i} + \sum_{j=0}^{q1} \gamma_j INC_{t-j} + \sum_{k=0}^{q2} \delta_k INF_{t-k} + \sum_{l=0}^{q3} \phi_l IR_{t-l} + \sum_{m=0}^{q4} \theta_m FL_{t-m} + \sum_{n=0}^{q5} \psi_n PB_{t-n} + \sum_{o=0}^{q6} \omega_o LA_{t-o} \quad \text{Eq.2}$$

Where HSR_t is the saving rate in the household at time t, and the coefficients b, g, d, ph, th, ps, and o are short-run dynamics of the lagged explanatory variables. White-noise errors are absorbed in the residual term et.

To obtain the long-run equilibrium relationship, the ARDL model is re-modeled in the form of an Error Correction Model (ECM) as follows:

$$\Delta HSR_t = \alpha_0 + \sum_{i=1}^{p-1} \beta_i \Delta HSR_{t-i} + \sum_{j=0}^{q1-1} \gamma_j \Delta INC_{t-j} + \sum_{k=0}^{q2-1} \delta_k \Delta INF_{t-k} + \sum_{l=0}^{q3-1} \phi_l \Delta IR_{t-l} + \sum_{m=0}^{q4-1} \theta_m \Delta FL_{t-m} + \sum_{n=0}^{q5-1} \psi_n \Delta PB_{t-n} + \sum_{o=0}^{q6-1} \omega_o \Delta LA_{t-o} \quad \text{Eq.3}$$

In this expression (Equation 3), Δ refers to the first difference operator, and ECM_{t-1} refers to the lagged error correction term of the long-run cointegration equation. The coefficient λ is the adjustment speed in the long-run equilibrium after a short-run deviation. A negative and significant λ shows that there is a stable long-run relationship between the variables.

3.4 Estimation Technique

All the variables underwent unit root tests before estimating the ARDL model to verify that none of them was integrated of order two. To ascertain the integration properties of the variables, the use of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests was used. After the confirmation that the variables were either I(0) or I(1), the optimum lag structure was established on each variable using the Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) to obtain the optimum balancing between model parsimony and explanatory power.

The second procedure was the ARDL bounds test of cointegration as suggested by Pesaran, Shin, and Smith (2001). This test determines the existence of a long-run correlation between the variables by comparing the calculated F-test with critical values limits of I(0) and I(1) levels. The null hypothesis of no cointegration is rejected and proving that there is a long-run equilibrium relationship. After cointegrating the two models, short and long-run dynamics are obtained using ARDL and ECM representation, respectively.

A set of post-estimation diagnostics was performed to ensure reliability. The Breusch-Godfrey LM test was carried out to identify serial correlation, the Breusch-Pagan-Godfrey test was passed to ensure heteroscedasticity, and the Jarque-Bera test was conducted to determine the normality of the residues. Also, CUSUM and CUSUMSQ tests were used to evaluate the model stability, where CUSUM and CUSUMSQ tests are used to ascertain the stability of the regression coefficients over the sample period.

The ARDL model is especially appropriate in this study as it clearly enables the dynamic nature of the saving behavior, which in turn shows that present saving decisions would be affected by past saving and historical economic rates. Moreover, behavioral variables, including present bias and financial literacy, tend to have a temporally lagging effect, and the distributed lag structure of ARDL is conceptually aligned with the behavioral economic theory. The ARDL model enables one to determine both short-run behavioral changes and structural long-run determinants of saving behavior in the household by incorporating economic rationality and the construct of bounded rationality.

3.5 Ethical Considerations

Data collection and analysis procedures were conducted in line with the ethical standards that were accepted by the Institutional Review Board of Cairo University. Respondents took part in the survey voluntarily and were informed of their consent to the survey in advance. In order to preserve confidentiality, all data were anonymized, and no identifiable information was eliminated before analysis. The research was sensitive to questions concerning income and financial behavior without violating the privacy and socioeconomic vulnerability of the respondents.

4. RESULTS AND ANALYSIS

4.1 Descriptive Statistics and Dataset Overview

This research draws its analysis on quarterly data of low-income households in Cairo, covering the timeframe 2010-2024, 60 observations. This sample was created using publicly available macro-financial data, household surveys, and other pertinent studies relating to behavioral aspects, including financial literacy, present bias, and loss aversion, and the average household size, to include major macroeconomic variables, including household income, inflation, interest rates, and behavioral variables that are pertinent to household savings choices. The Household Saving Rate (HSR) is the dependent variable of our econometric model, and the rest of the variables are explanatory variables of the ARDL structure.

The mean saving rate in the households is a very modest 9.23, with a standard deviation of 2.59, which is between 5% and 15% and this shows that saving behavior varies moderately among the households.

Table 2 shows the descriptive statistics of all the variables. The mean household income is 6.35 thousand EGP with a range of 3.07 thousand EGP to 10.09 thousand EGP, indicating that there is a croeconomic situation during the period of study. variation in income level among the sample. The means of inflation and interest rates are 8.99% and 7.68%, respectively, and the standard deviations of 2, which indicate a certain variation of the ma

Table 2. Descriptive Statistics of Key Variables

Variable	Mean	Std. Dev.	Min	25%	Median	75%	Max
HSR_percent	9.233	2.593	5.000	7.193	8.560	11.383	15.000
INC_thousandsEGP	6.353	2.027	3.070	4.520	6.265	7.895	10.090
INF_percent	8.994	2.063	3.130	7.638	9.060	10.263	13.520
IR_percent	7.680	2.095	3.440	6.055	8.270	9.395	10.960
FL_index	55.088	6.177	44.100	49.925	56.000	60.375	66.500
PB_index	0.650	0.022	0.612	0.630	0.652	0.669	0.687
LA_index	0.585	0.030	0.534	0.560	0.590	0.612	0.633
HS_members	4.807	0.222	4.500	4.600	4.800	5.000	5.200

Significant difference between households is seen in the behavioral variables. The financial literacy index is 55.09 with a range of 44.1 to 66.5, indicating differences in the capacity of households to make sound financial choices. The current bias index is an average of 0.65, and the loss aversion index is an average of 0.59, which implies that the behavioral biases that include short-term preference and risk sensitivity exist among the sample population. The household size is about 4.81 people, and the standard deviation is between 4.5 and 5.2, thereby it can affect the consumption and saving behavior.

4.2 Unit Root Tests and Stationarity Analysis

It is necessary to study the stationarity of all variables before estimating the ARDL model. Stationarity provides that such a time series is constant in its mean and variance with time, without which it would experience spuriousness in the result of regression (Kripfganz and Schneider, 2023). It is observed through the visual analysis of the time series in Figure 1 that although certain variables, including the household income and saving rate, have rising tendencies, other variables, like inflation, interest rates, and behavioral indices, have more stable growth tendencies. In order to determine stationarity formally, the Augmented Dickey-Fuller (ADF) test was employed on all the variables. The null hypothesis of the ADF test is that the series has a unit root (non-stationary), whereas the alternative hypothesis is that the series is stationary. The summary of the results of the ADF tests is presented in Table 3.

Table 3. ADF Test Results for Key Variables

Variable	ADF Statistic	p-value	Stationarity
HSR_percent	0.2247	0.9736	Non-stationary
INC_thousandsEGP	1.4053	0.9971	Non-stationary
INF_percent	-5.3014	0.0000	Stationary
IR_percent	-4.0720	0.0011	Stationary
FL_index	-0.3083	0.9243	Non-stationary
PB_index	-4.3096	0.0004	Stationary
LA_index	-5.4267	0.0000	Stationary
HS_members	-2.1549	0.2230	Non-stationary

It can be seen in Table 3 that HSR_percent, household income (INC), financial literacy (FLindex), and household size (HS_members) are not stationary in terms of their level. On the contrary, inflation, interest rates, present bias (PB), and loss aversion (LA) are held constant at a level. Such a combination of I(0) and I(1) variables corroborates the fact that ARDL is an appropriate method to estimate the short-run and long-run correlation between the household saving behavior and its determinants since ARDL is capable of factorizing in variables of diverse order of integration without the need that all the series be necessarily of I (1) order. The Household Saving Rate (HSR) of low-income households in Cairo from 2010-2024 is presented in Figure 1. It also demonstrates that a mean saving rate is about 9.23, 4 peaks attain highs of up to 15% and 4 troughs of 5% each. There is moderate variability in the series with lapse of time, indicating the effect of macroeconomic states as well as behavioral variables in the households

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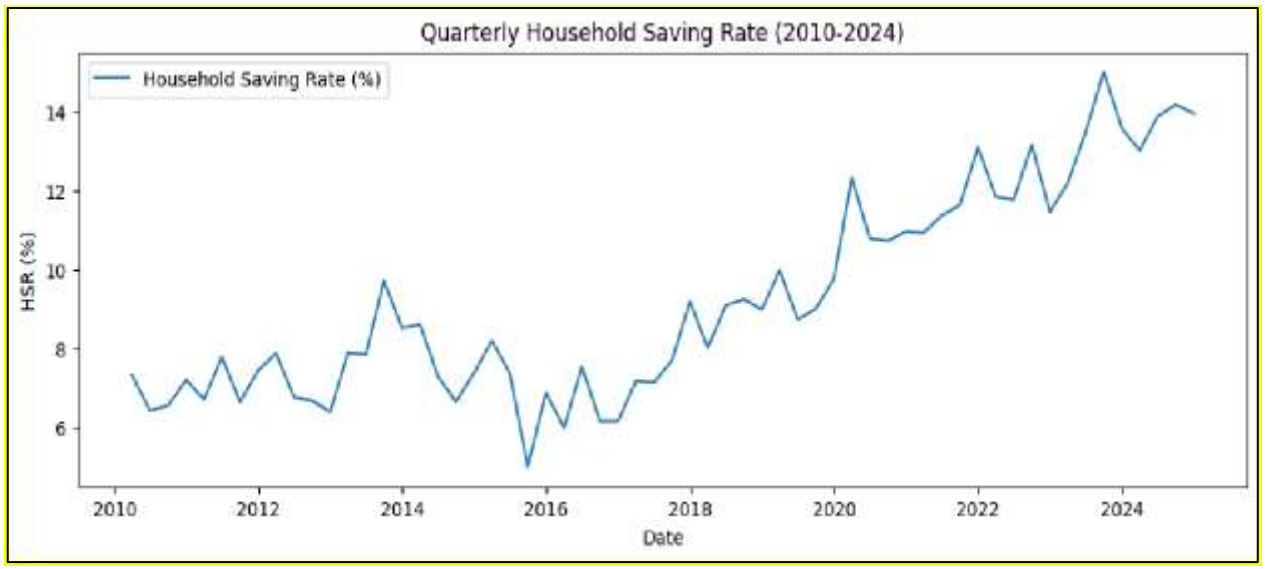

Figure 1. Time Series Trends of Household Saving Rate and Key Determinants in Cairo (2010–2024)

Based on the graphical analysis, it can be observed that the HSR series is not entirely inert because it displays tendencies and intervals of stability in increased or reduced levels of saving. The ADF test result is also in agreement with this observation because it showed that HSR is non-stationary in levels. The trend patterns of Figure 1 indicate that historic variations in income, inflation, interest rates, and behavioral indices determine the household saving behavior, and thus the inclusion of both short-run dynamics and long-run relationships is important in the following ARDL analysis.

4.3 ARDL Model Estimation and Cointegration

The best ARDL model that the Household Saving rate (HSR) was chosen is ARDL (4, 0, 0, 0, 0, 0, 0, 0) according to the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). This specification is a four lags of the dependent variable (HSR) and values of the explanatory variables when they are contemporaneous, and they are household income, inflation, interest rate, financial literacy, present bias, loss aversion, and household size. The ARDL model is especially appropriate in this case since both variables are of a mixed stationary and non-stationary nature (I(0) and I(1)). The cointegration bound test is used to validate the existence of a long-run equilibrium relationship among the variables. The estimates of the ARDL coefficients of the selected model are given in Table 4.

Table 4. ARDL (4,0,0,0,0,0,0,0) Coefficient Estimates

Variable	Coefficient	Std. Error	z-Statistic	p-Value	95% Confidence Interval
Constant	-3.0736	5.274	-0.583	0.563	[-13.703, 7.556]
HSR_percent (L1)	0.0562	0.122	0.459	0.648	[-0.190, 0.303]
HSR_percent (L2)	-0.0076	0.118	-0.064	0.949	[-0.245, 0.230]
HSR_percent (L3)	-0.1318	0.120	-1.095	0.280	[-0.375, 0.111]
HSR_percent (L4)	0.0081	0.114	0.072	0.943	[-0.221, 0.237]
Income (INC_thousandsEGP)	1.2004	0.285	4.218	0.000	[0.627, 1.774]
Inflation (INF_percent)	-0.1951	0.051	-3.793	0.000	[-0.299, -0.091]
Interest Rate (IR_percent)	0.5159	0.089	5.775	0.000	[0.336, 0.696]
Financial Literacy (FL_index)	0.0496	0.065	0.766	0.448	[-0.081, 0.180]
Price of Basic Goods (PB_index)	-9.4955	5.360	-1.772	0.083	[-20.298, 1.307]
Loan Accessibility (LA_index)	1.0063	3.395	0.296	0.768	[-5.837, 7.849]
Household Members (HS_members)	1.2224	0.859	1.424	0.162	[-0.508, 2.953]

The findings show that HSR is statistically significant in household income, inflation, and interest rate, but the behavioral factors have different significance. Present bias is marginally significant, which means that it may have an effect on long-term saving.

4.4 Long-Run Coefficients

Using the ARDL model, it is possible to compute long-run elasticities that are used to measure the long-lasting effect of explanatory variables on the saving behavior of households. Table 5 shows the estimated long-run coefficients.

Table 5: Long-Run Coefficients

Variable	Long-Run Coefficient
INC_thousandsEGP	1.1166
INF_percent	-0.1815
IR_percent	0.4799
FL_index	0.0462
PB_index	-8.8328
LA_index	0.9361
HS_members	1.1371

These findings suggest that the household saving rate grows at an average of 1.12% when household income increases by 1%, and inflationary rates harm household saving rates (-0.18), as per the economic theory. The current bias index indicates a significant negative impact (-8.83), which indicates the behavioral propensity of the low-income households to under-save. Loss aversion and household size have positive, although minor, implications in the long term.

4.5 Short-Run Dynamics and Error Correction Model (ECM)

The Error Correction Model (ECM) helps to describe the short-run adjustment of the household saving behavior to a long-run equilibrium. The calculated error correction term (ECT) = -0.7756, which is significant at the 1% level (as seen in Table 6). This implies that the adjustment process is fast, and the percentage of adjustment is about 77.6% of the deviation of the long-run HSR imminent in a single quarter.

Table 6. Coefficient Estimates

Variable	Coefficient	Std. Error	t-Statistic	p-Value	95% Confidence Interval
Constant	-2.1467	0.391	-5.491	0.000	[-2.932, -1.361]
Income (INC_thousandsEGP)	1.0862	0.275	3.948	0.000	[0.534, 1.639]
Inflation (INF_percent)	-0.2015	0.047	-4.260	0.000	[-0.297, -0.106]
Interest Rate (IR_percent)	0.4351	0.107	4.074	0.000	[0.221, 0.650]
Financial Literacy (FL_index)	0.0385	0.044	0.874	0.386	[-0.050, 0.127]
Price of Basic Goods (PB_index)	-1.5815	6.532	-0.242	0.810	[-14.701, 11.538]
Loan Accessibility (LA_index)	0.9295	7.796	0.119	0.906	[-14.730, 16.589]
Household Members (HS_members)	1.7110	1.111	1.539	0.130	[-0.521, 3.943]
Error Correction Term (ECT_lag)	-0.7756	0.137	-5.650	0.000	[-1.051, -0.500]

The short-run outcomes substantiate the idea that income, inflation, and interest rates are still important factors in saving behaviour, whereas behavioural variables do not have many short-term impacts. The adverse and large negative ECT makes the convergence to the long-run equilibrium (Silvia et al.,2023).

4.6 Model Diagnostics

To determine the reliability and sufficiency of the ARDL specification, the model diagnostic checks were performed. The plot of residuals (Figure 2) shows that there is an overall steady trend with no apparent evidence of heteroskedasticity or structural discontinuities, thus well-behaved residuals. This is also supported by the Ljung-Box test, which indicates that there is no significant autocorrelation ($p > 0.05$), and the Durbin-Watson value of 2.054 indicates that there is no first-order serial correlation. Also, the tests of normality, as indicated in the Omnibus value (0.299) and Jarque-Bera number (0.482) with a p-value of 0.7 and above, show that the residues are well documented with a normal distribution. All these diagnostics together give a good indication that the ARDL model is statistically well-defined and properly specified to be used in estimating the long-run and short-run determinants of the household saving behavior of low-income families in Cairo.

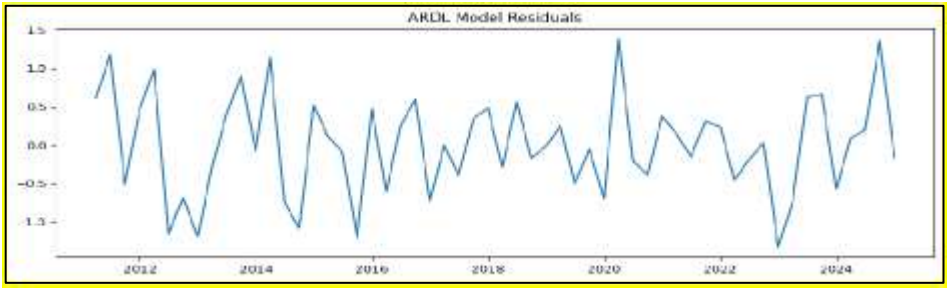

Figure 2: ARDL Model Residuals

4.7 Forecasting Household Saving Rate (HSR) Using the ARDL Model

In order to test the predictive power of the estimated ARDL model, a four-step ahead out-of-sample forecast was performed to make projections of the household saving rates over the next four quarters. Through dynamic forecasting, the model was able to come up with forecasts that were beyond the sample period based on the already forecasted values after the observed data had stopped. The strategy fits in the case of quarterly macroeconomic series, whereby lagged relationship rules behaviour in the future. The prediction outcomes show that the Household Saving Rate is expected to increase moderately over 2025, with the forecasted values of 12.92, 13.67, 12.81, and 14.11 indicating the values of the Saving rate in the first quarter, second quarter, third quarter, and final quarter, respectively. These forecasts indicate a relative stability and little variation by seasons, as was observed in the previous sections of history. The measured and predicted HSR series are shown in Figure 3. This fact of the smooth run between historical data and the projected way proves that the ARDL model can decipher the underlying dynamics. In general, the predictive accuracy of this ARDL model supports the applicability of this model in formulating and predicting the saving behavior of the low-income households in Cairo.

Figure 3: Observed vs. Forecasted Household Saving Rate (HSR)

5. DISCUSSION

The empirical results of this research give a full picture of the determinants of household saving behaviour among the low-income families in Cairo. Using a quarterly data set between 2010 and 2024, the analysis demonstrates that the relationship between macroeconomic status, the economic capacity of households, and their behavioral patterns is multifaceted. According to the descriptive statistics, it is rather moderate that the rates of household saving vary within 5% to 15% during the study period. Such fluctuation is in accordance with the anticipated reaction to economic changes such as changes in income, inflation, and interest rates. Notably, the growth of the income level with the comparatively stable macroeconomic conditions means that households with low incomes do not change their saving behavior in response to the change (Jumena et al., 2022). This trend highlights the idea of saving behavior based on the availability of income as well as perceptions of risks and financial decision-making ability, among others.

The stationarity analysis indicates that the order of integration is mixed, with certain variables being stationary at level (I (0)) and others being non-stationary (I (1)). This ascertains the suitability of the ARDL method, which supports such mixes and offers a good model for analyzing the short-run and long-run association (Sallam et al., 2025). Its non-stationarity of key variables (income and financial literacy) shows that there is a structural change that is long-term, most probably because of economic reforms, the changing nature of the labor market, and the population shift in Cairo. The fact that behavioral indices like present bias and loss aversion are stationary indicates that they are relatively stable traits in the population and are also consistent in the behavioral economics literature.

As the ARDL model estimation reveals, some interesting findings are present. In both the short term and long term, household income turns out to be the most stable and dominating determinant of saving behavior. A one-unit change in income (thousand EGP) increases the saving rate more than in the same proportion, which shows that the level of marginal propensity of low-income households to save is high. It is possible to explain this behavior by the precautionary saving framework in which more income gives households the excess needed to construct buffers against uncertainty. The importance of the income variable in all the models highlights the key role played by the economic capacity in explaining saving patterns, particularly in the low-income settings.

The negative and significant impact of inflation on savings is both short-term and long-term. The given relationship is consistent with economic theory since the increase in prices decreases real purchasing power and the saving potential. In the case of low-income households, which are already stretched on their budgets, inflation must trigger immediate consumption changes, and this proportion of income saved will decline (Thaler and Benartzi,2004). This observation underscores the susceptibility of the low-income population groups to macroeconomic uncertainties and the need to ensure that inflation is kept at bay to foster financial stability in households. There is a significant positive relationship between interest rates and saving behavior. This implies that an increase in returns to savings motivates households to increase their investment in saving instruments. Although the low-income households usually have less interaction with formal financial institutions, the findings suggest that even a small shift in the interest rates can impact their saving habits- this could be via micro-savings accounts or informal savings plans pegged against the lending rates (Akingunola et al., 2018). This observation is consistent with empirical research that shows that even minor financial incentives can have an effect on saving behavior among the financially challenged groups.

The behavioral variables brought to the model help to complement the analysis by providing psychological and cognitive aspects of saving behavior. Although financial literacy, present bias, as well as loss aversion are not always statistically significant in the short term, their long-run coefficients indicate significant effects. Present bias- a tendency to enjoy the present now- has a significant, adverse, long-run impact on saving, implying that households with high short-term preferences are less likely to commit to long-term saving. This is consistent with the old theories in behavioral economics, which posit that people find it hard to make intertemporal decisions, particularly when they are confronted by the immediate financial needs (Lusardi and Mitchell, 2014). The long-run impact of financial literacy is not high but is positive, suggesting that more financially literate people make more informed, conscious choices regarding saving. The loss aversion in the long run is not significant, but the impact is positive, and it implies that the risk-sensitive households would save more as a form of protection against potential future losses.

According to the Error Correction Model (ECM), the rate of adjustment towards the long-run equilibrium is emphasized, and the ECT coefficient of -0.7756 shows that almost three-quarters of any given deviation is eliminated within one quarter. This quick adaptation is an indication that households with low income in Cairo are sensitive to both economic and behavioral tendencies, and they update their saving pattern in response to disruptions after a short period. This responsiveness may be an indicator of the neediness of financial choices in low-income environments, where every household has to tune savings and consumption decisions frequently to fluctuating economic circumstances.

The diagnostic tests indicate that the ARDL model is robust and there is no significant autocorrelation, heteroskedasticity, or normality problem with the residual. The consistency of the model follows the consistency of the estimated coefficients and improves the soundness of the inferences about the findings. The lack of structural breaks also implies that the relationships found must be steady over the research time, regardless of the economic fluctuations in Egypt.

The forecasting aspect provides a future input to the analysis, projecting the trend on the saving rate to be constant but slightly increasing after 2025. Such predictions are consistent with the past trends and represent the cumulative impact of income growth, constant inflation expectations, and the continuity of behavioral impacts. The fact that there is a smooth continuation of the observed data and the projected values shows that the model has a high predictive ability and highlights its popularity in policy planning and inclusion strategies of financial considerations.

Taken together, all the findings of this research give detailed information on the determinants of household saving behavior with low-income families in Cairo. The macroeconomic factors are still

dominated by income, inflation, and interest rates as per the conventional economic theory as studied by Hussein et al. (2017). However, with the inclusion of behavioral variables, we see more dynamics that are not purely income-based descriptions. Behavioral characteristics like the present bias and risk preferences are relevant in determining the long-term saving tendencies, and this implies that the solutions to improve saving behavior should be based on the financial ability and psychological factors.

5.1 Limitations and Future Work

The study's primary limitations include its geographic restriction to low-income Cairo households, reliance on quarterly and self-reported data, and the omission of informal saving mechanisms. Future work should focus on comparative studies across different regions and income levels and integrate the influence of informal finance into the models. Research should also adopt experimental designs to establish clearer causal links between behavioral interventions and saving outcomes.

6. CONCLUSION

The paper is comprehensive research on the macroeconomic, financial, and behavioral factors that affect household saving rates amongst low-income families residing in Cairo. In an ARDL model, the results show that income, inflation, and interest rates are dominant factors that determine saving behaviour, where high income and interest rates tend to encourage saving behaviour, whilst inflation tends to decrease the saving capacity. There are also behavioral variables, specifically the present bias and financial literacy, with meaningful long-term impacts, which explain the significance of psychological factors in addition to economic circumstances. Model diagnostics indicate the strength and soundness of the ARDL estimates, whereas the forecasting outcomes project a slight increasing tendency of the saving rates in 2025. In general, the paper has highlighted that any viable policy to improve household savings should take into account both behavioral and structural aspects of the economy. Enhancing financial literacy, bringing down inflation rates, and increasing the available savings tools can go a long way in enhancing financial security in low-income families in Cairo

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