THE IMPACT OF INTEREST RATES ON MORTGAGE, LEASING DEMAND, HOUSE PRICES AND ARBITRAGE OPPORTUNITY: A CASE STUDY OF PAKISTAN

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Article Info	Abstract
	In this study, it is attempted to study how the interest rates have influence on key real estate market variables, including mortgage rates, leasing demand, house prices and arbitrage opportunities in Pakistan. The dataset used for the research is from 2014 to 2023 and the research employs a Simple Linear Regression (SLR) Model using SPSS software. The inclusion of inflation rates and GDP growth form controls variables to explain what drives the property sector more comprehensively. The findings show that interest rates have a large positive effect on mortgage rates thus changes in monetary policy are directly reflected in borrowing cost. However, interest rates do not explain leasing demand or house prices very well, emphasizing that there are other significant factors influencing lease demand and home prices than interest rates. Also, the study explains how the interest rate has a negative impact on arbitrage opportunities against the prevailing financial theories that higher interest rates diminish the feasibility of the investment in real estate arbitrage. The implications provided by these results are important for policymakers, investors, and financial institutions. However, mortgage markets are responsive to monetary policy while other policies may be needed to control prices of property and leasing trends. The findings also highlight the need for further research incorporating additional economic indicators, behavioural factors, and regional variations in Pakistan's real estate market.

Introduction

Real estate and construction are both key components of the overall national economy of Pakistan and have a major role to play in GDP generation and employment. The construction sector is a contributor of approximately 2.5 percent of GDP on its own while the wider 'real estate sector' which includes housing and commercial development contributes up to 9 percent (PBS, 2023). Residential and commercial property demand experienced extensive growth in the last several decades due to rapid urbanization and population growth. Annual growth rate of urban population in Pakistan almost 2.5% and this requires more housing and commercial spaces (World Bank).

Substantial property price appreciation, mostly fueled by sharply rising demand, sparse land and urban development initiatives has been witnessed by major urban centers such as Karachi, Lahore and Islamabad. For example, the China Pakistan Economic Corridor (CPEC) was shown to have heavily influenced property prices as well as follow up investment trends (Ahmed & Qureshi, 2021). However, even though market is growing, it is highly sensitive to economic conditions with macroeconomic variables such as leasing demand, house price inflation, interest rates and currency volatility key factors in determining property demand and pricing. Typically, the high incidence of construction costs following the rise in inflation and Interest rate changes have a direct impact on the affordability of housing and real estate investment choices (Khan et al., 2020).

Pakistan property market offers arbitrage opportunities for the reasons there are disparities in regional property prices, rental yields and financing costs. Often these price differentials are capitalized on by investors buying and selling undervalued property in developing areas at higher prices when infrastructure and the urban development project increase value of these property. With mortgage rates and rental yield gap arbitrage potential presents, investors can earn profits by buying properties at low interest rates and renting it at higher rate.

Umar et al, (2019) study establishes interest rates affect house prices in Pakistan, it finds that the supply of credit and the forces of demand, including tight monetary policy, are associated with decline in property value. This study examines these relationships, in order to gain insight into issues that inform policymakers, investors, and other stakeholders in making decisions.

In this study, the approach will be quantitative, and from a set of economic indicators including interest rates, mortgage, and leasing demand, property price, arbitrage opportunity, and inflation rate indexes, ones applied in the study will be selected on the basis of their respective importance. Research using econometric models (linear regression analysis) attempts to establish statistical relationship between these variables. Using Pakistan's central bank, property market reports and other credible sources, the study will shed light on the influence of economic rules of land on the survival and growth of commercial banks. This methodology will help to provide empirical insights about the property market in Pakistan and how interest rate changes can affect them.

Regarding the fact that interest rates have a significant impact on the market, there is little empirical data regarding Pakistan. Property market has been characterized by economic volatility, with consistent changes in the interest rates, making the decisions on buying property, leasing, or investing in the property itself quite uncertain. In Pakistan especially in urban areas there are no clear understanding about the real effects of interest rates on mortgage demand, leasing demand, property prices and arbitrage opportunity. This gap will be advantageous for policymakers, investors and households. There is a lack of data and insight that lead to a knowledge gap, and therefore, stakeholders do not have the proper guidance on navigating the highly complex real estate environment in Pakistan.

Developed Vs Developing Countries

The evidence of the monetary policy and house prices relationship provided by most of these studies is based on statistics from the developed countries. There is a dearth of literature concerning the relationship between monetary policy and house prices from developing countries. This has motivated us to select the data from a developing country of Pakistan and researching their impact on house prices given that the developed and developing economies are inherently dissimilar (Umar et al, 2019).

Role of Interest Rates in Property Markets

The SBP also influences the cost of borrowing by changing the interest rates from which the cost of other credit facilities becomes dependent on affordability like mortgages. A lower interest rate means less expensive borrowing costs that encourage investment in property and a higher rate incurs higher costs to borrow making it less attractive to homeowners.

Economic Challenges and the Housing Market

Pakistan is facing many economic problems, including high inflation, frequent currency fluctuation, and poorly developed mortgage market. For such reason, the housing market in Pakistan is greatly affected by interest rate changes. Compared to mature economies with stable mortgage system, Pakistani real estate market is self-financing which make it more susceptible to macroeconomic instability. Interest rates mean with the changes in demand for both buying and leasing properties with the changes in the affordability. Furthermore, with few financing options, peoples cannot afford their own homes, that is, the demand for rental properties in urban areas is high as a result of this creating the requirement for a good housing finance system to make housing open and reasonable in the market (Uppal, J.2021).

Significance of the Study

Authorities who control of Pakistan's monetary policy are also aware of how interest rates affect the real estate industry. Policy implications from the study can contribute to the state bank of Pakistan and other government agencies in crafting policies that are supportive of housing affordability, financial stability, and the investment in the real estate sector.

Interest rate fluctuations affect directly property developers, investors and financial institutions because they affect both demand for real estate and cost of financing projects. This research can help developers adjust their investment strategies depending on changes in interest rates expected, while banks and other lenders will be in a more informed position regarding mortgage risk and lending policies. The results of the study will assist real estate stakeholders in understanding the market risks, therefore they will be able to make more informed capital allocation and investment timing decisions.

By offering an empirical examination of interest rates, this study will close a large gap in the academic literature, effects on Pakistan's property market. While studies in other countries have established relationships between interest rates and property price, leasing demand, and arbitrage, there is limited research focused specifically on Pakistan. By building on international studies and adapting them to Pakistan's unique context, this study will contribute to the academic understanding of real estate finance in developing economies.

Literature Review

Meltzer (1974) was one of the first studies to examine the connection between monetary policy and home values. He looked at how monetary policy affected home prices and came to the conclusion that credit availability was a significant factor. However, the study found no proof that monetary policy had a lasting effect on home prices.

Miles (1992) studied the housing market of developed countries like Japan, the UK and USA and concluded that liberalization and easy availability of credit was behind the house prices surge in the period prior to the study. The findings of the above-mentioned studies were also confirmed by Woodford (2003), who came to the conclusion that real estate values are impacted by monetary policy changes in a number of factors.

Iacoviello and Minetti (2003) presented research on home prices and monetary policy a new direction at the start of the twenty-first century. They investigated whether or not changes in home values have an impact on monetary policy. The response was in the yes. Using data from the property markets in Finland, Sweden, and the UK, the study concluded that home prices have a significant impact on how monetary policy is developed. They employed the VAR model to analyse data that covered 20 years.

To gain a deeper understanding of the connection between home prices and monetary policy, the majority of the research mentioned above analysed data from across the country.

Del Negro and Otrok (2007) investigated the previous correspond using quarterly US state-level data from 1986 to 2005. According to the analysis, the primary cause of the home price bubble that lasted from 2001 to 2005 was expansionary monetary policy. In order to answer the topic of why changes in interest rates impact home prices, Mishkin (2007) proposed that a lower interest rate facilitates mortgage acquisition for customers, which in turn increases demand for housing and, eventually, raises home prices.

According to Taylor (2007), from the middle of the 1980s, US monetary policy has tempered the housing cycle by reacting more aggressively to inflation and so lowering the boom-bust cycle. The study found that monetary policy's departure from the consistent interest rate path was the cause of the housing bubble that lasted from 2002 to 2005.

Belke et al. (2008) examined the effects of global liquidity shocks and monetary policy on house prices in the Organisation for Economic Co-operation and Development (OECD) countries, adding a new dimension to the relationship between house prices and monetary policy. They discovered that global monetary policy conditions were in charge of determining the house prices through global liquidity shocks.

Studies was conducted on the connection between monetary policy and both residential and commercial real estate values. Positive interest rate shocks result in lower home prices, according to the study, but there was no apparent relationship between monetary policy shocks and commercial real estate prices.

Changes in monetary policy in Norway, Sweden, and the UK have an immediate effect on home prices, according to research by Bjørnland and Jacobsen (2010) on the transmission mechanism of monetary policy in these nations. Similar to several research already cited, they also discovered that a tight monetary policy decreases home values and inversely.

Kenneth and Shim (2012) expanded the scope to examine the connection between monetary policy and home prices. After examining the housing markets of 57 nations, they concluded that the Asia-Pacific region's housing market was more noteworthy. They discovered that rising short-term interest rates typically limit the growth of housing credit and the increase of home values. Nonetheless, they discovered that the impact of rising interest rates on home values was quite minor.

In an earlier investigation, Eickmeier and Hofmann (2013) similarly came to the conclusion that the US economy's financial imbalance and housing price boom were mostly caused by an expansionary monetary policy. In contrast to Meltzer's (1974) research, this study found that monetary policy influences not only home prices but also the entire real estate market and private sector debt.

According to Lee and Reed's (2013) analysis of Australian home price volatility, shocks have a greater effect on short-term (temporary) components than on long-term (permanent) ones. Additionally, the study found that permanent shocks are more persistent than transient shocks.

Using data from the United States' metropolitan statistical areas (MSA's), Füss and Zietz (2016) examined the factors influencing inflation in home prices and discovered a correlation between higher house prices in MSA's and a lower fed fund rate. They added that this relationship is dependent on tighter housing availability and increased demand.

The elasticity of home prices to shifts in monetary policy was examined by Cajias and Ertl (2017). In the long term, they discovered it to be detrimental. They added that, among Scandinavian nations, recessionary and expansionary monetary policy regimes have a significant impact on home values in Finland, Sweden, and Norway but not in Denmark.

Robstad (2018) discovered in another study on Norway that monetary policy has a greater effect on home prices than it does on household credit. Because monetary policy can influence changes in property prices, the study proposed that the Norwegian monetary policy could be utilised as an instrument to maintain the stability of the financial system.

A tight monetary policy has an adverse effect on housing values in China, especially in first-tier cities, according to a recent study by Wu and Bian (2018). Second- and third-tier cities were not particularly affected by monetary policy. Additionally, Kok et al. (2018) offered proof of the connection between monetary policy and developing-nation home prices. They discovered that monetary liquidity increases

the number of transactions involving the selling and purchase of homes; for instance, mortgages have an impact on housing demand.

In Guirguis and Trieste (2020), investigated the domestic mortgage rate affect under U.S. monetary policies while incorporating a wide basket of macroeconomic variables. The findings show that mortgage rates are generally influenced more by the macroeconomic environment than by monetary policy itself. Second, they can arguably overestimate the influence of different dimensions of monetary policy on mortgage rates by omitting macroeconomic variables. According to them, mortgage rates tend to go up significantly in the case of both tight monetary policy and strong economic growth.

The impact of various interest rate environments on mortgage rates in light of prepayment and default risks was investigated by Ahmad and Shehzad (2024). They then found that the likelihood of a prepayment or default has a major impact on the amount of the mortgage rate spread, as does the environment, in that an environment with high interest rates results in a greater mortgage rate spread. In low interest rates environment negative spreads can also occur.

The fluctuations in interest rates significantly affect Pakistan's both commercial and residential property markets leasing demand, stated by Hussain and Nawaz (2021).

The impact of interest rate changes on leasing markets in European economies is examined by Cajias and Ertl (2017). According to their study, monetary policy regimes of recessionary or expansionary affect leasing demand, so the higher the interest rate, the more leasing demand.

Empirical Studies on Interest Rates and Mortgage Demand

There is a direct correlation between the interest rates and the demand of the mortgage, as indicated by numerous international studies. Greens and Wachter (2005) show that interest rates higher deter applications for mortgage as rising rates do increase the monthly cost of repayment Tsatsaronis and Zhu (2004) conducted a study which confirmed that high borrowing cost lowers mortgage affordability in emerging economies and that their results will be more or less relevant to Pakistan.

Khan and Ali (2017) also Analyse how policy rate changes affect Pakistan's demand for mortgages, to find that an increase of policy rates results in a sharp decrease in mortgage issuance. Authors say that as Pakistan is not having a direct access to long term financing this is worse than ever eroding the effects of rate hikes in property acquisition. According to Rauf et al. (2020), mortgage finance is unaffordable due to Pakistan's increasing interest rates.

The affordability problem is still a very big thing in this country Ahmed and Aziz (2019). even moderate increase in rates leads to inability to afford a large chunk of the population to home affordable, especially those living in urban centers where prices of properties are already high. The study further stresses that housing needs turn to interest rate increases have further strengthened informal lending, therefore with costs and risk.

Empirical Studies on Interest Rates and Leasing Demand

Higher interest rates tend to raise leasing demand since buyers are charged out of the mortgage market. According to Glaeser and Kahn (2010), when borrowing costs increase consumers will more often resort to rental markets. This is in line with what is seen in Pakistan, where leasing is considered a lower cost option compared to mortgages when interest rates are high.

Both residential and commercial properties tend to get leased in such cases in Pakistan during high interest periods Rehman and Rashid (2018). lending demand increases as mortgages become pricier, and people are more likely to go for a lease in order to save themselves from paying high borrowing prices. This study also discovered that leasing demand may increase request rent and may impact affordability, particularly in urban areas.

Another factor for the rise in leasing demand in Pakistan is economic instability, which includes inflation, fluctuating currency depreciation and to avoid commitment for long term mortgage. Hussain and Nawaz (2021) noted that the more adverse market conditions are the more people lean towards leasing rather simply because a lease involves lower initial capital fees and shorter commitment time. This trend

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emphasizes how economic conditions drive what sorts of consumer preferences exist for leasing vs purchasing property.

Empirical Studies on Interest Rates and Property Prices

Iacoviello and Minetti (2008) investigate the connection between interest rates and real estate values in industrialised nations and discover that there is typically a substantial inverse link, lower interest rates tend to motivate growth in property prices by making financing cheaper. In Pakistan's real estate market, this effect is intensified as price sensitivity is higher and credit access is low.

Pakistani property values are very sensitive to changes in the country's interest rates. According to Awan et al. (2021), Reduced lending rates in Pakistan increase demand for real estate, which drives up prices because there is a shortage of available housing. On the contrary, high interest environments diminish purchasing power of property and dampening property prices. It is argued that interest rate volatility in Pakistan as in other emerging economies contribute significantly to price instability Tsatsaronis and Zhu (2004).

For example, in emerging markets like Pakistan, property prices are highly responsive to the rate of interest because of inflation that tends to compound the impact. Amin and Rasheed (2019), studying inflation effects of such property values, stated that inflationary impacts of such property values can be noticeable in two ways, which are both increases in the costs of construction materials and decrease in purchasing power. Demand will be hit as property prices stabilize as interest rates rise to combat inflation. Results of this study show that it is need of the hour for Pakistan to consider both the inflation and the interest rates while evaluating property price trend in Pakistan.

Empirical Studies on Arbitrage Opportunities in Real Estate

When people can buy properties for rent at rates above the cost of borrowing, there is an arbitrage in real estate. The differential is risk adjusted profit that brings investors who are hunting for the market inefficiencies. For example, investors could use low financing to make mortgage payments when rental yields are lower than mortgage rates.

One of the most crucial elements in raising the profitability of real estate investments, according to Geltner et al. (2007), is the existence of a sizable difference between financing costs and rental income. in periods of low interest rates, a rise in rental yields makes them more attractive and this increase in investor activity affects property values. Quigley and Shiller (2005) present empirical evidence that since individual investment decisions are affected by such arbitrage opportunities, housing market dynamics are also influenced. The study by them also indicates that the favourable conditions in the interest rate, can result to increased demand for properties which can lead to the value of the properties to increase.

An inclusive framework of arbitrage opportunity in the context of Pakistan is presented incorporating it as a dependant variable to describe how monetary policy affects financing costs and rental revenue returns. Low interest rates lower the cost of capital and make it simpler to execute an arbitrage strategy, which affects both real estate values and leasing demand.

2.9 Scope of the Study

This research emphasizes Pakistan's urban property market, examining cities like Karachi, Lahore, and Islamabad where there is a larger population density, a higher mortgage uptake rate, and a stronger demand for leasing, all of which intensify the influence of interest rates on real estate markets. The study period (2014–2023) allows for an analysis across multiple economic cycles, capturing both high and low-interest rate environments.

Chapter 3: Methodology

The present study adopts secondary data and a quantitative approach to examine the relationships among interest rates and four key dependent variables: mortgage demand, leasing demand, property prices, arbitrage opportunities and inflation rate and GDP growth rate as a control variables. This study has two models one is without the impact of control variables and other one is with control variables. The methodology is designed to capture panel data through archival records of 10 years data. The hypothesized relationships will be tested and the statistical significance of observed effects using econometric models.

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Research Design

This study's research design uses a quantitative, explanatory and correlational approach and a panel data. The employs SPSS to apply a simple linear regression model by using the aim of the study is to determine the effect of interest rates on mortgage rates, lease demand, house price and arbitrage opportunities in Pakistan from 2014 to 2023. Secondary data from financial institutions and indicators are used to conduct the study. The independent variable is the interest rates and the dependent variables are mortgage rates, leasing demand, house prices, arbitrage opportunity, inflation rate and GDP growth. Descriptive statistics, correlation, ANOVA and coefficient tests have been used to assess relationship and statistical significance in the analysis. The economic impact of interest rates on Pakistan's property market can be evaluated through this design.

Sample

The complete Pakistani real estate market and banking system.

All available data on interest rate, mortgage rate and leasing demand, property price, inflation rate and GDP growth rate in Pakistan over the study period (2014 –2023).

Sampling and Design

Data points include individual mortgage rate, leasing demand, interest rate, property prices, and calculated arbitrage margins (rental yields minus interest rates). The control variables inflation rate and GDP growth rate. The data is collecting by taking average of every year.

Since the study relies on archival and administrative records, a purposive sampling method is applied. The sample is drawn from official databases and market reports, which serve as the sampling frame.

While traditional probability sampling is less applicable to secondary data, efforts will be made to ensure representativeness by including data from major financial institutions and real estate markets. Tolerance levels for data inclusion will be predetermined only using data sets with at least 95% completeness and reliability.

Validity and Reliability

This thesis is validated with the necessary economic variables chosen and panel data from 2014 to 2023 from reliable financial and real estate databases like Zameen.com used. Using Simple Linear Regression (SLR) technique in SPSS, the study measures relationships between interest rates and dependent variables mortgage rates, leasing demand, house prices, and arbitrage opportunities. By accounting for GDP growth and inflation, the chosen variables are limited in their ability to accurately reflect the economic aspects they are intended to assess, and the internal validity is strengthened by reducing the possibility of confounding variables.

The consistency in the methodology used in the study helps in establishing the reliability of this study. Data on leasing demand and house prices is collected from Zameen.com in a monthly basis and with annual averages to make sure the data stays consistent over time. Like arbitrage, the formula for calculating the latter is standardized – borrowing costs are subtracted from rental yield. In the study, the application of SLR in SPSS ensures statistical reliability hence similar results are obtained if the analysis is done again using the same dataset. The high reliability of the findings is so due to the high consistency and this confirms the robustness of the findings for policy and investment decisions in the real estate market of Pakistan.

Data analysis

Regression analysis:

In this work, Simple Linear Regression (SLR) in SPSS with panel data is taking to examine the effect of interest rates on mortgage rates, leasing demand, house prices and arbitrage opportunities in Pakistan.

Econometric model

For example, the model for mortgage demand can be expressed as:

Mortgage Demand t = β0 + β1 (Interest Rate t) + β2 (Inflation t) + β3 (GDP Growth t) + ϵt

Since your thesis employs Simple Linear Regression (SLR) using panel data in SPSS, the econometric models for each dependent variable can be formulated as follows

- MRit = β0 + β1Irit + β2INFit + β3GDPit + ∈it
- ARBit = β0 + β1IRit + β2INFit + β3GDPit + ∈it
- LDit = β0 + β1IRit + β2INFit + β3GDPit + ∈it
- HPit = β0 + β1Irit + β2INFit + β3GDPit + ∈it

Where as:

- MRit = Mortgage Rate,
- ARBit = Arbitrage Opportunities
- LDit = Leasing Demand
- HPit = House Prices
- IRit = Interest Rate (Independent Variable)
- INFit = Inflation Rate (Control Variable)
- GDPit = GDP Growth Rate (Control Variable)
- β0 = Intercept
- β1,β2,β3 = Regression Coefficients
- ∈it = Error Term

For each model, interest rate is the main independent variable and control variables are inflation and GDP growth. They significantly contribute to measuring the impact of interest rates on important aspects of Pakistan's real estate market.

Methodology assumption

The following fundamental presumptions form the basis of this thesis' methodology:

- The connection between interest rates (independent variable) and the dependent variables (mortgage rates, leasing demand, house prices, and arbitrage opportunities) is assumed to be linear, making Simple Linear Regression (SLR) an appropriate model.
- The panel data has been used in this study (average values from 2014–2023), assuming that observations across years are independent and do not influence each other.
- The model makes assumptions that there is no perfect correlation between the independent variable (interest rates) and the control variables (inflation rate and GDP growth rate), preventing issues of multicollinearity.
- The error terms in the regression model are assumed to follow a normal distribution, which is essential for valid hypothesis testing and confidence interval estimation
- It is also assumed that changes in interest rates directly impact on the dependent variables, changes in interest rates cause a change in mortgage rates, leasing demand, house prices and arbitrage opportunities rather than the other way around.

Chapter 4: Results and Findings

Descriptive Analysis

Table 1

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Interest Rates	10	0.063	0.198	0.098	0.040	1.979	0.687	4.820	1.334

Mortgage Rates	10	0.091	0.226	0.126	0.040	1.979	0.687	4.820	1.334
Leasing Demand	10	-0.094	0.227	0.075	0.096	-0.148	0.687	-0.327	1.334
House Prices in Crs	10	-0.095	0.803	0.109	0.254	2.718	0.687	7.941	1.334
Arbitrage Opp	10	-0.216	-0.080	-0.116	0.040	-1.956	0.687	4.774	1.334
Inflation Rates	10	0.025	0.308	0.103	0.088	1.710	0.687	2.763	1.334
GDP Growth Rates	10	-0.013	0.066	0.042	0.023	-1.544	0.687	3.221	1.334
Valid N (listwise)	10								

- Interest and Mortgage Rates are highly correlated, as expected. Their strong positive skewness and high kurtosis indicate occasional spikes in rates
- Leasing Demand is stable with low skewness, but moderate variability suggests market fluctuations.
- House Prices potential housing bubbles. show significant volatility and extreme outliers, indicating speculative trends
- Arbitrage Opportunities are declining, with negative mean values and a left-skewed distribution.
- Inflation is moderately stable but shows occasional spikes, impacting interest rates and economic policies.
- GDP Growth Rates are positive but face occasional downturns, with left-skewed distribution indicating economic crises affecting overall performance.

Model Summary
Table 2

Model Summary											
						Change Statistics					
Variables	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
Mortgage	1	1.000a	1.000	1.000	0.000	1.000		1	8		
	2	1.000b	1.000	1.000	0.000	0.000		2	6		0.909
Leasing Demand	1	.274a	0.075	-0.040	0.098	0.075	0.650	1	8	0.443	
	2	.474b	0.225	-0.163	0.103	0.150	0.579	2	6	0.589	2.251

	Model	R	R²	Adjusted R²	Std. Error	R² Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
House Prices	1	.201ᵃ	0.040	-0.080	0.264	0.040	0.335	1	8	0.579	
	2	.357ᵇ	0.128	-0.309	0.291	0.087	0.301	2	6	0.751	1.921
Arbitrage Opportunity	1	.999ᵃ	0.999	0.999	0.001	0.999	6896.759	1	8	0.000	
	2	1.000ᵇ	1.000	1.000	0.001	0.001	11.931	2	6	0.008	2.624

Mortgage
- R = 1.000, R² = 1.000, Adjusted R² = 1.000: The model perfectly predicts mortgage demand, meaning 100% of the variance is explained by the predictors.
- Std. Error of Estimate = 0: Indicates no deviation between actual and predicted values.
- Durbin-Watson = 0.909: Suggests positive autocorrelation.

Leasing Demand
- R² (0.075 for Model 1, 0.225 for Model 2): The models explain only 7.5% and 22.5% of the variance, meaning a weak relationship between interest rates and leasing demand.
- Negative Adjusted R²: Indicates that adding more predictors does not improve model performance.
- Durbin-Watson = 2.251: Close to 2, indicating no serious autocorrelation issue.

House Prices
- R² (0.04 for Model 1, 0.128 for Model 2): The models explain only 4% and 12.8% of variance in house prices, indicating a weak relationship.
- Negative Adjusted R²: Suggests moderate fit.
- Durbin-Watson = 1.921: Suggests no major autocorrelation concerns.

Arbitrage Opportunity
- R = (0.999 for Model 1, 1.000 for Model 2, R² = 0.999-1.000): Indicates that the model explains nearly all variations in arbitrage opportunities.
- High F-statistics (6896.759 and 11.931): Indicates strong statistical significance (p < 0.01).
- Durbin-Watson = 2.624: Suggests possible negative autocorrelation.

Mortgage and arbitrage opportunities are highly predictable based on the independent variables, indicating a strong correlation between interest rates and these financial activities. This implies that fluctuations in interest rates play a significant role in shaping mortgage demand and arbitrage strategies within the property market

However, there are modest correlations between interest rates and property prices and lease demand, suggesting that other factors including market conduct, government policies, and economic growth may have a greater influence on these variables. This demonstrates how intricate the real estate market is, with several economic and non-economic factors influencing general patterns.

Because mortgage rates are calculated by adding a bank spread to interest rates, it was shown during data analysis that there was a strong correlation between mortgage rates and interest rates. This high collinearity posed challenges in the regression models. To address this issue, additional collinearity diagnostics were carried out to validate the accuracy of the findings.

"Mortgage rates are directly influenced by the central bank's policy rate, as banks determine mortgage rates by adding a spread to the benchmark interest rate (Saunders & Cornett, 2021) and (Mishkin, 2019). This results in a strong correlation between interest rates and mortgage rates, as observed in the regression results. Similar findings have been reported by (Hofmann ,2004) explains how monetary policy affects lending rates."

Correlation

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Table 3

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Correlations								
		Interest Rates	Mortgage Rates	Leasing Demand	House Prices in Crs	Arbitrage Opp	Inflation Rates	GDP Growth Rates
Interest Rates	Pearson Correlation	1	1.000**	-0.274	0.201	-.999**	.934**	0.146
	Sig. (2-tailed)		0.000	0.443	0.579	0.000	0.000	0.686
	N	10	10	10	10	10	10	10
Mortgage Rates	Pearson Correlation	1.000**	1	-0.274	0.201	-.999**	.934**	0.146
	Sig. (2-tailed)	0.000		0.443	0.579	0.000	0.000	0.686
	N	10	10	10	10	10	10	10
Leasing Demand	Pearson Correlation	-0.274	-0.274	1	-0.079	0.290	-0.127	-0.196
	Sig. (2-tailed)	0.443	0.443		0.829	0.416	0.727	0.587
	N	10	10	10	10	10	10	10
House Prices in Crs	Pearson Correlation	0.201	0.201	-0.079	1	-0.221	0.086	-0.031
	Sig. (2-tailed)	0.579	0.579	0.829		0.539	0.814	0.932
	N	10	10	10	10	10	10	10
Arbitrage Opp	Pearson Correlation	-.999**	-.999**	0.290	-0.221	1	-.923**	-0.155
	Sig. (2-tailed)	0.000	0.000	0.416	0.539		0.000	0.670
	N	10	10	10	10	10	10	10

Inflation Rates	Pearson Correlation	.934**	.934**	-0.127	0.086	-.923**	1	0.114
	Sig. (2-tailed)	0.000	0.000	0.727	0.814	0.000		0.754
	N	10	10	10	10	10	10	10
GDP Growth Rates	Pearson Correlation	0.146	0.146	-0.196	-0.031	-0.155	0.114	1
	Sig. (2-tailed)	0.686	0.686	0.587	0.932	0.670	0.754	
	N	10	10	10	10	10	10	10

The correlation table sheds light on the connections between interest rates and different aspects of the real estate industry. This is how the main findings are interpreted.

Mortgage Rates and Interest Rates (r = 1.000, p < 0.001)

- There is a perfect positive correlation between interest rates and mortgage rates, which is highly significant.
- This suggests that mortgage rates move in lockstep with interest rates, meaning when interest rates increase, mortgage rates also increase proportionally.

Arbitrage Opportunities and Interest Rates (r = -0.999, p < 0.001)

- There is a strong negative correlation between interest rates and arbitrage opportunities.
- This implies that when interest rates rise, arbitrage opportunities decrease significantly, likely because higher interest rates reduce the potential for profitable arbitrage in the property market.

Leasing Demand and Interest Rates (r = -0.274, p = 0.443)

- A weak negative correlation exists between interest rates and leasing demand, but it is not statistically significant.
- This suggests that leasing demand is not strongly influenced by interest rates and may be driven by other economic factors, such as employment levels, disposable income, and urban migration.

House Prices and Interest Rates (r = 0.201, p = 0.579)

- There is a weak positive correlation between house prices and interest rates, but it is not significant.
- This suggests that interest rates alone do not have a major impact on house prices, and other factors such as supply and demand dynamics, economic growth, and government policies may play a more significant role.

Inflation Rates and Interest Rates (r = 0.934, p < 0.001)

- A strong positive correlation exists between interest rates and inflation, which is statistically significant.
- This confirms that rising inflation is associated with increasing interest rates, likely due to central bank policies aimed at controlling inflation.

GDP Growth and Interest Rates (r = 0.146, p = 0.686)

- There is a very weak positive correlation between GDP growth and interest rates, which is not statistically significant.
- This suggests that interest rates do not have a direct or strong influence on GDP growth in this dataset, and other macroeconomic factors might be more important.

The correlation analysis highlights significant relationships between interest rates and key property market variables. Notably, mortgage rates exhibit a perfect positive correlation with interest rates, indicating that any fluctuation in interest rates directly influences mortgage rates, reinforcing the dependence of borrowing costs on monetary policy changes. Similarly, arbitrage opportunities display a strong negative correlation with interest rates, suggesting that higher interest rates reduce profitable arbitrage opportunities in the property market, likely due to increased financing costs and reduced speculative activity. However, both leasing demand and house prices are poorly correlated with interest rates, implying that they are also sensitive to other factors, for example, at the consumer end, such as preferences, supply and demand dynamics, trends in urbanization, etc., as well as broad economic conditions. Since interest rates are important, they alone do not explain the trends in property leasing and pricing. In addition, rising interest rates also exhibit a good positive correlation with inflation rates, in line with the general economic expectation about the fact that usually higher inflation leads to increased borrowing costs for central banks aimed at ensuring the economic stability. Yet, the correlation with GDP growth rates is completely unrelated to interest rates and economic expansion is essentially impeded by other macroeconomic conditions beyond the variation in interest rates. In general, the results show how interest rates determine both mortgage market structure and the arbitrage potential and display how multiple economic factors interact with each other to influence leasing demand, property prices and the broader economy.

Coefficient

Table 4

Coefficients^a									
Variables	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
			B	Std. Error	Beta			Tolerance	VIF
Mortgage	1	(Constant)	0.029	0.000					
		Interest Rates	1.000	0.000	1.000			1.000	1.000
	2	(Constant)	0.029	0.000					
		Interest Rates	1.000	0.000	1.000			0.126	7.958
		Inflation Rates	-4.661 E-18	0.000	0.000			0.127	7.889
		GDP Growth Rates	-9.818 E-17	0.000	0.000			0.974	1.026
Leasing Demand	1	(Constant)	0.139	0.086		1.627	0.142		

Dependent	Model	Variable	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
		Interest Rates	-0.660	0.818	-0.274	-0.806	0.443	1.000	1.000
	2	(Constant)	0.264	0.147		1.794	0.123		
		Interest Rates	-2.842	2.441	-1.181	-1.164	0.288	0.126	7.958
		Inflation Rates	1.085	1.104	0.992	0.982	0.364	0.127	7.889
		GDP Growth Rates	-0.566	1.511	-0.136	-0.374	0.721	0.974	1.026
House Prices	1	(Constant)	-0.016	0.231		-0.069	0.947		
		Interest Rates	1.280	2.212	0.201	0.579	0.579	1.000	1.000
	2	(Constant)	-0.215	0.414		-0.520	0.622		
		Interest Rates	6.202	6.868	0.971	0.903	0.401	0.126	7.958
		Inflation Rates	-2.357	3.107	-0.812	-0.758	0.477	0.127	7.889
		GDP Growth Rates	-0.891	4.251	-0.081	-0.210	0.841	0.974	1.026
Arbitrage Opportunity	1	(Constant)	-0.019	0.001		-15.442	0.000		
		Interest Rates	-0.995	0.012	-0.999	-83.047	0.000	1.000	1.000
	2	(Constant)	-0.015	0.001		-14.551	0.000		
		Interest Rates	-1.071	0.017	-1.075	-61.193	0.000	0.126	7.958
		Inflation Rates	0.037	0.008	0.082	4.697	0.003	0.127	7.889

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GDP Growth Rates	-0.011	0.011	-0.007	-1.035	0.340	0.974	1.026

The table presents the regression coefficients for different models predicting Mortgage, Leasing Demand, House Prices, and Arbitrage Opportunity based on Interest Rates, and Inflation Rates, GDP Growth Rates as Control variable.

Mortgage

Model 1

- Interest Rates (B = 1.000, p-value not provided): The coefficient is exactly 1, suggesting a perfect linear relationship.

Model 2 (with additional control variables)

- Interest Rates (B = 1.000, p = 0.126, VIF = 7.958): High VIF suggests multicollinearity, meaning interest rates are highly correlated with other predictors.
- Inflation Rates (B = -4.661E-18, p = 0.127, VIF = 7.889): The coefficient is effectively zero, showing no meaningful impact.
- GDP Growth Rates (B = -9.818E-17, p = 0.974, VIF = 1.026): near zero and insignificant.

Leasing Demand

Model 1

- Interest Rates (B = -0.660, p = 0.443): Not significant.

Model 2 (with controls)

- Interest Rates (B = -2.842, p = 0.288, VIF = 7.958): Negative but not significant.
- Inflation Rates (B = 1.085, p = 0.364, VIF = 7.889): Not significant.
- GDP Growth Rates (B = -0.566, p = 0.721, VIF = 1.026): Not significant.

House Prices

Model 1

- Interest Rates (B = 1.280, p = 0.579): Not significant.

Model 2 (with controls)

- Interest Rates (B = 6.202, p = 0.401, VIF = 7.958): High but not significant.
- Inflation Rates (B = -2.357, p = 0.477, VIF = 7.889): Not significant.
- GDP Growth Rates (B = -0.891, p = 0.841, VIF = 1.026): Not significant.

Arbitrage Opportunity

Model 1

- Interest Rates (B = -0.995, p < 0.001, VIF = 1.000): Strong and highly significant (negative relationship).

Model 2 (with controls)

- Interest Rates (B = -1.071, p < 0.001, VIF = 7.958): Strong and highly significant.
- Inflation Rates (B = 0.037, p = 0.003, VIF = 7.889): Significant (positive relationship).
- GDP Growth Rates (B = -0.011, p = 0.340, VIF = 1.026): Not significant.

The coefficient analysis provides critical insights into the relationship between interest rates and key property market variables, including mortgage demand, leasing demand, house prices, and arbitrage opportunities. The results indicate that interest rates significantly influence arbitrage opportunities, as evidenced by the high magnitude of standardized coefficients and strong statistical significance. However, the impact of interest rates on mortgage demand appears highly correlated and lacks statistical significance in the model. The mortgage rates be directly derived from interest rates by adding a fixed average bank spread, making them inherently dependent on interest rate fluctuations.

For leasing demand and house prices, the coefficients show varying levels of association with interest rates, but the significance levels remain weak. Inflation and GDP growth rates, included as control

variables, exhibit minimal explanatory power, further emphasizing the dominant role of interest rates in shaping property market dynamics. Additionally, high variance inflation factors (VIF) for mortgage rates and interest rates suggest multicollinearity, reinforcing the argument that mortgage rates are strongly influenced by interest rate movements.

Overall, while interest rates are a key driver of property market trends, their impact on specific variables varies. The findings highlight the need for careful interpretation of mortgage demand, as its correlation with interest rates may overshadow its independent significance. The findings demonstrate the influence of monetary policy in influencing investment strategies in Pakistan's real estate market and provide more evidence for the theory that interest rate fluctuations have a significant impact on arbitrage opportunities.

Analysis of Variance

Table 5

ANOVA							
Variables	Model		Sum of Squares	df	Mean Square	F	Sig.
Mortgage	1	Regression	0.014	1	0.014		.[b]
		Residual	0.000	8	0.000		
		Total	0.014	9			
	2	Regression	0.014	3	0.005		.[c]
		Residual	0.000	6	0.000		
		Total	0.014	9			
Leasing Demand	1	Regression	0.006	1	0.006	0.650	.443[b]
		Residual	0.076	8	0.010		
		Total	0.083	9			
	2	Regression	0.019	3	0.006	0.580	.649[c]
		Residual	0.064	6	0.011		
		Total	0.083	9			
House Prices	1	Regression	0.023	1	0.023	0.335	.579[b]
		Residual	0.557	8	0.070		
		Total	0.581	9			
	2	Regression	0.074	3	0.025	0.293	.830[c]
		Residual	0.507	6	0.084		
		Total	0.581	9			
Arbitrage Opportunity	1	Regression	0.014	1	0.014	6896.759	<.001[b]
		Residual	0.000	8	0.000		
		Total	0.014	9			

2	Regression	0.014	3	0.005	8589.432	<.001^c
	Residual	0.000	6	0.000		
	Total	0.014	9			

The ANOVA (Analysis of Variance) table assesses whether the independent variables significantly explain variations in the dependent variables (Mortgage, Leasing Demand, House Prices, and Arbitrage Opportunity).

Mortgage
F-Statistics
- Not reported in detail. Because of high correlation

Significance (Sig.)
- Not available. Because of high correlation

Interpretation
- Since R^2 = 1.000 in the model summary, the model perfectly predicts mortgage values, leading to zero residual variance. ANOVA results may not be meaningful in this case.

Leasing Demand
Model 1
- F = 0.650, Sig. = 0.443 → Not statistically significant.

Model 2
- F = 0.580, Sig. = 0.649 → Still not significant.

Interpretation
- The high p-values (>0.05) indicate that the independent variables (such as interest rates) do not significantly explain leasing demand variations. The model does not provide strong evidence that interest rates impact leasing demand.

House Prices
Model 1
- F = 0.335, Sig. = 0.579 → Not significant.

Model 2
- F = 0.293, Sig. = 0.830 → Even less significant.

Interpretation
- Similar to leasing demand, the high p-values suggest that interest rates do not significantly impact house prices. The model does not provide evidence of a strong relationship.

Arbitrage Opportunity
Model 1
- F = 6896.759, Sig. < 0.001 → Highly significant.

Model 2
- F = 8589.432, Sig. < 0.001 → Still highly significant.

Interpretation
- The extremely low p-values (<0.001) suggest that independent variables (e.g., interest rates) strongly predict arbitrage opportunities. This aligns with the high R^2 values seen in the model summary.

The ANOVA results provide a deeper statistical validation of the relationships between interest rates and key dependent variables, including mortgage demand, leasing demand, house prices, and arbitrage opportunities. The analysis assesses whether the mean differences in these variables across varying interest rate levels are statistically significant. A key finding from the ANOVA results is that Interest rate changes have a highly significant impact on arbitrage opportunities, demonstrating how important variations in borrowing costs are in influencing speculative and investment activity in the real estate

market. The low p-values associated with interest rates in the arbitrage model indicate a strong explanatory power, reinforcing decisions about arbitrage are affected by changes in monetary policy.

However, results for mortgage demand suggest a lack of significant variance, implying that mortgage rates are primarily derived from interest rates by adding a fixed bank spread, which results in a highly correlated yet statistically non-significant outcome.

And this adds further fuel to the argument that mortgage rates are also dependent variable, not an independent variable, but a mirror of interest rate moves. House prices and leasing demand also have moderate variation with respect to interest rate changes but significance levels are still weak, and therefore other macroeconomic factors could also influence these variables such as inflation and GDP growth.

In general, however, the ANOVA results indicate that arbitrage opportunities are strongly dependent on interest rates but the proportionality to other property market variables is in general not significant. The monetary policy in Pakistan's real estate sector are found to be complex, as these findings provide valuable insights into the financial decision making with reference to fluctuating interest rates.

Collinearity Statistics

Table 6

Variable	Model	Predictor	Tolerance	VIF
Mortgage	1	Interest Rates	1	1
	2	Interest Rates	0.126	7.958
	2	Inflation Rates	0.127	7.889
	2	GDP Growth Rates	0.974	1.026
Leasing Demand	1	Interest Rates	1	1
	2	Interest Rates	0.126	7.958
	2	Inflation Rates	0.127	7.889
	2	GDP Growth Rates	0.974	1.026
House Prices	1	Interest Rates	1	1
	2	Interest Rates	0.126	7.958
	2	Inflation Rates	0.127	7.889
	2	GDP Growth Rates	0.974	1.026
Arbitrage Opportunity	1	Interest Rates	1	1
	2	Interest Rates	0.126	7.958
	2	Inflation Rates	0.127	7.889
	2	GDP Growth Rates	0.974	1.026

Collinearity: Values close to 1 are indicative of low collinearity and values further down indicate high collinearity.

VIF (Variance Inflation Factor):
- VIF = 1 means no multicollinearity.
- VIF > 5 suggests moderate multicollinearity.
- VIF > 10 indicates severe multicollinearity.

For Model 1 (Single Predictor - Interest Rates)
- Tolerance = 1.000, VIF = 1.000, meaning no collinearity.

For Model 2 (Multiple Predictors - Interest Rates, Inflation, GDP Growth)
- Interest rates and inflation rates have high VIF values (7.958 & 7.889), indicating strong multicollinearity.
- GDP growth rates have a low VIF (1.026), showing little collinearity.

Considering particular focus on interest rates, inflation rates, and GDP growth rates, the collinearity statistics shed light on the extent of multicollinearity among the independent variables in the regression model. When two or more predictor variables in a regression model have a high degree of correlation with one another, it is known as multicollinearity and makes it challenging to estimate the separate effects of each variable. Strong interdependencies between interest rates, inflation rates, and GDP growth rates are indicated by the high Variance Inflation Factor (VIF) values for these variables in the regression models, which may have an impact on the stability and dependability of coefficient estimates.

One of the most prominent findings is the extremely high VIF value for interest rates in models where mortgage rates are included as a dependent variable. As mortgage rates are directly derived from interest rates by adding a bank-specific spread. Since mortgage rates are not independently determined but are functionally linked to interest rates, their inclusion in the model naturally results in high collinearity. This supports the argument that mortgage rates should not be treated as an entirely separate explanatory variable but rather as an extension of the interest rate, reinforcing the hypothesis that fluctuations in interest rates directly dictate mortgage lending costs.

Similarly, the high VIF values for inflation rates and GDP growth rates indicate that these macroeconomic variables are not entirely independent of interest rates. Inflation and GDP growth often have an inverse relationship with interest rates, as central banks adjust monetary policy based on these factors. For example, rising inflation generally prompts higher interest rates as a policy response to curb excessive price increases However economic expansion (more GDP growth) may raise credit demand, which in turn may affect interest rates. the strong correlation among these variables, as reflected in the VIF values, suggests that they move together within the broader macroeconomic framework.

Overall, the collinearity statistics indicate that while interest rates remain a primary driver of property market variables, their strong association with mortgage rates and macroeconomic indicators complicates direct causal inferences. The results underscore the importance of carefully handling multicollinearity in regression models to ensure robust and meaningful interpretations.

Conclusion

The researchers describe in detail their findings and what they mean in theory and practice. Results show that interest rates highly impact mortgage rates and arbitrage, but only to a limited extent in affecting for leasing or property prices. The need for a multi fisted approach when analyzing property markets and financial policies is reinforced by descriptive analysis, hypothesis testing and post hoc findings. In addition to the much-needed understanding of how forecasts are translated, credible, and effective outside of the real estate finance world, these insights provide invaluable guidance to agents of the housing and the financial sectors.

By outlining the general effects of interest rate changes on Pakistan's real estate market, this study adds to both academic literature and practical decision-making. The results show that mortgage rates as well as arbitrage opportunities are very sensitive to interest rate changes, while the demand for leasing and house prices respond to broader macroeconomic factors. The results in this context point to the need for multiple policy approaches that address housing affordability, investment stability as well as financial market efficiency. Future research should continue to develop research by including more variable variables, more sophisticated methodologies, and more comprehensive geographic comparisons.

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