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Monetary Policy Spillovers and Inter-Market Dynamics Perspective of Preferred Habitat Model

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Abstract: This study advances the understanding of the Preferred Habitat Model's capacity to shed light on the inter-market transfer of mean returns and the diffusion of price volatility in Pakistani investment markets. It examines the extent to which returns in one market exert a systematic influence on returns across others under the potential sway of interest rate policy shifts, USD exchange rate volatility, and domestic inflation trends. Employing a methodological arsenal that includes the GARCH process, enhanced by Dynamic Conditional Correlations (DCC), as well as the Markov Switching Model, this research assesses the propagation of mean returns and volatility across markets. The analysis uncovers significant linkages between monetary policy and stock market indices, underscoring the profound impact of monetary policy on cross-market performance transmission. These insights are pivotal for regulators overseeing the nuanced interaction between monetary policy and market performance. They are crucial for local and international investors interested in developing economies, especially in Pakistan's markets.

Keywords: mean and volatility spillover; preferred habitat model; markov switching model; GARCH

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1. Introduction

The seminal work by Hildebrand and Kerr (1986) heralded a predictive framework for the convergence and interdependency across securities markets that are both regionally and temporally distinct. This forecast posits that such convergence, upon realization, would be quantifiable through the correlation in performance metrics of publicly traded securities across these markets. Over the ensuing years, this hypothesis has garnered considerable support, both theoretical and empirical, as exemplified by studies such as those by (Alotaibi and Mishra 2015; Moon and Yu 2010; Wahid and Zubair Mumtaz 2018). Subsequent research has rigorously explored the inter-market transmission effects on securities prices spanning various time zones (Olbrys 2013) and extended these investigations to encompass commodities and foreign exchange markets (Alikhanov 2013).

Collectively, these research endeavors corroborate the "catch-up effects" posited by convergence theory, which asserts that shifts in any factors intertwined with financial policies or market dynamics precipitate significant alterations across interlinked market products and sectors. A particularly intriguing yet unresolved facet of economic and financial scholarship pertains to the study of how monetary policy adjustments within one jurisdiction influence trading patterns and volumes across disparate markets. The Mundell–Fleming model, pioneered by Mundell (1963) and Fleming (1962), provides a theoretical underpinning for this, suggesting that an expansionary monetary policy could devalue a nation's currency and diminish its trade terms, thereby enhancing investment opportunities in comparison to its trading partners. This, in turn, is anticipated to redirect investment towards markets offering greater liquidity and returns.

This study endeavors to elucidate the transmission effects of monetary policy, applying a Preferred Habitat Model across diverse markets. The Preferred Habitat Model elaborates on the theory that investors exhibit distinct preferences for asset maturities, fundamentally shaped by their expectations for returns and the existing monetary policy conditions (Strohsal 2017). This model asserts that such preferences are not merely driven by yield considerations but also by a desire for alignment with the investor's risk tolerance and investment horizon (Costa 2019; Dale et al. 2022; Vayanos and Vila 2021). It underscores the impact of central bank policies on market interest rates, which in turn influence the demand for different maturity assets. As a result, this model offers insights into how monetary policy adjustments can alter investment strategies across various market segments, highlighting the intricate relationship between policy dynamics and investor behavior (Strohsal 2017).

It ambitiously extends the existing literature in four significant dimensions. Primarily, it represents an unprecedented comprehensive analysis of monetary policy's transmission effects across varied markets, including, but not limited to, mercantile, real estate, and stock markets. Prior analyses have somewhat overlooked intermarket returns in mercantile and real estate sectors. There is both a practical and theoretical imperative to investigate the influence of monetary policy on real estate markets. Notably, the real estate sector in Pakistan is valued between USD 300 and USD 400 billion, with residential prices on a per-square-foot basis increasing annually by 5.05% since 2010 (Pakistan Bureau of Statistics 2019). With over 70% of total savings invested directly or indirectly in real estate, Pakistan's market has emerged as Asia's most substantial and rapidly expanding real estate market, boasting an average annual growth rate of approximately 9% (The Federation of Pakistan Chambers of Commerce and Industry 2017).

A second pivotal contribution of our research lies in presenting empirical evidence to gauge the impact of monetary policy on the dynamics of the mercantile market. The implications of an expansionary monetary policy within this sphere remain ambiguous without a pre-policy change analysis. Our study further delves into product and sector-level implications, underscoring the practical significance through historical returns analysis. For instance, the KSE 100 Index stocks have realized compounded annual returns of 15.13% over the past 15 years (Pakistan Stock Exchange 2020) as shown in Figure 1. Additionally, the net foreign investment in Pakistan's stock market witnessed a 20 percent decrease during the 2019–2020 period, amounting to a net outflow of USD 284.832 million, in stark contrast to the USD 356.04 million recorded in the preceding year (Sohail Sarfraz 2020). A comparison of stock market return to the returns on other assets is displayed on the bar chart below.

To enrich our comprehension of the theoretical implications, this paper seeks to explore the following question: How do modifications in monetary policy influence the average returns and market volatility within the stock, mercantile, and real estate sectors in Pakistan?

The results of this study comprehensively illustrate the profound influence of monetary policy on the average returns and volatility within various market segments, highlighting the intricate network of relationships between distinct markets. Importantly, the investigation reveals that modifications in monetary policy exert a dual impact: they directly alter market indicators and precipitate considerable spillover effects across diverse sectors. These ramifications are observable in the shifting allocation strategies of investors, who adjust their portfolios to capitalize on the arbitrage opportunities emerging from market condition variances. Additionally, the analysis delineates a positive correlation between returns in the commodity market and stock prices, in contrast to the inverse relationship observed in the real estate sector's dynamics. The complexity of this interaction is further intensified by the effects of interest rate movements, inflationary trends, and exchange rate shifts. This intricate examination provides an expansive view into the manner in which macroeconomic policy interventions sculpt the contours of market development in Pakistan, offering insightful implications for policymakers and investors alike.

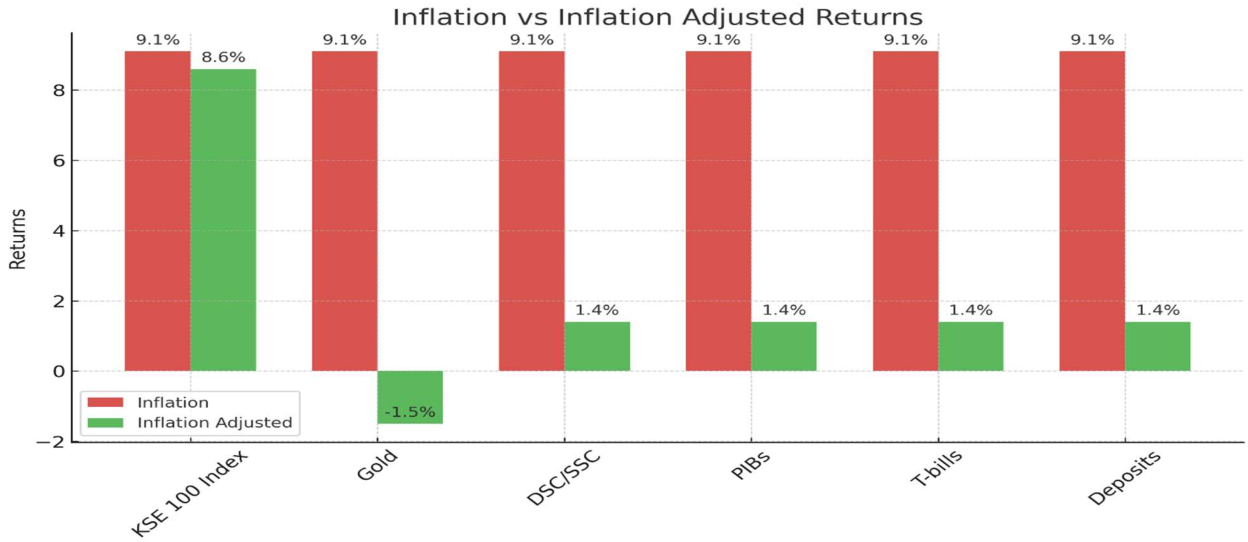

Figure 1. Returns of Stock Market, Mercantile and Financial Market Source: https://www.psx.com.pk/psx/resources (accessed on 10 June 2022).

The structure of the remainder of the document is meticulously organized as follows: Section 2 presents an in-depth examination of the existing scholarly discourse, with a particular focus on the theoretical considerations surrounding the transmission effects of monetary policy on market dynamics. Section 3 elaborates on the econometric model utilized in the study. This section also provides a detailed description of the data, the sample size employed, and the primary findings derived from the analysis. The Section 4 of the paper engages in a comprehensive discussion of the empirical findings, interpreting the implications of these results within the context of the overarching research question. This section also synthesizes the study's findings, offering conclusive remarks on the investigation and suggesting avenues for future research within this domain.

2. Literature Review

2.1. Theoretical Underpinning of Spillover Effects

The consensus of the research findings supports the "catch-up effects" of convergence theory. The empirical support is evidenced by the synchronization of financial dynamics among exchanges (Alotaibi and Mishra 2015) and the transmission of risks from the global market to regional markets (Liu and Ouyang 2014). However, there remain unresolved questions relating to changing patterns of inter-market investment portfolios within a country. We will address this question by exploring the inter-market transition patterns of risk and returns of mercantile, stock, and real estate markets.

The theory of inter-market transmissions is derived from the Mundell–Fleming (MF) model, Mundell (1963) and Fleming (1962). The theory was widely adopted in studies of external monetary policy shocks (see Frenkel and Razin (1987) and Frenkel and Razin (1989)). Those papers studied the transmission of monetary shocks between nations and markets. The Mundell–Fleming (MF) model, when evident, can be assessed through its transmission effects of monetary policy on the value of currency, dynamics of trade, and asset prices in the long run (Dornbusch 1976). The research was extended by (Vissing-Jorgensen and Krishnamurthy 2011). Those authors defined five transmission chan Vissing nels of monetary policy, i.e., changes in the money supply, policy signaling, portfolio rebalancing, market liquidity, and investor confidence effects. In this study, we will use the host market monetary policy dynamics, US monetary policy effects, and local inflation as explanatory factors for the inter-market transition of risk and returns pattern.

The Preferred Habitat Theory (PHT) is based on the proposition that investors demonstrate a preference for different kinds of asset portfolios if investors expect them to yield significantly higher returns relative to conventional stock portfolios (see Costa (2019)). After the financial crisis in 2007, the Preferred Habitat Theory received empirical support as investors and financial institutions reallocated their portfolios towards real estate and mercantile markets (Costa 2019; Vayanos and Vila 2021). With this backdrop in mind, we will focus on the transition patterns of risk and return as well as investment magnitude transitions across mercantile, stock, and real estate markets.

2.2. Inter-Market Transmissions Dynamics

Numerous studies have explored the spillover effects and transmission of mean return and price volatility across different markets, e.g., Musampa et al. (2024) investigating the effects of oil price volatility on the South African stock market returns, utilizing GARCH–Copula and EGARCH models. They highlight the asymmetric impacts of oil price fluctuations. This emphasizes the vulnerability of the tourism sector, driven by its dependence on transportation costs, and underscores the need for tailored monetary policies to mitigate these effects. Sahabuddin et al. (2023) reveal persistent co-movements and variable volatility responsive to economic disruptions. They highlight how, during the global financial crisis, Chinese markets experienced greater volatility in contrast to the more stable Malaysian markets. These findings inform risk management and investment strategies, emphasizing the value of sophisticated econometric tools in decoding the intricate dynamics between different stock markets under economic stress, thus enriching the financial literature (Zhu 2018).

Similarly, a study conducted by (Nafisi-Moghadam and Fattahi 2022) investigates the dynamic correlations and co-movements among gold prices, exchange rates, and stock market returns in Iran, applying continuous wavelet transform analysis to uncover significant medium-term correlations. The results underscore the utility of combining econometric and machine learning techniques to improve volatility forecasting and risk management in financial markets. Majumder and Nag (2018) reveal no volatility spillover from commodities to the equity market but note specific intra-commodity spillovers, particularly from oil to rice and gas. Crucially, they find no spillover between gold and equity markets, indicating that these assets could effectively diversify portfolio risks (Viceira 2001). The findings provide valuable insights for investors about interdependencies in commodity and equity markets, enhancing strategies for risk mitigation.

Ampountolas (2022) highlights the GJR-GARCH model's superior predictive accuracy in capturing asymmetric shocks and reveals significant bidirectional spillover effects among cryptocurrencies like Bitcoin, Ethereum, Litecoin, and Ripple, underscoring market interdependencies. Additionally, the multivariate DCC–GARCH model effectively identifies cross-market volatility transmissions, thereby advancing our understanding of cryptocurrency dynamics and contributing valuable insights to the financial economics literature through the application of advanced econometric models (Li et al. 2021; Liu and Ouyang 2014).

Petrakis et al. (2022) demonstrate that conventional and unconventional monetary interventions positively impacted equity returns, especially in less affected core eurozone nations. The study found a negative correlation between inflation and market returns, while industrial production positively influenced market gains. A sentiment indicator also positively affected returns, highlighting its utility in capturing unique market insights. The distinct responses between core and peripheral eurozone countries underline the importance of tailored policy applications across diverse economic contexts, providing critical insights for policymakers and investors. Similarly, Tiwari et al. (2021) identify significant spillover effects that underscore the dynamic relationship between oil price volatility and stock market performance, particularly during economic shocks like the global financial crisis. The study reveals varying sensitivities across different markets and provides insights critical for investors and policymakers, enhancing the understanding of the implications of oil price fluctuations on global financial stability.

Koulis and Kyriakopoulos (2023) reveal a mainly unidirectional volatility transmission from gold to silver, offering valuable insights for developing volatility-based trading strategies, especially using options during periods of economic uncertainty. This research is crucial for investors aiming to improve portfolio diversification and risk management, enhancing the understanding of volatility interactions between these metals over a long-term period. Balcilar et al. (2021) find significant bidirectional spillovers, with crude oil often playing a pivotal role in information transmission. The research notes that the effectiveness of oil and gold as safe havens and portfolio diversifiers has diminished since 2002 due to the financialization of commodity markets. These findings offer critical insights for investors and policymakers focused on financial risk management.

These findings demonstrate that post-globalization, markets have become significantly integrated, indicating that fluctuations in one market can precipitate changes in others. This analysis further elucidates the mechanisms of intermarket and intramarket transmission effects.

3. Data and Methods

3.1. Data and Sample

Our dataset comprises monthly index figures and sector-specific price data across select markets, with a temporal scope extending from January 2010 to August 2020. For the mercantile sector, we sourced the monthly valuations of precious commodities such as gold, platinum, palladium, and silver within Pakistan, as documented by the Pakistan Mercantile Exchange. In the realm of real estate, our acquisition process entailed gathering data on the per-square-foot valuation of residential properties within Pakistan's metropolitan hubs, including Karachi, Lahore, Islamabad, Rawalpindi, and Faisalabad. This was achieved by aggregating figures from prominent real estate platforms such as Zameen.com, Gharana, and OLX, among others.

Further, our collection encompassed the month-end values of quintuple sectoral indices from the Pakistan Stock Exchange (PSX) alongside the KSE 100 Index. We have also procured the monthly monetary policy rates as set by the State Bank of Pakistan (SBP), the United States Federal Funds rate, the USD to PKR exchange rate dynamics, and Pakistan's inflation trajectory, as recorded in the World Bank's database. Our objective is to probe into the cascading influences exerted by domestic financial market forces—namely, shifts in the policy rate and inflationary pressures—as well as external economic currents originating from the United States upon the average returns and volatility metrics of local market entities.

3.2. Methods and Econometric Techniques

In pursuit of quantifying the reverberating consequences of these variable dynamics upon market mean returns and volatility indices, we have implemented a dual-method analytical framework encompassing the Markov Switching Model alongside an advanced GARCH model variant, namely the Exponential GARCH (EGARCH) model, integrated with a Dynamic Conditional Correlation (DCC) structure. The Markov Switching Model is adept at demarcating the upper and lower echelons of market trends, charting their evolution, and examining their susceptibility to shifts in local economic policy determinants, inflationary indices, and U.S. economic indicators. In tandem, the EGARCH model, fortified with a DCC mechanism, is harnessed to expound upon the conduits of transmission for mean returns and price volatility, thereby furnishing a comprehensive portrait of market fluctuations in response to both domestic and international economic stimuli.

3.3. Markov-Switching Econometric Model

To ascertain the bull and bear phases within financial markets, we utilize the Markov-switching econometric model. This sophisticated statistical approach is designed to recognize market states by categorizing the nadir of market returns as a bear market regime, emblematic of declining trends, and the zenith as a bull market regime, representative of rising trends. The implementation of this model is conducted via an established equation, which systematically incorporates regime-switching dynamics to delineate between these distinct market conditions effectively:

$$r_t = \mu_{St} + \epsilon_t, \quad where\ \epsilon_t \ \sim \ i.i.d.\ N(0, \sigma_{st}^2) \tag{1}$$

Here, μ_{St} and σ_{St}^2 indicate the regime-dependent mean and variance, respectively. We differentiate between a bear regime and a bull regime by classifying these regimes as binary-valued random variables. The binary-valued variable s_t is defined to be 0 if the regime is a bear market and is defined to be 1 otherwise (see Alemohammad et al. 2013).

The returns of each market, products and sectors are symbolized by r_t. Its properties reflect a two-state Markov process which has the following transition probabilities:

$$P(s_t = j | s_{t-1} = i) = P_{ij}(t) \quad j,\ i = \begin{Bmatrix} 1 \\ 0 \end{Bmatrix} \tag{2}$$

$$P = (s_i = m | \zeta_{t-1}, \delta) = p_m(G_{t-1}, \delta) = \frac{exp(G_{t-1}\ \prime\delta_m)}{\sum_{j=1}^{M} exp(G_{t-1}\ \prime\delta_m)} \tag{3}$$

Generally, these probabilities are considered time-invariant, but that restriction is not required. See Goodwin and Goodwin (2017). The Markov switching matrix is defined as follows:

$$P = \begin{bmatrix} p^{00} & p^{01} \\ p^{10} & p^{11} \end{bmatrix} \tag{4}$$

where, $P^{00} = P(s_t = 0 | s_{t-1} = 0); P^{11}(s_t = 1 | s_{t-1} = 0); P^{01} = 1 - P^{11}; P^{10} = 1 - P^{00}$.

After the two regimes are statistically identified, the filtered probabilities for each state are computed. Those indicate the probability of the bear (or bull) market each month:

$$\theta_{jt} = P(s_t = j | \varphi_{t-1}), \qquad j = \{0, 1\}.$$

This technique was first used by Hamilton (1989). His application specified that real GNP growth follows an autoregressive process (see Huang 2014). In this paper, we refine the probabilistic estimators by defining probabilities that have a Markov property of the one-step ahead probabilities of regime change: $P(s_t = m | \zeta_t)$. The value of the dependent variable in a given period identifies the regime in effect. We use this contemporaneous information to obtain updated estimates of the regime probabilities. The process by which the probability estimates are updated is commonly called filtering. By applying Bayes' theorem and the laws of conditional probability, we have the filtering expressions:

$$P(s_t = m | \zeta_t) = P(s_t = m | y_t, \zeta_{t-1}) \ \frac{f(y_t | s_t = m, \zeta_{t-1}).\ P(s_t = m | \zeta_{t-1})}{f(y_t | \zeta_{t-1})} \tag{5}$$

The expressions on the right-hand side of (5) are obtained as a by-product of the densities obtained during likelihood evaluation. Substituting those densities into Equation (5) we have:

$$P(s_t = m | \zeta_t) = \frac{\frac{1}{\sigma_m} \phi\left(\frac{y_t - \mu_t(m)}{\sigma(m)}\right) .P_m(G_{t-1},\ \delta)}{\sum_j^M = 1 \frac{1}{\sigma_j} \phi\left(\frac{y_t - \mu_t(j)}{\sigma(j)}\right) .p_j(G_{t-1,\ \delta})} \tag{6}$$

In this model, nonlinearity is manifested as discrete shifts in the mean between high-and low-growth states. These discrete shifts are specified as a two-state first-order Markov process:

$$r_t - \mu_{st} = \begin{array}{l} \varnothing_1(r_{t-1} - \mu_{st-1}) + \varnothing_2(r_{t-2} - \mu_{st-2}) \\ +\varnothing_3(r_{t-3} - \mu_{st-3}) + \varnothing_4(r_{t-4} - \mu_{st-4}) \\ +\sigma_{\varepsilon_t t} \text{where} \sigma_{\varepsilon_t} \sim \mathrm{N}(0,1) \end{array} \tag{7}$$

3.4. EGARCH with DCC Specification

In order to analyze the effect(s) of monetary policy on the means and the volatility of products in securities markets and in other selected markets, we use the Exponential GARCH model (EGARCH) with DCC composition proposed by Nelson (1991). The statistical basis for applying the EGARCH with DCC specification is the recognition that the individual elements or sectors of sub-market markets can be more volatile than the overall weighted average of the market.

In the first step, the EGARCH model can be expressed as follows:

$$\log\left(\gamma_t^2\right) = \rho + \sum_{j=1}^{q} \beta_j \ln\left(\gamma_{t-1}^2\right) + \sum_{i=1}^{p} \alpha_i \left|\frac{\varepsilon_{t-i}}{\sigma_{t-i}}\right| + \sum_{k=1}^{r} \Upsilon_k \frac{\varepsilon_{t-k}}{\sigma_{t-k}} \tag{8}$$

$log\left(\gamma_t^2\right)$ is the log of the conditional variance. This specification implies that the leverage effect is exponential, rather than quadratic and that forecasts of the conditional variance are guaranteed to be non-negative. The presence of leverage effects can be tested by the hypothesis that $0 < \Upsilon_k$. The impact is asymmetric if $0 \neq \Upsilon_k$.

Nelson assumed that the random error term ε_t is governed by a Generalized Error Distribution (GED). The specification for the log conditional variance of the GED is:

$$\log\left(\gamma_t^2\right) = \rho + \sum_{j=1}^{q} \beta_j \ln\left(\gamma_{t-1}^2\right) + \sum_{i=1}^{p} \alpha_i \left(\left|\frac{\varepsilon_{t-i}}{\sigma_{t-i}}\right| - E\left|\frac{\varepsilon_{t-i}}{\sigma_{t-i}}\right|\right) + \sum_{k=1}^{r} \gamma_k \frac{\varepsilon_{t-k}}{\sigma_{t-k}} \tag{9}$$

The explanatory variables include the rate of inflation, the rate of unemployment, the exchange rate variability, and the availability of credit. The Dynamic Conditional Correlation (DCC)–GARCH model incorporating those variables is defined by three relations as:

$$\mathrm{r_t} = \mu_\mathrm{t} + \alpha_\mathrm{t}$$

$$\alpha_\mathrm{t} = \mathrm{H_t^{1/2} z_t}$$

$$H_t = D_t R_t D_t$$

The symbol $\mathrm{r_t}$ is an $\mathrm{n} \times 1$ vector of n observations at time t, e.g., the log of the inflation, the rate of unemployment, the exchange rate, and the availability of credit in the market at time t. The symbol α_t is an $n \times 1$ vector of mean-adjusted n observations at time t, e.g., the mean-adjusted log of inflation. The conditional variance–covariance matrix in the bivariate GARCH (1, 1) model is symbolized by H_t. It is assumed $E[\alpha_t] = 0$ and $Cov[\alpha_t] = H_t$. The symbol μ_t represents an $n \times 1$ vector of the expected values of the conditional variances.

The elements in the main diagonal of the matrix D_t are standard deviations from univariate GARCH models.

$$D_t = \begin{bmatrix} \sqrt{h_{1t}} & 0 & \cdots & 0 \\ 0 & \sqrt{h_{2t}} & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ 0 & \cdots & 0 & \sqrt{h_{nt}} \end{bmatrix} \tag{10}$$

where

$$h_{it} = \alpha_{i0} + \sum_{q=1}^{Q_i} \alpha_{iq} \alpha_{i,t-q}^2 + \sum_{p=1}^{P_i} \beta_{ip} h_{i,t-p} \tag{11}$$

h_{it} is the $n \times n$ matrix of conditional variances of at time t. The correlation matrix is

$$R_t = \begin{bmatrix} 1 & \rho_{1,2,t} & \rho_{1,3,t} & \cdots & \rho_{1,n,t} \\ \rho_{2,1,t} & 1 & \rho_{23,t} & \cdots & \rho_{2n,t} \\ \rho_{3,1,t} & p_{23,t} & 1 & \ddots & \vdots \\ \vdots & \vdots & \ddots & \ddots & p_{n-1,n,t} \\ \rho_{n,1,t} & \rho_{2n,t} & \cdots & \rho_{n-1,n,t} & 1 \end{bmatrix} \quad (12)$$

where the elements are the correlations of the element of the vector α_t at time t. It is assumed the pdf of the random variable $r_t \sim N(0, H_t)$. In the DCC model, the log of the likelihood function can be estimated as follows:

$$\begin{aligned} L &= -\tfrac{1}{2}\sum_t (nln(2\pi) + \ln|H_t| + r_t' H_t^{-1} r_t \\ &= -\tfrac{1}{2}\sum_t (nln(2\pi) + \ln|D_t R_t D_t| + r_t' D_t^{-1} R_t^{-1} D_t^{-1} r_t \\ &= -\tfrac{1}{2}\sum_t (nln(2\pi) + 2\ln|D_t| + \ln|R_t| + \varepsilon_t\prime R_t^{-1} \varepsilon_t \end{aligned}$$

The log likelihood function can be maximized with respect to the parameters of the model. That maximization will facilitate model estimation when the covariance matrix is large. We measure intermarket transmissions by applying a two-stage GARCH-in-mean approach, referred to as GARCH-M. The GARCH-in-mean approach (GARCH-M), as specified by Bhar and Nikolova (2007), was used to test inter-market transmissions. Specification of the technique is as follow:

$$r_{p,t} = \delta_0 + \delta_1 r_{p,t-1} + \delta_2 V_{p,t} + \delta_3 \mu_{p,t-1} + \mu_{p,t},\ \mu_{p,t} \quad (13)$$

$$V_{p,t} = \tau_0 + \tau_1 V_{p,t-1} + \tau_2 \mu_{p,t-1}^2 \quad (14)$$

where:

$r_{p,t}$ = change in the value of indices of each market at time t $\mu_{p,t}$ = a random variable. It is assumed to be distributed with mean zero and with time conditional volatility variance symbolized by $V_{p,t}$. ARMA or MA are included in the model to mitigate the effects of series correlation. In the next step, mean and volatility transmission effects are calculated by obtaining the standardized residual (standardized error term) and by taking its square in the first step i.e.,

$$r_{c,t} = \delta_0 + \delta_1 r_{c,t-1} + \delta_2 V_{c,t} + \delta_3 \mu_{c,t-1} + \eta_c \mu_{c,t} + \mu_{c,t},\ \mu_{c,t} - N(0, V_{c,t}) \quad (15)$$

$$V_{c,t} = \tau_0 + \tau_1 V_{c,t-1} + \tau_2 \mu_{c,t-1}^2 + \sigma_c \iota_{p,t}^2 \quad (16)$$

where

$\iota_{p,t}$ = standardized residual series for parental the market index. It captures the mean transmission effects from economic variables. To examine the volatility of transmission effects, the exogenous variable $\iota_{c,t}^2$ is defined as the square of the standardized residual series. It is included in the conditional variance, i.e., the volatility equation. Its volatility is calculated as follows: $-\iota_{p,t} = \frac{\mu_{p,t}}{\sqrt{V_{p,t}}}$.

4. Findings and Discussion

4.1. Descriptive Analysis

Table 1 displays the descriptive statistics of the study. It shows the beta values of state-I and state-II, which indicate the lowest and highest values of selected variables and markets, respectively. Furthermore, it also indicates the probability and duration of staying in the same state. The beta values for the highest regimes (β1 = 0.085, $p < 0.05$ & β2 = 0.11, $p < 0.05$), along with probabilities and durations of 0.97 and 4.84 months for state-I, and 0.045, 22.49 months for state- II, respectively, suggest that the Pakistan policy rate remained on the higher side during the period spanning 2010 to 2020. As a consequence, it led to shrinkage in the money supply as well as lower trends in the markets.

Table 1. Descriptive statistics.

Variable	(β1)	(β2)	p11	p21	Duration (I)	Duration (II)
γ_1	0.085 ** (12.43)	0.111 ** (15.39)	0.979	0.045	4.849	22.492
γ_2	−0.011 ** (3.60)	0.040 ** (3.33)	0.675	0.578	71.600	72.543
γ_3	0.005 ** (7.14)	0.023 ** (13.06)	0.957	0.208	33.083	6.582
γ_4	−0.219 ** (3.59)	0.013 ** (2.68)	0.854	0.145	6.853	2.923
γ_5	0.048 ** (4.33)	0.049 ** (4.34)	0.528	0.471	2.119	3.403
γ_6	−0.021 ** (3.80)	−0.003 (1.43)	0.914	0.016	1.231	1.000
γ_7	0.037 ** (6.30)	0.087 ** (15.00)	0.973	0.026	37.791	86.285

Note: This table displays descriptive statistics from a Markov Switching Model analysis based on 128 monthly observations from January 2010 to August 2020. γ_1 *to* γ_7 covers variables such as Pakistan's monetary policy rate, mercantile, real estate, and stock market returns, the US policy rate, Pakistan's exchange rate, and inflation rate. β1 and β2 represent the range of these economic indicators, i.e., highest and lowest values. Probabilities p11 and p21, along with duration (I) and (II), detail the likelihood and expected duration of market states indicative of economic cycles. Significance levels are denoted by * for $p < 0.05$ and ** for $p < 0.01$. Source: authors' calculations.

Similarly, the beta values of the lowest regimes (β1 = −0.011, $p < 0.05$ & β2 = 0.040, $p < 0.05$), along with probabilities and durations of 0.675 and 71.60 months for state-I, and 0.045, 72.53 months for state-II, respectively, indicate that the mercantile market exhibited a relatively equal distribution of time spent in both states over the observed period. On the flip side, the beta values (β1 = 0.005, $p < 0.05$ & β2 = 0.023, $p < 0.05$), alongside probabilities and durations of 0.957 and 33.08 months for state-I, and 0.208 and 6.582 months for state-II, respectively, suggest that the real estate market tends to provide positive returns with a relatively low probability of experiencing loss. These findings indicate a favorable risk-return profile for investments in the real estate sector. Pakistan's stock market also produces lower returns, i.e., −0.219, but only for a short period of time. There remain more periods in bunny state as compared to bull and bear from 2010 to 2020. However, the probability of transition from one state to another state is higher as compared to staying in the same state, which further elaborates that the stock market was more volatile as compared to the real estate and mercantile market. There was a nominal change in the US policy rate from 2010 to 2020 compared to the Pakistan policy rate, as well as inflation and the exchange rate. Pakistan's currency depreciated, and an upward trend in the inflation rate has been observed during the entire period.

4.2. Transmission Effects on Overall Markets

In order to measure the strength of transmission effects in the three different markets reflecting changes in monetary policy, we apply a Markov Switching Model. In models I and II as shown in Table 2, we describe the general condition of the lowest and the highest returns of markets and with explanatory variables. The results of the Markov Switching Model show that explanatory variables, including the policy rate, along with other controlling variables, such as the US policy rate, the exchange rate, and the inflation rate, are significantly and negatively related to intermarket transmissions. It has been observed that interest rate policy has a strong impact on the real estate market as compared to conventional markets. The economic linkage goes like this: If the policy rate increases, ceteris paribus, the rate of savings will likewise increase. To the extent that deposits increase, one would expect to observe an increase in investment portfolios of real estate by banks and other financial institutions, as well as an increase in business activities of the overall economy. Alternatively, if the policy rate decreases to the extent that deposits decrease in financial institutions due to lower rates of returns, one would expect to observe an increase in investment portfolios of real estate by the general public. This is happening because investments in real estate offer higher returns and faster growth as shown in Figure 2, as well as high liquidity of real estate assets compared to other conventional markets.

Table 2. Markov Switching Model on overall markets.

	Mercantile		Real Estate		Stock Market	
	I	II	I	II	I	II
σ_1	−0.001 **	−0.022 **	0.044 **	0.056 **	−0.112 **	−0.148 **
	(−4.12)	(−5.68)	(8.09)	(6.45)	(−4.12)	(−10.28)
σ_2	−0.096 **	−0.097 **	0.017 **	0.025 **	−0.129 **	−0.217 *
	(−18.31)	(−8.17)	(6.15)	(5.24)	(−4.12)	(−2.45)
$\ln \Sigma_1$	−3.155 **	−3.472 **	−5.697 **	−5.219 **	−2.715 **	−4.713 **
	−36.6	−23.34	−54.57	−60.96	−25.15	−16.27
$\ln \Sigma_2$	−4.509 **	−2.959 **	−4.434 **	−4.927 **	−3.459 **	−2.847 **
	−16.05	−30.36	−39.96	−16.41	−12.04	−35.29
α_0		0.243	0.159 *	0.05	−0.155 **	−1.064 **
		−0.6	−2.35	−0.97	−6.51	−4.01
p11	−0.773	−0.915	0.051	0.925	0.946	0.919
α_1		−0.986 **		−0.026 **		−1.080 **
		(−3.21)		(−3.82)		(−8.07)
α_2		0.356 **		−0.055 **		−0.244 **
		(−4.03)		(−3.27)		(−5.19)
α_3		−1.448 **		−0.115 **		−2.420 **
		(−5.41)		(−5.02)		(−4.59)
p21	−0.744	−0.968	0.776	0.107	0.223	0.156
β_1		0.302 **		0.101 **		0.980 **
		(−3.79)		(−4.47)		(−3.63)
β_2		−0.403 **		0.213 **		0.986 **
		(−4.03)		(−5.16)		(−3.95)
β_3		0.477 **		0.298 **		−1.521 **
		(−4.39)		(−3.61)		(−4.27)
AIC		−3.111		−6.86		−2.821
HQIC		−2.9813		−6.73		−2.691
SBIC		−2.79		−6.539		−2.5
Log likelihood		182.575		386.91		166.767
N	126	126	126	126	126	126

Note: This table indicates the descriptive statistics of the Markov Switching Model with a sample size of 128-month data from January 2010 to August 2020. β indicates the lowest and highest value of constructs. p11 and p21 indicate the probability of staying in state-I and state-II. Model-I and Model-II for each market state the state-I and Stat-II coefficient with and without the coefficient of switching factor, i.e., the Pakistan policy rate, and non-switching factors, i.e., the US policy rate, the PKRs/USD exchange rate, and the Pakistan inflation rate, respectively. * $p < 0.05$; ** $p < 0.01$ represent significance levels at 1 and 5%, respectively.

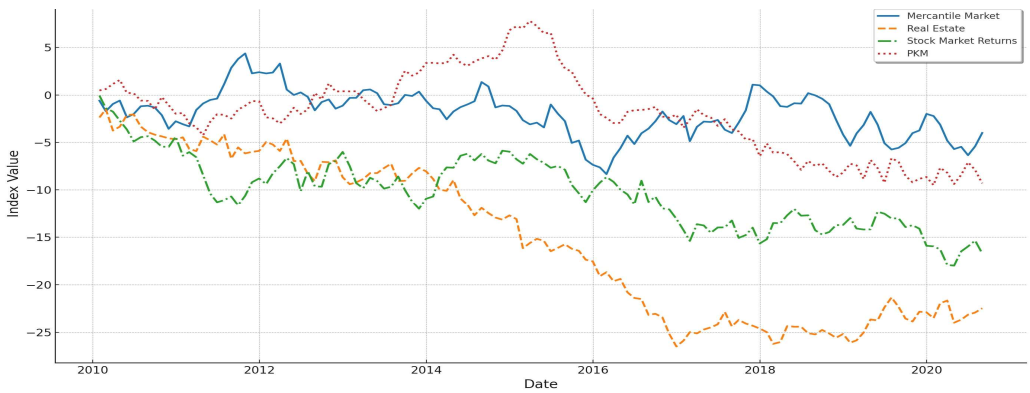

Figure 2. Volatility transmission effects of policy rate on real estate, mercantile, and the stock market.

4.3. Transmission Effects on Real Estate Market of Different Regions

We measure the transmission effects of interest rate policy on the price dynamics and returns in the real estate markets in five regional markets: Faisalabad, Islamabad, Karachi, Lahore, and Rawalpindi. The results mentioned in Table 3 show that there is a significant transmission effect of policy rate (alpha sub 1 = 0.307, 0.040, 0.091, 0.292, and 0.159, $p < 0.05$) on mean returns of Faisalabad, Islamabad, Karachi, Lahore, and Rawalpindi real estate markets, respectively. Similarly, there are also significant volatility transmission effects of policy rate ($\beta_1 = -24.388, -13.968, 0.810, 7.045$, and 9.188, $p < 0.05$) of Faisalabad, Islamabad, Karachi, Lahore, and Rawalpindi real estate markets, respectively. Our results also show that Islamabad real estate is the most with regard to controlling variables such as the US policy rate, the exchange rate, and the inflation rate. This is because of the relatively high demand in the real estate sector of Islamabad, which is associated with its political stability, peacefulness, law and order, and municipal services compared to the rest of Pakistan. Secondly, it is the most cosmopolitan city in Pakistan, and a large number of expatriates reside in Islamabad, and those people tender payments in US dollars. Thirdly, consumer prices and the cost of living in the city of Islamabad are higher as compared to the rest of the cities in Pakistan.

Table 3. Spillover effects on real estate markets of different regions.

	I		II		III		IV		V	
Variable	**β**	**SE**	**B**	**SE**	**B**	**SE**	**β**	**SE**	**β**	**SE**
α_0	0.004	0.008	0.013	0.005	0.01	0.008	−0.005	0.003	0.009	0.006
α_1	0.307 **	0.103	0.040 **	0.054	0.091 **	0.123	0.292 **	0.041	0.159 **	0.083
α_2	−0.191	0.252	0.083 **	0.028	0.015	0.028	0.028 **	0.01	0.03	0.028
α_3	−0.038	0.07	−0.034	0.056	−0.136	0.116	−0.247 **	0.051	0.161 **	0.072
α_4	−0.377 **	0.081	−0.107	0.126	−0.411	0.254	−0.094	0.115	−0.003	0.228
∂_0	−4.158	2.046	−2.032 **	0.000	−2.389	0.982	−13.272 **	0.116	−2.484 **	0.824
Γ	0.760 **	0.342	−0.920 **	0.000	0.989	0.327	2.371 **	0.232	0.266	0.216
Σ	−0.081	0.188	0.546 **	0.062	0.373	0.244	0.134	0.135	0.587 **	0.196
λ	0.593	0.189	0.666 **	0.000	0.863 **	0.086	−0.213 **	0.072	0.819 **	0.066
β_1	−24.388 **	14.50	−13.968 **	0.000	0.810 **	10.7	7.045 **	23.43	9.188 **	9.612
β_2	37.948	30.52	42.693 **	4.096	−7.231	11	19.308 **	8.023	−32.513 **	6.973
β_3	12.769	11.043	11.222 **	0.001	−1.069	10.6	21.058	25.14	−8.172	7.621
β_4	24.604 **	13.942	24.896 **	0.015	12.746	18.56	−82.574 **	33.32	1.277	15.260
AIC	−5.328		−5.938		−5.682		−6.232		−6.118	
SC	−4.915		−5.525		−5.27		−5.819		−5.705	
HQC	−5.161		−5.77		−5.515		−6.065		−5.95	
Likelihood	315.372		349.521		335.208		365.988		359.597	

Note: This table indicates the result of the EGARCH–DCC model with a sample size of 128-month data from January 2010 to August 2020. Model-I, II, III, IV, and V indicate the spillover effects policy rate of Pakistan (PKM) with the US policy rate (USM), Pakistan inflation rate (INF), and exchange rate (EXR) on the real estate market of Faisalabad, Islamabad, Karachi, Lahore, and Rawalpindi. * $p < 0.05$; ** $p < 0.01$ represent significance level at the 1 and 5%, respectively.

4.4. Transmission Effects on Mercantile Market's Products

We measure the transmission effects of monetary policy in the context of the preferred habitat model within the mercantile market. Results reported in Table 4 show transmission effects of monetary policy on mean return ($\alpha_1 = -0.211, -0.177, -0.117$ and -0.181, $p < 0.05$) and price volatility ($\beta_1 = -15.925, -9.855, -20.420$ and -39.544, $p < 0.05$) of mercantile products, i.e., gold, silver palladium, and platinum but this mean returns and price volatility transmission effects are negative. The Pakistan exchange rate has also significant and negative penetration on mean returns ($\alpha_4 = -0.194, -1.125, -0.746$, and -0.599, $p < 0.05$) and price volatility ($\beta_4 = -1.917, -28.570, 46.092$, and -37.979, $p < 0.05$) of gold, silver palladium, and platinum. This indicates that if the policy rate increases, then it leads to a decrease in investment magnitude in the commodities of the mercantile market in Pakistan. The constant increase in prices of gold and other relevant commodities all over the world, especially in Pakistan, led to a higher volume of trading in Pakistan's mercantile market. According to the Pakistan Mercantile Exchange (PMEX), the trading volume of the

PMEX increases from an average of PKR 49 billion to PKR 63 billion a year. The investment volume remained more than the Pakistan stock exchange at PKR 7.725 billion. The trading volume on the Pakistan Mercantile Exchange (PMEX) rose to PKR 306 billion in October 2018, marking a notable increase of 166 percent compared to the same period last year, when it stood at PKR 115 billion. The average daily trading volume grew to PKR 13.307 billion in October 2018 compared to the average daily trading volume of PKR 6.651 billion over the last 12 months.

Table 4. Spillover effects on different products of the mercantile market.

	I		II		III		IV	
Variable	**β**	**SE**	**B**	**SE**	**β**	**SE**	**β**	**SE**
α_0	−0.023	0.021	−0.039	0.036	0.039	0.058	−0.037	0.043
α_1	−0.211 **	0.340	−0.177 **	0.633	−0.117 **	0.930	−0.181 **	0.581
α_2	−0.569	0.164	−0.827	0.425	−0.898	0.413	−0.525	0.229
α_3	0.058	0.270	−0.112 **	0.504	−0.150 **	0.776	0.009 **	0.442
α_4	−0.194 **	0.676	−1.125 **	1.185	−0.746 **	1.389	−0.599 **	0.864
∂_0	−7.178	1.452	−10.751	1.491	−3.520	2.081	−0.720	0.660
γ	1.125	0.190	0.174	0.226	0.053	0.401	−0.298	0.213
σ	0.545	0.226	0.288	0.169	0.258	0.220	0.348	0.174
λ	0.235	0.165	−0.734	0.174	−0.155	0.530	0.386	0.243
β_1	−15.925 **	17.827	−9.855 **	26.777	−20.420 **	17.497	−39.544 **	16.498
β_2	−21.314	14.591	0.719	7.992	9.628	13.919	13.769	10.819
β_3	−3.186	15.747	34.190	22.015	5.575	15.504	30.324	13.626
β_4	−1.917 **	33.375	−28.570 **	45.479	−46.092 **	44.549	−37.979 **	25.291
AIC	−3.301		−2.652		−2.230		−2.787	
SC	−2.985		−2.336		−1.915		−2.471	
HQC	−3.173		−2.524		−2.102		−2.659	
likelihood	197.852		161.502		137.886		169.070	

Note: This table indicates the result of the EGARCH–DCC model with a sample size of 128-month data from January 2010 to August 2020. Model-I, II, III, and IV indicate the spillover effects of the policy rate of Pakistan (PKM) with the US policy rate (USM), the Pakistan inflation rate (INF), and the exchange rate (EXR) on gold, silver palladium, and platinum. * $p < 0.05$; ** $p < 0.01$ represent significance level at the 1 and 5%, respectively.

4.5. Transmission Effects on Stock Market's Sectors

In order to measure the transmission effects of policy rates on the pricing dynamics and returns of the real estate market in five regional markets, we examined its impact on mean returns (α_1 = 0.410, 0.045, 0.077, 0.223 and −0.132, $p < 0.05$) and prices volatility (β_1 = 13.123, 11.612, 0.122, 8.133 and 8.188, $p < 0.05$) across various sectors including the banking, textile, engineering, and food and chemical sectors as shown in Table 5. Out of these sectors, the mean return and price volatility of the banking sector are highly affected by all other explanatory variables such as the US policy rate, the Pakistan inflation rate, and the exchange rate ($\alpha_2 = -0.201$, $\alpha_3 = -0.149$, and $\alpha_4 = 0.266$, $p < 0.05$), and ($\beta_2 = 25.611$, $\beta_3 = 0.149$, and $\beta_4 = 21.112$, $p < 0.05$), respectively. It shows that the US monetary policy significantly impacts the financial sector of Pakistan. These findings confirm the catch-up effects of convergence theory and the dominant positioning of US policy globally, which allows them to "catch up" with well-established and technologically-equipped nations. This shows that any substantial change in US policy may affect the financial sector as well as the listed financial sector firm on the Pakistan Stock Exchange. Previous studies confirm mean and volatility transmission effects between US monetary policy on emerging markets as well as developed markets. However, these findings also explore that only mean transmission effects exist between these markets. Our findings also exhibit that the transmission effects can be seen within the markets at the sector level.

Table 5. Spillover effects on the real estate market of different sectors listed on the PSX.

	I		II		III		IV		V	
Variable	**β**	**SE**	**B**	**SE**	**β**	**SE**	**B**	**SE**	**β**	**SE**
α_0	0.012	0.019	0.017	0.012	0.017	0.078	−0.018	0.341	0.114	0.014
α_1	0.410 **	0.121	0.045 **	0.051	0.077 **	0.215	0.223 **	0.281	−0.132 **	0.078
α_2	−0.201 **	0.91	0.051	0.012	0.011	0.065	0.023 **	0.121	0.112	0.121
α_3	−0.149 **	0.098	−0.012	0.041	−0.211 **	0.227	−0.212 **	0.034	0.114 **	0.143
α_4	−0.266 **	0.067	−0.191 **	0.141	−0.511	0.321	−0.141 **	0.221	−0.115 **	0.118
∂_0	−3.671	2.067	−1.012	0.013	−3.611	0.452	−1.272	0.112	−2.484	0.321
γ	0.581	0.651	−0.123	0.016	0.651	0.331	1.371	0.123	0.266	0.241
σ	−0.051	0.211	0.144	0.071	0.415	0.231	0.431	0.145	0.587	0.213
λ	0.516	0.231	0.112	0.071	0.877	0.087	−0.161	0.112	0.819	0.771
β_1	−13.123 **	10.671	−11.612 **	0.018	0.122 **	1.121	8.133 **	23.321	8.188 **	6.213
β_2	25.611 **	28.511	23.711	3.081	−1.121	1.321	12.308 **	8.112	−12.545	5.973
β_3	10.881 **	12.081	10.161 **	0.021	−1.076 **	1.321	−19.221 **	25.223	−7.172 **	5.443
β_4	21.112 **	15.881	11.331 **	0.054	1.481 **	1.321	−34.561 **	33.112	−1.231 **	13.121
AIC	−4.118		−4.112		−3.121		−5.121		−5.118	
SC	−3.123		−4.211		−4.321		−4.154		−4.705	
HQC	−4.123		−5.231		−4.321		−5.431		−4.95	
likelihood	411.271		366.121		411.208		322.254		233.112	

Note: This table indicates the result of the EGARCH–DCC model with a sample size of 128 months of data from January 2010 to August 2020. Model-I, II, III, IV, and V indicate the spillover effects of the policy rate of Pakistan (PKM) with the US policy rate (USM), the Pakistan inflation rate (INF), and the exchange rate (EXR) on different sectors of the Stock Market such as the banking, textile, engineering, and food and chemical sectors. * $p < 0.05$; ** $p < 0.01$ represent significance level at the 1 and 5%, respectively.

4.6. Inter-Market Transmission Effects

We examined the transmission effects of mean and volatility between real estate investment and conventional investment opportunities. The results shown in Table 6 confirm mean return transmission effects from the stock market to both the mercantile and real estate markets (φ = −0.034, and −0.054 at $p < 0.05$) as well as price volatility transmission (λ = −0.045, and −0.091 at $p < 0.05$) from the stock market to the mercantile and real estate markets. It also indicates that mean return and price volatility effects are negative from the stock market to the real estate market and the mercantile market. It shows that the higher the return in the stock market, the lesser the chances to shift their investment from the stock market to the real estate and mercantile markets. The results also confirm that negative mean return transmission effects from real estate to the stock market and real estate market (φ = −0.116, and −0.234 at $p < 0.05$) and negative price volatility transmission (λ = −0.212, and −0.078 at $p < 0.05$) from real estate market to the stock market and mercantile. Similarly, the mercantile market results show the positive mean return and price volatility transmission effects (φ = 0.082, and 0.045 at $p < 0.05$) and (λ = 0.145 and 0.012 at $p < 0.05$), respectively, from the mercantile market to the real estate and stock market. It shows that higher returns and growth in the mercantile market lead toward an increase in return and price volatility in the stock market and real estate market. In the literature, weak but positive (Siddiqui and Roy 2019) and negative transmission effects between the stock market and mercantile markets products and services (Raza et al. 2016) are reported.

Table 6. Inter-markets spillover effects among the stock market, real estate market, and mercantile market.

	SM	**MM**	**REM**	**REM**	**SM**	**MM**	**MM**	**SM**	**REM**
β_0	−0.312 (0.021)	−0.212 (0.022)	0.134 (0.010)	−0.113 (0.031)	0.011 (0.011)	0.341 (0.005)	−0.001 (0.001)	0.001 (0.005)	0.001 (0.005)
β_1	−0.113 * (1.970)	0.739 ** (4.169)	0.682 ** (3.154)	0.821 ** (4.681)	0.464 ** (4.293)	1.603 (1.901)	−1.381 (1.610)	1.469 (1.906)	1.461 (1.929)
β_2	0.123 * (2.144)	−0.431 * (2.183)	−0.377 ** (4.356)	−0.517 ** (5.318)	0.066 ** (4.754)	0.029 (2.320)	1.328 * (2.077)	0.525 (2.265)	0.395 (2.296)

Table 6. *Cont.*

	SM	MM	REM	REM	SM	MM	MM	SM	REM
β_3	−0.067 *	−0.009 **	−0.098	−0.229 **	−0.253 **	−1.601	0.091 *	−1.966	−1.833
	(2.021)	(3.398)	(1.377)	(3.978)	(2.722)	(1.145)	(2.050)	(1.125)	(1.130)
φ		−0.034 **	−0.054 **		−0.116 **	−0.234 **		0.082 *	0.045 **
		(4.020)	(4.107)		(4.172)	(4.075)		(2.065)	(0.052)
δ_0	0.024 *	0.023 **	0.003	0.010 **	0.004	0.002	0.121	0.132	0.001
	(2.011)	(4.002)	(0.002)	(2.004)	(0.118)	(0.004)	(3.211)	(0.653)	(0.004)
δ_1	0.154 **	0.578 **	0.678 **	3.087 **	0.139 **	0.265	0.044 **	0.272 **	0.272
	(3.039)	(4.064)	(4.054)	(4.015)	(3.036)	(0.060)	(3.024)	(3.062)	(0.063)
δ_2	0.136 **	0.593 **	0.602 *	0.881 **	0.314 **	0.699 *	0.901 **	0.693 *	0.691
	(4.012)	(5.028)	(2.019)	(4.023)	(4.195)	(0.048)	(4.231)	(2.051)	(0.052)
λ		−0.045 **	−0.091 **		−0.212 **	−0.078 **		0.145 **	0.012 **
		(5.012)	(4.003)		(4.001)	(0.004)		(0.000)	(0.002)
Q(24)		0.341	0.671		0.587	0.781		0.891	0.881
Q(24) Sq		0.455	0.681		0.597	0.892		0.861	0.897

SM, MM, and REM indicate the mean returns and index volatility of the stock market, mercantile market, and real estate market, respectively. Standard errors are presented in parentheses. The residual diagnostics series are shown through *p*-values. The Q (24) portmanteau statistic indicates the presence of residual serial correlations, where the null hypothesis of no serial correlations is assessed through a lag of 24. Likewise, Q(24) Sq employs the same method with squared residual series to test the null hypothesis of the no residual ARCH effect. Significance levels are denoted by * and **, indicating effects at 95% ($p < 0.05$) and 99% confidence ($p < 0.01$), respectively.

5. Conclusions

This study provides a comprehensive analysis of the determinants affecting the transmission of average returns and market volatility across stock, commodity, and real estate sectors in Pakistan. It specifically delves into the interplay between these market variables and the influence of monetary policy adjustments by the Central Bank of Pakistan, US dollar exchange rate fluctuations, and inflationary pressures. The findings substantiate the existence of spillover effects concerning mean returns and volatility among diverse market segments, underscored by investor strategies to leverage arbitrage opportunities within commodities and real estate markets.

Notably, the analysis indicates a positive correlation between commodity market dynamics and stock prices, in contrast to an inverse correlation observed within the real estate sector. Furthermore, the prevailing high interest and inflation rates have steered investor preferences towards the mercantile and real estate markets over the stock market. The study also highlights a negative correlation between changes in interest rates, inflation, and exchange rates with stock market prices—a trend similarly reflected in the real estate and commodity markets. This suggests a cohesive influence of Pakistan's monetary policy on portfolio reallocation strategies across these markets.

The study acknowledges limitations due to its reliance on monthly data with a constrained number of observations. Additionally, it does not distinguish between the investment preferences of local versus expatriate investors, who may have differing risk and liquidity appetites. Future research could address these gaps by incorporating a more extensive dataset and differentiating investor types to provide a nuanced understanding of investment behaviors in Pakistan's financial markets.

Author Contributions: A.W. was responsible for the manuscript's conceptualization, the establishment of the methodology, and the collection of data. O.K. contributed through the analysis of the findings and the subsequent revision and editing of the document. All authors have read and agreed to the published version of the manuscript.

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