The US Monetary Conditions and Dubai's Real Estate Market: Twist or Tango?

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Abstract

The monetary policy is an important driver of the real estate sector's performance. The recent wave of monetary tightening in 2022 in response to the cost-of-living crisis has been associated with the decline in housing prices across the globe. There are two main channels through which the US monetary policy may affect the real estate market in the dollar-pegged countries: (1) the cost of serving mortgages (financing cost) (2) the exchange rate channel (for example, the appreciation of the US dollar and consequently the local currency). The exchange rate channel is particularly important in the case of Dubai, given how international the housing market in Dubai and might be viewed as a tradable good. This paper uses recent data to evaluate the spillover impact of the US monetary policy on the housing market performance in the dollar-pegged countries using Dubai as a case study. For this purpose, the study collected unique longitudinal data on the volume of the monthly transactions of residential properties and performs a panel-data analysis using within-variation models. The changes in the interest rate policy in the US are determined by the domestic inflation in the US, thereby, representing an exogenous shock in the UAE. Our results are robust to different specifications and suggest that a strong negative correlation between the interest rate in the US and the housing sector demand in Dubai. Fiscal policy measures can be taken to mitigate tighter financial conditions in case of policy misalignment. Few studies have looked at the spillover impact of the global monetary conditions on the real estate market in the GCC region. This study fills this gap by exploring the impact of the US financial conditions on Dubai's real estate, using panel data analysis.

I.   Introduction

The spillover of the U.S. monetary policy on other countries, especially those with pegged exchange rate regimes, can significantly impact their economies (Caceres et al., 2016a, Dahlhaus and Vasishtha, 2014, Arteta et al., 2022). Arteta et al. (2022) examine the impact of rising US interest rates on emerging markets and developing economies (EMDEs) and concluded that the spillover effect to EMDEs depends on the type of interest rate shock. They identify three types of shocks: inflation expectation shock, changes in the perception of the Federal Reserve reaction function (reaction shock) and change in economic activity (real shock). The paper reveals that inflation and reaction shocks lead to tighter financial conditions, declining capital flows, a depreciation of the real exchange rate, and a drop in consumption and investment, ultimately increasing the likelihood of a financial crisis for EMDEs. Real shocks due to better economic activity, on the other hand, have more benign effects. The paper highlights the precarious situation many EMDEs are facing in 2023 and the potential for destabilizing financial market movements and procyclical reductions in fiscal spending. In the case of the GCC countries who have pegged their currencies to the US dollar for decades, Prasad and Khamis (2011)'s study demonstrate that a 150 basis point hike in the federal funds rate caused a 1.5 percentage point drop in the non-oil GDP two years after the tightening.

Global financial conditions are also an important determinant of the real estate market (Deghi et al., 2022). High lending rates have an immediate impact on mortgage lenders and impact the demand for new homes. Recently, the property markets worldwide have been exposed to new pressures after the supply chain crisis that is associated with the Covid-19 pandemic lockdown and the economic consequences of the Russian invasion, which prompted central banks to hike interest rates at the fastest pace in decades to combat inflation. Tighter financial conditions weaken the demand for properties by making it less affordable for mortgage buyers to finance home purchases or refinance existing loans, driving down house prices.

Dubai is an international real estate market, thanks to its laws that allow foreigners to own properties, a stable currency that is pegged to the US dollar, the emirate's advanced infrastructure facilities, and the city's attractions. The construction and the real estate sector together constitute about 13.5% of Dubai's economy, with the real estate sector accounting for 6.9 percent and the construction sector accounting for 6.6 percent of Dubai's GDP in 2021. The non-tradable sector usually plays a vital role in the oil economies and the natural-resource dependent ones, a phenomenon known as the Dutch disease.

The UAE currency has been pegged to the US dollar since November 1997, at AED 3.67 to the dollar, which has shaped the UAE monetary policy by aligning the UAE Central Bank interest rate with the US Federal Funds' target rate. The peg to the dollar, which is the main currency used in international reserves and transactions, reduces foreign exchange-related risks and uncertainty as much of the Gulf countries' revenue comes from oil that is priced internationally in the US dollar. A stable exchange rate is also critical for foreign trade-dependent countries. For example, Dubai's total imports and exports reached 213 percent of Dubai's GDP in the year 2018. But on the other hand, a fixed exchange rate ties policymakers' hands as it imports monetary policy from the US. But if macroeconomic fluctuations are not in harmony, it is possible that a dollar peg may not be supportive and generates the risk of policy misalignment when economic cycles are out of step. For instance, the country (the US) that is in control of monetary policy might be hiking interest rates to curb domestic inflation at the same time the other country with the pegged rate is going into recession. This has been evident in the economic conditions that follow the Covid-19 pandemic, as the US economy quickly recovered from the pandemic and became overheated with high inflation rates and tight markets thanks to the strong economic stimulus policies. While the Gulf economies were in the process of recovering from the effects of the pandemic with moderate inflation rates. For example, the inflation rate in the US in 2021 is around 4.7% (above the Fed target) and in the UAE was about 0.2% (International Monetary Fund, 2022). Unlike Twist, Tango requires the partners to strictly maintain harmony and synchronize their steps, the fixed exchange rate regime works best when the two countries involved have similar macroeconomic fluctuations.

The recent waves of financial tightening in the US have affected the property markets worldwide and increased the risk of macro instability. Albeit the importance of the real estate sector in the Gulf economies and Dubai in particular, the impact of the US monetary conditions on the housing market in the Gulf region and Dubai has been understudied. Evaluating the impact of the US monetary conditions on the UAE housing market has paramount importance from the macroprudential perspective. The study fills the gap by evaluating the effect of the US interest-rate policy on the performance of the housing market in Dubai using longitudinal data. The paper aims to study the spillover impact of the U.S. monetary policy on the housing market in Dubai given that the UAE domestic policy rate broadly follows the U.S. interest rate, which has not been extensively studied before.

In the context of recent waves of inflation-driven monetary tightening in the US that have affected property markets worldwide and increased the risk of macro instability, this study sheds light on the potential effect of the US monetary policy on the performance of the real

estate markets in the dollar-pegged countries. This study specifically focuses on Dubai's housing market, as one of the most important real estate markets in the Middle East. This study seeks to quantify the impact of the Fed monetary tightening on the demand for real estate in Dubai and discuss alternative policies that might be considered to mitigate the potential negative impact of US monetary conditions on the real estate market in Dubai. The study is to fill the gap in the literature by revisiting the impact of the US interest-rate policy on the housing market in the context of interest rate hikes in the US. The study is one of the earliest that explores the effect of the US monetary policy after Covid on the housing market. The study's unit of analysis is the monthly number of real estate transactions in Dubai covering the period from 2014 to July 2022. The key finding of the study is that an increase in the interest rate (year over year) by one percentage point will cause about a 17.7% fall in overall real estate deals in Dubai. This effect is economically large and highly significant at a 1% level of significance. This study has important policy implications for policymakers given the aggressive hiking of interest rates. Firstly, the study quantifies the impact of the Fed tightening on the real estate demand in Dubai. Secondly, the study discusses alternative policies that might be considered to ease pressure on the sector and counterbalance the impact of monetary tightening in case of policy misalignment.

II. Conceptual Framework

The US monetary policy is a critical tool for controlling inflation and influencing economic growth. When there are high inflationary pressures, the Fed may increase interest rates to reduce borrowing and spending, which can slow down economic activity and reduce inflationary pressures. However, this can also lead to a decrease in economic growth, which can negatively impact employment and other economic indicators. The Fed's decision-making process involves analyzing economic data and forecasts and assessing the potential impact of different policy options. Ultimately, the goal of the US monetary policy is to strike a balance between controlling inflation and maintaining economic stability and growth. The following graphical representation illustrates the two main monetary policy transmission channels through which the monetary conditions in the US can affect property demand in Dubai. The premise is that changes in the US interest rate will be followed by changes in the short-term interest rate in the UAE, which in turn affects the long-term interest rate and the mortgage rates increasing the cost of borrowing or refinancing for mortgage buyers. Mortgages play an important role in Dubai's economy, where the value of mortgages represents about half of the total value of real estate transactions in Dubai. Additionally, higher borrowing costs could also motivate investors to shift to other types of liquid investments with a higher return.

The second channel is the changes in the Fed rate affect the value of the US dollar and automatically the Dirham value which in turn affects the property prices in Dubai. For example, a stronger US Dollar raises the property relative price in Dubai for foreigners with non-dollar incomes. Dubai is a cosmopolitan city in which foreigners represent more than 90% of its population. The city striving to attract real estate investors from abroad, thereby the impact of the exchange rate channel on the real estate market is expected to be exceptionally large. For example, Figure 2 shows the top investors in the Dubai Real Estate market by nationality in 2018. The figure clearly shows the significant number of foreign investments in the real estate market, which might be sensitive to fluctuations in the exchange rate. Additionally, tighter monetary conditions have an indirect effect on the real estate market by decelerating economic activity and weakening the aggregate demand the real estate investments.

Figure 1: Monetary Policy Transmission Mechanism and the UAE Real Estate Market

Figure 2: Real Estate Investments in Dubai by Nationality in 2018 (AED Billion)
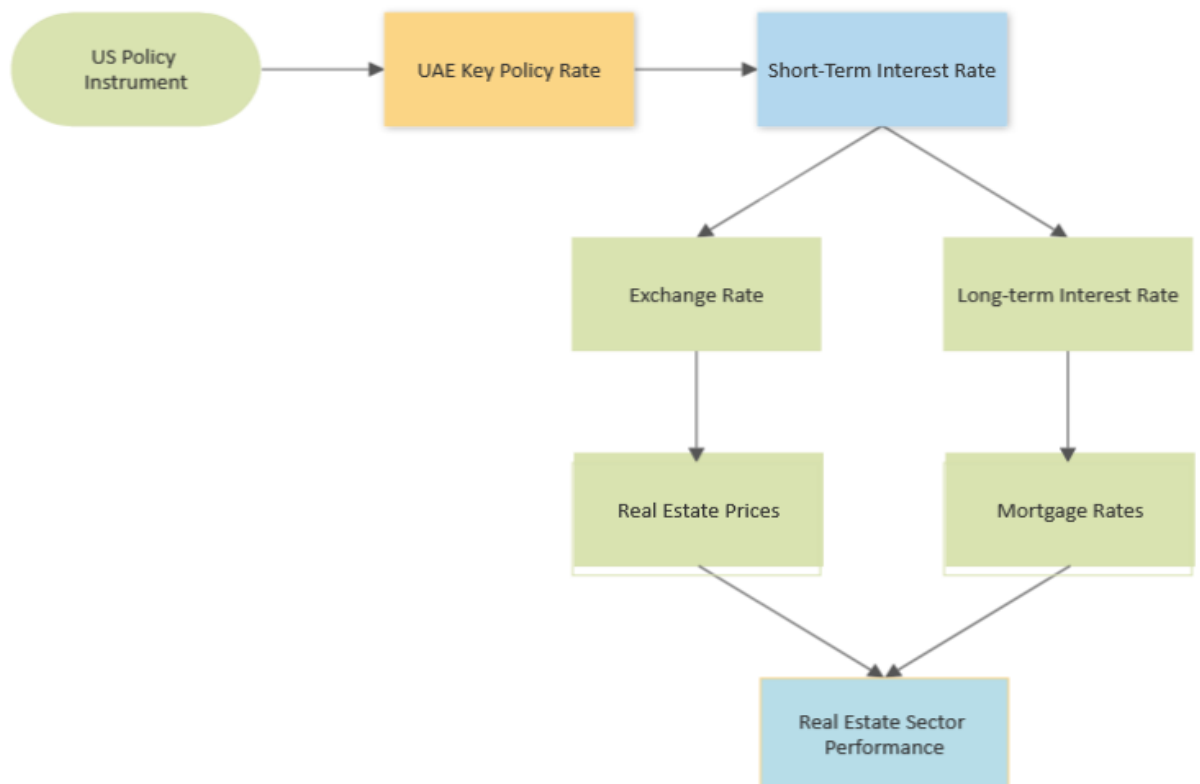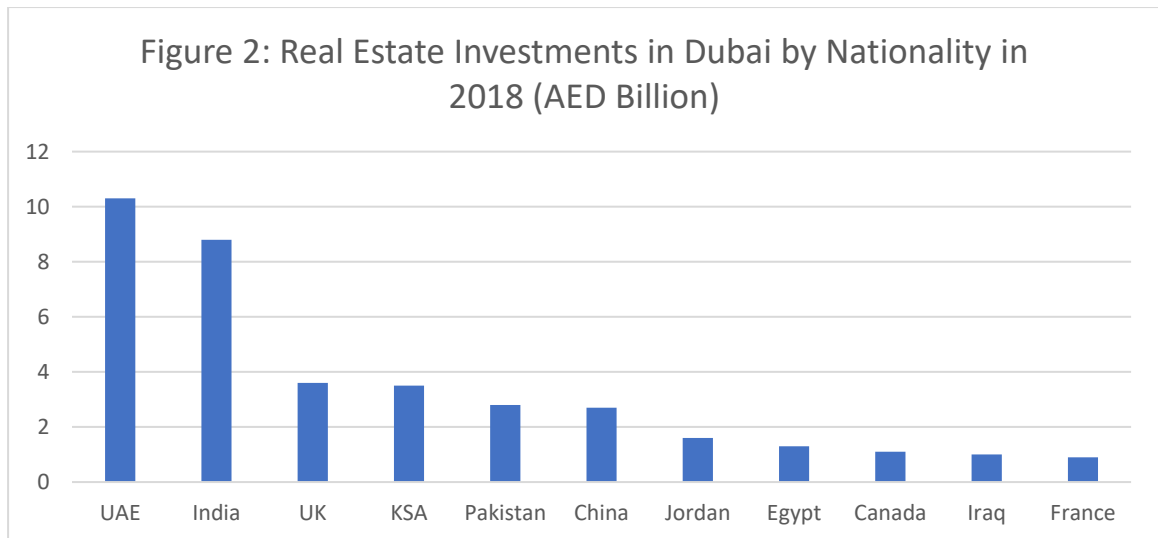
Source: Dubai Economic Report 2019

III.   Literature Review

Spillovers from the US monetary policy have a significant impact on EMDEs (Dahlhaus and Vasishtha, 2014, Caceres et al., 2016b, Chen et al., 2014, Bowman et al., 2015)   and the consensus in the literature is that tighter monetary policy in the US has a detrimental impact on EMDEs given the soaring interest rates are driven by inflationary shocks and hawkish Fed- as the one existing at the moment- (Mishra et al., 2014, Eichengreen and Gupta, 2015, Ahmed et al., 2017, Aizenman et al., 2014, Chari et al., 2017, Kalemli-Özcan, 2019, Bräuning and Ivashina, 2020, Hoek et al., 2022, Arteta et al., 2022, Ha, 2021, Cajias and Ertl, 2017). For example, tighter monetary policy can result in an increase in local-currency bond yields, a widening of sovereign risk spreads, a decrease in equity prices, a depreciation of currencies, and a reduction in capital flows (Arteta et al., 2022). The findings of Manasse and Roubini (2009) and Kose et al. (2021) suggest that increases in US interest rates can elevate the probability of a financial crisis in EMDEs in the following year.

The soaring interest rates in the US and across the world, which have been driven by the rise in global inflation, pose a risk to the property markets throughout the world. IVariousstudies have examined the monetary policy impact on the real estate sector. In line with the theoretical predictions, the prevailing viewpoint in the empirical literature is that the rise in interest rates harms the real estate market and has a depressing effect on real estate prices, output, and demand (Kabundi and Ngwenya, 2011, Silva et al., 2019, Tunc and Gunes, 2022, Ciarlone, 2015, Singh and Nadkarni, 2020, Alhodiry et al., 2021, Wadud et al., 2012, Xu and Chen, 2012, DeFusco and Paciorek, 2017). For example, Tunc and Gunes (2022) examine the relationship between monetary policy and real estate prices in a group of seven emerging

market economies using a panel-structural vector autoregressive (SVAR) model. Their findings suggest that real estate prices in many emerging economies tend to decrease in response to a contractionary monetary policy shock. This is because the surge in interest rates reduces housing demand by decreasing income and increasing mortgage interest payments, which in turn puts downward pressure on prices. They highlighted the response of prices in EMDEs is more limited compared to advanced economies due to structural differences, such as smaller mortgage markets and less well-functioning secondary markets for housing finance. Mishkin (2007) showed the absence of a flexible interest rate system in EMDEs hinders the effectiveness of monetary policy in influencing housing prices, which may serve as a potential explanation to Tunc and Gunes (2022)'s findings.

In Brazil, Silva et al. (2019) employ an SVAR methodology, in conjunction with a DSGE model calibrated. The findings indicate that when aggregate productivity experiences a positive shock, the housing market reacts favourably. Conversely, if there is a contractionary monetary policy shock, housing output, demand, and prices all get depressed. In Pakistan and in line with previous literature, Umar et al. (2019) suggested that tight monetary policy lead to lower house prices and vice versa. However, they highlight the housing-monetary policy relationship is unidirectional. This implies that house prices are impacted by monetary policy, but the central bank does not use them as a determinant when formulating its monetary policy.

Costello et al. (2015) extend the literature by going beyond the national average impact and they suggested that monetary policy impact on the Australian housing market can be heterogenous across states within the country. They explain the asymmetric impact of the monetary policy impact the variations in wealth and leverage levels across the regions. Speaking of asymmetry and averaging effect, Bahmani-Oskooee et al. (2022) analysed how increases and decreases in the money supply affect house prices in the United States, using data from various states. They point out that the impact of positive and negative changes in M2 differs in magnitude. Therefore, the impact of monetary policy shocks on house prices is not the same for expansionary and contractionary shocks. The analysis shows that in the short run, the effect of changes in money supply on house price growth is symmetric across 38 states. However, in 48 states, the impact of positive changes in money supply is different from that of negative changes. This asymmetry is also noticed in the relationship between the monetary policy and housing permits in the US (Bahaman-Oskooee et al., 2023).

There have been few studies that have examined the spillover effects of US monetary policy on the economies of the GCC (Ziaei, 2014, Espinoza and Prasad, 2012, Adedeji et al., 2019, Istiak and Alam, 2020) and even fewer studies that explored the macro determinants of the

UAE housing market (Hepşen and Vatansever, 2011, Hepşen and Vatansever, 2012, Renaud, 2012, Al-Malkawi and Pillai, 2013, Worku, 2017). To the best of our knowledge, this study represents the first attempt to explore the spillover impact from the US monetary policy on the housing market in Dubai and the UAE. Additionally, this study is the one of the earliest studies that considers the recent monetary tightening that is taking place at the moment throughout the world.

IV.   Dubai Real Estate Overview

Dubai's real estate sector is a key driver of the economy of Dubai, and since 2001 the Dubai real estate cycle was a reflection of the emirate economic cycle and witnessed two peaks, two recessions and two growth points as illustrated in Figure 3, the period from 2001 to end of 2008 witnessed the highest expansion ever in the real estate market in line with the city expansion plan and the freehold law. However, the global financial crisis of 2008 had a profound impact on the real estate sector ending the housing boom that preceded the crisis. As a result, demand for new housing construction also fell sharply, and this led to a deep contraction in the real estate and construction sectors in 2009-2011.

The real estate sector in Dubai began to show signs of recovery in 2011. This was due to a combination of factors, including oil prices that surged between 2011 and 2014 averaging around $100 per barrel. In addition to the Dubai government initiatives to stimulate the sector, such as the introduction of regulations to protect investors and the hosting of Expo 2020. However, towards the end of 2014, oil prices began to decline sharply, with Brent crude oil prices falling from over $100 per barrel in September 2014 to below $50 per barrel by early 2015. The fall in oil prices had significant implications for oil-exporting countries including the UAE and as a result Dubai's property market went through a soft landing until 2020. The Dubai real estate market experienced another contraction in 2020 due to the Covid pandemic and the resulting decrease in demand for real estate properties.

To mitigate the economic consequences of the Covid pandemic, the UAE Central Bank introduce regulatory changes that was aimed at increasing access to financing for real estate purchases. The UAE Central Bank eased the loan-to-value (LTV) ratio limits in 2020. The LTV ratio refers to the maximum amount of a property's value that a lender is willing to lend to a borrower. In the case of UAE nationals, the UAE Central Bank increased the LTV ratio limit to first-time homebuyers from 80% to 85% for properties valued at AED 5 million or less and in the case of non-UAE nationals, it increased the borrowing limit from 75% to 80%

Figure 3: Dubai Real Estate Sector Cycle
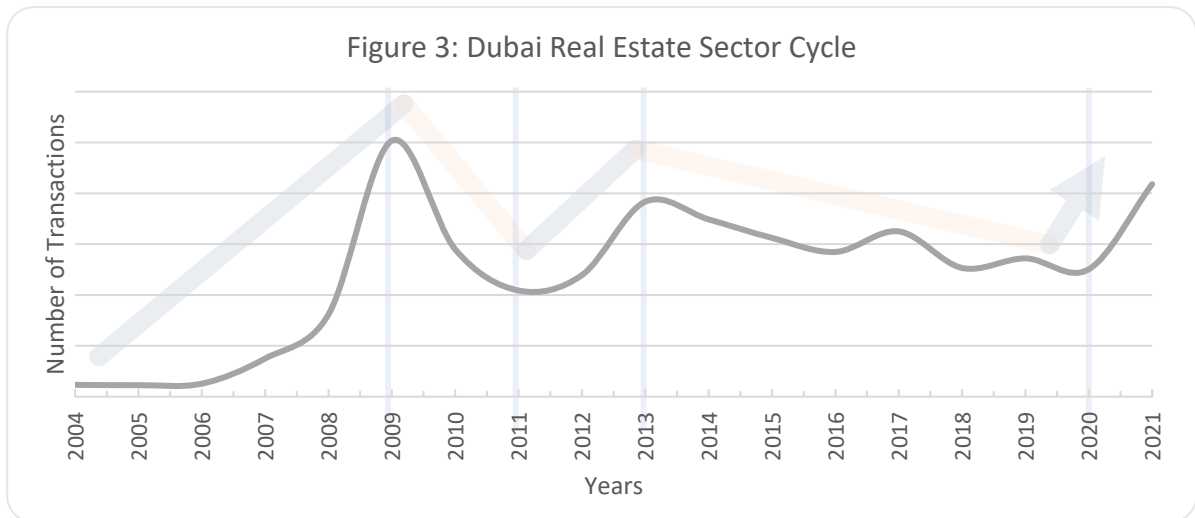
Growth	Decline	Recovery	Soft Declining	Potential growth
(2004 – 2008)	(2009 – 2011)	(2012 – 2014)	(2015 – 2018)	(2021 – 2023)

Source: Calculated by the Authors using DLD data.

Despite the unprecedented restraints caused by the pandemic, the Dubai real estate sector registered the second highest number of transactions in a single year in 2021 with more than 83 thousand transactions that is associated with the government stimulus packages including the recent changes in the loan-to-value ratio and the decline in the borrowing cost. An analysis of the real estate transactions by transaction type reveals that the year 2021 registered the highest number of mortgages ever registered in the Dubai real estate sector with 19,525 mortgages (Figure 4).
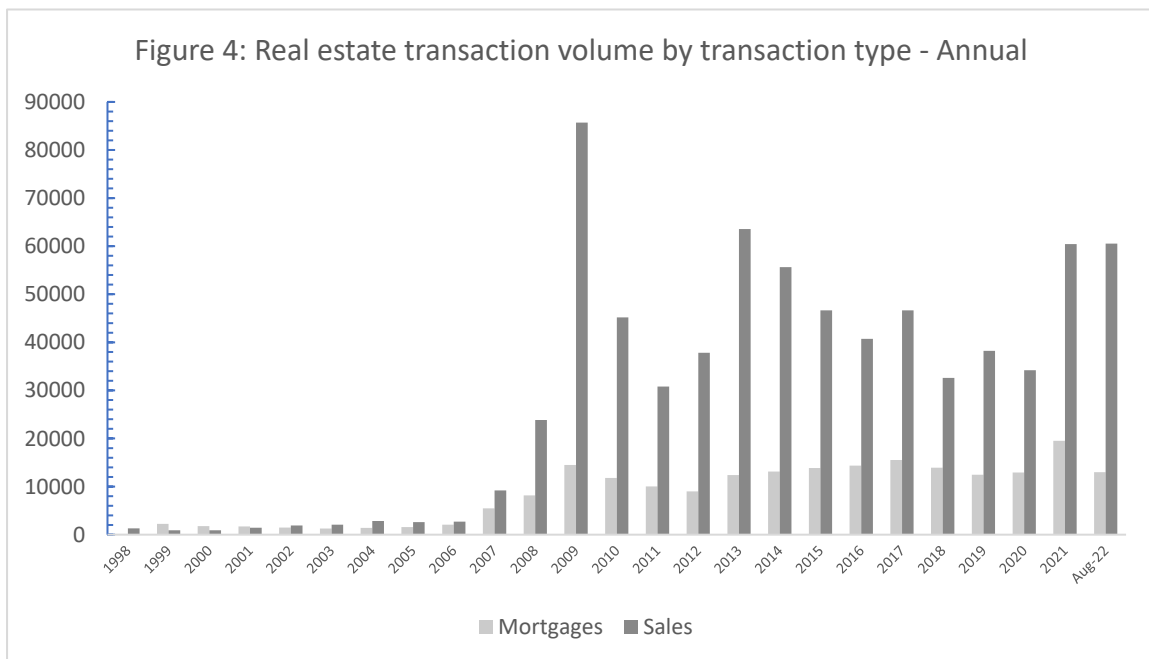
Source: Dubai Land Department-Government of Dubai

V.   Data and Method

We employed a fixed effects panel-data model to study the relationship between the U.S. monetary policy spillover and the number of monthly sold houses while controlling for unobserved heterogeneity. Our dataset consisted of a panel of two groups: the number of houses sold with a mortgage and the number of houses sold without mortgage over 91 months, as the U.S. monetary policy will affect houses sold via mortgages through interest rate channel and will affect houses sold without mortgage through the exchange rate channel and other channels. The panel data structure allowed us to control for unobserved heterogeneity that may vary across the two types of properties but not change over time. For example, some potential time-invariant differences between leveraged properties vs unleveraged properties are size and features. For example, cash buyers maybe more interested in larger or more luxurious properties, while mortgage buyers maybe more focused on finding a property that meets their budget and lender's requirements. Additionally, banks do not finance the off-plan units only ready and near-ready properties. Mortgage buyers maybe more limited in terms of the locations they can consider, as some areas may not meet their lender's requirements. Cash buyers, on the other hand, may have more flexibility to purchase properties in high-priced areas. Additionally, the use of a dependent variable with a panel component, mortgage and non-mortgage financed properties, allows for a more nuanced analysis of the spillover impact of the US monetary policy. It enables us to identify the pathways through which spillover effects from US monetary policy impact the market by adding an interaction term to the regression model as illustrated in equation (1).

The fixed effects model includes two individual-specific intercepts that captured the time-invariant unobserved heterogeneity, which may otherwise confound the relationship between the monetary policy spillover effect and the activity of the real estate sector in Dubai. By controlling for these individual-specific intercepts, we were able to isolate the spillover effect from the monetary policy on the activity of the real estate sector, while holding constant any unobserved heterogeneity that was unique to the financing method of purchase.

Additionally, we included time-varying controls for other potential confounding factors that may affect the relationship between the monetary policy and the performance of real estate sector, such as Brent oil prices, an index for residential prices in Dubai, a proxy for population growth. These controls allowed us to capture time-varying differences that may otherwise influence the relationship. We estimate robust standard errors clustered to account for potential serial correlation in the errors.

We collected data from several official open sources. Data on the number of monthly sold houses are collected from Dubai Land Department (DLD) covering the period from the year 2014 to July 2022. Data on the US interest rate are collected from the FRED database (see https://fred.stlouisfed.org/ for details). To control for the effect of home prices on housing demand, we use the Dubai House Price Index produced by DLD. The Dubai House Price Index is a monthly index that is based on hedonic price methodology and goes back to the year 2011. (see https://dubailand.gov.ae/en/open-data/residential-properties-price-index-rppi/#/ for more details). House renting is a substitute good for house owners and might be an important determinant of the housing demand. The DLD produces a monthly index on the performance of the residential rental market. Similarly, the index uses the hedonic imputation method and the data goes back to the year 2012 (see https://dubailand.gov.ae/en/open-data/residential-rental-performance-index/#/ for more details). Although Dubai is the most diversified economy in the GCC region, oil prices remain important determinant of the external demand; therefore, we collected data on the global price of Brent Crude from the Fred database. As the population size is not estimated on monthly basis and is an important factor for housing units demand, monthly numbers on active mobile subscriptions in the UAE are collected from the Telecommunication and Digital Government Regulatory Authority (visit: https://tdra.gov.ae/ for details) as a proxy. Our data can be described as long panel data since periods T is far larger than the number of groups N. We have monthly data on two groups of properties (mortgage-financed and non-mortgage financed) covering 86 months per group starting from January 2015. Thus, both a generalized least square model as well a fixed effect linear model with an AR(1) disturbance can be adopted to take into account the large T. The following equation represents our housing unit demand model as a function of the US interest rate, price of houses in Dubai, rent prices in Dubai, global oil prices, etc:

$$\Delta \log(House_{it}) = \beta_0 + \beta_1 \Delta interest_t + \beta_2 \Delta Brent_t + \beta_3 \Delta Price_t + \beta_4 \Delta Rent_t + \beta_5 Covid + \beta_6 Base + \beta_7 \Delta \log(mobile_t) + \beta_8 Mortgage_i \times \Delta interest_t + u_{it}$$
(1)

Our dependent variable $\Delta \log(House_{it})$ is the approximate annual growth rate in property transactions in Dubai at month t for the property group i. $\Delta interest$ is the annual change in the US interest rate ($interest_t - interest_{t-12}$). We expect the US interest rate coefficient β_1 to have a negative effect on the annual growth of properties, as the interest rate goes up and the cost of borrowing increases the demand for properties falls. $\Delta Brent$ is the annual change in the global Brent price ($Brent_t - Brent_{t-12}$). The expected sign for β_2 is positive. As the oil revenue increases, we expect a spill over in the housing market. $\Delta price$ is the annual change in the Dubai House

Price Index ($index_t$-$index_{t-12}$), and we expect it to have a negative effect, reflecting the typical inverse relationship between the quantity demand and the price. $\Delta Rent$ is the change in the Dubai rent index compared to a year ago. If renting a property is a substitute good for property ownership, we expect a positive coefficient for the variable rent. The variable *Covid* is a dummy variable for the Covid lockdown period in Dubai. We expect β_5 to carry a negative sign, as the Covid restrictions and the uncertainty around the pandemic dampen the aggregate demand. As the Covid lockdown period witnessed a sharp drop in property deals, the months of March 2021 and April 2021 saw a steep growth in property sales. Thus, we include the dummy variable *Base* to account for the base-year effect. $\Delta \log$ (*mobile*) is the approximate annual growth rate in the number of active mobile subscriptions. This variable serves as a proxy for population growth as well as economic activity, which is a fundamental driver of housing demand. As the economy grows, the demand for foreign labour increases, and that is reflected in population numbers. Therefore, we expect β_7 to be a positive coefficient. β_8 is the coefficient for the interaction term *Mortgage*×$\Delta interest$, where *Mortgage* is a dummy variable for the mortgage financed properties. The model control for the fixed effect and eliminates serial correlation and heteroscedasticity by using the variables in difference form. The regression analysis and the following graphs have been performed using STATA 17 software.

VI.   **Results**

Descriptive Results

Figure 5 presents the association between the US discount rate (the interest rate charged by the US Federal Reserve on loans that it makes to commercial banks) and real estate transactions in Dubai over the period between January 2014 to July 2022. The inverse association between the US discount rate and housing demand is quite obvious in the case of non-mortgage buyers, as the discount rate went up after 2016, the property units sold went down and vice versa. For the mortgage buyers, the inverse correlation is less visually obvious and can be further checked in the regression models.

Figure 5: Real Estate Sector and the US Interest Rate

Source: DLD and FRED
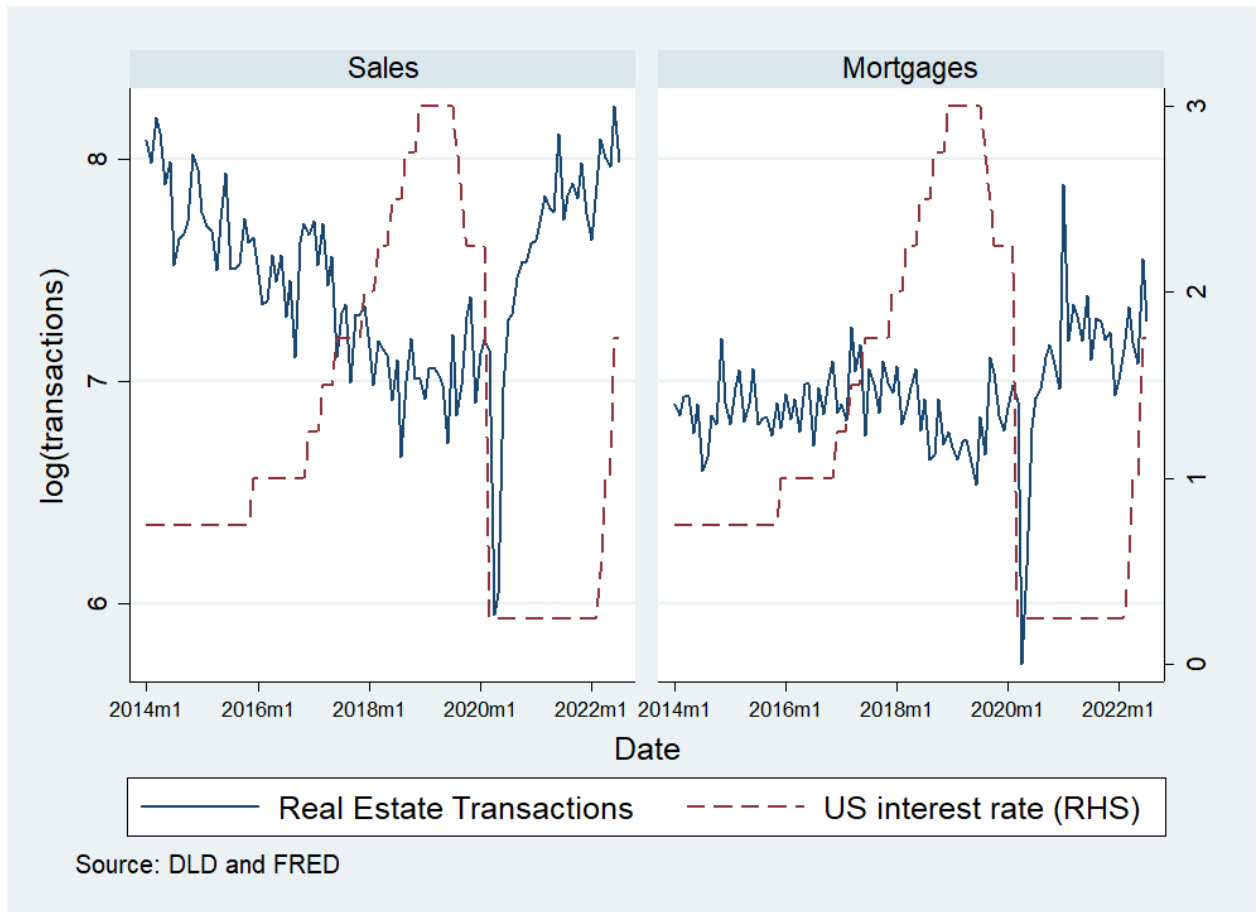
Table 1 provides panel summary statistics that decompose the total variation in the variables into within variation over time and between variation across groups. It shows also the mean, the minimum and maximum, and the number of observations for each group. The dependent variable Δlog(house) varies over time as well as across the two groups and the degree of variation is quite close. For all other variables, there is variation over time and zero between variations, as they are group-invariant regressors. The fixed effect estimation methods are solely looking at the within variation, ignoring the variation across groups.

Table 1: Panel Summary Statistics: Within and Between Variation

Variable		Mean	Std. Dev.	Min	Max	Observations	
Δlog(house)	overall	0.02	0.39	-1.08	1.83	N =	182
	between		0.03	0.00	0.05	n =	2
	within		0.39	-1.06	1.85	T =	91
US Discount rate	overall	1.25	0.90	0.25	3.00	N =	206
	between		0.00	1.25	1.25	n =	2
	within		0.90	0.25	3.00	T =	103
Δinterest	overall	-0.07	1.02	-2.75	1.00	N =	172
	between		0.00	-0.07	-0.07	n =	2
	within		1.02	-2.75	1.00	T =	86
log(house)	overall	7.20	0.43	5.73	8.24	N =	206
	between		0.37	6.94	7.46	n =	2
	within		0.35	5.69	8.15	T =	103
Oil Prices	overall	65.64	21.35	26.80	117.70	N =	206
	between		0.00	65.64	65.64	n =	2
	within		21.35	26.80	117.70	T =	103
log(mobiles)	overall	16.72	0.07	16.61	16.83	N =	198
	between		0.00	16.72	16.72	n =	2
	within		0.07	16.61	16.83	T =	99
Price Index	overall	107.01	6.78	94.90	118.70	N =	206
	between		0.00	107.01	107.01	n =	2
	within		6.78	94.90	118.70	T =	103
Rent Index	overall	101.39	11.43	79.50	117.80	N =	206
	between		0.00	101.39	101.39	n =	2
	within		11.43	79.50	117.80	T =	103

Results from within Estimation Models

To evaluate the effect of the monetary policy on the housing market in Dubai, we employ a fixed effect linear model with AR(1) disturbance and use different within-estimation models (generalized least squares (GLS) and pooled OLS with AR(1) term and standard errors that allows correlation between groups) as a robustness check. Table 2 provides a comparison of various estimation models. Model 1 is a fixed effect linear model with an AR(1) disturbance. It accounts for the fixed effect and eliminates the effect of the AR(1) error. Model 2 is the GLS model assuming an AR(1) error and correlation across the two groups of properties. Model 3 is the pooled OLS with AR(1) term.

As expected, the coefficient of the annual change in interest rate has the expected negative sign. Model (1) suggests an increase in the interest rate (year over year) by one percentage point will cause about 17.7% [exp (-0.195)-1=-0.177] fall in the overall real estate deals. This is economically large and the coefficient is highly significant at a 1% level of significance. This finding remains robust across the other two models, the generalized least square assuming AR(1) error and correlation across the two groups as well as the pooled OLS model that assumes AR(1), and the interest rate coefficient's value remains almost unchanged to different estimation methods. The variable Rent has a positive sign, which may suggest that as rents increase, properties purchase increase too. This is a reasonable finding, as renting properties can be a substitute good for owning homes. However, the effect of rent on real estate transactions is not economically large (about 1%). Although the annual change in oil price has the expected positive sign, the coefficient is not statistically significant across different specifications. The annual growth in the number of active mobile subscriptions in the UAE is not significantly correlated with the movements in the real estate market. In line with the law of demand, there is a negative association between the annual change in the Dubai House Price Index and the growth in properties purchased. Model (1) suggests an increase in the Price Index by 1 unit will cause about a 2% fall in purchased properties. The coefficient is significant at a 5% level of significance for model 1 and a 10% level of significance for model 3. The interaction term (Mortgage×Δinterest) was not statistically significant suggesting that the effect of the interest rate change is the same for both mortgage buyers and non-mortgage buyers. The two variables Covid and Base both control for the Covid lockdown and restrictions. The Covid dummy accounts for the sharp drop in purchased properties after the strict lockdown in Dubai. The three months lockdown causes about a 53% fall in purchased properties compared to the previous period. The base dummy variable accounts for the sharp growth in purchased

properties, as we are comparing the growth in purchased properties to a low base period (the Covid lockdown period). Thus, the period from March 2021 to June 2021 witnessed a sharp annual growth of 185%. Our fixed effect model explains well the variation in the dependent variable, and the adjusted R square equals 0.55.

Table 2: Determinants of the Dubai's Housing Market

|	(1) FE-AR	(2) GLSAR	(3) OLSCORR
$\Delta interest_t$	-0.195***	-0.200***	-0.201***
	(0.0384)	(0.0461)	(0.0458)
$\Delta Rent_t$	0.0155**	0.0140	0.0139
	(0.00567)	(0.00737)	(0.00737)
$\Delta Brent_t$	0.00129	0.00178	0.00179
	(0.00113)	(0.00147)	(0.00147)
$\Delta \log(mobile_t)$	-0.847	-0.697	-0.697
	(0.524)	(0.688)	(0.688)
$\Delta Price_t$	-0.0203*	-0.0188	-0.0187
	(0.00863)	(0.0112)	(0.0113)
Interaction term	0.0436	0.0425	0.0423
	(0.0402)	(0.0344)	(0.0344)
Covid dummy	-0.758***	-0.720***	-0.720***
	(0.117)	(0.148)	(0.148)
Base dummy	1.049***	0.986***	0.986***
	(0.105)	(0.133)	(0.133)
_cons	0.0202	-0.00959	-0.00960
	(0.0229)	(0.0353)	(0.0349)
N	172	172	172
adj. R^2	0.551		
Fixed effect	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As a further robustness check, we replace the US discount rate with the Emirates Interbank Offered Rate (EIBOR). EIBOR is the benchmark interest rate used by banks in the UAE for lending to each other. This rate is set daily by the UAE Central Bank. EIBOR is also used as a reference rate for various financial transactions, including loans such as mortgages, personal loans, and car loans. For example, a bank may offer a mortgage loan with an interest rate of

EIBOR plus a certain percentage (known as the "margin"), which would adjust as the EIBOR rate changes over time. The EIBOR rate closely follows the Federal Fund Rate (see Figure 6).

Figure 6: The Correlation between the US and the UAE Rates
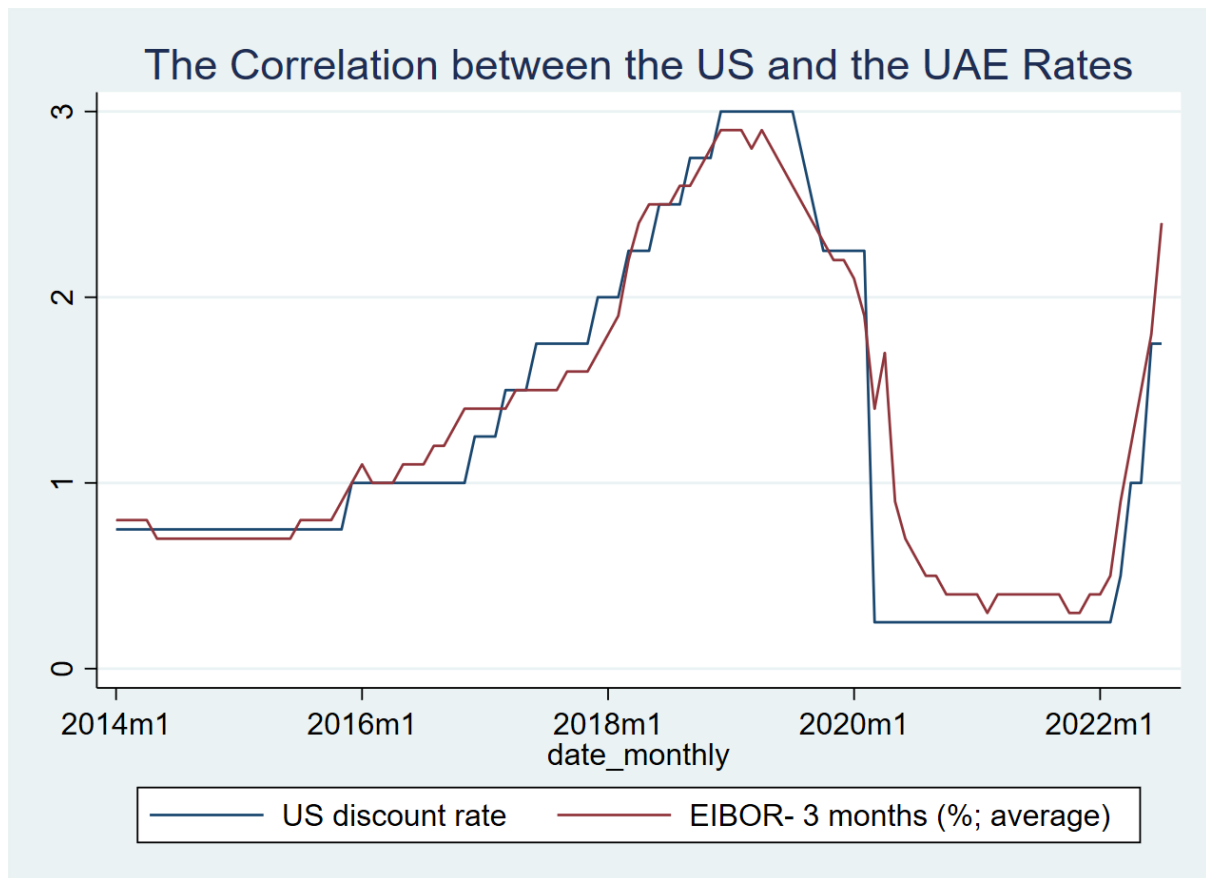
In addition, we conduct a robustness check, where we run the regression model in equation (1) in levels rather than in variables in the difference form. The results are reported in Table 3. The robustness check results confirm the key finding that the US monetary policy has a significant spillover impact on Dubai's housing market.

Table 3: The Determinants of Dubai's Housing Market: Robustness Checks

	(1) GLSAR	(2) GLSAR
Δ EIBOR	-0.278***	
	(0.0515)	
US Rate		-227.1***
		(63.32)
Interaction	0.0778	
	(0.0412)	
Δ Rent	0.0112	
	(0.00703)	
Rent		-17.49
		(13.36)
Δ Brent	0.00212	
	(0.00136)	
Brent		10.37***
		(2.445)
Δ log(mobile)	0.0140	
	(0.699)	
Δ Price index	-0.0169	
	(0.0105)	
Price index		32.02
		(21.81)
Covid dummy	-0.555***	-293.2
	(0.128)	(189.6)
Base year	0.782***	395.0*
	(0.135)	(182.7)
_cons	-0.00987	-146.5
	(0.0346)	(1221.2)
N	174	206

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

VII.   Discussion

The worldwide surge in inflation after the war in Ukraine and the supply chain crisis has caused a rapid increase in interest rates, both in the United States and globally. This situation presents a significant threat to EMDEs in terms of their economic welfare. The substantial rise in U.S. interest rates and the consequent appreciation of the dollar's foreign exchange value have significant spillover effects on the borrowing costs of EMDEs. This amplifies their debt burdens, making it more challenging to finance debt repayments and increasing the likelihood of debt distress.

The rise in interest rates can affect the real estate market. The increase in borrowing costs can lead to a decrease in demand for housing. Moreover, a rise in interest rates can make it more expensive for real estate developers to obtain financing for new projects, which can lead to a slowdown in new construction and residential investment (Case and Shiller, 2003, Vargas-Silva, 2008).

The monetary policy in the UAE is highly dependent on the monetary policy stance in the U.S. due to the pegged exchange rate regime and in this study, we examine the monetary policy spillover from US on the demand for housing in Dubai. Our findings suggest a significant spillover from US monetary policy on Dubai's housing market. Other factors hold constant, the impact of 100-point increase in the US interest rate slows down the number of property transactions by about 17% and vice versa. Our finding is in-line with the previous empirical literature on the impact of monetary policy on the housing market. For example, Alhodiry et al. (2021) used autoregressive distributed lag (ARDL) to examine the spillover influence of the US monetary policy on Turkey's real estate market. It was shown that the real estate market in Turkey is significantly impacted by the spillover effects of interest rates in the United State. Similarly, Wadud et al. (2012) used a structural vector autoregression (VAR) model to examine the impact of the local monetary policy on the Australian housing market. The results demonstrate that a contractionary monetary policy has a notable reduction effect on housing activity; however, it does not have a significant negative impact on actual real estate prices. In China, Xu and Chen (2012) analyze the effects of monetary policy variables, such as long-term benchmark bank loan rates, money supply growth, and mortgage credit policy indicators, on the dynamics of real estate price growth in China. Quarterly data from 1998: Q1 to 2009: Q4 and monthly data from July 2005 to February 2010 were used for time series econometric analysis. The empirical results indicate that expansionary monetary policy tends to accelerate subsequent home price growth, while restrictive monetary policy tends to decelerate.

In contrast to the previous literature, our paper represents a methodological departure from the traditional time-series techniques that used in the previous literature. The utilization of panel data allows for a more comprehensive analysis of the relationship between monetary policy and the housing market, as it considers the heterogeneity and dynamics of properties and type of buyers over time. This approach provides a richer and more nuanced understanding of the effects of monetary policy on the housing market. Our study benefits from the panel structure of the data and used an interaction term, which allows us to identify the transmission channel through which changes in the US interest rate policy affects Dubai's housing market. The insignificance of the interaction term in the model suggests that the spillover from the US monetary policy is not driven by the surge in the mortgage rates. This suggests that the exchange rate is likely the pathway through which the US monetary policy spills to Dubai's housing market. In 2022 for example, the US dollar and consequently the UAE dirham have appreciated by 22% against the Japanese Yen, 13% against the Euro and 6% against the emerging market currencies, a shock that lifts the price of properties in Dubai in 2022 when converted to other currencies. The exchange rate effect can be well justified by the openness of the city as Dubai is considered to be one of the world's most cosmopolitan cities.

VIII.   Conclusion and Policy Implications

In this paper, we studied the impact of changes in monetary conditions in the United States on the performance of the real estate market in Dubai. Since November 1997, the UAE has adopted a fixed exchange rate policy, where each US dollar is equivalent to 3.67 dirhams, a policy that simplifies international trade and reduces the risks of investing in international securities. But on the other hand, one of the shortcomings of the fixed exchange rate policy is that it includes the automatic follow-up of US monetary policy. Which may require harmony in economic conditions. This paper is gaining importance considering the high rates of inflation around the world after the pandemic that caused disruption in supply chains and the Russian war and the resort of the US Federal Reserve to aggressively raise interest rates to combat domestic inflation. It is useful to estimate the impact of monetary tightening in the United States on the performance of the real estate market in the Gulf region, taking Dubai as a case study as the previous literature that tackles this topic is quite scarce. There are two main channels through which the monetary policy in the United States can affect the real estate market in Dubai: First, the change in the interest rate in the US will trigger a change in the interest rate in the UAE which in turn affects the interest rates on mortgages increasing the cost of financing. Secondly, the interest-rate policy is an important determinant of the value of the

US dollar and consequently the dirham relative to other currencies. With the tightening of monetary policy, the dollar and the dirham gain more strength relative to other currencies, which increases the relative price of Dubai real estate in other currencies such as the euro or the pound sterling which may weaken the real estate demand.

We collected monthly longitudinal data from the DLD on the volume of monthly transactions from 2014 to Q1-2022. The data is broken down into two groups, the first group is the real estate units that were sold directly through the developer to the real estate buyer without financial intermediation. The second group is the real estate units that were sold through the mortgage and involve financial intermediation. This classification helps to use the panel-date analysis controlling for the fixed effect, as mortgage buyers and the type of mortgage properties might differ from the other group properties. This arrangement has an additional benefit in identifying the transmission channel through which the changes in the US interest-rate policy transmit to the real estate sector in Dubai, i.e. the cost of financing channel or the exchange rate channel.

As expected, our models suggest that there is a strong inverse relationship between the changes in the interest rate in the US and the demand for properties in Dubai. An increase in the US interest rate by one percentage point lowers the number of property transactions by about 17% and vice versa. This finding remains robust across different regression specifications.

This is study is not in a position to evaluate the exchange rate policy. However, the International Monetary Fund (IMF) suggests that the exchange rate peg is appropriate and provides a credible policy anchor and stability, and moving away from the peg in the near term would be destabilizing and have limited benefits for competitiveness (IMF, 2022). That being highlighted, iff the economic conditions differ between the two countries, fiscal policy can play a role in maintaining the competitiveness of the real estate sector. If the US economy is overheated and inflation is high, while it remained low in the UAE that necessitated the intervention of the Federal Reserve, fiscal policy can be used in the UAE to neutralize the effect of contractionary monetary policy. For example, DLD imposes 4% of the total price of a property as a registration fee upon transfer of ownership of the property. One policy option is to reduce or waive the registration fees during the time of a strong dollar to mitigate some of the impacts of the monetary policy tightening. Another policy option to stimulate mortgage investors during a time of tight monetary conditions is to change the loan-to-value ratio (LTV), which determines the minimum amount to put in a down payment to get mortgage finance. The maximum loan amount in the UAE ranges between 80 to 85% of the property value.

The current study is not free of limitations. One limitation is that we do not have data on the property's characteristics and their price distribution. Luxury properties might respond differently to changes in interest rate policy compared to affordable properties. The availability of individual unit data in the future would facilitate conducting further research to study the heterogenous response in the real estate market. By collecting data on individual units and applying quantile regression for example, policymakers could better understand the relationship between monetary policy and different segments of the real estate market gaining insight into how different percentiles of property prices respond to changes in monetary policy, which helps in designing more effective policies.

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