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Analyzing the Impact of Interest Rate Changes on Saudi REIT Returns during Various Monetary Policy Cycles: A Panel Data Analysis

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Abstract: The recent proliferation of Saudi real estate investment trusts (REITs), catalyzed by serious economic reforms as part of Saudi Vision 2030, has garnered global interest in accessing the Saudi real estate market, which has emerged as a leading investment hub in the Middle East. This study focuses on gauging the sensitivity of REITs' returns to interest rate movements using the two-index model of equity and debt market returns. The dataset is based on monthly data of individual REITs, equity market index, and short- and long-term interest rates, spanning the period 2016M12 to 2024M10, which coincides with three monetary policy cycles. In our econometric analysis, we initially estimate the two-index model for each REIT and test whether all REITs exhibit an equivalent exposure to market and interest rate risks. The test results fail to reject the cross-sectional homogeneity among Saudi REITs, leading us to continue the analysis using pooled ordinary least squares (OLS). The results show, on the one hand, that short- and long-term interest rates exert a statistically significant negative impact on REITs' returns over the entire sample period. On the other hand, the results based on subsamples corresponding to the prevailing monetary policy regime unveil the time-dependent nature of the REIT-interest rate nexus. Interest rates seem to exert a stronger influence on REITs' returns during the falling interest rate cycle induced by the COVID-19 pandemic. This influence, however, is substantially weakened during the ongoing monetary tightening, rendering the long-term interest rate impact statistically insignificant.

Keywords: REIT; interest rate; monetary policy cycles; panel data; Saudi Arabia

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تحليل تأثير تغيرات أسعار الفائدة على عوائد صناديق الاستثمار العقاري المتداولة في سوق الأسهم السعودية خلال دورات السياسة النقدية المختلفة باستخدام بيانات السلاسل الزمنية المقطعية

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المستخلص: لقد شهدت صناديق الاستثمار العقارية المتداولة (الريتس) في سوق الأسهم السعودي نموًا متسارعًا في الآونة الأخيرة، مدعومة بالإصلاحات الاقتصادية الجادة ضمن رؤية المملكة 2030، مما أدى إلى جذب اهتمام عالمي للاستثمار في سوق العقارات السعودي، الذي برز كمركز استثماري رائد في منطقة الشرق الأوسط. تركز هذه الدراسة على قياس حساسية عوائد صناديق الريتس لتحركات أسعار الفائدة باستخدام نموذج المؤشرين لعوائد سوق الأسهم والديون. تشمل عينة الدراسة بيانات شهرية لصناديق الريتس ومؤشر سوق الأسهم، بالإضافة إلى أسعار الفائدة قصيرة وطويلة الأجل، والتي تمتد للفترة من شهر ديسمبر 2016 إلى أكتوبر 2024. وتأتي هذه الفترة بالتزامن مع ثلاث دورات للسياسة النقدية. وتستخدم الدراسة أسلوباً قياسياً يقوم ابتداءً على تقدير نموذج المؤشرين لكل صندوق على حدة، ثم اختبار ما إذا كانت جميع الصناديق تظهر تعرضًا متكافئًا لمخاطر السوق وأسعار الفائدة. وقد أشارت نتائج الاختبار إلى عدم وجود أدلة كافية لرفض فرض التجانس المقطعي بين صناديق الريتس السعودية، مما دفعنا إلى مواصلة التحليل باستخدام طريقة المربعات الصغرى العادية المجمعة (OLS) لتحليل السلاسل الزمنية المقطعية، وبالرغم من أن النتائج القائمة على بيانات فترة العينة بأكملها تشير إلى أن أسعار الفائدة القصيرة والطويلة الأجل تؤثر سلبيًا وبشكل معنوي إحصائيًا على عوائد صناديق الريتس، إلا أن النتائج المستندة إلى العينات الفرعية الناجمة عن تقسيم العينة الرئيسة لفترات فرعية تعكس كل منها التوجه السائد للسياسة النقدية في حينه تميط اللثام عن ديناميكية العلاقة بين صناديق الريتس وأسعار الفائدة؛ حيث يبدو جلياً أن أسعار الفائدة تملك تأثيرًا أقوى على عوائد صناديق الريتس خلال دورة أسعار الفائدة المنخفضة الناجمة عن جائحة كورونا، بينما يضمحل هذا التأثير بشكل كبير خلال السياسة النقدية الانكماشية السائدة حالياً؛ حيث تلاشى تأثير سعر الفائدة طويل الأجل إلى الحد الذي أفقده دلالته الإحصائية.

الكلمات المفتاحية: صناديق الريتس؛ سعر الفائدة؛ دورات السياسة النقدية؛ بيانات السلاسل الزمنية المقطعية؛ المملكة العربية السعودية.

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1. Introduction

Securitized real estate vehicles, in the form of a real estate investment trust (REIT), which first emerged in the US in the 1960s, remain among the most remarkable financial innovations. Over the past three decades, REITs have witnessed tremendous growth globally in terms of both the number of listings and market values, displaying a remarkable performance that outpaced other asset classes.[1] This resounding success is achieved because REITs facilitate the flow of funds to real estate (Glascock et al., 2000) by alleviating some of the complexities associated with direct real estate investment, such as low liquidity, high transaction costs, large denomination, and lack of diversification that arise when investing in large-scale commercial real estate properties (Hoesli & Oikarinen, 2012; Wong & Reddy, 2018). Furthermore, these vehicles also enjoy a tax "pass-through" status that exempts them from paying corporate taxes. They attain this status by pooling funds and investing at least 75% of these funds in a variety of income-generating properties and adhering to the legally mandated dividend payout policy by distributing at least 90% of their taxable income as dividends annually. Indeed, REITs generally adopt a highly leveraged capital structure given the predominantly tangible nature of their assets, which are more likely to be financed by debt compared to intangible assets held more often by corporations in other industries.[2]

The business model of REITs and the regulations that govern their operations render them responsive to changes in economic fundamentals, particularly the interest rate as determined by monetary policy. The theoretical underpinning of the REITs-interest rate relationship, as elucidated by Giliberto and Shulman (2017), is rooted in the notion that the widely acknowledged direct inverse relationship between the changes in the yield of risk-free securities and the valuation of fixed-income securities may transcend, albeit to a lesser extent, to the valuation of equity REITs. This is because of the distinctive features of equity REITs that we discussed earlier, which differentiate them from typical equities, rendering them more sensitive to interest rate changes. According to this conjecture, an increase in the risk-free yield is expected to decrease the valuation of equity REITs and vice versa. However, Allen et al. (2000) maintain that the relationship between equity REITs' returns and interest rates relies more on the economic fundamentals that determine the direction and the pace of monetary policy decisions that ultimately produce a change in interest rates, rather than the direction of the interest rate change, *per se*. For example, an increase in interest rates may signal inflationary expectations that may translate to an increase in real estate prices and rents, offsetting Giliberto and Shulman's (2017) hypothesized inverse interest rate effect on real estate valuation. Case and Wachter (2011) endorse this argument both on theoretical and empirical grounds, illustrating that REITs act as strong hedges against inflation. Indeed, monetary policy contractionary cycles in the US had varying impacts on commercial real estate, the primary underlying of REITs, with the recent monetary tightening leading to the sharpest price drops in the past five decades.[3] Of course, the drop in demand for specific commercial properties (offices and retail) as a result of technological advancements catalyzing the spread of e-commerce and working from home has exacerbated the ongoing drastic decline in commercial real estate prices (International Monetary Fund. European Dept., 2024).

These differing perspectives vis-à-vis the direction and the strength of the relationship between the returns of REITs and interest rate changes, combined with the changes in the fundamentals of the commercial real estate market, have always fueled a renewed interest in reexamining this intricate relationship in different contexts (Akimov et al., 2020; Allen et al., 2000; Chen & Tzang, 1988; Giliberto & Shulman, 2017; Ito, 2016; Lin et al., 2022; Reddy & Wong, 2018; Rosa, 2024; Weis et al.,

[1] *See* https://www.reit.com/investing/global-real-estate-investment ***and*** https://www.spglobal.com/spdji/en/documents/research/the-impact-of-rising-interest-rates-on-reits.pdf.

[2] *See* https://www.reit.com/news/blog/market-commentary/looking-at-reit-leverage-versus-other-stock-market-sectors.

[3] *See* https://www.imf.org/en/Blogs/Articles/2024/01/17/us-commercial-real-estate-remains-a-risk-despite-investor-hopes-for-soft-landing.

2021; Wong & Reddy, 2018; Yong & Singh, 2015). However, the empirical evidence emerging from these studies remains inconclusive, varying across countries, econometric techniques, interest rate proxies, and sample periods. Furthermore, prior studies are predominantly based on REITs listed in advanced markets; nonetheless, studies addressing the REIT-interest rate nexus in emerging markets remain scarce. While REITs enjoy a long history in advanced economies, they remain in the early stage of development in most emerging markets. Emerging markets lag their advanced counterparts in terms of regulations, transparency, and the degree of institutional and international investment. That said, emerging markets REITs are making notable progress on these fronts, offering promising growth potential and valuable diversification benefits as these emerging economies continue their economic and population growth path (Marzuki & Newell, 2021, 2025; Newell, 2021). We believe that the structural differences between advanced and emerging markets can yield new insights into the REIT-interest rate nexus, warranting research endeavors that revisit this long-standing relationship in a new context. Indeed, the limited empirical evidence generated within an emerging market context on the REITs' relationship with interest rates is based on research conducted within an East Asian context (Ito, 2016; Sukor et al., 2020). However, this relationship remains widely untapped in West Asian economies. Indeed, the GCC region, particularly Saudi Arabia, enjoyed unprecedented economic growth over the past few decades, witnessing serious economic reforms as part of Saudi Vision 2030. Besides, the tight monetary policy stance that followed the ultra-loose monetary policy during the COVID-19 pandemic renders revisiting the REIT-interest rate nexus even more timely. To this end, we elected to address this research gap by exploring the REIT-interest rate nexus in Saudi Arabia, the largest REIT market in the Middle East (Marzuki & Newell, 2025), during different monetary policy cycles. This boils down to two research questions regarding the REIT-interest rate relationship:

RQ1: Are the returns of Saudi REITs sensitive to interest rate changes?

RQ2: Does the sensitivity of Saudi REITs' returns to interest rate changes vary during different monetary policy cycles?

Indeed, few studies examined other aspects of the workings of Saudi REITs, inter alia, REITs' efficiency (Alsharif, 2021); the determinants of REITs' IPO underpricing (Albarrak et al., 2023); and the risk-adjusted performance and diversification benefits (Marzuki & Newell, 2025). Nonetheless, the research questions we put forward remain unanswered for the time being.

The Saudi market is conducive to furthering our understanding of the REIT-interest rate nexus for several reasons. First, the real estate sector occupies a central role in the Saudi economy, acting as a key pillar in the country's economic diversification plan, Vision 2030. The sector is witnessing a major transformation fueled by the construction of mega projects, the hosting of significant international events, and the expanding tourism, entertainment, and accommodation and food services sectors.[4]

Second, the growth in the real estate sector transcended into the securitized real estate vehicles that proliferated in terms of the number of listings and assets under management. The Capital Market Authority (CMA) approved the first Saudi REIT listing in 2016 to stimulate private investment in the real estate sector as part of the national transformation program. Since then, REITs have grown enormously both in terms of the number of listings and asset value, from only one REIT with an asset value of SAR

[4] This unprecedented growth in the real estate sector is facilitated by government reforms in real estate regulations, creating a conducive investment climate for domestic and international investors (Hadchity, 2024). Based on Data Saudi (2025), in 2023, the contribution of real estate activities to the Gross Domestic Product (GDP), measured in real terms, stands at SAR 229.2 billion, compared to SAR 131.5 billion in 2010—constituting a share of 6.6% of total GDP. The sector exhibited a strong growth in foreign direct investment (FDI) stock since 2015, reaching a peak of SAR 56.19 billion before experiencing a dramatic decline in the wake of the COVID-19 pandemic, ending at a trough of SAR 18.7 billion in 2021. Since then, the FDI in the sector has resumed steady growth, reaching SAR 21.7 billion by the end of 2023.

555 million in 2016 (CMA, 2016, p. 72) to 19 REITs with a combined asset value of SAR 27.72 billion by the end of 2023—constituting more than 22% of the investment fund industry, succeeding money and stock markets' funds with a narrow margin (CMA, 2023, p. 112). This highlights the increased importance of REITs in the Saudi investment landscape, attracting more retail and institutional investors. Third, the international prominence of Saudi REITs attained in 2019 upon their inclusion in the FTSE EPRA/Nareit Global Real Estate Index (Argaam, 2019), attracting significant allocations from international money managers, including BlackRock, Vanguard, and Mitsubishi UFJ (Marzuki & Newell, 2025, p. 101), aiming to gain exposure to the largest real estate market in the Middle East. This can potentially increase the linkages with international markets.

Fourth, the Saudi market is exclusively dominated by equity REITs whose interest rate linkages are less understood than their mortgage-based counterparts that share more similarities with fixed-income securities. Fifth, the long-lived riyal-dollar peg limits the monetary policy autonomy of the Saudi central bank (SAMA), leading to a close alignment with the Federal Reserve's (the Fed's) decisions regarding interest rates. Such a setting offers a rare opportunity to examine the impact of monetary policy changes on REITs' returns when monetary policy is not determined domestically. Sixth, the sample period coincides with the COVID-19-induced aggressive expansionary monetary policy employed by the Fed, slashing the fed funds rates to a range between 0% and 0.25% (Milstein & Wessel, 2022), which comes between two monetary tightening cycles (Blinder, 2023). These circumstances offer a rare opportunity to reexamine the dynamics of the REIT-interest rate nexus across different monetary cycles. Seventh, the level of financial leverage widely varies among Saudi REITs, ranging from zero to about 50%, a maximum mandated by the CMA bylaws, which can shed light on the potential cross-sectional differences in the sensitivities of REITs to interest rate movements. Finally, despite the strong growth in the number of Saudi REITs and their asset value, their stock market performance has been less impressive. Albarrak et al. (2023) show that 8 of the 17 Saudi REITs they examine closed below their IPO price on the first trading day, which warrants an attempt to model their return-generating process.

The primary contribution of this study lies in providing new empirical evidence on the relationship between REITs' returns and interest rate movements in the Saudi market, thereby offering fresh insights into the REIT-interest rate nexus in a unique context. Moreover, we consider both short- and long-term interest rates, for they may be perceived differently by investors. On the one hand, the short-term interest rates directly reflect the changes in monetary policy that affect the cost of short-term funding in the money market. On the other hand, the long-term interest rate reflects the implied expectations of interest rates and anticipated inflation in the future (Allen et al., 2000). Furthermore, we estimate the Stone (1974) two-index model using a refined econometric analysis approach that explicitly incorporates the potential cross-sectional heterogeneity across Saudi REITs and the time-varying nature of their return-interest rates nexus. The cross-sectional heterogeneity is modeled utilizing the no-common-effect model (see Hurn et al., 2021, p. 321), through which we explicitly model and test the heterogeneity of the REITs' exposures to interest rate and market risks and other unobservable features as we consider individual REITs rather than the aggregated sectoral index. To inspect the time-varying REITs' return-interest rates nexus, we divide the sample period into three phases based on the Fed's prevailing monetary policy cycle as defined by Blinder (2023). This will enable us to ascertain to what extent the REIT return-generating process changes during differing monetary policy cycles.

The remainder of this study is organized as follows: the second section presents a detailed review of related studies, the third section introduces the research design, the fourth section defines the dataset and summarizes its main features, the fifth section reports and discusses results considering prior studies the sixth section concludes the study by summarizing the main findings, highlighting their policy implications and suggests plausible further research extensions.

2. Literature review

This section reviews prior studies examining the sensitivity of returns to interest rate changes. To this end, we divided this section according to the chronological progression of the literature in this realm into two main sections: the first section examines the return-interest rate relationship predominantly in financial institutions, while the second section examines the return-interest rate relationship predominantly in financial institutions. In contrast, the second provides a detailed review of this relationship exclusively in the context of REITs. The second section is divided into three subsections based on the equity markets in which the examined REITs are listed (the US, advanced, and emerging markets).

2.1. The relationship between interest rates and returns of financial institutions

The debate on the relationship between the changes in interest rates and equity returns is not new, dating back to the 1970s. This literature can be traced back to the work of Stone (1974), who extended the renowned market-index model of the return-generating process to capture the impact of movements in the interest rate. Controversies arose regarding the strength and the direction of this relationship and whether it's of particular importance only in specific industries like financial institutions and utilities due to their special asset-liability structure and dividend policy (Chance & Lane, 1980). By and large, subsequent studies predominantly find evidence for the presence of an inverse relationship between the stock returns of financial institutions and changes in interest rates (Bae, 1990; Dinenis & Staikouras, 1998; Elyasiani & Mansur, 1998; Flannery & James, 1984; Yourougou, 1990).

2.2. The relationship between interest rates and returns of REITs

The literature naturally progressed to discuss the sensitivity of REITs to interest rate movements in the late 1980s. The attention to REITs stems from their relatively heavy reliance on debt in their capital structure and their legally mandated dividend payout policy, which renders them acceptable substitutes to fixed-income securities that are, by definition, sensitive to interest rates.

2.2.1. Empirical evidence from the US market

Early studies in this strand of literature predominantly focus on the US market. These studies include Chen and Tzang (1988), who examine the effect of the changes in short- and long-term US treasury yields on equity and mortgage REITs based on monthly data from 1973 to 1985. Using a two-factor regression, they find, on the one hand, that both categories of REITs are exposed to market risk, recording higher betas during the 1970s that dropped substantially during the 1980s. On the other hand, they observe an inverse relationship between treasury yields' changes and the returns of both REIT categories, which is more persistent with long-term yields. Using a different proxy for interest rates, that is, investment-grade bond returns rather than yields, Giliberto (1990) applied the two-factor regression based on quarterly data from 1978 to 1989. In line with Chen and Tzang (1988), he found that equity REITs exhibit a similar market risk exposure. On the contrary, he reported a positive relationship between bond returns and the returns on equity REITs, perhaps because he used bond returns rather than the change in yield. Mueller and Pauley (1995) analyze the REITs-interest rate relationship over different rising and falling interest rate cycles. Using a simple regression based on monthly REITs' data and yields of long- and short-term US treasuries from 1972 to 1993, they find a weak negative relationship between REITs and interest rates that strengthens during falling interest rate regimes.

In a subsequent study, Allen et al. (2000) examine whether the REITs' operating features affect their sensitivity to interest rate movements. They construct equity and mortgage REITs' portfolios using monthly data from 1992 to 1996 and use the yields on short- and long-term US treasuries to proxy for interest rates. Based on a two-factor time series regression, they arrived at a surprising finding showing that equity REITs have no significant exposure to market risk, which is at odds with the results of prior studies. This outcome is possibly due to using residuals from an auxiliary regression of market return against the interest rate proxies rather than the actual market returns. The results about interest rate risk are, however, in accordance with Chen and Tzang (1988), indicating that both equity and mortgage REITs exhibit significant negative responses to changes in short- and long-term interest rates, with slightly more sensitivity to long-term interest rates. Based on the cross-sectional regression results, Allen et al. (2000) show that REITs' operating features, notably leverage and management strategy, can alter their exposure to the market but not interest rate risk. In an attempt to reconcile the findings of prior studies, He et al. (2003) employ several interest rate proxies encompassing both the returns and the changes in yields on US treasuries and high-grade corporate bonds. They revisit the REIT-interest rate relation using equity and mortgage REIT indices from 1972 to 1998. On the one hand, they show that equity REITs exhibit a significant negative reaction to changes in the yield of government and corporate bonds while being insensitive to bonds' returns. On the other hand, mortgage REITs are found to be sensitive to all proxies of interest rate, showing a negative response to changes in yield and a positive response to returns. Furthermore, they show that the sensitivity of REITs' returns to interest rate movements varies over time. In a recent study, based on daily data from 1995 to 2016, Giliberto and Shulman (2017) confirm the time-varying relationship between REITs' returns and bond returns, showing that it can be positive, negative, and insignificant depending on the sample period.

2.2.2. Empirical evidence from other advanced markets

While early studies in literature focused exclusively on the US market, a growing number of studies have explored a wider range of advanced markets. Empirical evidence in the UK context is provided by Stevenson et al. (2007), who used a GARCH-M specification of the two-factor model based on daily data from 1993 to 2003 to examine the impact of interest rate changes on the returns and volatility of property companies.[5] The real estate proxy is the FTSE real estate index, while the FTSE All Share index represents the broad equity market. The interest rate proxies are the one-month LIBOR rate and the yield on both ten- and fifteen-year government bonds. An interesting finding that emerges from their analysis is that returns of property companies exhibit a significant positive relation with the short-term interest rate, diverging from the findings of most prior studies. However, they find a negative relation with long-term rates, aligning with most existing research. The exposure of these companies to market risk is positive and significant in line with other studies.

Studies that explore the Australian REIT sector include Yong and Singh (2015) and Wong and Reddy (2018). Using a sample of monthly data on 73 Australian equity REITs over the period 1980 to 2013, Yong and Singh (2015) examine whether the REITs' management structure and level of debt have any bearing on the sensitivity of REITs' returns to interest rate movements. The ASX100 index represents the broad equity market, while interest rates are proxied by the yields of 90-day bank-accepted bills and ten-year treasury bonds. Like most prior studies, the authors employ a two-factor regression, albeit on a panel data structure with fixed and random effects, and the quantile regression. To trace out the influence of the REITs' management structure and level of debt, the equity REITs are segmented into two groups based on management structure—externally or internally managed—and two other groups based on the level of debt: high or low-to-medium. Two other groups were constructed by combining these two criteria. The results about the exposure to market risk show that the highly leveraged and internally managed REITs have higher market risk (higher beta). Besides, not only do the results show that the sensitivity of REITs to interest rates varies between groups, but also across market conditions and interest rate maturities in line with some of the findings of other studies, including Chen and Tzang (1988) and Giliberto and Shulman (2017). The adverse impact of short-term interest rates on REITs' return is only

[5] *Property companies differ from REITs in several aspects including taxation and regulatory restriction on the leverage, dividend policy and asset structure (see, Stevenson et al., 2007, pp. 705-706).*

present during bearish market phases. However, the negative impact of long-interest rates is more evident, particularly during bullish market conditions, with highly leveraged and internally managed REITs showing higher exposures.

Wong and Reddy (2018) examine a more recent sample spanning the period 1995 to 2016 and comprising 30 Australian REITs. Based on the sampled REITs, the authors formed five portfolios, two of which are constructed based on the level of debt, while the remaining three portfolios are size-based, in addition to a portfolio that includes all 30 REITs. They use a multifactor OLS regression estimated for three subsamples: pre-, during, and post-GFC. The results obtained over the entire sample show that all portfolios except large REITs are positively related to short-interest rate changes. In contrast, they find a negative relation with long-interest rate changes for all portfolios, which is largely consistent with the findings of Stevenson et al. (2007). Furthermore, the starkest finding that emerges from subsample analysis is the jump in stock market beta during the GFC. In a similar vein, Ito (2016) provides fresh evidence regarding the relationship between the REIT interest rate in the Japanese context during the Abenomics era. His dataset consists of daily data on the TSE REIT and the TOPIX indices in addition to the Japanese government bond yields and swap rates with maturities of 5 and 10 years from 2010 to 2015. He employs a two-factor OLS regression using the logs of the series rather than the returns on two subsamples divided based on the launch of Abenomics. The results based on the entire sample show that all interest rates negatively impact REITs' prices. The subsample results show that the introduction of Abenomics had strengthened the impact of interest rates, and the swap rates became more influential. At the same time, the stock market beta declined, which is evidence of the activation of the wealth effect.

More recent studies tend to have a cross-country focus on advanced economies (Akimov et al., 2020; Lin et al., 2022; Weis et al., 2021). Akimov et al. (2020) examine the sensitivity of REITs to interest rate changes in seven European markets, namely, Belgium, France, Germany, the Netherlands, Sweden, Switzerland, and the UK. Using daily data on the respective REITs' indices and long- and short-interest rates in addition to the term spread in each market, they employ a GARCH-M specification of the two-factor model from 1990 to 2013. The market risk results are similar across markets, showing a positive and significant exposure as usual. Nonetheless, interest rate sensitivities differ across markets, interest rate maturities, and sample periods. The mean equation finds evidence for a negative relation with interest rates in all markets except for the Netherlands, where REITs display a rather weak positive response to interest rate changes, and in Switzerland, where no significant relation is documented. Using a broader sample, Weis et al. (2021) examine the sensitivity of REITs and real estate operating companies to interest rate movements. Their analysis is based on monthly data on 352 of the constituents of the FTSE EPRA/NAREIT Global Real Estate Index, operating in 12 countries from 2005 to 2014. Their dataset also comprises data on the four risk factors proposed by Carhart (1997), i.e., RM, SMB, HML, and WML, in addition to several interest rate proxies, including the one-year deposit rate, ten-year government bond yield, redemption yield of quality (investment-grade) corporate bonds, default spread, and the term spread. The authors employ an augmented version of the Carhart (1997) model, estimated using a panel data structure while including fixed effects. Their results show that short interest rates have a weak positive impact on real estate companies in general; however, value stocks are affected more negatively by short interest rates compared to growth stocks. On the flip side, they find that long interest rates have a strong negative impact on real estate companies, particularly growth stocks. To ascertain whether the nature of the assets underlying the REITs has any bearing on their interest rate exposure, Lin et al. (2022) calculated sector-specific value-weighted indices for office, retail, industrial, residential, specialty, and diversified REITs based on daily data from the Australian, Japanese, Singaporean, and US markets over the period 2006 to 2018. The interest rate proxies used include the yield on the 10-year Treasury bonds and three-month T-bills for the US, while 10-year government bonds and three-month interbank (or Bank Accepted Bill for Australia) rates are used for the remaining countries. The authors employ a GARCH-M specification of the two-factor model and arrive at the following main findings: The interest rate sensitivity varies across interest rate maturities, countries, and REIT sectors, with some sector-specific REITs showing less vulnerability to changes in their domestic interest rates compared to their diversified counterparts. In fact, among the specialized REITs, retail and residential REITs exhibit the highest sensitivity to domestic interest rates. Moreover, the movements in the US interest rates are shown to significantly impact Singaporean residential and retail REITs and Australian residential REITs.

2.2.3. Empirical evidence from emerging markets

The sparse evidence concerning the relationship between real estate return and interest rates in the context of emerging markets includes studies performed by Al Dohaiman (2017) and Sukor et al. (2020) for the Saudi and Malaysian markets, respectively. Al Dohaiman (2017) examined the impact of macroeconomic variables on the return of real estate companies before the introduction of REITs in the Saudi market. The sample comprises monthly data on the S&P Saudi Arabian real estate index, the Tadawul All Share Index (TASI), broad money, CPI, crude oil, and interest rates as represented by the Saudi interbank offering rate (SAIBOR) over the period 2008 to 2012. Using quantile regression, the author finds that neither the interest rate nor the money supply appears to significantly impact real estate return, regardless of the considered quantile. On the other hand, the broad equity market and crude oil, to a lesser extent, seem to account for most of the variation in real estate returns. Sukor et al. (2020) use quarterly data from the Malaysian market over the period 2011 to 2017. Their sample consists of 13 REITs from which they construct four portfolios: based on market cap into small and large, and Sharia compliance into Islamic and conventional. The KLCI index represents the broad equity market, and CPI is a gauge of inflation, while interest rates are proxied by the three-month Treasury Bill and 10-year government bonds. Using a multifactor OLS regression, they obtain results showing no significant impact of short-interest rates on the returns of REITs. In contrast, a significant negative impact is found for long-term interest rates on the returns of all but Islamic REITs. Two of the four REITs' portfolios display a significant positive exposure to market risk, whereas inflation did not significantly impact REITs' returns.

On balance, it can be inferred that shortcomings remain in prior studies regarding the following issues: First, the impact of recent monetary policy developments on the sensitivity of REIT returns to interest rate changes remains largely unexplored. Second, studies in the context of West Asian emerging economies are sparse. Third, many prior studies ignored the possibility of cross-sectional heterogeneity and simply used a broad sectoral index. Therefore, the present study aims to address these gaps in the literature by examining the return-interest rate relationship in the leading REIT market in West Asia (i.e., Saudi Arabia). This is achieved empirically via an intricate analysis that enables us to explicitly test for the presence of cross-sectional heterogeneity instead of taking it for granted. Moreover, we segment the sample period according to the prevailing monetary policy regime to examine the impact of the recent monetary policy decisions on the REIT-interest rate nexus.

3. Research design

3.1. Econometric model

Following Allen et al. (2000), among others, we employ the two-index model of the return-generating process proposed by Stone (1974), which is given by

$$R_{jt} = \alpha + \beta_1 R_{mt} + \beta_2 \%\Delta i_t + \varepsilon_{jt}, \quad \varepsilon_{jt} \sim \left(0, \sigma_j^2\right), \tag{1}$$

where R_{jt} represents the simple return, which is equivalent to the percentage change in the closing price of REIT j at the end of month t ($R_{jt} = \frac{REIT_{jt} - REIT_{jt-1}}{REIT_{jt-1}} \times 100$), R_{mt} is the simple return for the stock market index i.e. the Tadawul All Share Index (TASI) at the end of month t ($R_{mt} = \frac{TASI_t - TASI_{t-1}}{TASI_{t-1}} \times 100$), $\%\Delta i_t$ is the percentage change in interest rate at the end of month t ($\%\Delta i_t = \frac{i_t - i_{t-1}}{i_{t-1}} \times 100$), α is the intercept parameter representing the component of the REITs' returns that are independent of the stock market performance and interest rate changes, while the slope parameters β_1 and β_2 measure the responsiveness of the REIT's returns to the movement in the stock and debt markets, respectively. Indeed, all the regression parameters defined above are assumed to be the same across all the sampled REITs. However, the error term ε_{jt} captures the REIT j idiosyncratic risk at the end of month t, thereby allowing for differing idiosyncratic risk for each individual REIT, σ_j^2.

3.2. Estimation techniques

3.2.1. The no-common-effect model vs. the common-effect model

Several studies in the extant literature use REIT sector-level indices or construct equally weighted portfolios of REITs in their analysis of the determinants of REITs' returns (for example, Akimov et al., 2020; Chen & Tzang, 1988; Giliberto & Shulman, 2017; Ito, 2016). Thereby, these studies implicitly assume that the constituents of sectorial indices and/or portfolios share the same risk characteristics. However, Allen et al. (2000) show that the level of leverage increases the exposure of REITs to market risk, while Yong and Singh (2015) find that the level of leverage affects the REITs' exposure to both market and interest rate risks. Therefore, rather than assuming full homogeneity, we start with the most unrestricted model, the no-common-effect model (see, Hurn et al., 2021, p. 321) in which the regression parameters are allowed to vary over cross sections (REITs) without imposing any restrictions as follows:

$$R_{jt} = \alpha_j + \beta_{j1} R_{mt} + \beta_{j2} \%\Delta i_t + \varepsilon_{jt}, \quad \varepsilon_{jt} \sim \left(0, \sigma_j^2\right), \tag{2}$$

To illustrate, the model is separately specified for all REITs $j = 1, 2, \ldots, N$ as follows:

$$R_{1t} = \alpha_1 + \beta_{11} R_{mt} + \beta_{12} \%\Delta i_t + \varepsilon_{1t}, \quad \varepsilon_{1t} \sim (0, \sigma_1^2),$$

$$R_{2t} = \alpha_2 + \beta_{21} R_{mt} + \beta_{22} \%\Delta i_t + \varepsilon_{2t}, \quad \varepsilon_{2t} \sim (0, \sigma_2^2),$$

$$\vdots \qquad \vdots \qquad \vdots$$

$$R_{Nt} = \alpha_N + \beta_{N1} R_{mt} + \beta_{N2} \%\Delta i_t + \varepsilon_{Nt}, \quad \varepsilon_{Nt} \sim (0, \sigma_N^2),$$

We then test whether the regression parameters vary across REITs by imposing the following restrictions:

$$H_0: \alpha_1 = \alpha_2 = \cdots = \alpha_N, \beta_{11} = \beta_{21} = \cdots = \beta_{N1} \text{ and } \beta_{12} = \beta_{22} = \cdots = \beta_{N2}$$

H_1: at least one restriction fails.

These restrictions are tested using the F statistic that is defined as follows:

$$F = \frac{SSR_r - SSR_{ur}}{SSR_{ur}} \times \frac{N(T-k-1)}{q} \sim F(q, N(T-k-1)) \tag{3}$$

where SSR_r is the sum of squared residuals from the restricted model, SSR_{ur} is the sum of squared residuals from the unrestricted model obtained by summing the SSR of the separate regressions pertaining to each of the 17 REITs, N is the number of cross-sections (REITs), T is the number of time series observations, k represents the number of independent variables, and q is the total number of restrictions imposed by the common effect model which can be obtained by $(k+1)N - (k+1)$ whereby $(k+1)N$ represents the number of unknown parameters in the no common effect model and the number of unknown parameters in the common effect model, $(k+1)$.[6]

If we fail to reject these restrictions, then we can proceed to estimate a common-effect model (Hurn et al., 2021, pp. 322-325) as

[6] *In the case of unbalance sample, the length of the time series of REITs differs. Therefore, the equation (3) can be adjusted to be* $F = \frac{SSR_r - SSR_{ur}}{SSR_{ur}} \times \frac{(\sum_{j=1}^{N} T_j) - (k+1)N}{q} \sim F(q, (\sum_{j=1}^{N} T_j) - (k+1)N)$.

expressed in equation (1) using pooled OLS. In his seminal book, Hsiao (2014, p. 4) states that panel data provides a greater number of observations, offering a higher degree of freedom and mitigating collinearity among regressors, which ultimately improves the efficiency of econometric estimates and enables more accurate inference of the model's parameters.

4. Data definitions and descriptive statistics

The independent variable data comprises the monthly closing prices of the REITs listed in the main Saudi stock market. The Riyad REIT Fund was the first Saudi REIT to be listed, started trading on 13/11/2016, while Alistithmar REIT was the latest, beginning secondary market trading on 04/09/2024. The number of REITs listed in the Saudi main market enjoyed steady growth over the past 8 years, standing at 19 funds at the time of writing this paper. Following Allen et al. (2000), we limit our sample to REITs with adequate data of at least 60 months of historical prices starting from the inception month of the first REIT to the end of October 2024. As shown in Table 1, the inception dates of the REITs are different. Therefore, we end up with an unbalanced panel of 17 funds, with only two funds being excluded due to their short historical data span of less than 60 monthly observations. The total observations of the unbalanced panel is attained by summing the number of time series observations for each individual REIT across the 17 cross-sections (REITs) as $\sum_{j=1}^{N} T_j = 1383$. Indeed, we are aware of the disadvantages of extracting a balanced panel from an unbalanced dataset in terms of the loss of efficiency. Nonetheless, we elected to estimate a balanced panel and compare the results against those obtained from the unbalanced panel estimation to check for any traces of selection bias (see, Kennedy, 2008, p. 289). The longest possible balanced panel that can be extracted from our dataset consists of 67 monthly observations uniformly for each REIT, leading to a total number of observations of 1139, which is simply obtained by $N \times T = 17 \times 67 = 1139$.

For the sake of comparing the aggregated performance of the REIT sector with the stock market in general, we include the Tadawul REITs Index (TRTI) measures the performance of the REIT sector in Saudi Arabia. Of course, while we report the descriptive statistics for the REIT index, we do not include this index in our panel regression analysis to avoid collinearity.

The data on the independent variables is available over the entire sample period. The independent variables we use include the Tadawul All Share Index, TASI, as a proxy for the Saudi stock market performance in addition to two interest rate variables: the one-year Saudi interbank rate (SAIBOR) to proxy for short-term interest rates, while we use the 10-year US Treasury bond yield to proxy for long-term interest rates. The use of the 10-year US Treasury bond as the long-term interest rate proxy is dictated by the unavailability of a continuous series of a long-term Saudi interest rate proxy. Besides, SAMA employs a fixed exchange rate regime whereby the Saudi Riyal has been pegged to the US dollar since 1986 (Al-Jasser & Banafe, 1999; Bhatti & Al-Nassar, 2021, 2023). The adoption of the fixed exchange rate system limits the independence of monetary policy, which is reflected in the riyal interest rate movements that closely follow the changes in dollar interest rates with a risk premium, which is higher for long-term rates (Al-Jasser & Banafe, 1999, p. 210). In addition, SAMA is among the top holders of U.S. treasury securities (Arab News, 2024). These securities are also routinely held by Saudi financial institutions. Therefore, the US 10-year treasury bond yield is an acceptable surrogate to its Saudi counterpart as a proxy for long-term interest rates. All data series are obtained from the Eikon database. Table 1 summarizes the key features of the REITs we analyze in our study.

Table 1. Key features of Saudi REITs

RIC	REIT name	IPO Date	Net asset value	Debt-to-assets ratio (%)
4330.SE	Riyad REIT	13/11/2016	1,467.11	47.18
4331.SE	AlJazira REIT	15/02/2017	88.01	0.00
4332.SE	Jadwa REIT Al Haramain	30/04/2017	504.51	29.54
4333.SE	Taleem REIT	30/05/2017	549.81	34.63
4334.SE	Al Maather REIT	22/08/2017	513.66	26.71
4335.SE	Musharaka REIT	01/10/2017	784.76	48.61
4336.SE	Mulkia Gulf Real Estate REIT	05/11/2017	790.84	36.39
4337.SE	SICO Saudi REIT	18/01/2018	357.96	28.41
4338.SE	AlAhli REIT 1	08/01/2018	1,237.88	33.24
4339.SE	Derayah REIT	26/03/2018	884.48	40.17
4340.SE	Al Rajhi REIT	20/03/2018	2,213.74	28.58
4342.SE	Jadwa REIT Saudi	11/02/2018	1,830.56	9.81
4344.SE	SEDCO Capital REIT	01/05/2018	1,533.22	33.26
4345.SE	Alinma Retail REIT	16/04/2018	865.35	6.57
4346.SE	MEFIC REIT	16/04/2018	513.16	44.64
4347.SE	Bonyan REIT	15/04/2018	1,384.34	13.78
4348.SE	Alkhabeer REIT	20/03/2019	1,045.61	40.43

Source: The data is retrieved from the LSEG Eikon database.

Notes: The net asset value is expressed in millions of Saudi Riyals. The net asset value and debt-to-assets ratio are based on the financial statements for the year ended December 31, 2023.

We compute the descriptive statistics for all series under investigation to get a preliminary insight into the main features of the dataset. Because the economic fundamentals that generated the returns series may change across different sample periods, we calculate the same set of descriptive statistics for all series based on both an individual (unbalanced) and a common (balanced) sample to allow for a better comparison against the broad market returns. The descriptive statistics are reported in Table 2. Based on Table 2, we can see that 11 out of the 17 REITs that we examine show a negative mean monthly return, averaging at -0.37% based on the market-weighted REIT sectorial index, which falls below the broad stock market index mean returns over the entire sample period. When we consider the balanced sample, we observe an improvement in the average performance of REITs based on the REIT index, which amounted to -0.08%. Besides, the average performance of individual REITs has generally improved, as only 9 out of the 17 REITs exhibit negative mean returns based on the balanced sample. The statistics pertaining to median returns paint a similar story.

Regarding the measures of dispersion, the individual REITs seem to fluctuate widely. However, the REITs index shows a lower standard deviation than the broad stock market index across both samples. These findings align with those of Marzuki and Newell (2025), who find that the Saudi REITs index exhibits lower risk than its broad stock market counterpart. Strikingly, across the two samples, the REITs' returns are predominantly positively skewed with only a few exceptions, whereas the broad stock market return shows, as usual, a negative skewness. This outcome aligns with the findings of Stevenson et al. (2007, p. 709) for UK property companies, Yong and Singh (2015, p. 83) for most of the REIT groups they analyze, and the results pertaining to the Belgian REITs, as reported by Akimov et al. (2020, p. 141). The positive skewness implies that most returns are relatively low, albeit a few higher returns increase the mean, as evidenced by the wider range for REITs relative to the stock market index. Indeed, most REITs and stock market index return series show high kurtosis, consistent with the stylized facts of returns data and results reported elsewhere in the literature.

Turning to the debt market variables, we find that the averages of the SAIBOR rate and the bond yield are 3.14% and 2.56% (3.35% and 2.54%) for the unbalanced (balanced) sample, respectively, with the SAIBOR rate showing a higher standard deviation given the various monetary policy cycles during the sample period.

Table 2. Descriptive statistics for the unbalanced and balanced sample periods.

Series	Mean (%)		Median (%)		Max (%)		Min (%)		Std. Dev. (%)		Skewness		Kurtosis		Obs.	
	Unbal	Bal	Unbal	Bal	Unbal	Bal	Unbal	Bal	Unbal	Bal	Unbal	Bal	Unbal	Bal	Unbal	Bal
Riyad	-0.44	-0.10	-0.38	-0.25	15.00	15.00	-11.72	-11.60	5.52	5.55	0.27	0.26	3.43	3.31	95	67
AlJazira	0.32	0.78	-1.14	-0.83	45.49	45.49	-23.17	-23.17	9.96	10.51	1.29	1.32	7.05	7.09	92	67
Jadwa Al Haramain	-0.43	-0.11	-1.19	-1.16	31.96	31.96	-19.33	-19.33	7.18	7.59	1.46	1.40	9.13	8.87	90	67
Taleem	0.05	0.30	-0.40	-0.18	17.55	17.55	-16.06	-16.06	5.73	5.83	0.12	0.07	3.96	3.95	89	67
Al Maather	-0.15	0.50	-0.05	0.12	34.63	34.63	-19.28	-18.69	5.77	5.86	1.71	2.34	18.86	20.00	86	67
Musharaka	-0.67	-0.61	-0.34	-0.25	14.39	14.39	-16.71	-16.71	4.65	5.01	-0.13	-0.15	5.57	5.11	84	67
Mulkia Gulf Real Estate	-0.52	-0.49	-0.50	-0.55	16.30	16.30	-13.95	-13.95	4.22	4.61	0.34	0.32	8.13	7.11	83	67
SICO Saudi	-0.74	-0.62	-1.30	-1.37	43.09	43.09	-11.62	-11.62	7.27	7.81	3.01	2.89	18.23	16.42	81	67
AlAhli 1	-0.10	0.12	-0.12	0.20	21.04	21.04	-16.73	-16.73	6.10	6.62	0.50	0.39	5.24	4.51	81	67
Derayah	-0.32	-0.35	-0.62	-0.80	13.33	13.33	-9.53	-9.53	3.92	4.15	0.63	0.65	4.54	4.24	79	67
Al Rajhi	0.03	0.12	-0.23	-0.11	14.44	14.44	-11.46	-11.46	4.47	4.74	-0.05	-0.09	4.38	4.05	79	67
Jadwa Saudi	0.33	0.58	-0.35	-0.25	12.28	12.28	-14.48	-14.48	5.40	5.82	0.12	0.00	3.07	2.70	80	67
SEDCO Capital	0.18	0.24	-0.13	0.00	19.92	19.92	-13.93	-13.93	5.72	5.87	0.89	0.87	5.33	5.39	77	67
Alinma Retail	-0.61	-0.53	-1.02	-1.01	37.75	37.75	-20.69	-20.69	6.77	7.08	2.16	2.05	16.04	14.73	74	67
MEFIC	-0.66	-1.00	-1.37	-1.55	31.99	31.99	-20.63	-20.63	6.96	6.69	1.41	1.38	10.11	11.45	71	67
Bonyan	0.21	0.12	0.23	0.23	11.68	11.68	-13.97	-13.97	4.19	4.15	-0.42	-0.60	4.80	5.10	75	67
Alkhabeer	-0.67	-0.67	-0.13	-0.13	23.74	23.74	-14.23	-14.23	5.36	5.36	0.97	0.97	8.73	8.73	67	67
Market index	0.69	0.60	0.90	1.41	10.61	10.61	-14.72	-14.72	4.83	5.28	-0.46	-0.55	3.20	2.93	95	67
REIT index	-0.37	-0.08	-0.56	-0.10	15.84	15.84	-13.18	-11.55	4.61	4.26	0.31	0.43	5.15	5.79	95	67
SAIBOR	3.14	3.35	2.65	2.77	6.26	6.26	0.91	0.91	1.84	2.14	0.49	0.16	1.85	1.31	95	67
T-bonds	2.56	2.54	2.43	2.14	4.88	4.88	0.54	0.54	1.14	1.34	0.09	0.12	2.09	1.53	95	67

Notes: Unbal = the unbalanced sample period (2016M12 2024M10); Bal = the balanced sample period (2019M04 2024M10). The descriptive statistics for the individual REITs and the REIT and market indices are calculated based on their respective simple returns, while those pertaining to interest rate proxies, namely the SAIBOR rate and T-bond yield, are calculated based on the levels of these variables without any transformations.

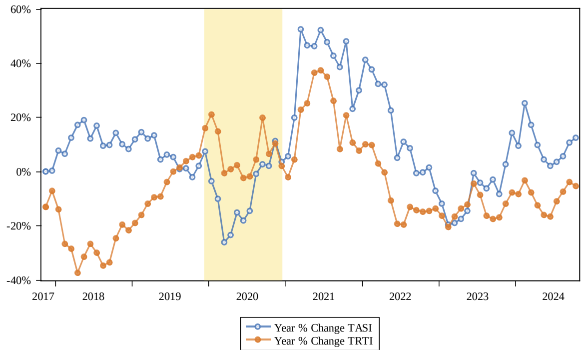

Figure 1. Time series plot of yearly percentage change (simple returns) of the Tadawul All Share Index (TASI) and the Tadawul REITs index.

To gain a visual perspective of the performance dynamics of the REIT sector relative to the broad stock market, we plot the yearly percentage changes of the Tadawul REITs index against those of its stock market counterpart in Figure 1. A look at Figure 1 reveals that the REITs index predominantly underperformed the broad market, except for the beige-shaded area that represents the midst of the COVID-19 pandemic, in which REITs showed a conspicuous resilience. The decoupling between REITs and the broad stock market can be tentatively justified on the grounds of the notion that REITs' long-run performance is more linked to the performance of the direct real estate market than the broad stock market (Giliberto, 1990; Hoesli & Oikarinen, 2012). This outcome is hardly surprising given the unique operating features of REITs that set them apart from the average industrial company.

Table 3. Unit root tests

Series	ADF		PP	
	Level	%Δ	Level	%Δ
Riyad	-1.55	-9.48***	-1.51	-9.49***
AlJazira	-1.94	-10.16***	-1.93	-10.14***
Jadwa Al Haramain	-2.23	-10.78***	-2.13	-10.74***
Taleem	-2.28	-10.19***	-2.23	-10.19***
Al Maather	-4.74***	-9.56***	-4.75***	-9.58***
Musharaka	-0.33	-8.53***	-0.32	-8.53***
Mulkia Gulf Real Estate	-0.53	-9.06***	-0.50	-9.06***
SICO Saudi	-1.24	-8.87***	-1.24	-8.87***
AlAhli 1	-1.55	-8.82***	-1.52	-8.85***
Derayah	-0.03	-6.87***	-0.35	-6.86***
Al Rajhi	-1.63	-8.34***	-1.63	-8.33***
Jadwa Saudi	-1.54	-7.46***	-1.54	-7.60***
SEDCO Capital	-1.63	-8.68***	-1.76	-8.68***
Alinma Retail	-1.57	-9.56***	-1.50	-9.52***
MEFIC	-1.21	-9.94***	-1.02	-9.88***
Bonyan	-3.34**	-10.68***	-3.27**	-11.50***
Alkhabeer	-0.76	-9.57***	-1.05	-10.62***
Market index	-1.15	-10.26***	-1.12	-10.27***
REIT index	-1.58	-8.88***	-1.58	-8.85***
SAIBOR	-0.87	-5.31***	-0.76	-5.24***
Bond	-0.52	-7.54***	-0.66	-7.52***

*Notes: %Δ is monthly percentage change (simple returns); ADF = Augmented Dickey and Fuller unit root test statistics; PP = Phillips and Perron unit root test statistics; the unit root test equation includes an intercept only; the lag lengths for the ADF test are based on the Schwarz Information Criterion (SIC). *** and ** denote statistical significance at the 1% and 5% levels.*

As a precursor to regression analysis, we conduct the Dickey and Fuller (1981) and Phillips and Perron (1988) unit root tests for each series to ensure that all series we use in the regression analysis are stationary. The results of the unit root tests are presented in Table 3. As per Table 3, both tests confirm that the percentage changes (simple returns) are stationary, as the null hypothesis that these series have a unit root is rejected at the 1% level across the board. Therefore, we can safely proceed to regression analysis in the sequel.

5. Results and discussion

5.1. The no-common-effect model

As a starting point, we estimate the no-common effect model, as per equation (2), using OLS to obtain the model parameters' estimates for each REIT separately. Similarly, to prior studies, we run two regressions, each of which uses one of our two interest rate proxies: the SAIBOR rate and the 10-year US Treasury bond yield. Furthermore, we include an impulse dummy in both regressions to absorb the impact of the COVID-19-induced stock market collapse in March 2020, the month in which the outbreak was declared a global pandemic by the World Health Organization. The inclusion of this impulse dummy variable is justified not only from a statistical perspective to enhance the model's fit but also due to the unprecedented impact of the COVID-19 pandemic on the fundamentals of the REIT sector.[7] Furthermore, the COVID-19 outbreak can be viewed as a one-off event that is unlikely to repeat in the foreseeable future under normal circumstances (see, Brooks, 2014, pp. 210-214).

The estimates of the regression parameters based on the unbalanced and balanced samples are reported in Tables 4 and 5. Although the COVID-19 dummy's parameter estimates are jointly different from zero in all cases, at least at the 5% level, we did not report their estimates to conserve space. These results, however, will be made available upon request.

A review of Tables 4 and 5 reveals that the intercept parameter estimates are predominantly negative, albeit generally higher for the balanced sample, with only two exceptions, which corroborates the slight improvement in REITs' performance as shown in the summary statistics. The stock market and interest rate slope parameters display the expected signs across the board, with a positive relation with the stock market and a negative one with interest rates, both short and long. Indeed, the stock market slopes show an increase when considering the balanced sample, reflecting the concentration of market turbulences, which are amplified due to the shorter sample, albeit all market slopes remain statistically significant, at least at the 5% level. On the other hand, while the size of the interest rate slope parameters' estimates is comparable across the two samples, the statistical significance slightly varies.

The bottom of Tables 4 and 5 contains six test statistics for each regression, corresponding to the joint Wald-parameter restriction tests for the no-common-effect model's intercept parameters, each of its two slopes' parameters, the COVID-19 dummy parameters, the intercept and slopes excluding the COVID-19 dummy parameters, and all the reported regression's parameters, respectively. We can see that regardless of the regression model specification (short or long interest rate) and the sample used (unbalanced or balanced), we fail to reject all sets of restrictions except for those imposed on the stock market slopes highlighted in bold. While this restriction is marginally rejected at the 10% level in the unbalanced sample case, it's strongly rejected at the 1% level when we employ a balanced sample. Although we can proceed to estimate a common effect model because the joint Wald-parameter restriction test of all the no-common effect model's parameters cannot be rejected in any case, we had a closer look at the stock market slope estimates. One can clearly see that the stock market slope parameters' estimates for a single REIT (namely, AlJazira) appear to be substantially higher than the rest. This REIT is tiny relative to the remaining REITs, as indicated in Table 1. So, we re-estimated the no-common-effect model without AlJazira REIT to ascertain whether it's driving the results we obtained earlier. The estimation results show that the joint Wald parameter restriction test for the stock market slope parameters based on the model excluding AlJazira REIT cannot be rejected in any case. These results are not reported here for the sake of brevity; however, the author will make them available upon request. In the sequel, we can safely move on to estimate the common effect model.

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[7] *For more on the impact of the COVID-19 pandemic on the GCC sector, see* https://www.marmoremena.com/en/insights/impact-of-covid-19-on-gcc-reits/

Table 4. OLS estimates for the no-common effect regression model with COVID-19 dummies based on an unbalanced sample

	$R_{jt}=\alpha_j+\beta_{j1}R_{mt}+\beta_{j2}\%\Delta Interbank_t+\delta_j D_t+\varepsilon_{jt}$						$R_{jt}=\alpha_j+\beta_{j1}R_{mt}+\beta_{j2}\%\Delta Bond_t+\delta_j D_t+\varepsilon_{jt}$					
	α_j	t-State	β_{j1}	t-State	β_{j2}	t-State	α_j	t-State	β_{j1}	t-State	β_{j2}	t-State
Riyad	-0.79	-1.48	0.53***	4.67	-0.02	-0.36	-0.73	-1.38	0.55***	4.86	-0.07	-1.43
AlJazira	-0.10	-0.10	0.91***	4.41	-0.12	-1.05	-0.17	-0.18	0.92***	4.43	-0.09	-1.03
Jadwa Al Haramain	-0.67	-0.94	0.57***	3.85	-0.04	-0.56	-0.58	-0.83	0.60***	4.10	-0.11*	-1.80
Taleem	-0.29	-0.53	0.64***	5.73	-0.12**	-1.96	-0.44	-0.81	0.63***	5.52	-0.04	-0.79
Al Maather	-0.10	-0.17	0.36***	2.97	-0.07	-1.17	-0.13	-0.23	0.37***	3.02	-0.06	-1.25
Musharaka	-0.71	-1.47	0.34***	3.38	-0.07	-1.29	-0.77	-1.60	0.34***	3.37	-0.04	-1.01
Mulkia Gulf Real Estate	-0.60	-1.45	0.38***	4.47	-0.06	-1.36	-0.62	-1.52	0.39***	4.59	-0.06*	-1.76
SICO Saudi	-0.80	-1.02	0.54***	3.36	-0.13	-1.59	-0.88	-1.14	0.55***	3.43	-0.11*	-1.77
AlAhli 1	-0.26	-0.42	0.59***	4.83	-0.07	-1.16	-0.28	-0.48	0.60***	4.93	-0.08	-1.56
Derayah	-0.38	-0.89	0.31***	3.54	-0.07	-1.62	-0.44	-1.04	0.31***	3.55	-0.05	-1.34
Al Rajhi	-0.19	-0.43	0.52***	5.87	-0.08*	-1.64	-0.20	-0.47	0.54***	6.12	-0.08**	-2.29
Jadwa Saudi	0.40	0.74	0.45***	4.01	-0.14**	-2.46	0.17	0.30	0.43***	3.69	-0.03	-0.55
SEDCO Capital	0.18	0.30	0.41***	3.22	-0.08	-1.24	0.26	0.44	0.44***	3.63	-0.14***	-2.85
Alinma Retail	-0.77	-1.02	0.55***	3.67	-0.11	-1.44	-0.86	-1.15	0.56***	3.67	-0.07	-1.10
MEFIC	-0.89	-1.21	0.66***	4.58	-0.10	-1.41	-0.88	-1.23	0.69***	4.78	-0.11**	-2.03
Bonyan	0.13	0.32	0.40***	4.92	-0.04	-0.84	0.18	0.46	0.42***	5.28	-0.07**	-2.25
Alkhabeer	-0.69	-1.09	0.31**	2.51	-0.02	-0.28	-0.59	-0.96	0.34***	2.70	-0.06	-1.29
Parameter Restriction												
Intercept	0.39	(16, 1315)	[0.99]				0.37	(16, 1315)	[0.99]			
Stock market slopes	1.51	(16, 1315)	[0.09]				1.51	(16, 1315)	[0.09]			
SAIBOR/Bond market slopes	0.31	(16, 1315)	[1.00]				0.35	(16, 1315)	[0.99]			
COVID-19 dummy parameters	0.62	(16, 1315)	[0.87]				0.85	(16, 1315)	[0.63]			
All except COVID-19	0.73	(48, 1315)	[0.91]				0.74	(48, 1315)	[0.90]			
All parameters	0.73	(64, 1315)	[0.94]				0.75	(64, 1315)	[0.93]			

*Notes: The parameters' restrictions are denoted as follows: the intercepts' restrictions $\alpha_1=\alpha_2=\cdots=\alpha_N$; the stock market slopes' restrictions $\beta_{11}=\beta_{21}=\cdots=\beta_{N1}$; the SAIBOR/Bond market slopes' restrictions $\beta_{12}=\beta_{22}=\cdots=\beta_{N2}$; COVID-19 dummy parameters' restrictions $\delta_1=\delta_2=\cdots=\delta_N$; all the parameters except COVID-19 restrictions $\alpha_1=\alpha_2=\cdots=\alpha_N, \beta_{11}=\beta_{21}=\cdots=\beta_{N1}$ and $\beta_{12}=\beta_{22}=\cdots=\beta_{N2}$; the restrictions imposed on all parameters $\alpha_1=\alpha_2=\cdots=\alpha_N, \beta_{11}=\beta_{21}=\cdots=\beta_{N1}, \beta_{12}=\beta_{22}=\cdots=\beta_{N2}$ and $\delta_1=\delta_2=\cdots=\delta_N$. The parameters' restrictions are tested using the Wald F-statistics with $F(q,(\sum_{j=1}^{N}T_j)-(k+1)N)$ degrees of freedom and their corresponding p-values are in [ ]. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.*

Table 5. OLS estimates for the no-common effect regression model with COVID-19 dummies based on a balanced sample

	$R_{jt} = \alpha_j + \beta_{j1}R_{mt} + \beta_{j2}\%\Delta Interbank_t + \delta_j D_t + \varepsilon_{jt}$						$R_{jt} = \alpha_j + \beta_{j1}R_{mt} + \beta_{j2}\%\Delta Bond_t + \delta_j D_t + \varepsilon_{jt}$					
	α_j	t-State	β_{j1}	t-State	β_{j2}	t-State	α_j	t-State	β_{j1}	t-State	β_{j2}	t-State
Riyad	-0.50	-0.85	0.63***	5.48	-0.01	-0.20	-0.38	-0.67	0.66***	5.73	-0.07	-1.46
AlJazira	0.34	0.29	1.10***	4.87	-0.12	-1.06	0.30	0.26	1.12***	4.89	-0.09	-1.04
Jadwa Al Haramain	-0.33	-0.40	0.70***	4.22	-0.05	-0.57	-0.22	-0.27	0.73***	4.44	-0.10	-1.53
Taleem	-0.03	-0.05	0.74***	6.41	-0.12**	-2.15	-0.20	-0.33	0.73***	6.10	-0.04	-0.75
Al Maather	0.66	1.00	0.35***	2.70	-0.08	-1.20	0.64	0.99	0.36***	2.78	-0.07	-1.30
Musharaka	-0.65	-1.17	0.41***	3.74	-0.05	-0.98	-0.67	-1.20	0.42***	3.77	-0.04	-0.97
Mulkia Gulf Real Estate	-0.54	-1.12	0.44***	4.59	-0.06	-1.17	-0.53	-1.11	0.45***	4.73	-0.06	-1.56
SICO Saudi	-0.69	-0.75	0.58***	3.16	-0.12	-1.32	-0.67	-0.74	0.60***	3.31	-0.12*	-1.70
AlAhli 1	-0.03	-0.04	0.64***	4.60	-0.06	-0.93	0.03	0.04	0.67***	4.81	-0.09*	-1.67
Derayah	-0.42	-0.88	0.36***	3.76	-0.07	-1.57	-0.47	-0.98	0.36***	3.75	-0.04	-1.20
Al Rajhi	-0.05	-0.10	0.52***	5.25	-0.08	-1.55	-0.03	-0.07	0.54***	5.47	-0.08**	-2.08
Jadwa Saudi	0.71	1.13	0.47***	3.80	-0.14**	-2.32	0.51	0.79	0.46***	3.55	-0.04	-0.74
SEDCO Capital	0.28	0.41	0.43***	3.28	-0.09	-1.31	0.38	0.59	0.47***	3.67	-0.13***	-2.62
Alinma Retail	-0.62	-0.76	0.58***	3.60	-0.12	-1.48	-0.69	-0.84	0.59***	3.61	-0.08	-1.24
MEFIC	-1.12	-1.56	0.66***	4.67	-0.09	-1.29	-1.09	-1.56	0.68***	4.84	-0.10*	-1.74
Bonyan	0.03	0.06	0.44***	5.47	-0.03	-0.74	0.11	0.27	0.46***	5.88	-0.07**	-2.18
Alkhabeer	-0.69	-1.09	0.31**	2.51	-0.02	-0.28	-0.59	-0.96	0.34***	2.70	-0.06	-1.29
Parameters' Restrictions												
Intercept	0.55	(16, 1071)	[0.92]				0.51	(16, 1071)	[0.94]			
Stock market slopes	1.98	(16, 1071)	[0.01]				1.98	(16, 1071)	[0.01]			
SAIBOR/Bond market slopes	0.33	(16, 1071)	[0.99]				0.27	(16, 1071)	[1.00]			
COVID-19 dummy parameters	0.69	(16, 1071)	[0.81]				0.92	(16, 1071)	[0.54]			
All except COVID-19	0.96	(48, 1071)	[0.56]				0.95	(48, 1071)	[0.58]			
All parameters	0.90	(64, 1071)	[0.69]				0.90	(64, 1071)	[0.71]			

*Notes: The parameters' restrictions are denoted as follows: the intercepts' restrictions $\alpha_1 = \alpha_2 = \cdots = \alpha_N$; the stock market slopes' restrictions $\beta_{11} = \beta_{21} = \cdots = \beta_{N1}$; the SAIBOR/Bond market slopes' restrictions $\beta_{12} = \beta_{22} = \cdots = \beta_{N2}$; COVID-19 dummy parameters' restrictions $\delta_1 = \delta_2 = \cdots = \delta_N$; all the parameters except COVID-19 restrictions $\alpha_1 = \alpha_2 = \cdots = \alpha_N, \beta_{11} = \beta_{21} = \cdots = \beta_{N1}$ and $\beta_{12} = \beta_{22} = \cdots = \beta_{N2}$; the restrictions imposed on all parameters $\alpha_1 = \alpha_2 = \cdots = \alpha_N, \beta_{11} = \beta_{21} = \cdots = \beta_{N1}, \beta_{12} = \beta_{22} = \cdots = \beta_{N2}$ and $\delta_1 = \delta_2 = \cdots = \delta_N$. The parameters' restrictions are tested using the Wald F-statistics with $F(q, N(T-k-1))$ degrees of freedom and their corresponding p-values are in [ ]. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.*

5.2. The common-effect model

We estimate the common-effect model, as presented in Equation (1), using pooled OLS that includes all REITs. The estimation results are reported in Table 6 for all model specifications and samples (unbalanced and balanced).

Table 6. Pooled OLS estimates for the common effect regression model

$R_{jt} = \alpha + \beta_1 R_{mt} + \beta_2 \%\Delta Interbank_t + \delta D_t + \varepsilon_{jt}$				$R_{jt} = \alpha + \beta_1 R_{mt} + \beta_2 \%\Delta Bond_t + \delta D_t + \varepsilon_{jt}$			
α	β_1	β_2	δ	α	β_1	β_2	δ
Unbalanced sample: 2016M12 2024M10							
-0.38	0.50***	-0.08***	-8.07***	-0.41	0.51***	-0.07**	-7.17***
(-1.03)	(6.32)	(-3.23)	(-5.71)	(-1.21)	(6.22)	(-2.62)	(-5.88)
Adj R^2	0.21	Obs.	1383	Adj R^2	0.21	Obs.	1383
Balanced sample: 2019M04 2024M10							
-0.22	0.55***	-0.08***	-7.43***	-0.21	0.57***	-0.07**	-6.59***
(-0.49)	(6.38)	(-3.29)	(-5.01)	(-0.52)	(6.24)	(-2.49)	(-5.19)
Adj R^2	0.25	Obs.	1139	Adj R^2	0.26	Obs.	1139

*Notes: The t-statistics in parentheses are calculated based on White two-way cluster standard errors and covariance (degree of freedom corrected), as well as standard errors and t-statistic p-values adjusted for clustering. *** and ** denote statistical significance at the 1% and 5% levels.*

Based on Table 6, we can see that the intercepts are negatively signed, lacking statistical significance across all specifications and samples, nonetheless. The generally poor performance of Saudi REITs is in accordance with the findings of Albarrak et al. (2023). The stock market slopes, as expected, are positive and statistically significant at the 1% level across the board with a modest magnitude of around 0.5, slightly differing across model specifications and samples. The relatively low stock market slope is typical for defensive companies with stable share prices and dividends and closely resembles those reported by He et al. (2003) and Chen and Tzang (1988) in the later sample period. Moving to the interest rate slope, we can see that REITs exhibit a negative relationship with short and long interest rates in all cases, at least at the 5% level of significance, in accordance with the Giliberto and Shulman (2017) conjecture and the findings of several prior studies, *inter alia*, Chen and Tzang (1988), Allen et al. (2000), He et al. (2003), and Ito (2016), while the exposure to the US T-bonds is consistent with the findings of Lin et al. (2022) that show that Singaporean residential and retail REITs and Australian residential REITs are susceptible to US interest rates. Given the absence of an autonomous monetary policy on the part of the Saudi central bank due to the Saudi riyal/dollar peg, our results lend support to the premise that regardless of whether monetary policy is formulated domestically or not, REITs' returns remain susceptible to interest rate changes, thereby highlighting the relevance of US monetary policy to the public real estate market (see, Akimov et al., 2020, p. 149).

While statistical significance is strongly established, a word on the economic significance of the REIT-interest rate nexus is warranted. The slopes on the SAIBOR rate and (T-bond yield) are -0.07 and (-0.08), implying that a hike in the SAIBOR rate (T-bond yield) of as high as 40% will be associated, on average, with a moderate fall in REITs prices of 2.8% (3.2%), ceteris paribus. Indeed, the impact of interest rates seems to be fairly small, even in response to sharp changes in interest rates. To put these findings in context, we compare them to the findings of He et al. (2003), who use a similar interest rate metric and document a slope of -0.18 on the percentage changes in long-term government bond yields. Our reported interest rate slopes are less than half of that figure. The relatively lower exposure of Saudi REITs to interest rate changes is perhaps due to the relatively low leverage and/or hedging interest rate risk by entering long-term financing with banks.

Considering the COVID-19 estimated parameter, we can clearly see the significant negative impact of the pandemic declaration news on REITs' returns. The magnitude of the COVID-19 estimated parameter as per Table 6 reaches about -8% and -7% for the first and second specifications, respectively, confirming the negative consequences of the pandemic news on the REITs' returns. Indeed, when we compared our findings to those of Yong and Singh (2015), who included a GFC dummy, we found that both crises had a comparable negative impact on the return of REITs. Regarding the goodness of fit, both specifications display an adjusted R^2 of 0.21 over the unbalanced sample, which increases to about 0.25 over the balanced sample. The explanatory power of our regression models is comparable to that reported by Allen et al. (2000), exceeds that of Yong and Singh (2015), yet remains lower than the levels observed in the studies by Chen and Tzang (1988) and He et al. (2003).

To check the robustness of our baseline model (pooled OLS), we run fixed- and random-effects regressions and report their results in Table 7.

Strikingly, the results obtained using the fixed-effects model are remarkably the same as those attained using pooled OLS, with only negligible differences in the t-statistics and R^2. Moreover, applying the redundant fixed effects test, we failed to reject the absence of fixed effects. What is even more surprising is that the random-effects regression produced estimates identical to those of pooled OLS. A look at the lower panel in Table 7 pertaining to the random-effects results reveals the reason behind this finding. The estimated standard deviation of the cross-section error component is zero $\sigma_u = 0$, implying that all REITs had the same intercept. Therefore, the random effects estimator reduces to the OLS estimator (see, Kennedy, 2008, p. 293).

Table 7 The common-effect regression model estimates with fixed and random effects

Fixed effects							
$R_{jt} = \alpha_j + \beta_1 R_{mt} + \beta_2 \%\Delta Interbank_t + \delta D_t + \varepsilon_{jt}$				$R_{jt} = \alpha_j + \beta_1 R_{mt} + \beta_2 \%\Delta Bond_t + \delta D_t + \varepsilon_{jt}$			
α	β_1	β_2	δ	α	β_1	β_2	δ
Unbalanced sample: 2016M12 2024M10							
-0.38	0.50***	-0.08***	-8.06***	-0.41	0.51***	-0.07**	-7.15***
(-1.06)	(6.29)	(-3.21)	(-5.68)	(-1.24)	(6.19)	(-2.60)	(-5.85)
Adj R2	0.20	Obs.	1383	Adj R2	0.21	Obs.	1383
Redundant Fixed Effects Test				Redundant Fixed Effects Test			
0.404	(16,1363)	[0.98]		0.403	(16,1363)	[0.98]	
Balanced sample: 2019M04 2024M10							
-0.22	0.55***	-0.08***	-7.43***	-0.21	0.57***	-0.07**	-6.59***
(-0.51)	(6.34)	(-3.27)	(-4.99)	(-0.54)	(6.19)	(-2.47)	(-5.18)
Adj R2	0.24	Obs.	1139	Adj R2	0.25	Obs.	1139
Redundant Fixed Effects Test				Redundant Fixed Effects Test			
0.579	(16,1119)	[0.90]		0.584	(16,1119)	[0.90]	
Random effects							
$R_{jt} = \alpha + \beta_1 R_{mt} + \beta_2 \%\Delta Interbank_t + \delta D_t + w_{jt}$				$R_{jt} = \alpha + \beta_1 R_{mt} + \beta_2 \%\Delta Bond_t + \delta D_t + w_{jt}$			
Unbalanced sample: 2016M12 2024M10							
-0.38	0.50***	-0.08***	-8.07***	-0.41	0.51***	-0.07**	-7.17***
(-1.03)	(6.32)	(-3.23)	(-5.71)	(-1.21)	(6.22)	(-2.62)	(-5.88)
Adj R2	0.21	Obs.	1383	Adj R2	0.21	Obs.	1383
σ_u	0.00			σ_u	0.00		
σ_ε	5.39			σ_ε	5.37		

Balanced sample: 2019M04 2024M10							
-0.22	0.55***	-0.08***	-7.43***	-0.21	0.57***	-0.07**	-6.59***
(-0.49)	(6.38)	(-3.29)	(-5.01)	(-0.52)	(6.24)	(-2.49)	(-5.19)
Adj R2	0.25	Obs.	1139	Adj R2	0.26	Obs.	1139
σ_u	0.00			σ_u	0.00		
σ_ε	5.42			σ_ε	5.40		

*Notes: The t-statistics in ( ) are calculated based on the White two-way cluster standard errors & covariance (degree of freedom corrected) and standard errors and t-statistics p-values adjusted for clustering. The composite error term w_{jt} is $w_{jt} = u_j + \varepsilon_{jt}$ with standard deviations σ_u and σ_ε . *** and ** denote statistical significance at the 1% and 5%.*

5.2.1. Subsample analysis

Despite obtaining similar results using both unbalanced and balanced samples for the Stone (1974) two-index model, we decided to segment our sample period into three subsamples according to the Fed's prevailing monetary policy cycle as defined by Blinder (2023). This subsample analysis explores to what extent does monetary policy influence the relationship between REITs' returns and the movements in interest rates? Using Figure 2, we illustrate the three monetary policy cycles that coincide with our sample period.

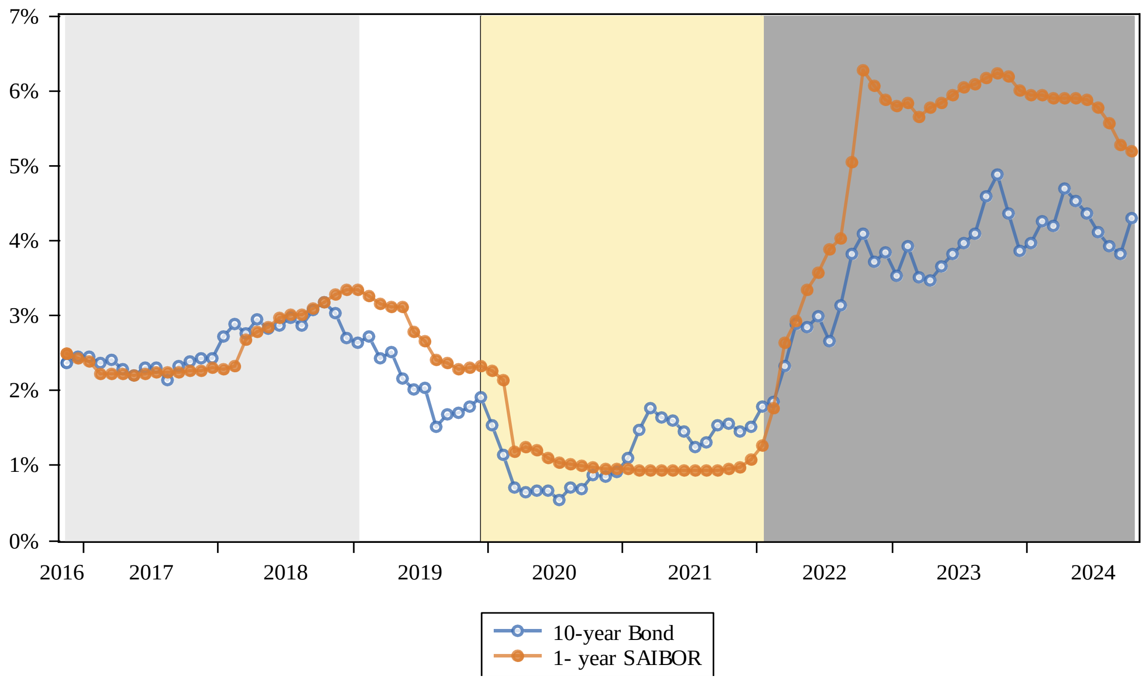

Figure 2. Time series plot of the monthly 10-year US treasury bond yield and the one-year Saudi interbank rate (SAIBOR)

Figure 2 presents the time plot of the one-year SAIBOR and the 10-year US T-bond yield series over the entire sample. The period pertaining to each of the three monetary cycles is shaded with a different color within the time plot. The light-gray-shaded area represents the first subperiod (2016M11 to 2019M01) that corresponds to part of the 11th Fed tightening cycle that spanned the period 2015M11 to 2019M01 (see, Blinder, 2023, p. 119). The second subperiod (2019M02 to 2021M12) comprises the year preceding COVID-19 (the white-shaded area), when the Fed signaled to stop raising rates amid economic uncertainty[8],

[8] *See https://edition.cnn.com/2019/01/30/economy/federal-reserve-january-rate-meeting/index.html*

and the COVID-19 period that induced sharp rate cuts up to the beginning of the present tightening cycle (the beige-shaded area). The darker gray shaded area represents the present tightening cycle that started from 2022M01 through the end of the sample. Table 8 reports the estimation results of the common effect model, as presented in equation (1), by means of pooled OLS including all REITs based on the abovementioned three sample periods.

Table 8. Pooled OLS estimates for the common-effect regression model across monetary policy cycles

$R_{jt} = \alpha + \beta_1 R_{mt} + \beta_2 \%\Delta Interbank_t + \delta D_t + \varepsilon_{jt}$				$R_{jt} = \alpha + \beta_1 R_{mt} + \beta_2 \%\Delta Bond_t + \delta D_t + \varepsilon_{jt}$			
α	β_1	β_2	δ	α	β_1	β_2	δ
First subsample period: 2016M12 2019M01							
-0.94	0.09	-0.14*		-1.18**	0.09	-0.21***	
(-1.63)	(0.71)	(-2.00)		(-2.56)	(0.71)	(-4.01)	
Adj R2	0.001	Obs.	212	Adj R2	0.05	Obs.	212
Second subsample period: 2019M02 2021M12							
-0.19	0.66***	-0.32***	-16.70***	0.34	0.70***	-0.11**	-6.57***
(-0.25)	(4.26)	(-4.06)	(-6.04)	(0.50)	(3.75)	(-2.24)	(-3.83)
Adj R2	0.25	Obs.	593	Adj R2	0.27	Obs.	593
Third subsample period: 2022M01 2024M10							
-1.00***	0.46***	-0.03**		-1.09***	0.45***	-0.02	
(-3.42)	(8.45)	(-2.68)		(-4.46)	(8.66)	(-0.65)	
Adj R2	0.25	Obs.	578	Adj R2	0.25	Obs.	578

*Notes: The t-statistics are in ( ) are calculated based on the White two-way cluster standard errors & covariance (degree of freedom corrected) and standard errors and t-statistics p-values adjusted for clustering. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.*

A look at Table 8 reveals some striking findings regarding the stability of the regression estimates across the subsample periods, confirming the conclusion reached by He et al. (2003) and Giliberto and Shulman (2017) with respect to the time-varying sensitivity of REITs to stock market and interest rate movements. That said, the interest rate slope parameters remain negative and statistically significant, at least at the 5% level in all cases except for the long interest rate specification during the ongoing monetary tightening cycle. Focusing on the magnitude of the interest rate slope parameters, one can see a differing magnitude across both samples and model specifications, with long interest rates being more influential in the first subsample, whereas short interest rates became more influential during the COVID-19 pandemic, and the influence of both has been considerably diminished during the present contractionary monetary cycle. The falling interest rates triggered by the expansionary monetary policy employed in response to the pandemic seem to induce a more substantial influence of short interest rates, which reflect the direct cost of funds, on REITs' returns. This finding largely aligns with Mueller and Pauley (1995) results in showing that the relationship between REITs' returns and interest rates strengthens during falling interest rate regimes.

Interestingly, the first subsample results reveal seemingly anomalous results pertaining to the stock market slope parameter, which were negligible and statistically insignificant. The post-IPO behavior of these REITs can perhaps explain this outcome after their inception. The subsequent subsample witnessed an increase in stock market beta amid the COVID-19 crisis, reflecting a spillover effect similar to that documented by Giliberto and Shulman (2017) during the GFC, albeit far less in magnitude, emphasizing the diversification benefit of Saudi REITs (see, Marzuki & Newell, 2025). Moreover, the stock market betas dropped during the recent interest rate hikes.

6. Conclusion

The Saudi real estate sector is witnessing unprecedented growth catalyzed by serious economic reforms and mega projects as part of Saudi Vision 2030. The REIT sector is keeping step with these developments, emerging as the largest in the Middle East and attracting international investors. Furthermore, the drastic changes in interest rates following a long period of monetary expansion warrant a careful analysis of the relationship between REIT returns and interest rate movements, given the unique features of REITs that render them more sensitive to the stance of monetary policy. The Saudi REITs context is especially insightful given the lack of autonomous monetary policy on the part of the Saudi central bank due to the long-standing fixed exchange rate regime with the US dollar.

Our methodology employs a refined econometric analysis that explicitly integrates the potential cross-sectional variations among Saudi REITs and the dynamic relationship between their returns and interest rates over time. To address the possible idiosyncrasies of the individual REITs, we initially start with a no-common-effects estimation of the Stone (1974) two-index model, a framework that enables us to determine whether individual REITs display distinct exposures to interest rates (short- and long-term) and market risks. This is achieved by testing the hypothesis that individual REITs have equivalent exposures to market and interest rate risks. Indeed, the results obtained confirm that this hypothesis cannot be rejected. Therefore, we proceeded with the common-effects model based on pooled OLS to exploit the advantages of our panel dataset. To examine potential shifts in the relationship between REIT returns and interest rates over the sample period, we segment the dataset into three distinct phases as dictated by the Federal Reserve's prevailing monetary policy cycle, as defined by Blinder (2023). This approach facilitates a comprehensive understanding of how the REITs' return-generating process evolves amidst changing monetary policy regimes.

The results from the pooled OLS estimation show that short- and long-term interest rates have a statistically significant negative impact on REITs' returns over the entire sample period, albeit this effect is generally economically moderate. The broad market returns exhibit a positive relationship consistent with the results reported elsewhere. Indeed, the results based on the prevailing monetary policy regime reveal the time-dependent nature of the REIT-interest rate nexus. Interest rates seem to exert a more substantial influence on REITs' returns during the falling interest rate cycle induced by the COVID-19 pandemic, in contrast, this influence is substantially diminished during the ongoing monetary tightening, rendering the long-term interest rate impact statistically insignificant. Market betas, on the other hand, seem to rise during the crisis period, reflecting a heightened spillover effect during turbulent market phases.

These findings carry important implications for fund managers, investors, and policymakers. The time-varying sensitivity highlights the importance of monetary policy decisions to REITs' valuations, although these decisions were made by the Fed rather than SAMA. The time-varying relationship calls for more research examining the return and risk spillovers among Saudi REITs and their international counterparts, on the one hand, and other asset classes to explore hedging and portfolio management implications, on the other. Based on our findings, we tentatively predict that the performance of Saudi REITs will improve as the Fed eases its current contractionary policy. While we appreciate the importance of macroprudential policy in ensuring the soundness of the financial system, we recommend that the CMA consider relaxing the leverage limits by allowing REITs to employ higher leverage, given their documented resilience to interest rate risk, subject to their credit ratings. In addition, REITs' managers may also consider hedging interest rate risk by entering into long-term financing agreements with banks. These steps may enable REITs to play a pivotal role in developing the promising Saudi real estate sector in the coming years.

A caveat of this research is that the relatively small sample of REITs precludes considering more risk factors and/or REIT characteristics in our regression model, like size, value, and momentum. Future research endeavors may address these limitations by conducting a cross-country study that primarily focuses on emerging markets' REITs and compares their results to ours.

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