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The Volatility of Listed Real Estate in Europe and Portfolio Implications

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Introduction

- Research project funded by EPRA (in progress)
- Analyze volatility changes of European listed real estate (LRE) across sectors and investigate if this information can be exploited in a dynamic portfolio framework with tactical asset allocation (TAA)
- This is undertaken by analyzing the period from 2006 to 2022 (17 years)
  - The period covers three bear markets

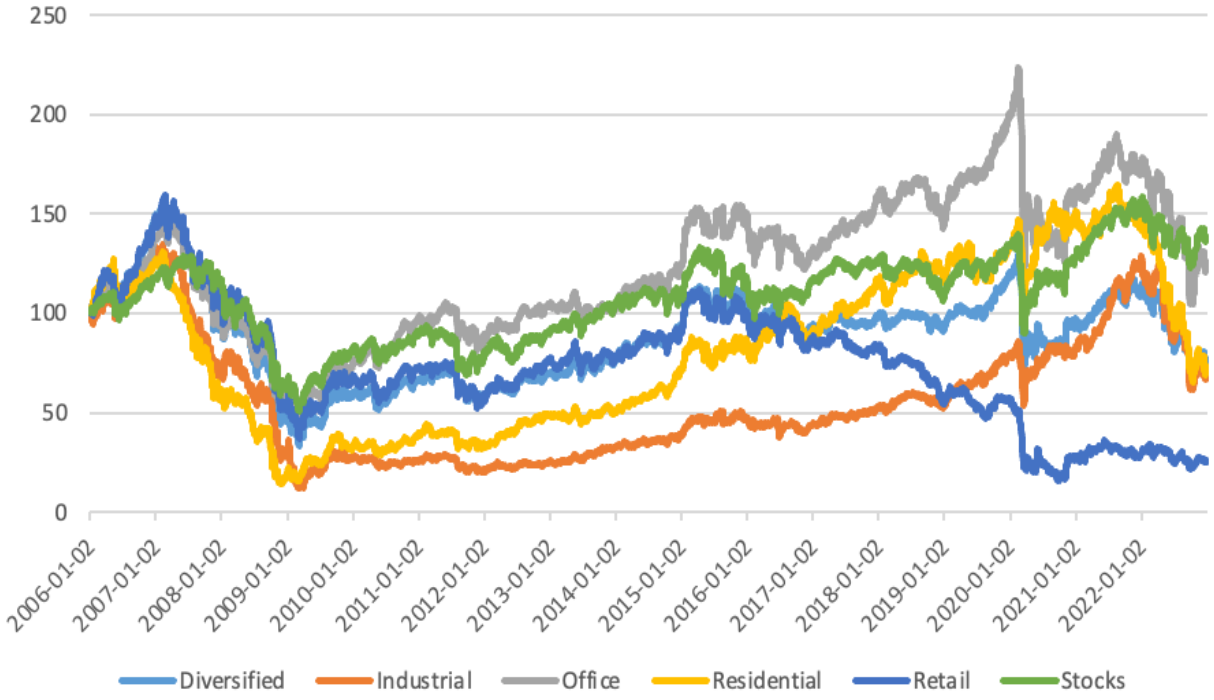
Literature Review

- Much research has focused on the reaction of LRE during periods of distress (Kallberg *et al.*, 2002; Hoesli and Reka, 2013; Liow and Huang, 2018)
- Studies show that LRE sectors react differently in periods of turmoil (Hoesli and Malle, 2022; Ling *et al.*, 2020; Milcheva, 2022; Wang *et al.*, 2023)
- GARCH models have been widely applied for volatility estimation of REITs (Cotter and Stevenson, 2006; Lee *et al.*, 2018; Liow, 2013; Akimov *et al.*, 2019; Zheng *et al.*, 2022)
- Some evidence regarding the benefits of tactical allocation for REITs exists (Liu and Lu, 2020; Chen *et al.*, 2022; Fei *et al.*, 2010)

Data

- Daily return data for 2006-2022
- LRE sectoral returns are proxied using FTSE EPRA/NAREIT Developed Europe indices
  - Five LRE sectors are considered: office, retail, residential, industrial, diversified
- STOXX Europe 600 index is used for the returns of the European stock market
- Premium/discount to NAV and market capitalization time series for each sector were provided by EPRA (monthly basis)

Price Return Indices for LRE and Stocks



Method: Time-Varying Volatility (Step 1)

- Apply ARMA(p,q)-GARCH(1,1) model to each log price return series
  - ARMA lags (i.e., p and q) are determined based on the ACF and PACF plots
- GARCH(1,1) model is preferred for its robustness and parsimony
  - Other GARCH models will be implemented in further steps
- Identify regimes of high/low volatility with Markov regime switching model
  - Volatility time series estimated with the ARMA-GARCH models are used as inputs

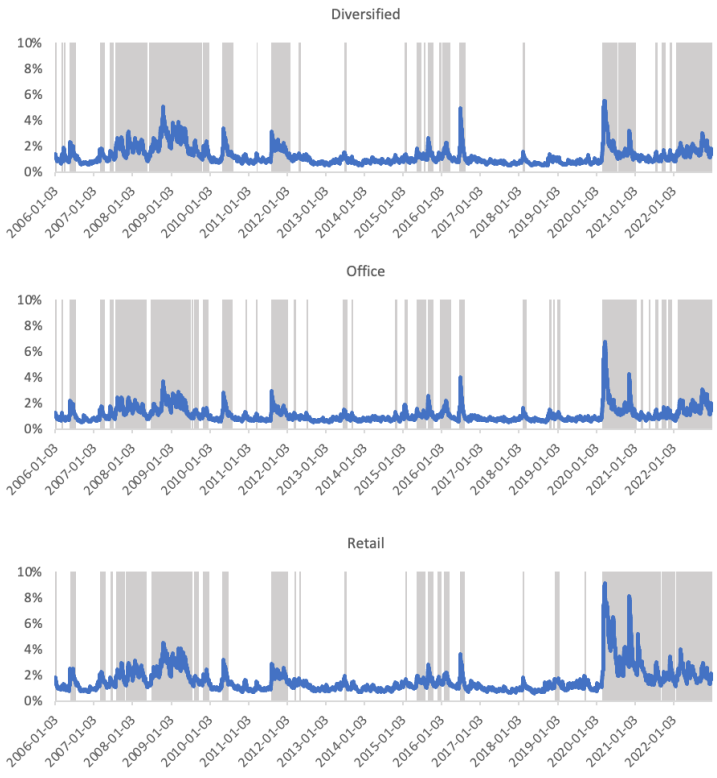
Method: LRE Portfolio Analysis (Step 2)

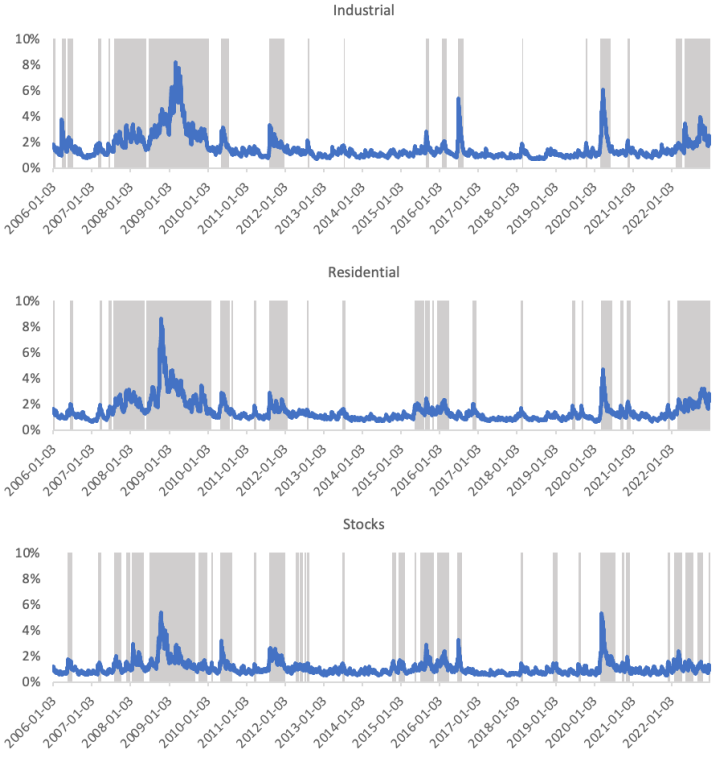
- Backtesting 15 investment strategies (5 SAA x 3 TAA)
- Five strategic asset allocation (SAA) strategies:
  - Equally-Weighted, Capitalization-Weighted, Maximum Sharpe Ratio, Minimum Variance, Risk Parity
- Three TAA approaches (20% of AUM):
  - No TAA (i.e., TAA pocket allocated similarly as with SAA)
  - Volatility-based TAA which seeks exposure to LRE sectors with recent high volatility
  - NAV-based TAA which seeks exposure to LRE sectors with high discounts to NAV (or low premiums to NAV)

Method: LRE Portfolio Analysis (Step 2)

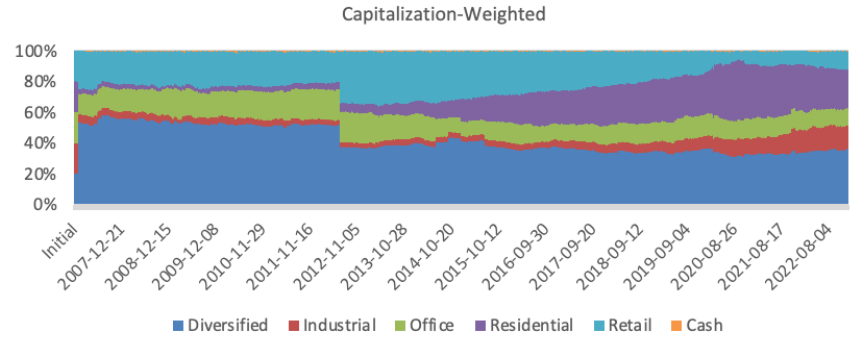
- Backtesting relies on a realistic investment setting with portfolio rebalancing and avoiding look-ahead bias:
  - Daily frequency over the period from 2007 to 2022 with monthly rebalancing of the SAA
  - Dividends reinvested only at time of rebalancing
  - Monitoring for potential trigger events (TAA inception or TAA liquidation) on a monthly basis
  - Transaction costs of 10 bps

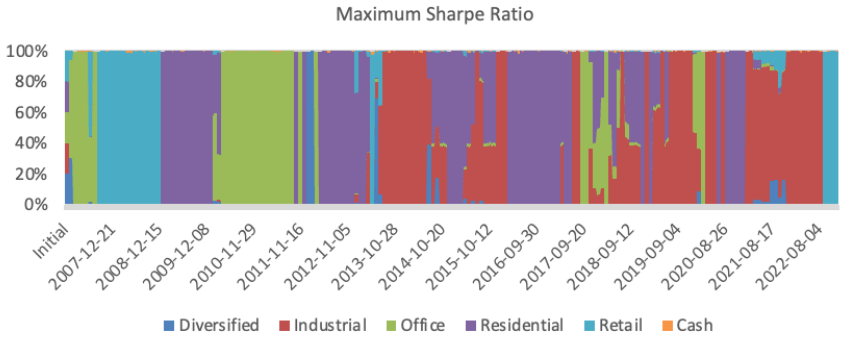
Time-Varying Volatility

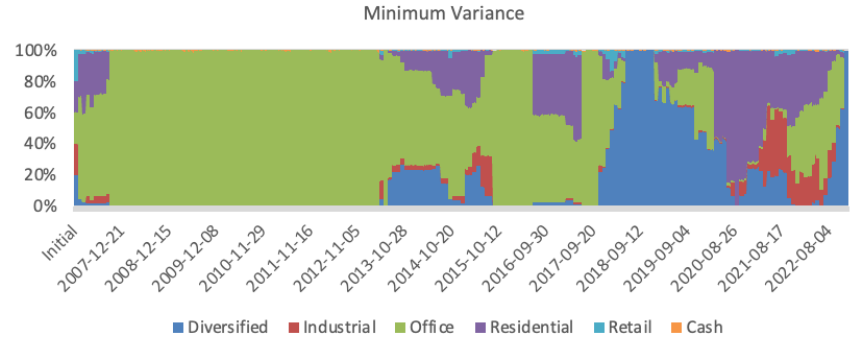




Strategic Asset Allocations without TAA

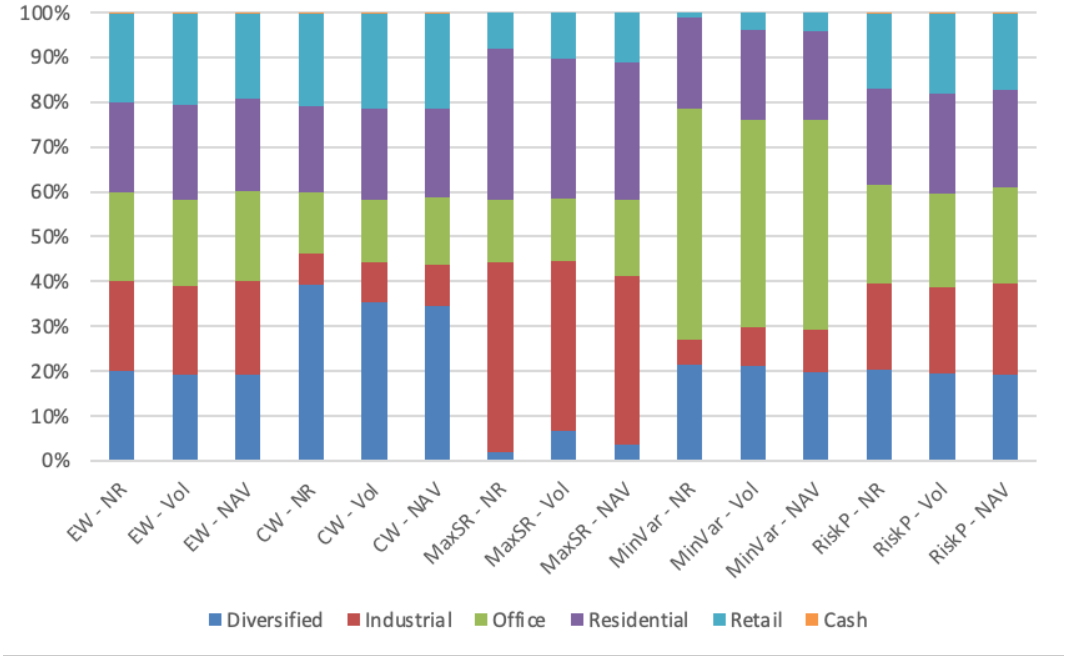






- Cap.-Weighted: well-diversified and quite stable allocations with substitution effect from retail to residential LRE
- Max Sharpe Ratio and Min Variance: less stable and highly concentrated portfolios
- Equally-Weighted and Risk Parity: stable and well balanced allocations (not displayed)

Portfolio Compositions Averaged over Time



- Average allocation varies substantially across the SAA approaches
- TAAs have more muted impacts on the average allocation
- Cap.-Weighted: large allocation to diversified, retail and residential
- Max Sharpe Ratio: concentrated in industrial and residential
- Min Variance: large allocation to offices
- Equally-Weighted and Risk Parity: no sector dominates the allocation

Performance Metrics for the Strategies

- For the Equally-Weighted, Capitalization-Weighted and Risk Parity strategies, TAA generates incremental total returns ranging from 35 to 65 bps
  - TAA results in only marginally higher risk leading to a slight improvement of the Sharpe ratios
- For the Maximum Sharpe Ratio strategy, total returns are 77 and 119 bps lower with volatility-based TAA and NAV-based TAA, respectively
  - TAA results in lower risk but still worse Sharpe ratios due to the large allocation to diversified and office sectors
  - This is also possibly due to the good SAA performance of this low-risk strategy given the time period
- For the Minimum Variance strategy, TAA has virtually no impact on return and risk

Further Steps

- Undertake analysis starting after the GFC (as we do not have full buildup to the crisis): more representative of a full cycle
- Check the robustness of GARCH results by using other specifications (e.g., APARCH, TGARCH)
- Test whether the TAA implementation leads to an improvement of portfolio's Sharpe ratio (test proposed by Memmel, 2003)
- Check the robustness of TAA results by changing parameters (i.e., duration TAA, stop loss and profit-taking levels)
- Replicate the analysis from the perspective of an LRE investor diversifying across countries (Germany, the U.K., Switzerland, Sweden, France, Spain, Belgium), instead of sectors

Thank you for your attention!