RISK FACTORS OF U.S. REAL ESTATE INVESTMENTS

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Outline

- Objectives of the Research
- Literature
- Data
- Descriptive Statistics
- Returns and Risk Factors Analysis
- Conclusion
Objectives of the Research

1. Identify impacts of macroeconomic risk factors and specific investment characteristics on real estate returns

   Impacts of various risk factors and characteristics are identified and quantified

2. Compare these effects across three real estate exposures:
   - Direct investments
   - Non-listed funds
   - Listed companies

   Non-listed closer to direct than non-listed to listed

3. Explore further dynamics and linkages across real estate exposures

   Corroborates the greater proximity of direct and non-listed
Literature

• Regarding direct returns, effects have been identified for macroeconomic variables such as:
  • GDP
  • Inflation
  • Interest rates
  • Construction costs
  • …


• Some of these macroeconomic risk factors are also found for REITs, with a strong link to the stock market.

• In addition, it is necessary to control for REIT characteristics:
  • Size
  • Value/growth factor
  • Leverage
  • …

Literature

• Far less research exists on non-listed real estate funds risk factors. The main reasons are:
  • Lack of availability of relevant and reliable data
  • Often short time horizon and low frequency data (often yearly)
• However a few studies recently analyzed this question and identified similar risk factors as direct and listed investments.
• In addition to control for size and leverage, most of these studies claim to take into account:
  • Investment style (core, value-added, opportunistic)
  • Fund structure (open-end, closed-end)
  • Fund age and vintage (mainly for closed-end funds)
• For all exposures performance can be influenced by:
  • Location of investments (country, region, city, district, ...)
  • Sector (residential, industrial, office, retail, hotel, ...)
Lee (2001), Glascock & Kelly (2007)
Data

Consider U.S. Market: Over the period 1985Q1 to 2015Q3
Across regions as defined by NCREIF
By Sector (office, hotel, industrial, residential, retail)

Direct Indices

• NCREIF indices at U.S. regions level by sector

Non-Listed Core Funds

• NCREIF ODCE index constituent funds

Non-Listed Value-Added Fund Indices

• Cambridge Associates fund indices at U.S. regions level by sector

REITs Companies

• NAREIT All-Equity index constituents sourced from Datastream and Compustat

Macroeconomic and Financial Series

• National level series sourced from Datastream, St. Louis Fed, RS Means
Appraisal-based series desmoothed with regime-switching desmoothing model (TAR-TAR) (Lizieri, Satchell & Wongwachara; 2012) augmented by a robust filter (Fried; 2004)

Desmoothed series appear similar to their transaction-based counterparts, according to direct.

Statistics indicate:
- Core is close to direct
- Value-added is even more volatile than REITs
- Median returns close, around 2.5% QoQ
- All slightly negatively skewed
- All leptokurtic
Return Analysis: Risk Factors – Models

• Apply panel regression model
  • It allows taking advantage of both the time series and cross-sectional dimensions of the datasets
  • The specification we use also includes:
    • Random effects (Laird & Ware; 1982)
    • Residual autocorrelation structure

• Regress excess total returns on risk factors
  • Separately by real estate exposure
  • Controlling for:
    • Specific characteristics of investments (for non-listed and REITs)
    • Sectoral and geographic allocation
  • Alternatively with both desmoothed and original series (for direct and non-listed)
First of all, we test the relevance of using desmoothed series

- By comparing results obtained with each type of series
  - Original appraisal-based
  - Desmoothed appraisal-based
  - Transaction-based
- Only since 1994Q1 due to availability of transaction-based indices

In general, the same risk factors are identified for each type

- Most coefficients have same magnitude between original appraisal-based and transaction-based series
  - But the explanatory power is lower in the transaction-based model

In comparison, for model with desmoothed series:

- Slightly fewer coefficients are significant
- Coefficients usually have a greater magnitude, but are not necessarily significantly different
- The explanatory power is about the same as with transaction-based
Return Analysis: Risk Factors

Regarding models for all exposures over the whole period

• Differences across regions and sectors are observed but are not always the same for each exposure.

• For indirect exposures there is limited evidence of effect on returns for the following characteristics:
  • Size
    *The smallest core funds and REITs tend to underperform*
  • Leverage
    *Core and value-added funds with the lowest leverages tend to underperform*
  • PER
    *REITs with the high PER values tend to underperform*
Return Analysis: Risk Factors – (with desmoothed series)
Return Analysis: Risk Factors – (with non-desmoothed series)

- Direct
- Core
- Value-Added
- REITs
Return Analysis: VAR models

- We finally fit vector autoregressive (VAR) models in order to assess how each exposure is dynamically linked to others.

- We use an index by real estate exposure, which implies several adjustments:
  - Adjusting the property-type mix, both by geography and sector
  - Deleveraging indirect investments (core, value-added and REITs)
Return Analysis: VAR Models – IRF from REITs

- REITs
- Core Funds
- Direct
- Value-Added Funds

95% CI
Return Analysis: VAR Models – IRF from Direct

- REITs
- Core Funds
- Direct
- Value-Added Funds
Return Analysis: VAR Models – IRF from Core Funds

- REITs
- Core Funds
- Direct
- Value-Added Funds
Return Analysis: VAR Models – IRF from Value-Added Funds

- REITs
- Core Funds
- Direct
- Value-Added Funds
Conclusion

- Core funds react quite similarly as direct investments to risk factors, with some responses of greater magnitude.

- For these two exposures we observe the following significant impacts:

<table>
<thead>
<tr>
<th>Positive Impact</th>
<th>Negative Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP growth</td>
<td>Inflation surprise</td>
</tr>
<tr>
<td>(Expected inflation)</td>
<td>(Unemployment)</td>
</tr>
<tr>
<td>Money supply</td>
<td>(Term Spread)</td>
</tr>
<tr>
<td>Construction costs</td>
<td>Credit Spread</td>
</tr>
<tr>
<td>Leading Indicator</td>
<td>VIX</td>
</tr>
</tbody>
</table>

- Value-added funds and REITs react to only a few risk factors.
  - However responses have larger magnitude
  - REITs is particularly linked to stock market risk through VIX changes

- Models for desmoothed series usually identify fewer risk factors and have lower explanatory power.
Conclusion

- Linkages analysis shows that:
  - *Similarity between direct and core funds is verified*
  - *Shocks on REIT market propagate over all other exposures but value-added funds*
  - *Both core and value-added funds respond to changes in direct market*
  - *Movements in both non-listed markets are not propagated to direct and REIT markets*
Thank you for your attention