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Measuring the Risk of Unlisted Property Funds - A Forwards Looking Approach

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Research Questions and Motivations

- There continues to be knowledge gap in terms of quantifying and understanding risk in property portfolios and in particular leveraged property investments
- Unlisted property funds have become a significant conduit in the real estate investment landscape and so their performance and risk characteristics need to be well understood
- Purpose of this study is create a framework for quantifying the risk of these vehicles in the absence of the requisite time series data of historical fund performance
- Increasing regulatory (and in our case – client) requirements relating to risk measurement
- In the absence of significant historical time series data for the performance of unlisted property funds, forward looking simulation/monte carlo frameworks can be employed
- Direct property returns are known to be non-normal and we would expect this to be amplified for unlisted funds – rising interest costs, fund performance fees, and higher default probabilities which are all associated with higher leverage levels, will exacerbate asymmetries
- Key that risk measures account for non-normality and fat tails

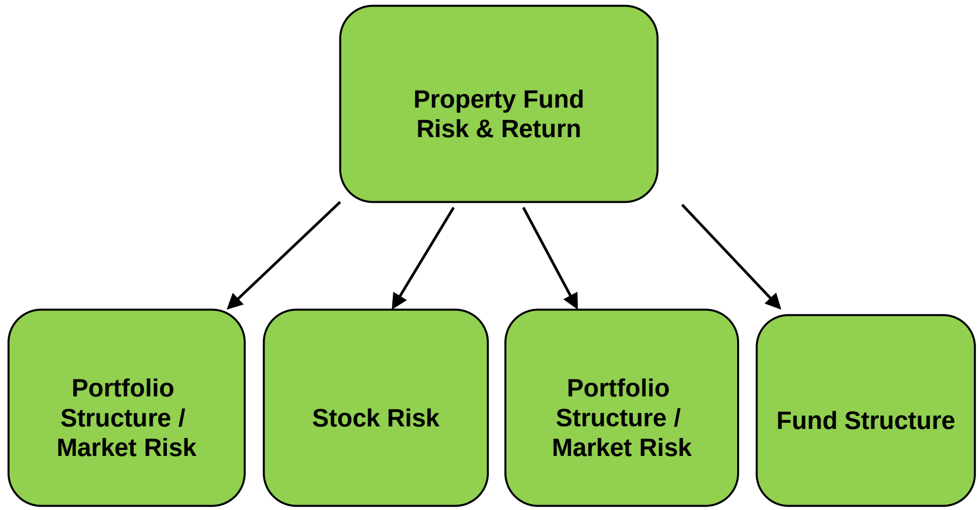
Sources of Risk and Return In Property Funds

- Market risk:
  - Allocations to more volatile sectors
  - Macro / supply risks
  - Transparency, property rights

- Stock risk:
  - Asset level (operating) leverage
  - Risk continuum from ground rents to speculative developments
  - Age, structure
  - Income quality

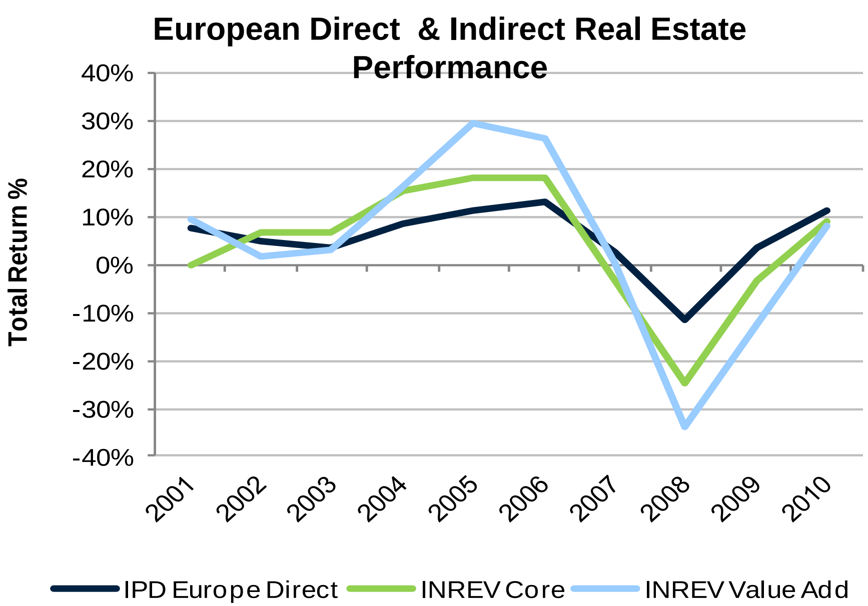
- Fund structure:
  - Financial leverage: floating rate/fixed rate debt, collateralization
  - Vehicle characteristics: age, structure, fees/costs (alignment), fiscal efficiency

- Accounting policy:
  - Treatment of items e.g. mark-to-market valuations of interest hedging instruments, costs incurred

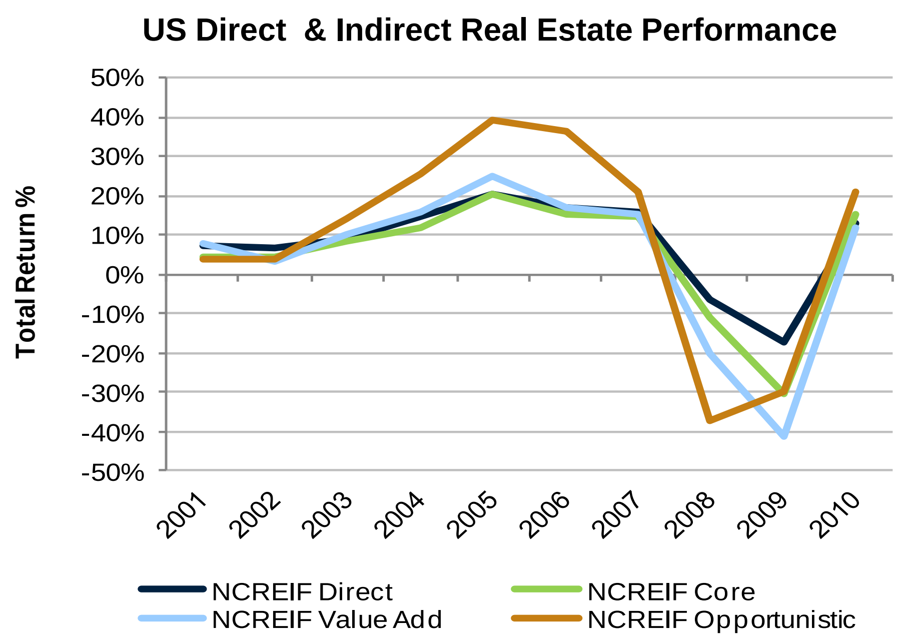


Impact of Sources of Risk Upon Property Fund Performance

- Property funds provide 'leveraged' direct property performance



Core beta: 1.7
Value Add beta: 2.4



Core beta: 1.3
Value Add beta: 1.7
Opportunistic beta: 2.1

Motivations For Employing Financial Leverage in Property Investments

- Return enhancement
- Shortage of equity
- Cost of capital
- Tax benefits – minimize leakage through the tax deductibility of interest
- What do the theories say:
  - Modigliani-Miller – no justification
  - Trade-off theory - optimal leverage level which maximizes return in presence of tax incidence
  - Pecking order – easier to raise debt capital than equity capital
  - Market timing – raise debt when debt is cheap and equity returns are attractive
  - Incentive theory – management motivated to grow business and enhance remuneration
  - Industry effects – herding towards industry average leverage levels

Current Literature

- Market Risk
  - Pai & Geltner (07) location (Tier I & III location performance differential), Fuerst & Matysiak (12) , Farrelly & Matysiak (12) - weighted direct market return, IPF (11) – UK region exposure, property type tracking error/concentration

- Stock risk – direct portfolio assets' characteristics
  - Yield : Fuerst & Marcato (09) high/low yield return differential, Bond & Mitchell (09) equivalent yield, IPF (11) relative equivalent yield, Farrelly & Matysiak (12) relative initial yield
  - Income: Pai & Geltner (07) - performance differential between assets with short/long ease lengths, IPF (11) - void rate, covenant strength, % income from top 10 tenants. Farrelly & Matysiak (12) % income from top 10 tenants
  - Development/Vacancy: IPF (11), Farrelly & Matysiak (12) void rate

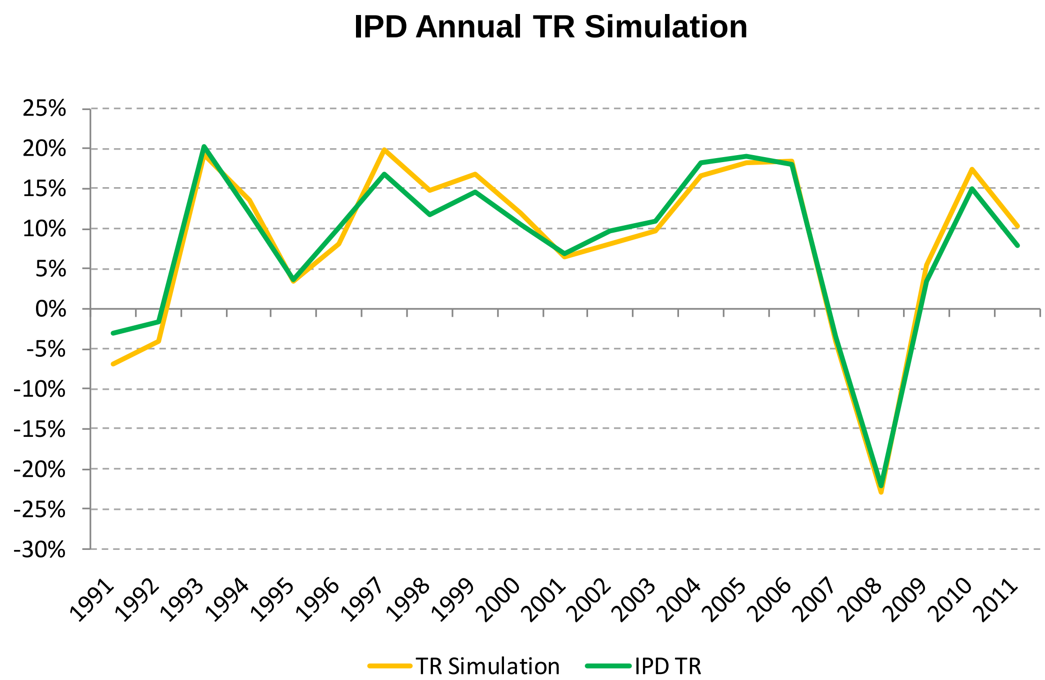
- Fund structure
  - Financial leverage: Fuerst & Matysiak (08), Marcato & Tira (10), IPF (11) all found financial leverage to be significant.
  - Farrelly & Matysiak (12) find asymmetric impacts of financial leverage upon fund performance in market downturns.
  - McDonald (1999) extended Cannaday & Yang's (96) DCF approach to estimating optimal leverage to include defaults
  - Tyrrell & Bostwick (05) used a mean variance optimization approach, De Franceso (07) includes interest rate correlations
  - Liquidity: Lee (00) found no evidence, Marcato & Tira (10) found evidence

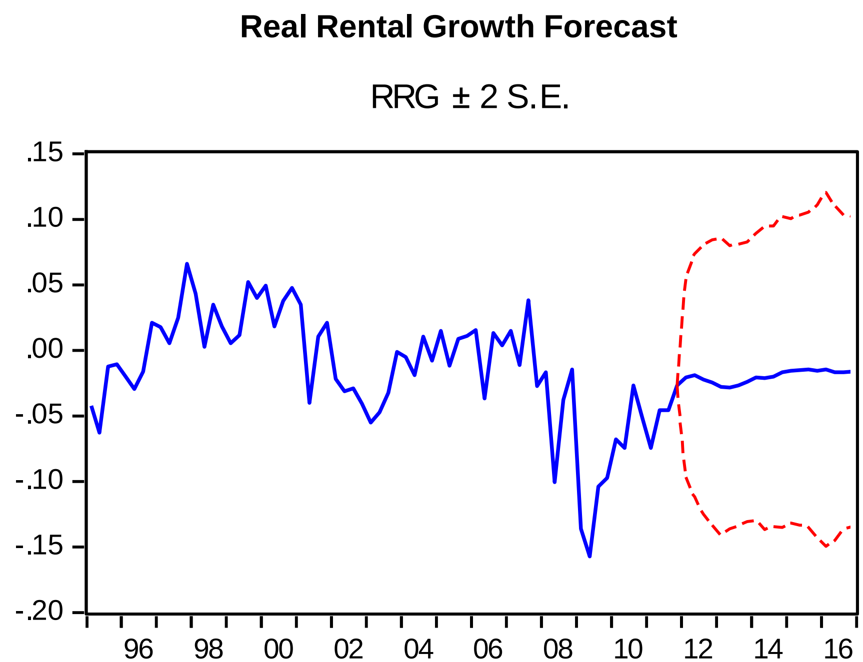
- Two closely related studies
  - Gordon & Tse (03): measured VaR of portfolio with differing leverage levels. Found the Sharpe ratio disguised the risks associated with high levels of leverage, recommend future research extends the analysis to account for normality
  - Hoorenman & van der Spek (2011): 20% LTV is optimal and beyond 40% is inefficient from a risk adjusted returns perspective. Negative probability IRR estimates suggest non-normality

Modelling Framework Used

- Hypothetical unlisted property fund return simulations are produced:
  - Created an a UK IPD Index replication model - similar vein to Schofield (1997)
  - Overlaid a fund structure: debt package (LTV covenant & cash sweeps), management and performance fees – 1.0% NAV AMC + 20% over 9% preferred return
  - An econometric model to provide the simulation inputs – namely rental growth, equivalent yields, voids, and interest rates
- Econometric model has a macroeconomic specification which is similar to Rudebusch and Svensson (1999). Outputs from this feed property variable equations – stochastic simulations created
  - Accelerationist Philips Curve – output shocks lead to permanent inflation adjustments and monetary policy impacts via output gap
  - Output gap driven by lags and temporary shifts in real interest rates. HP estimated output gap
  - Taylor rule based interest rate equation
  - Equivalent yield = f(Lag, output, real interest rate)
  - Real rental growth = f(Lag, output)
  - Estimation period 1990-2011, IPD Monthly data used for property variables

Simulation Outputs





Risk:Return Measures

- Absolute:
  - Volatility
  - (Normal) Value at Risk (VaR): how much can a portfolio's value decline with a given probability and investment horizon

$$VaR_p = \mu + z_p \sigma$$

- Modified Value at Risk (VaR): Uses a Cornish-Fisher expansion to include skewness and kurtosis in addition to the standard deviation:

$$MVaR_p = \mu + \left[z_p + \frac{1}{6}(z_p^2 - 1)S + \frac{1}{24}(z_p^3 - 3z_p)K - \frac{1}{36}(2z_p^3 - 5z_p)S^2 \right] \sigma$$

- Relative:
  - Tracking error: volatility of portfolio and benchmark return differential
  - Relative VaR: use portfolio relative returns – measures risk of underperformance and expected returns impact unlike tracking error

Results: Fixed (2%) Interest Rates

Loan-To-Value	0.0%	20.0%	40.0%	60.0%
Average Annual Total Return	6.9%	7.7%	8.5%	8.4%
Standard Deviation	10.3%	12.6%	16.4%	33.4%
Skew	-0.06	-0.20	-0.60	-3.53
Absolute Risk Measures				
Sharpe Ratio*	0.33	0.33	0.31	0.15
Normal VaR (95% confidence level)	-10.1%	-13.0%	-18.4%	-46.5%
Modified VaR (95% confidence level)	-10.2%	-13.6%	-20.6%	-58.9%
Modified Sharpe Ratio	0.34	0.31	0.24	0.08
Relative Risk Measures (Vs Direct Returns)				
Tracking Error	0.8%	0.8%	2.7%	12.3%
Benchmark VaR	-2.3%	-1.6%	-4.0%	-19.9%

*3.5% risk-free rate assumed

Results: Floating Interest Rates

Loan-To-Value	0.0%	20.0%	40.0%	60.0%
Average Annual Total Return	6.9%	7.6%	8.1%	7.6%
Standard Deviation	10.3%	12.7%	17.5%	37.3%
Skew	-0.06	-0.26	-0.98	-3.42
Absolute Risk Measures				
Sharpe Ratio*	0.33	0.32	0.26	0.17
Normal VaR (95% confidence level)	-10.1%	-13.3%	-20.7%	-53.8%
Modified VaR (95% confidence level)	-10.2%	-14.2%	-23.7%	-63.9%
Modified Sharpe Ratio	0.34	0.29	0.21	0.06
Relative Risk Measures (Vs Direct Returns)				
Tracking Error	0.8%	1.0%	3.4%	14.4%
Benchmark VaR	-2.3%	-2.1%	-5.3%	-24.1%

*3.5% risk-free rate assumed

Initial Conclusions From These First Steps

- Simulation framework provides a practical framework for assessing the risk arising from financial leverage and providing quantitative risk estimate
- In line with prior studies and real world observations – fund investments with LTV's beyond 40% do not provide attractive long-term risk adjusted returns
- Leverage impacts the risk profile by substantially increasing downside risk
- Necessitates the need for risk measures that account for higher statistical moments

Next steps:

- Improve macroeconometric specification and reflect asset risk
- Widen simulation framework to measure the impact of interest rate and mark-to-market adjustments – yield curve modelling/forecasting
- Make use of additional risk measures – e.g. CVaR
- Asset allocation implications of leveraged performance – downside based optimization

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