Discussion of “Very Long-Run Discount Rate”

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This Paper

- Estimate carefully the discount associated with homes with different lease terms.
- Being very intuitive in using these discount rates to estimate the term structure for the very long-run discount rate.
    - Inconsistent with constant discount rate model (Gordon model).
    - Inconsistent with a simple stochastic discount factor model.
    - Inconsistent with models that have upward sloping term structure for the long run risk.

Implications for the term structure

- Main puzzle:
  1. short-term return to housing at least 6.5 % (consistent with housing being a very risky asset)
  2. long-run discount rate for housing return should be much lower to be consistent with the estimated discount rates for different leaseholds.
- The result is only consistent with models that have downward sloping term structure.
  - Authors preferred solution: a mix of hyperbolic and exponential discounting
  - Another possible solution: mean reversion in housing returns (Lettau-Wachter framework)

Summary of the discussion

- Sample selection bias
  - both leaseholder liquidity constraint and lease extension fixed costs can result in positive correlation between property value and lease-term.
- The estimated discount rates are not necessarily a puzzle for a stochastic discount model.
  - in order to be a puzzle we need to assume both:
    1. low long-run house prices growth
    2. high risk premium for claims to long-run house prices.
- Leaseholds holdup problem can also result in a “downward sloping term structure”.

Sample selection bias

- In UK, you can extend your lease by 90 years. The cost for a 80.001 year leasehold is:
  - a fixed legal cost: £4,000-£5,000
  - a variable cost less than 2% of the property value.
- *Fixed cost of lease extension* $\longrightarrow$ *lease extension is relatively cheaper for more expensive houses.*
  - For an average flat in UK (£100,000) extension cost is about 7% of the value of the property.
  - For a £400,000 flat this cost is about 3% of the value of the property.
- Sample selection bias I: positive sorting into lease extension.
- A test for selection to lease length based on property value:
  - Estimate the discount between 80-100 year leasehold and 170-190 year leaseholds for different cities
  - estimate the relation between the estimated discount rate and city-average house prices.

Sample selection bias (continued)

- The estimated discount rate between a 80 year leasehold and 170 year leasehold is about 13%
  - For an average flat (£100,000) lease extension is a £6,000 arbitrage opportunity.
  - For an average flat in London (£400,000) lease extension is a £40,000 arbitrage opportunity.
- Question: Why there is such a huge arbitrage opportunity?
  - If the answer is that the seller is constrained, then this can result in further sample selection bias
- *liquidity constraint* ↗ *no lease extension* ↘ *lower value*; *liquidity constraint* ↘ *no remodeling* ↗ *lower value*
- Regression of rents on leaseholds (Table 3) does not address liquidity problem.

Let's go to the puzzle

- Let's keep the assumption that leaseholds and freeholds have the same flow of rent income during the leasehold period.
- Arbitrage equation:

$$\begin{aligned}\text{Freehold Price} &= \text{a T-maturity leasehold price} \\ &+ \text{present value of a freehold starting at time T.}\end{aligned}$$

$$Disc^T = \frac{E_t[P_T]/Pt}{R^f_{t,t+T} + RP_{t,t+T}}$$

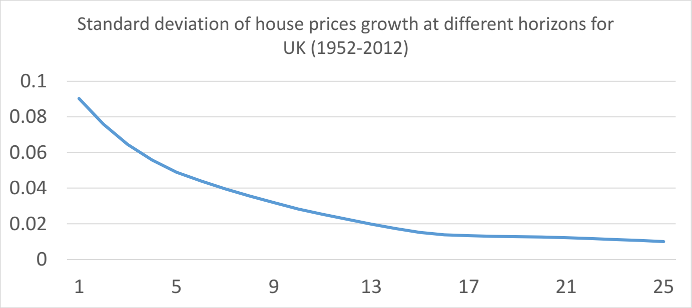
- This equation only requires:
    - risk free rate in long run
    - average house price growth in long-run
    - risk premium of long run house prices.

Long run house prices growth

- Historical data: 2.9% for UK (1952-2009) , 7.2% for Singapore (1975-2009)
  - It is possible that it is an overestimation of long run growth
- If housing supply is relatively inelastic (and constant share of housing expenditure): real house prices is co-integrated with consumption, GDP $=$ long-run growth $=$ 2%
  - Both Singapore and UK look inelastic (not only 70 years from now but also today)
  - We will check robustness to other values of house prices growth as well.

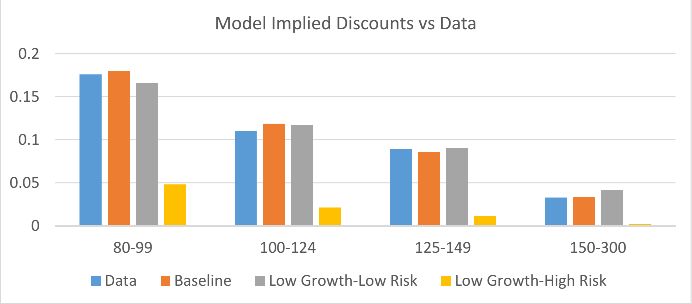
How risky are long run house prices?

- Let's look at the variance of annual house price growth rate from t to $t+T$ ($\frac{ln(hpi_{t+T}/hpi_t)}{T}$) for different values of T (similar to Cochrane JPE 1988).



- Downward sloping term structure or downward sloping risk?

Back to asset pricing



- Baseline: $hpg = 2\%$, $RP = 3.8\%$, $R^f = 1.4\%$
- Low Growth-Low Risk: $hpg = 0.7\%$, $RP = 2.3\%$, $R^f = 1.4\%$
- Low Growth-High Risk: $hpg = 0.7\%$, $RP = 4\%$, $R^f = 1.4\%$

What about high rates of return on housing?

Does high rate of return imply long-run house prices are risky?

- Median household moves every six years $\rightarrow$ The main risk is asset value risk in the short term.
  - From historical data, volatility of $g_{t,t+6}$ is at least five times larger than volatility of $g_{t,t+25}$.
- Housing is a very illiquid asset (6% transaction cost)
  - Even if housing is not risky, it should have a high return to compensate homeowners for its illiquidity / transaction cost (Kaplan and Violente 2010).

An alternative model of "downward sloping term structure"

- So far we assumed that rent incomes from a leasehold and rent incomes from a freehold are the same.
- However a hold-up problem can result in:

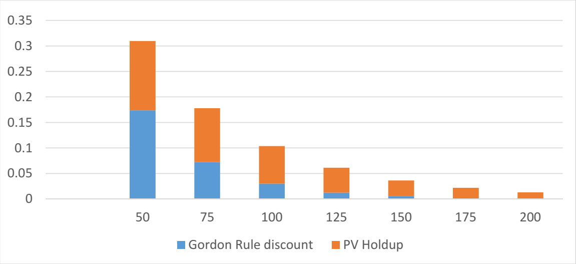
$$(Rent\ Leasehold)_t = (Rent\ Freehold)_t \times [1 - \alpha e^{-\gamma(T-t)}]$$

- Basically you don't remodel your kitchen if you know you won't be the owner of the home the next year.
- Then even assuming a constant rate of return for housing (r) and a constant growth rate for freehold rental income (g), leasehold discount is equal to:

$$\frac{P_t^T}{P_t} = \underbrace{\left(1 - e^{-(r-g)T}\right)}_{Gordon\ Formula} - \underbrace{\alpha \frac{r-g}{r-g-\delta}\left(e^{-\gamma T} - e^{-(r-g)T}\right)}_{Present\ Value\ of\ Hold-up}$$

The importance of holdup problem

- Present value of hold-up problem is a decreasing function of remaining years of lease.
- This result in shorter leaseholds being discounted faster than what Gordon Formula predicts.
- Hold-up problem can be quantified by extending the regression of rents for leases below 80 years.



$\alpha = 0.3,\ \gamma = 0.02,\ r = 4.5\%,\ g = 1\%$

Miscellaneous comments

- Almost all the asset pricing puzzles between a freehold and a 80 years leasehold exist between a 80 years leasehold and 150 years leasehold.
  - Within differences emphasis keeps paper more focused.
- Compute the discount between 80 year leasehold and 150 leasehold during a boom period and during a bust and see if they are different.
  - A robustness check for stochastic discount factor model.
- It is hard to reject even upward sloping term structure models if either rental income (relative to a freehold) or riskiness of housing capital gain is declining over time.
- Model needs representative agent to be hyperbolic and exponential discounting but individual agents to not

Conclusion

- This is a unique framework to quantify how long-run risk interacts with short-run risk in determining asset prices.
- Can't imagine a better setting (or data) to learn about how people value and form expectations about 200+ years from now
- Puzzle is very intriguing, but
- without putting some more structure on the data it is very hard to rule out other stories about the term structure.