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Principal Asset Management℠

PRINCIPAL REAL ESTATE

Using economic state models to assess the U.S. office outlook

INDRANEEL KARLEKAR, PH.D.
Senior Managing Director,
Global Head of Research &
Portfolio Strategies

ARMEL TRAORE DIT NIGNAN
Head of Real Estate
Data & Analytics

With support from:

Rahul Choudhury, Lead Consultant – Data Science
Abhijit Kulkarni, Principal Consultant – Data Science
Sandeep Saha, Consultant – Data Science
Jesse Waitman, Quantitative Developer

A complex and conflicting set of macroeconomic and capital market data has complicated forecasts for the U.S. economy. The Federal Reserve is actively slowing the economy through aggressive monetary policy tightening to offset a strong economy. The Treasury curve has been inverted for quite some time and the recent volatility in 10-year bonds has made the economic outlook murkier. Given the heterogeneity of real estate markets, this complicated setup has made the landscape challenging to navigate, even for the most seasoned strategists. Against this backdrop, economic state models can be powerful tools for investors seeking to formulate investment strategies in periods of uncertainty by systematically grouping real estate market cycles into discernable regimes potentially identifying actionable trends.

Executive summary

- Economic state models can yield hypotheses about economic behavior[1]. Using Bayesian probability frameworks, these models provide insights into current market conditions and potential paths forward.
- A key advantage of economic state models is in gauging relative relationships between different market states that can help provide market assumptions and potentially improve decision-making for investors.
- In the context of commercial real estate, economic state models can provide investors with empirical assumptions observed across different regimes. When combined within a probabilistic framework, it can allow investors to create a set of expectations and possible forward-looking strategies.
- In this paper we utilize a non-structural economic state model that utilizes key indicators including GDP, unemployment, interest rates, consumer price index, and real estate pricing to model the potential probability and impact of regime shifts on the U.S. office market.
- The findings from our economic state model suggest a cumulative value decline of approximately 42% for the U.S. national office market (based on the NPI appreciation index starting in Q2 2022) with a recovery likely to ensue from 2025.

[1] Ouliaris, Sam. IMF (2011). What are Economic Models. Retrieved from https://www.imf.org/external/pubs/ft/fandd/2011/06/basics.htm#:~:text=An%20economic%20model%20is%20a,objective%20measures%20of%20economic%20outcomes.

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Defining an economic state model

There are several approaches to modeling economic cycles: structural, non-structural, and large-scale models. Structural models are mostly based on economic theory while non-structural models are statistically driven and without pre-defined relationships. Large-scale models are hybrid models that combine the benefits of underlying economic theory (structural models) and build relationships among different key indicators using empirical data (non-structural models).

Economic state models are used in identifying shifting patterns of growth or transition from one set of conditions or "state" to another. In commercial real estate, economic state models can be used as another valuable tool for investors to (a) recognize cycles given market conditions and, (b) signal inflection points in demand cycles to potentially prepare for a shift from one state to another.

Our non-structural model uses empirical observations

In this paper, we provide investors with a framework for navigating real estate markets with the use of non-structural economic state models. These models provide a simplified view of the economy and real estate markets that helps understand current and future market conditions and can allow investors to formulate forward looking strategies using a probabilistic transition matrix derived from empirical observations. We also limited our model to the office sector since it encompasses a large set of heterogeneous characteristics and is currently in the eye of a storm given very weak operating fundamentals.

Since our economic state model focuses on commercial real estate, our inputs include supply and demand fundamentals, investment performance, NOI growth, working-age population growth, and treasury spreads. Using a clustering algorithm, we identified six regimes focusing on the U.S. office real estate market with data starting in 1990. The model relied on the following key indicators:

- Rent growth, vacancy rates, new supply as a percentage of stock, and new demand as a percentage of stock.
- NOI growth rates, appreciation, and income returns from the NCREIF National Property Index.
- Working-age population growth, the spread between the 10-year and the 2-year U.S. bond yields, and the spread between the 10-year bond yield and office cap rates from NCREIF.

Exhibit 1 below provides a breakdown of our regimes using average values from the key indicators above to describe U.S. office real estate markets:

EXHIBIT 1: Regime summary statistics, quarterly basis

Regime	New Demand as % of Stock	New Supply as % of stock	Working Age Population Growth	Rent Growth	Vacancy	NOI Growth (SAAR)	Appreciation Return	Income Return	Spread 10Y-2Y (Bps)	Spread Cap Rate - 10Y (Bps)
Regime 1	0.29%	0.47%	0.16%	1.48%	13.49%	1.83%	-2.19%	1.54%	-0.44%	5.95%
Regime 2	0.20%	0.31%	0.21%	-0.29%	15.49%	-0.06%	-1.55%	1.62%	1.76%	6.54%
Regime 3	0.29%	0.32%	0.21%	0.52%	13.78%	0.71%	0.15%	1.70%	0.60%	6.66%
Regime 4	0.21%	0.25%	0.22%	-0.49%	16.64%	-0.35%	-0.84%	1.72%	2.38%	6.96%
Regime 5	0.14%	0.32%	0.15%	0.06%	14.86%	0.69%	-0.04%	1.44%	1.22%	5.68%
Regime 6	0.58%	0.50%	0.24%	1.43%	12.31%	1.18%	1.67%	1.62%	0.15%	6.27%

Source: Principal Asset Management, September 2023

Each state represents a unique combination of market conditions and associated investment performance for U.S. national office market over the time horizon of our analysis, spanning four decades.

- Under the current state (Q2 2023), our analysis indicates that the U.S. office sector is in **Regime 1**, historically characterized by the worst appreciation returns, -2.19% (-8.48% on an annualized basis). This regime is more characteristic of a deep contraction, although it still has positive NOI and rent growth which is unusual for this stage in the cycle.
- Conversely, **Regime 6**, with the lowest vacancy rate (12.31%) among all regimes, and the highest appreciation rate, 1.67% (6.85% on an annualized basis) which is characteristic of an expansion for the U.S. national office sector in our analysis.

Insights into U.S. office based on our economic state model

To understand how U.S. office sector regimes may transition from one state to another, we use probability-based analysis to generate a matrix (Exhibit 2). These probabilities calculate the likelihood of transition from one state to the next within a single quarter based on the input variables described above. Each iteration represents a quarter: Iteration 1 is the first quarter ahead, Iteration 2, the second quarter ahead, and so on. Our model suggests:

- The probability that the U.S. office sector goes from Regime 1 to Regime 6 within the first quarter is zero while the probability of transitioning to Regime 3 is about 17%; and
- The probability that the U.S. office sector stays within Regime 1 during the same time (Iteration 1) is 83%.
- In the second iteration, which refers to the last quarter of 2023, the probability that the U.S. office sector remains in Regime 1 drops to 69% while the transition to Regime 3 moves to 24%.

EXHIBIT 2: Regime transition scenarios for U.S. office

	Regimes	Regime 1	Regime 2	Regime 3	Regime 4	Regime 5	Regime 6
Q3 2023	1	83%	0%	17%	0%	0%	0%
	2	0%	58%	0%	17%	25%	0%
	3	0%	4%	60%	0%	16%	20%
	4	0%	16%	0%	84%	0%	0%
	5	0%	23%	23%	0%	55%	0%
	6	6%	0%	13%	0%	0%	81%
Q4 2023	1	69%	1%	24%	0%	3%	3%
	2	0%	42%	6%	24%	28%	0%
	3	1%	8%	42%	1%	19%	28%
	4	0%	23%	0%	73%	4%	0%
	5	0%	27%	26%	4%	39%	5%
	6	11%	1%	19%	0%	2%	68%

Source: Principal Asset Management, September 2023

By repeating this process over multiple iterations, we get to a point where there is no more change in the probability distribution, indicating an equilibrium state where the odds of moving from one state to the other are stationary. In considering six regimes for our study of the U.S. office sector, we reach equilibrium after nine quarters with the probability of remaining in Regime 1 dropping to 24%, followed by the probability to transition from Regime 1 to Regime 3 or Regime 6, indicating improved market conditions, standing respectively at 26% and 23%.

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Using our model to forecast office performance

An additional benefit of economic state models is their ability to forecast expected returns for the U.S. office sector. By employing the transition matrix in conjunction with the annual appreciation returns associated with each regime, we estimated expected annual appreciation returns for the NPI U.S. office index using two transition paths as illustrated in the table below.

EXHIBIT 3: Potential office value drawdown

Most likely path

	Current Regime	Q3 '23	Q4 '23	Q1 '24	Q2 '24	Q3 '24	Q4 '24	Q1 '25	Q2 '25	Q3 '25
Regimes	Regime 1	Regime 1	Regime 1	Regime 1	Regime 1	Regime 1	Regime 1	Regime 1	Regime 1	Regime 3
Transition probabillities		83.33%	69.44%	58.09%	48.89%	41.47%	35.52%	30.73%	26.89%	26.30%
Annualized return		-8.48%	-8.48%	-8.48%	-8.48%	-8.48%	-8.48%	-8.48%	-8.48%	0.60%
Expected return		-7.06%	-5.89%	-4.92%	-4.14%	-3.52%	-3.01%	-2.61%	-2.28%	0.16%
									Cumulative return	**-42%**

Source: Principal Asset Management, September 2023

This relatively simple approach allows us to derive key takeaways for U.S. office sector.

- Following the most likely path scenario depicted above, which is based on the highest transition probability of each regime along the path, we'd expect the U.S. office national sector to continue to face headwinds for at least the next two years and crossing positive territory only in the third quarter of 2025.
- Using historical measure to and the performance associated with this scenario, the estimated cumulative value decline for U.S. office market starting in Q2 2022 would be around 42% for the index.

It is important to recognize that the use of economic state models in forecasting forward-looking returns is limited by their heavy reliance on historical patterns. As such, caution should be exercised in times of unprecedented changes in the market like what we've seen in the U.S. office sector. We should also note that there is an appreciable lag between the index and the "spot" transaction market which is already suggesting material price dislocation in the office sector. Therefore, given well documented appraisal lags in private markets, our estimate may never be realized within the index but is likely to be recognized in transaction data.

Conclusion

Economic state models are valuable in providing investors with a systemic way to gauge the state of the economy, and perhaps more importantly, a path forward especially in times of uncertainty. Employing the transition matrix in conjunction with annual appreciation returns associated with each regime can help investors extrapolate expected annual returns over their forecast horizon. Economic state models are also a valuable tool for investors seeking a framework to methodically analyze dynamics between macroeconomic indicators and local market trends, as well as anticipate changes in real estate cycles and formulate better-informed strategies.

Applying our non-structural economic state model to the office sector, we conclude a difficult period lies ahead. While this will be challenging to navigate, it could also offer investors confidence, and decision-making tools as well as a potential time frame to deploy capital in the office sector with input from potential outcomes using an economic state model.

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