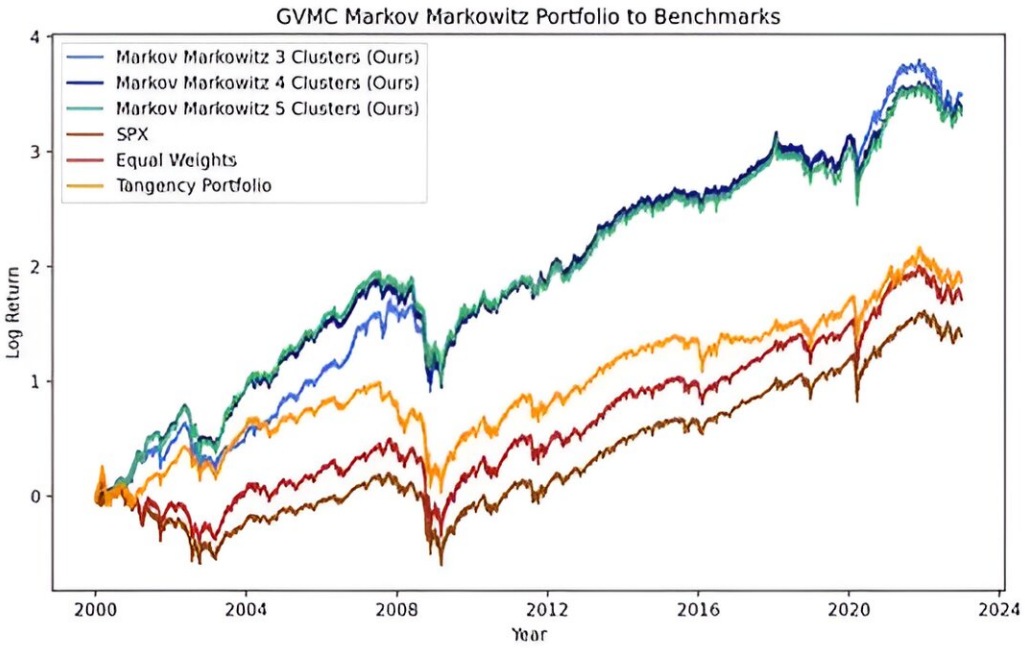
Researchers develop new method of modeling market regimes using efficient frontier information

November 21 2023



Performance of the novel Markov Markowitz portfolio with 3–5 clusters as compared to benchmarks when run on the Growth, Value, Market Cap (GVMC) asset data out-of-sample from 2000–2022. The novel models labeled "Ours" all outperform the benchmarks. Credit: Nolan Alexander et al.

Financial markets often undergo changing regimes or states, where

environments can be significantly different from one another. Various models have attempted to capture the dynamics of these regimes, but exhibit poor performance when tested on unfamiliar data.

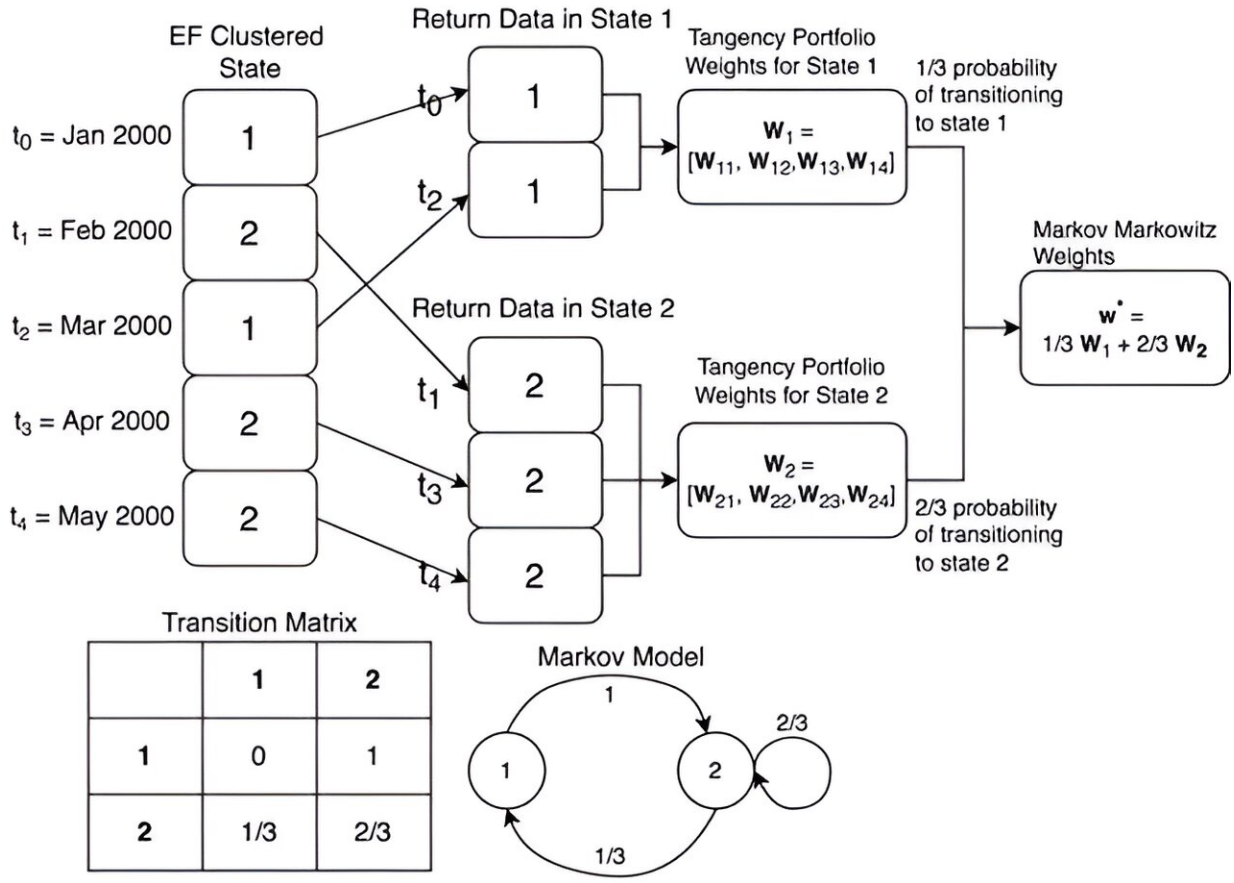
In a study published in *The Journal of Finance and Data Science*, a team of researchers in the US developed a novel method to model market regime dynamics and construct portfolios with significant out-of-sample performance compared to benchmarks.

"To define the market states, we used efficient frontiers, which are trade-off curves constructed when optimizing portfolios that maximize expected return and minimize volatility," explained first and corresponding author of the study, Nolan Alexander. "These efficient frontiers can be decomposed to their functional form, which are defined by three coefficients."

These states then followed a Markov process—a model where the probability of transitioning to one state given the current state is the historical proportion of that same transition.

"To develop a portfolio using this Markov model, we computed portfolio-optimized weights for each state that are each calculated using only data in that state," said Alexander. "Then, the weights are aggregated [and] weighted by the probability of transitioning to each state."

"The proposed model is more interpretable than standard regime shifting Hidden Markov Models (HMM)," added Alexander. "A significant limitation with HMMs is the lack of interpretability due to the states being hidden."



	1	2
1	0	1
2	1/3	2/3

In this example, there are only two states, five months of data, and four assets. Given that the last state is state 2, the probability of transitioning to state 1 is 1/3 and the probability of transitioning to state 2 is 2/3. The tangency portfolios for each state is calculated using only data within that state, and the final portfolio is an aggregation of these state tangency portfolio, weighted by the state transition probabilities: 1/3 and 2/3. Credit: Nolan Alexander et al

As the team's proposed model uses observable states, observing intermediate components of the model to better understand how it determines the final weights is now possible.

"We found that among each of the universes, there exists multiple bull market states, with one significantly more likely to transition to a bear

market than the others," said Alexander.

"Additionally, we found that for the universes that partition the US stock market, when in the bearish state, are more likely to recur than transition to any other state. However, this recurrence property does not hold for the Developed Markets universe."

More information: Nolan Alexander et al, Asset Allocation Using a Markov Process of Clustered Efficient Frontier Coefficients States, *The Journal of Finance and Data Science* (2023). DOI: 10.1016/j.jfds.2023.100110

Provided by KeAi Communications Co.