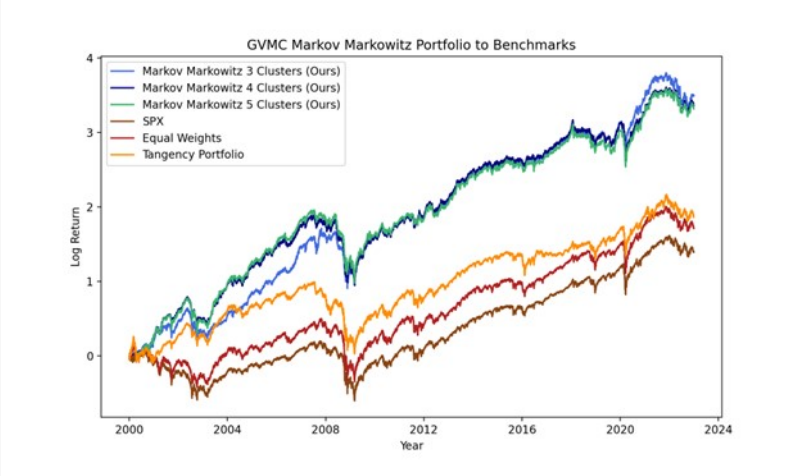
New Method of Modeling Market Regimes Using Efficient Frontier Information

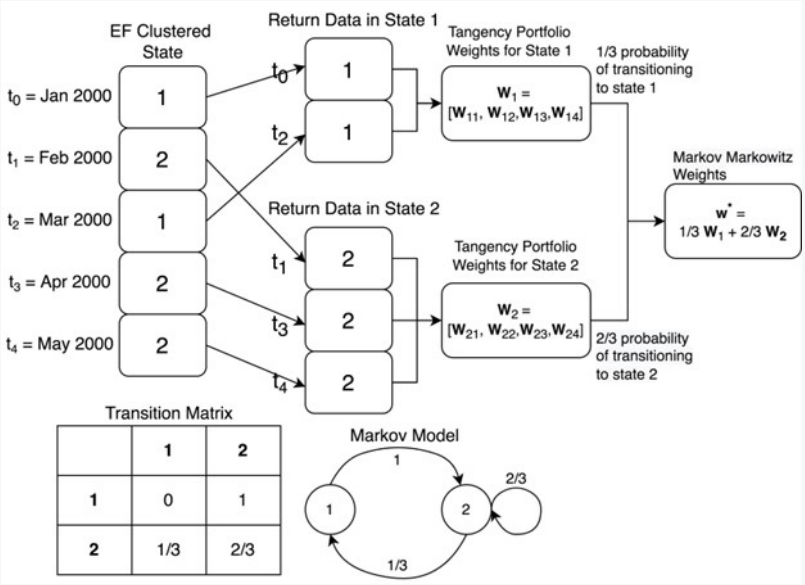
CHINA, November 27, 2023 /EINPresswire.com/ -- We developed a novel model that defines Markov market states using efficient frontier coefficients. Efficient frontiers can be defined by three functional coefficients. We cluster these coefficients to define market states that follow a Markov process, and develop portfolios from this process. We find that our model outperforms benchmarks when run on three different asset universes. We found that there generally exist four states: two bull markets, one bear market, and one neutral market.

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 (Figure 1).



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.



A visualization of a simple example of the proposed Markov Markowitz Model.

“To define the market states, we used

efficient frontiers, which are tradeoff 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 historically 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 weighted by the probability of transitioning to each state."

A simplified example of this method is shown in Figure 2.

"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."

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," shared 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."

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