RHODES CAPITAL FUND

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Our Values

Mission

- Achieve long-term value for our clients' investments, always in a very safe way, such that our clients can stay confident allocating their wealth with us

Vision

- Invest with integrity and respect
- Limit the risks
- Full Transparency
- Motivation, Knowledge and Passion

Investment Philosophy and Approach (I)

The mean-variance optimization problem leads to sub-optimal results when using the standard sample-based variance-covariance matrix

Problems using the sample covariance matrix

- **Linear dependence** between assets
- It has **high estimation error** that leads to extremely wrong 'optimal' weights
- **Diversification** effects disappear

How do we solve this issues?

- Consider the **non-linearity** of the dependence between the assets in the portfolio
- Introduce a **new restriction** in the optimization problem
- Reduce the left-tail dependence

The outcome of our model

- The portfolio does not suffer from bad surprises during **black swans**
- **Better risk-adjusted performance** than the sample-based portfolio
- Preferable portfolio allocations for a **risk-averse** investor

Competitive Advantage

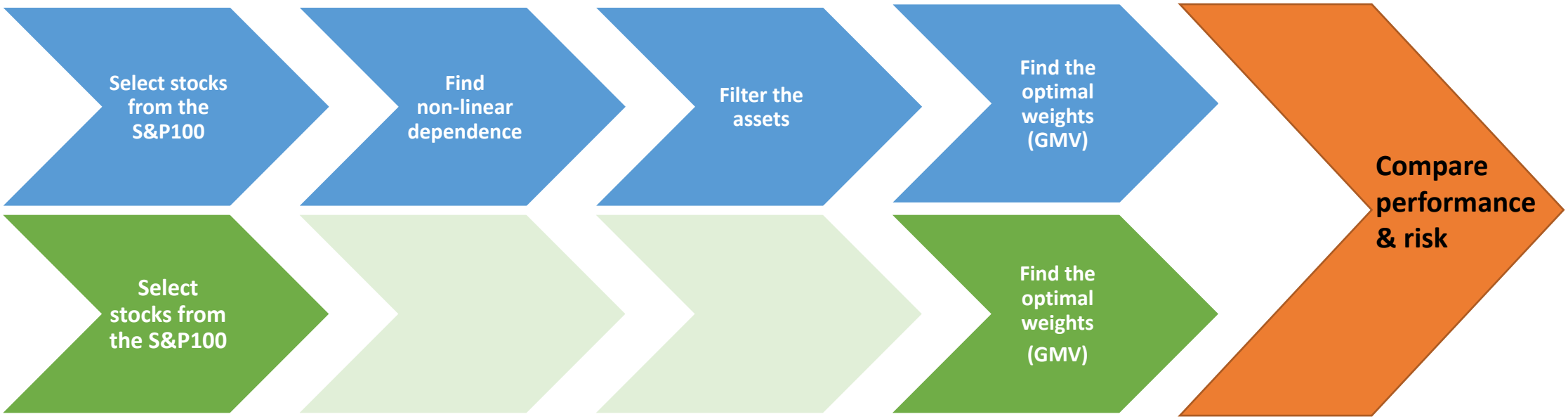
Existent frameworks that address the same issues

- **Ledoit and Wolf:** Shrink the covariance matrix using a constant-correlation matrix
- **Goto and Xu:** Use a sparse covariance matrix to reduce the high estimation error
- **Jagannathan and Ma:** Impose the no-short-sales constraint to the optimization problem

*Why does our model **differ** from all these already existing models?*

- We carefully look at the **joint behavior** of the assets in the portfolio
- It is more intuitive and it has "**economic sense**"
- Our focus is on **avoiding big losses** in the crisis periods
- We also reduce estimation error of the parameters computing the optimal weights of the Global Minimum Variance

Investment Philosophy and Approach (II)



Investment Strategy (I)

Technical explanation

STEP 1

We select a portfolio with n assets

STEP 2

Construct a nxn matrix **A** with the cross-asset Spearmans' ρ

$$\mathbf{A} = \begin{bmatrix} & \cdots & & \cdots & \\ \cdots & & \cdots & & \cdots \\ & \cdots & & \cdots & \\ \cdots & & \cdots & & \cdots \\ & \cdots & & \cdots & \end{bmatrix}$$

STEP 3

Matrix **B**: Sort the column vectors v_i of A from highest ($\rho_{i,1}^{1}$) to lowest ($\rho_{j,1}^{k}$), taking off $\rho_{i,i}$, for $i = 1, \ldots, n$

$$\mathbf{B} = \begin{bmatrix} & \cdots & \\ \cdots & & \cdots \\ & \cdots & \end{bmatrix}$$

Intuitive explanation

STEP 1

We select a portfolio with n assets

STEP 2

Analyse the rank correlation between the assets

STEP 3

For each asset, sort the values of the rank correlations of the assets with all the other assets

Investment Strategy (II)

Technical explanation

STEP 4

For each v_i , select first x values (from ρ_i^1 to ρ_i^x) and compute the mean

$$\bar{v}_i = \frac{1}{x}\sum_{y=1}^{x} \rho_i^y$$

where x is a chosen threshold

B =

$$\begin{bmatrix} & \cdots & \\ \cdots & & \cdots \\ & \cdots & \\ \cdots & & \cdots \\ & \cdots & \end{bmatrix}$$

STEP 6

Construct the 1xn vector $\bar{\boldsymbol{v}}$ by the sorting the means $\bar{v}_i$

$\bar{v}_i^1$ is the highest $\bar{v}_i$

$\bar{v}_i^s$ is the lowest $\bar{v}_i$

$\bar{\boldsymbol{v}} = (\bar{v}_i^1 \ldots \bar{v}_i^j \ldots \bar{v}_i^s)$

Choose the first m values $(\bar{v}_i^1 \ldots \bar{v}_i^m)$

STEP 7

The assets associated with these $\bar{v}_i^1, \ldots, \bar{v}_i^m$ values are the ones deleted from the sample

Intuitive explanation

STEP 4

For each asset, select rank correlations above a threshold and look at the average rank correlation

STEP 6

Choose the assets that have the highest rank correlation in its highest values

STEP 7

Get rid of these assets and compute optimal weights of the portfolio

Performance and Risk (I)

- **Descriptive Statistics**

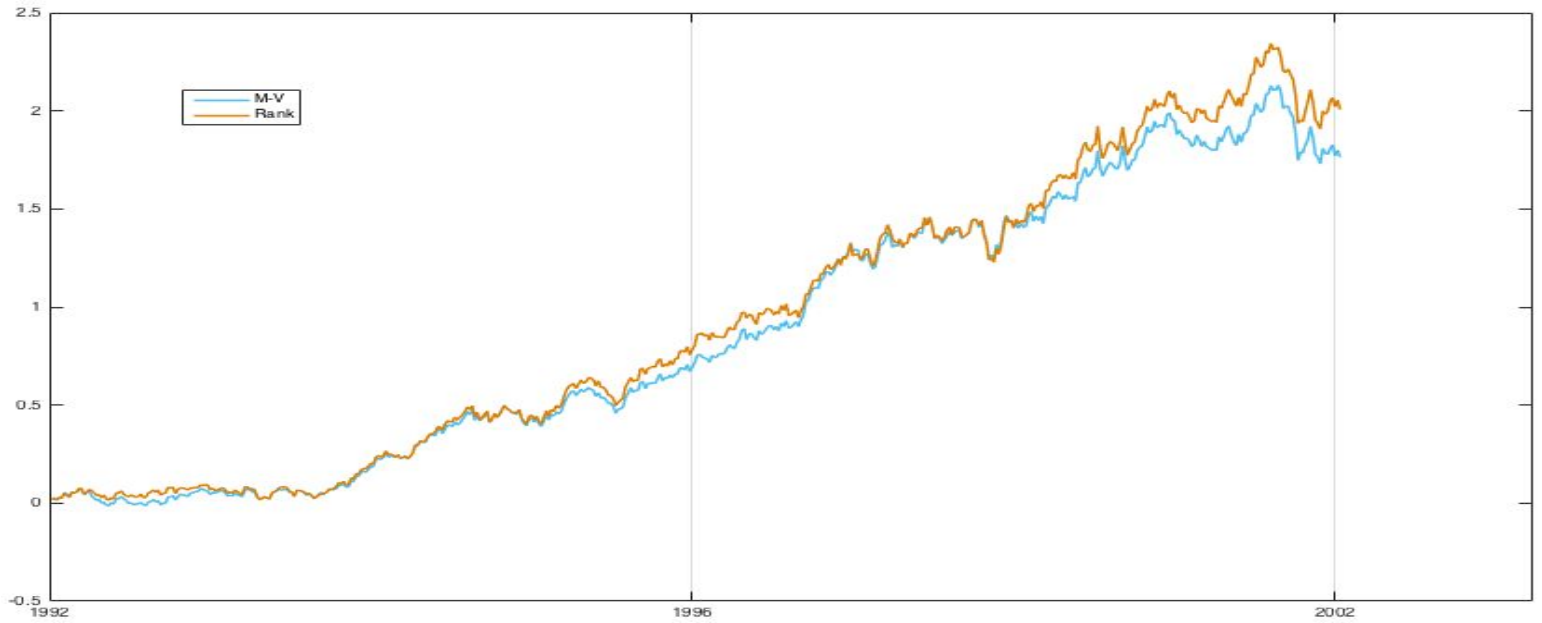
Dec 1992 - Nov 2002	S&P 100
Annualized Return	17.82%
Annualized Volatility	17.67%
Skewness	-0.57
Kurtosis	5.11
VaR at 5 %	-13.00%
Tail dependence (worst 10 weeks)	91.83%
Average correlation	9.87%

- Weekly S&P100 index for the period 12/01/1992 – 12/01/2002
- Data taken from DATASTREAM
- High left-tail dependence

Performance and Risk (II)

- **Out-of-sample results with no rebalancing**

April 1994 - Nov 2002	MV (without rebalancing)	Rhodes (without rebalancing)
Annualized Return	11.30%	12.35%
Annualized Volatility	9.40%	10.03%
Skewness	-0.167	-0.15
Kurtosis	2.91	3.15



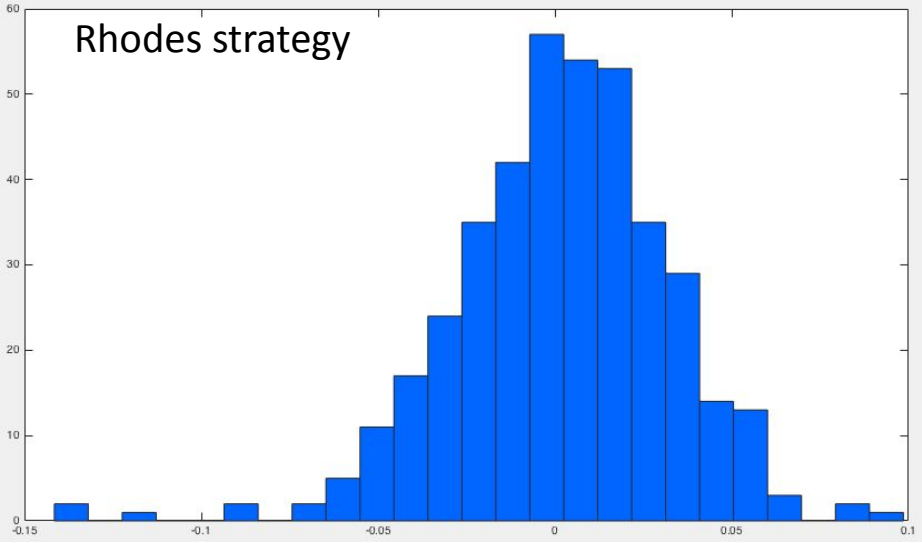
- The Sharpe ratio of our strategy is higher than the benchmark
- Higher cumulative return for our strategy

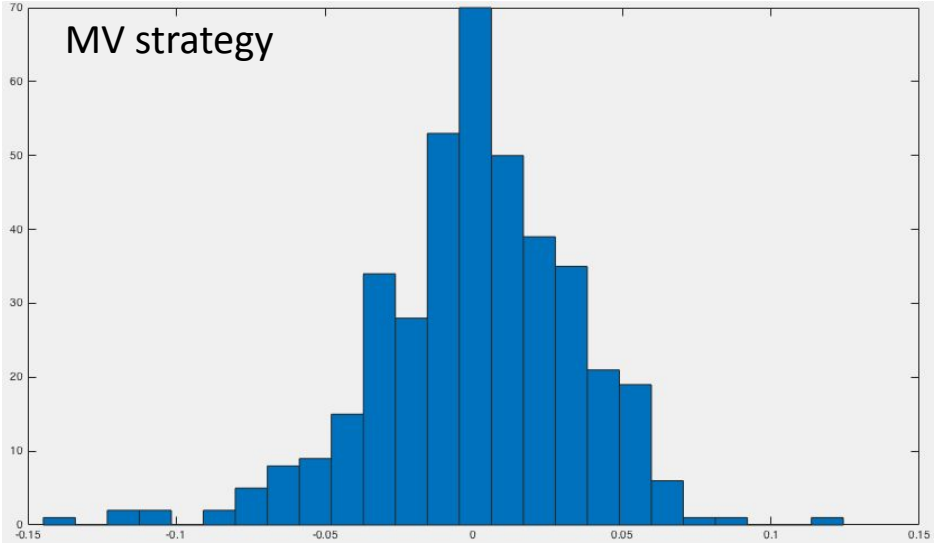
Performance and Risk (III)

- **Descriptive Statistics**

April 1994 - Nov 2002	S&P 100	Rhodes (rebalancing)	MV (rebalancing)
Annualized Return	8.08%	9.72%	4.02%
Annualized Volatility	32.90%	22.26%	24.43%
Skewness	1.2822	-0.28	-0.512
Kurtosis	7.87	4.86	4.5
VaR at 5 %	-40.70%	-4.61%	-5.80%
ES	-49.47%	-6.20%	-8.70%
Tail dependence (worst 10 weeks)	91.95%	83.60%	91.87%

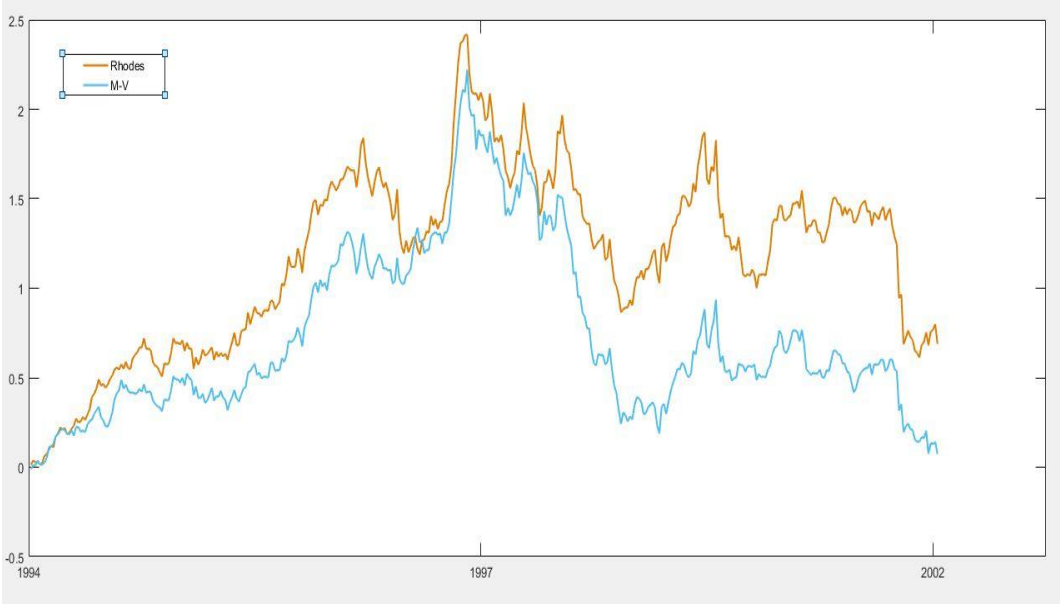
- Higher returns/lower risk
- Consistently lower risk than the benchmark
- Lowered tail dependence by almost 9%



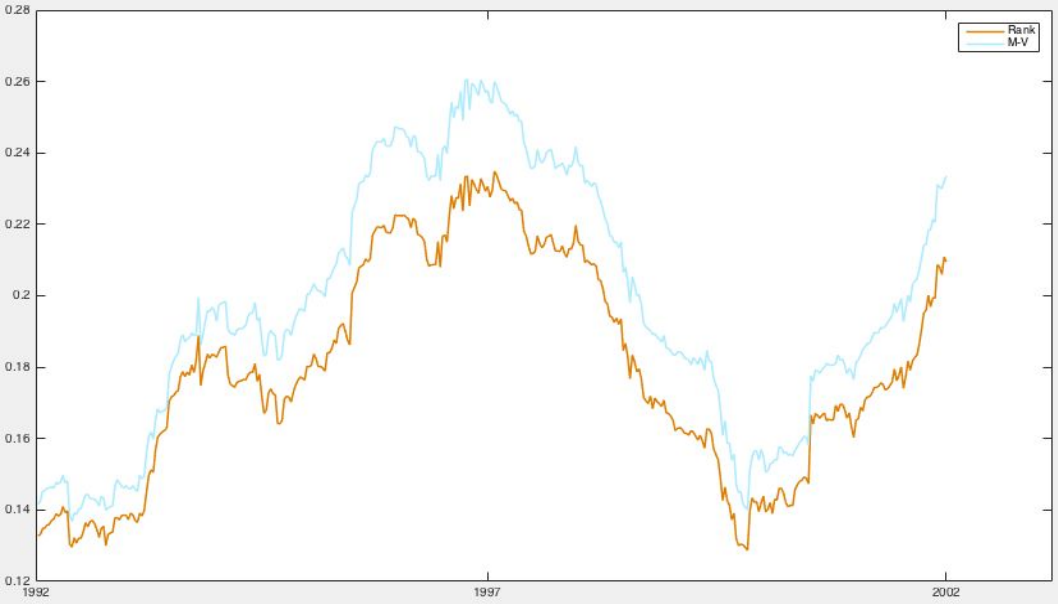


Performance and Risk (IV)

Cumulative returns of M-V and Rhodes portfolios



Correlations of M-V and Rhodes with rebalancing



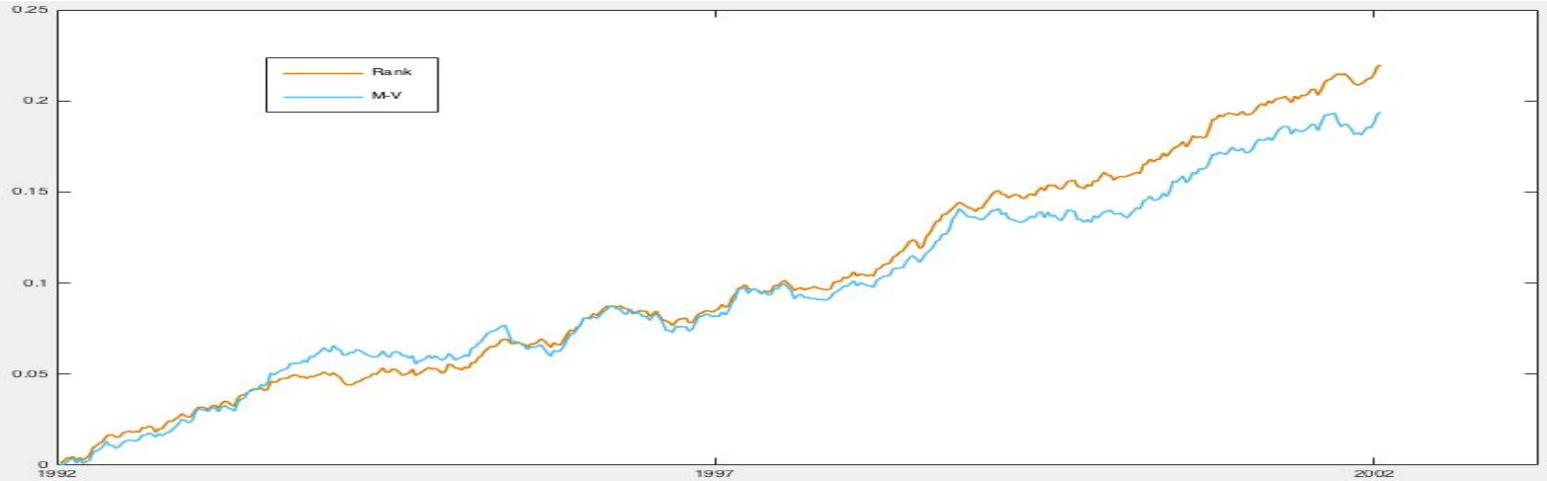
- The cumulative returns of our strategy are higher
- The average correlation of the fund is always lower than the benchmark

Performance and Risk (V)

- **Monte Carlo Simulations**

April 1994 - Nov 2002	Simulated data	Rhodes (simulated data)	MV (simulated data)
Annualized Return	10.08%	2.60%	2.32%
Annualized Volatility	7.55%	1.05%	2.26%
Skewness	1.33	0.113	-0.034
Kurtosis	5.36	2.89	2.91
Max Drawdown	-7.39%	-1.15%	-3.68%
VaR at 5 %	-8.20%	-4.24%	-7.23%
ES	-10.20%	-5.23%	-8.53%
Tail dependence (worst 10 weeks)	90.88%	78.82%	87.88%

Cumulative returns of M-V and Rhodes portfolios with simulated paths



- The returns are higher and the volatility is lower for our strategy
- Our strategy is safer, we grealty reduced the losses in the worst periods

RHODES CAPITAL FUND, in brief words

- The aim of Rhodes Fund is to provide investors with a low risk portfolio by adding a non-linear dependence innovation in the Markowitz mean-variance optimization
- The outcome is a portfolio less sensitive to dependence between the assets
- Our results verify the improvements in risk management and portfolio allocation