Random Portfolios – an introduction

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Why would you want a random portfolio?

A few questions which random portfolios can help with:

How effective is my risk model? Measuring the accuracy of risk forecasts over a large number of portfolios gives one good metric, but how to create these portfolios?

How good was my performance given the constraints under which I operate?

Given I would like to get a tracking error around 2%, what constraints would be effective?

Where’s the problem?

Surely generating random portfolios is simple? Just pick stocks and weights at random and scale them to add up to 100%.

The problem comes in that we don’t want our portfolios to be completely random: the weights should look “reasonable” (where we could define reasonable as “something that a PM wouldn’t mind buying). So ideally we have to be able to impose constraints on the solution.

Also, we want to ensure that we have sampled the space of possible portfolios in a uniform fashion, or at least with a distribution that we know is “spread out”.

A brief review

There are few papers that really investigate the approaches to generating random portfolios.

What papers there are seem to have completely different approaches – genetic algorithms, random walks …

Below we highlight two of the methods chosen by authors not speaking this evening.

Scowcroft & Sefton – Stratified Sampling

Algorithm

Given we want *n* final portfolios with *p* assets in each, create a list of assets which is the benchmark index replicated sufficient times to have more than *n*p* assets.

Multiply each weight in the list by a random percentage

Shuffle the list

For each asset in the list

- Add to the first portfolio where the asset doesn't already exist and the number of assets is less than p

Rebalance all the portfolios to 100%

Scowcroft & Sefton – Stratified Sampling

Suppose we require three portfolios with two assets in each. The following chart shows how the assets are allocated.

	Portfolio 1	Portfolio 2	Portfolio 3
Asset 1	●		
Asset 2	●	●	
Asset 3		●	●
Asset 4			●

It is possible to add some constraints on the weights. The advantages of this method are that the number of names is controlled, but no guarantee of the distribution of the weights.

James – Random Walks in Portfolio Space

Algorithm:

For each portfolio required

Starting from a cap weighted list. Pick a value for δ (say 0.1 basis point)

Repeat 100,000 times

Randomly select an asset, Asset 1, in the list with non-zero weight.

Subtract d = MAX (δ, existing weight of Asset 1) from Asset 1's weight

Select another asset, Asset 2, in list with non-zero weight

Add d to Asset 2's weight

Benefits

Simple, shouldn't have a bias

Problems

Can't control for the number of assets, nor easily impose constraints

References

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Neutral	**Hold/Neutral**	36%	36%
Sell	**Sell**	8%	20%
UBS Short-Term Rating	**Rating Category**	**Coverage[3]**	**IB Services[4]**
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Sell	**Sell**	less than 1%	50%

1:Percentage of companies under coverage globally within the 12-month rating category.
2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.
3:Percentage of companies under coverage globally within the Short-Term rating category.
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Definitions & exceptions

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