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Technical article

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Firm-wide risk management for funds

While there has been considerable research on risk management for fund portfolios, there is scant information on managing the risk of an entire fund management company. Chris Marrison suggests a solution

Asset managers must control risks for both their fundholders and shareholders. For fundholders, risk arises simply from changes in the value of the fund. For shareholders, risk arises from volatility in the net cashflow, which is driven by fee structures, fund values, customer behaviour and cost structure. To measure the risk to fundholders, asset managers are now adopting the value-at-risk tools developed by banks. A similar approach is needed to measure the risk to shareholders.

This article offers a methodology for measuring risk for asset managers at the institutional level, rather than at the fund level. This is useful in guiding senior management in the mixture of funds they choose to promote, as well as the fee and cost structures used. It also gives a measure of which funds are giving the greatest risk-adjusted contribution to the profitability of the asset management company.

Value volatility versus earnings volatility

VAR methodology calculates changes in the net present value of a portfolio. This can give a good measure of the value changes caused by both short-term and long-term events. However, it requires that the cashflows in the portfolio be well structured. For corporations and asset managers, their value is in their earnings stream. Changes in the net present value of this stream are very sensitive to the discount rates chosen to cover such items as operating risk. A more practical approach is to measure earnings volatility, typically with a one-year horizon.

All other things being equal, for a given level of earnings, shareholders are willing to pay more for a company that has stable earnings than for a company with volatile earnings. This relationship between price and volatility is illustrated in figure 1, which shows data from first-quarter 2000 for 10 large publicly traded asset management companies.

Along the x-axis, there is the standard deviation of earnings divided by average earnings. Along the y-axis, there is the price/earnings ratio. The figure shows that as the volatility increases, the price falls. The message for the chief executive officer (CEO) of an asset management firm is simple: if you want your stock price to go up, you can either increase earnings or reduce earnings volatility.

Management of earnings volatility for asset management

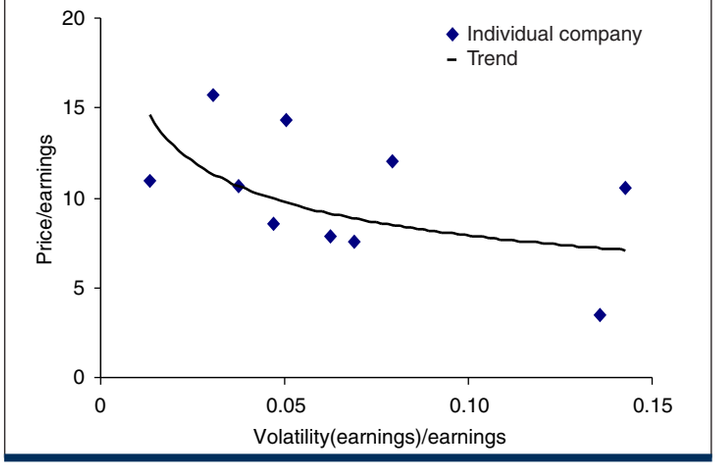
While it is apparent that combining high earnings with low volatility ought to be the goal of any CEO, there are practical difficulties in measuring and managing the risk. The task is less straightforward than for a bank's proprietary trading desk. A bank has the comparative luxury of a high degree of autonomy and liquidity in managing its risk exposure. As a result, a trading desk at a bank that identifies a high VAR level has two choices that it can act upon. The first would be to recognise its exposure to a high VAR level and accept the trade-off that it is making between this and the expectation of generating commensurately high returns. The second would be to acknowledge that its VAR signals an uncomfortably high exposure, which it could reduce either by selling positions or hedging.

For asset managers acting as custodians of third-party funds, the management of earnings risk is less straightforward, but there are effective ways in which they can reduce high levels of earnings volatility.

The first of these is to modify the mix of funds within the institution's suite of products. Obviously, an institution managing only funds linked to Nasdaq will be exposed to much higher earnings volatilities than one which runs a mix of funds, eg, Nasdaq, high-yield bonds and European equities. By diversifying their family of funds, asset management companies can expect to reduce the cumulative volatility of their institutional earnings. In part, this is because maintaining a diversified suite of funds can act as a natural hedge for asset management companies. In depressed markets, for example, customers reducing their holdings in volatile products may switch into more defensive ones such as money market or government bond funds. Most large asset management companies do diversify their business mix based on the business sense of senior managers, but until now there have been no tools to quantify the trade-offs and guide management to the optimum earnings mix.

A second approach would be to alter the fee structure – probably on a fund-by-fund basis. This would be especially applicable to asset management companies with mandates that inescapably steer them towards more volatile markets. An asset management company tying its fee structure exclusively to its total assets under management (AUM) leaves itself exposed to market volatility in two ways. First, its fee income will generally rise (or fall) with the performance of the market. Second, its overall fee income will typically fall with market downturns if customer redemptions rise more quickly in depressed markets than in buoyant ones. Asset management companies can protect themselves against cycles of this kind by adapting their fee structures to reduce the volatility of their revenue. For example, this could be achieved by increasing the fee levels for investors in very volatile funds, by charging entry and exit fees to

1. Relationship between price and earnings volatility



compensate for the costs associated with customer redemptions, or by shifting away from fees based on AUM and towards fixed fees.

Given that an asset management company's earnings are defined as its income minus its costs, a third way of reducing earnings volatility is to refine the company's broader cost structure. This refinement will ensure that, during periods of reduced earnings, the costs are also reduced, for example, by linking vendors' fees to AUM.

Volatility could also be reduced by tying fees to performance relative to a benchmark. If the benchmark is chosen well, the fees should depend on the performance of the manager rather than the performance of the market, thereby producing fees that are uncorrelated with earnings from the rest of the institution.

Finally, the institution could hedge its net earnings stream by selling derivatives whose payments are linked to market levels. However, there is the possibility that this may be perceived by customers as reducing the manager's incentive to perform well.

All these strategies are used by asset management companies based on the management's intuition. This article gives management a methodology for quantifying the effectiveness of each strategy.

Risk-adjusted profitability measurement

Risk measurement allows us to calculate risk-adjusted performance for the institution. It also allows us to measure each business unit's contribution to the institution's earnings, as well as the 'damage' it contributes to earnings volatility. Risk-adjusted performance can be used to guide business development efforts and may even be linked to an individual fund manager's compensation. The fund manager could be rewarded for achieving the optimum balance of maximising earnings for the institution and minimising earnings volatility.

We can define three risk measures for earnings:

- Worst probable case (WPC).
- Earnings volatility ratio (EVR).
- Earnings added (EA).

The 95% WPC is how bad the annual earnings could be in one in 20 years.[1] It is well approximated as the expected earnings minus 1.64 standard deviations of earnings uncertainty[2]:

$$95\%\text{WPC} = \bar{E} - 1.64\sigma_E$$

The earnings volatility ratio is simply the earnings divided by the earnings volatility:

$$\text{EVR} = \frac{E}{\sigma_E}$$

The earnings added requires that we define a hurdle rate, H, for required earnings for any given level of volatility. The hurdle rate is set by management. It could, for example, be defined as the average earnings volatility ratio of the institution, or it could be defined from the price/earnings ratio in figure 1. The hurdle rate can be interpreted as the minimum acceptable earnings volatility ratio. The required earnings is the earnings volatility times the hurdle rate:

$$\text{Required earnings} = H \times \sigma_E$$

The EA is then the actual earnings minus the required earnings:

$$\text{EA} = E - H \times \sigma_E$$

Calculation of earnings volatility

Each of the metrics requires that we calculate the earnings volatility, σ_E. To explain the methodology for calculating earnings volatility, we start with a simplified model. If an institution had fixed costs, C, and the fee structure was 1% of AUM, then the earnings would be the fees minus costs:

$$E = 1\%\text{AUM} - C$$

AUM is the product of the net asset value (NAV) and the number of assets, A. Therefore, we can express earnings as follows:

$$E = 1\% \times A \times \text{NAV} - C$$

If we assume the number of assets is fixed, then for this simple case the volatility of earnings depends only on the volatility of NAV:

$$\sigma_E = 1\% \times A \times 0.6 \times \sigma_{\text{NAV}}$$

Here, σ_{NAV} is the annual standard deviation of the Net Asset Value. The factor of 0.6 converts from year-end volatility to an average yearly volatility. This is used because fee income is typically based on the average AUM over the year, not just the value on the last day.

For this simple case, we have the three performance metrics for the institution as a whole:

Worst probable case $\quad 95\%\text{WPC} = \bar{E} - 1.64 \times 1\% \times A \times 0.6 \times \sigma_{\text{NAV}}$

Earnings volatility ratio $\quad \text{EVR} = \dfrac{E}{1\% \times A \times 0.6 \times \sigma_{\text{NAV}}}$

Earnings added $\quad \text{EA} = E - H \times 1\% \times A \times 0.6 \times \sigma_{\text{NAV}}$

A more general earnings volatility model for less simple cases is developed in the appendix.

[1] *The confidence level chosen should be meaningful to management. For example, a 99% worst probable case would indicate a one in 100-year loss, which is not intuitively meaningful to most managers*

[2] *Assuming a Gaussian distribution, 1.64 corresponds to the 95th percentile*

Calculation of volatility contributions

So far we have discussed the earnings volatility for the institution as a whole. This is interesting, but it is not a great guide to management. We need an approach to break out the risk and allocate it to individual business lines. This can be done using the value-at-risk contribution (VARC) approach. This allows us to split the risk between two business units, as follows:

$$\sigma_{E_T} = \sigma c_{E_1} + \sigma c_{E_2}$$

Here, σ_{E_T} is the standard deviation of earnings for the total institution, and σc_{E_1} and σc_{E_2} are the volatility contributions from each fund. The calculation of the contributions is based on the correlation between the funds. The calculation of volatility contribution for multiple funds is given in the appendix. Here we show the simple case of an institution with two funds. The standard deviation of the sum of two funds is given by either of the following:

$$\sigma_{E_T}^2 = \sigma_{E_1}^2 + 2\rho_{E_1,E_2}\sigma_{E_1}\sigma_{E_2} + \sigma_{E_2}^2$$

$$\sigma_{E_T}^2 = \sigma_{E_1}\left(\sigma_{E_1} + \rho_{E_1,E_2}\sigma_{E_2}\right) + \sigma_{E_2}\left(\sigma_{E_2} + \rho_{E_1,E_2}\sigma_{E_1}\right)$$

Here, σ_{E_1} and σ_{E_2} are the standard deviations of earnings from funds one and two and ρ_{E_1,E_2} is the correlation between the funds. We define the contribution of an individual fund as follows:

$$\sigma c_{E_1} = \sigma_{E_1}\left(\frac{\sigma_{E_1} + \rho_{E_1,E_2}\sigma_{E_2}}{\sigma_{E_T}}\right)$$

This has the property that the earnings volatility contributions add up to the earnings volatility for the total institution, as we required:

$$\sigma_{E_T} = \sigma c_{E_1} + \sigma c_{E_2}$$

We now have the amount of volatility contributed by each business unit to the institution's overall risk. This allows us to calculate business-level performance metrics:

Contribution to worst case

$$95\%\text{WPCC}_i = \bar{E}_i - 1.64\sigma c_{E_i}$$

Earnings volatility contribution ratio

$$\text{EVCR}_i = \frac{E_i}{\sigma c_{E_i}}$$

Earnings added contribution

$$\text{EAC}_i = E_i - H \times \sigma c_{E_i}$$

Figure 2 shows the earnings added contribution for each of the 260 separate funds managed by one institution. The first 50 funds add a high amount of earnings for the volatility they cause. The last 160 funds do not add significantly to the expected earnings, but do contribute a large amount to the earnings volatility, therefore their earnings added contribution is below zero. The funds with the greatest negative contribution clearly require management attention.

Conclusions

By measuring risk at an institutional level, asset management companies can reduce their earnings volatility and increase their share price. Those that do so will enjoy substantial competitive advantages once rigorous analysis of earnings volatility becomes the rule rather than the exception. □

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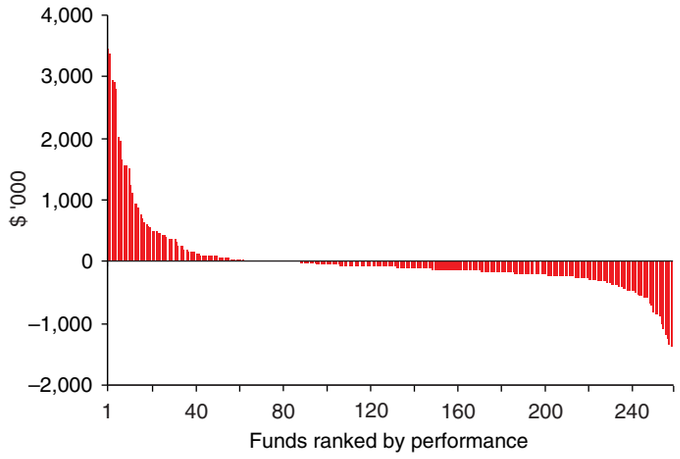
2. Earnings added by each of the institution's funds



Appendix. General models

□ **A general model for earnings volatility.** The simple example given in the main text assumes there is a single fund with a basic fee and cost structure. A more realistic earnings model would have multiple funds and include fees driven by injections or redemptions, and costs that vary with assets under management (AUM), and other costs that are not correlated with AUM:

$$E_T = \sum_i \left[a_i\,\text{AUM}_i + b_i R_i + c_i I_i - d_i\,\text{AUM}_i - e_i\right]$$

Here, E_T is the total earnings of the institution, i represents business unit i, AUM_i are the assets under management, R_i represents the redemptions, I_i stands for the injections, and a_i, b_i and c_i are the associated fees. d_i represents the costs that scale with AUM (eg, vendor fees) and e_i represents the other costs not tied to AUM. The earnings volatility for the whole institution is then given by:

$$\sigma_{E_T} = \sqrt{\text{ACA}^T}$$

A is the vector of standard deviations for each element and C is the correlation matrix.

□ **A general model for volatility contribution.** In the body of the text, we derived the volatility contribution for two funds. Here, we describe the approach for multiple funds. From the equation above, we have the following:

$$\sigma_{E_T}^2 = \text{ACA}^T$$

This can be re-expressed as:

$$\sigma_{E_T}^2 = A_1\text{CA}^T + A_2\text{CA}^T + \ldots + A_N\text{CA}^T$$

$$\sigma_{E_T} = \frac{A_1\text{CA}^T}{\sigma_{E_T}} + \frac{A_2\text{CA}^T}{\sigma_{E_T}} + \ldots + \frac{A_N\text{CA}^T}{\sigma_{E_T}}$$

Here, the volatility vector A is as before. A_i is the volatility vector with all the elements zeroed out, except for business unit i. We can then define the earnings volatility contribution of business unit i to be σc_{E_i}:

$$\sigma c_{Ei} = \frac{A_i\text{CA}^T}{\sigma_{E_T}}$$

This gives us the volatility contributed by each business unit to the institution's overall risk and allows us to calculate business-level performance metrics: worst probable case contribution, earnings ratio and earnings added contribution.