Which Shock Drives the Volatility Anomaly?

Cash Flow Versus Discount Rate

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Two Shocks: Cash Flow Versus Discount Rate

The dividend discount model says that

$$p_t = \sum_{s=1}^{\infty} \frac{d_{t+s}}{1 + r_{t+s}},$$

and intuitively, **the stock price increases as the future cash flow increases or the future discount rate decreases**, and so does the return.

$$r_{t+1} = \frac{d_{t+1} - \left(p_t - \sum_{s=2}^{\infty} \frac{d_{t+s}}{1+r_{t+s}}\right)}{p_t - \sum_{s=2}^{\infty} \frac{d_{t+s}}{1+r_{t+s}}}$$

$$\Rightarrow \frac{\partial r_{t+1}}{\partial d_{t+s}} = \frac{d_{t+1}}{\left(p_t - \sum_{s=2}^{\infty} \frac{d_{t+s}}{1+r_{t+s}}\right)^2 (1 + r_{t+s})} > 0$$

$$\Rightarrow \frac{\partial r_{t+1}}{\partial r_{t+s}} = - \frac{d_{t+1} d_{t+s}}{\left(p_t - \sum_{s=2}^{\infty} \frac{d_{t+s}}{1+r_{t+s}}\right)^2 (1 + r_{t+s})^2} < 0.$$

Econometric Applications

Researchers have investigated the relative importance of these two shocks by log-linearizing some equations and introducing a few econometric methods.

- Campbell (1991) decomposes the two shocks from aggregate returns using Campbell-Shiller difference equation.
- Vuolteenaho (2002) decomposes the two shocks from individual returns using the clean surplus accounting equation.
- Callen and Segal (2004) extends Vuolteenaho's research using Feltham–Ohlson relations.

So researchers can extract unobservable cash flow and discount rate shocks from observable data with these linearized variations.

Reported Findings

In the past, people just thought that cash flow shocks rather than discount rate counterparts drive returns without clear evidence.

- Campbell and his folks, however, found that returns at an aggregate level are largely driven by discount rate shocks.
- On the other hand, Vuolteenaho, one of Campbell's folks, reported that cash flow shocks rather than discount rate counterparts mostly drive returns at an individual level.
- One important thing among his major findings is that **cash flow shocks are greatly washed away at a portfolio**, while discount rate shocks are not.

These researchers also explained why CAPM is unsuccessful in explaining size and book-to-market anomalies using cash flow and discount rate shocks of aggregate and individual returns.

Volatility Anomaly

Many theorists articulated in the past that idiosyncratic volatilities may not be priced or be at least positively priced assuming rational investors (e.g. CAPM, ICAPM, etc.).

- Surprisingly, according to Ang et al. (2006), it is exactly the opposite in reality—idiosyncratic volatilities are "negatively" priced. **Why do investors value high-vol stocks and compensate for low-vol counterparts?**
- Researchers have rationalized this anomaly based on
  - Mismeasured volatilities
  - Short-term return reversals
  - Investors' skewness (or maxing-out) preference
  - Investor sentiment
  - Liquidity
  - Arbitrage asymmetry

My First Year Paper

As returns consist of cash flow and discount rate shocks, volatilities correspondingly consist of three pieces.

- Variance of cash flow shocks
- Variance of discount rate shocks
- **Covariance of cash flow and discount rate shocks**

and in my first year paper I found that only the volatilities due to cash flow shocks—i.e. the first piece—are negatively priced. One problem is that I must introduce a multivariate GARCH, which is computationally expensive, to compute the third piece together. The result of my first year paper relies on a univariate GARCH instead.

My Questions

If the researchers are right, then why don't investors value the second and third pieces?

- Do they cherry-pick cash flow volatilities, while don't care about discount rate volatilities?
- Do they only appreciate skewed cash flow shocks? Why don't they appreciate skewed discount rate shocks then?
- If investors prefer volatilities at the cross-section of stocks due to the aforementioned reasons, then is the volatility anomaly consistent at the cross-section of portfolios?

Or another story is that **investors for some reasons only value (or misprice) cash flow volatilities**, and hence value high-vol stocks due to their high cash flow volatilities, while don't value high-vol portfolios because their cash flow volatilities are diversified away.

Checklists

For example, if investors prefer high-vol stocks to low-vol counterparts because of their lottery-like payoffs, then due to the same reason they will also prefer

- High-vol portfolios to low-vol counterparts
- Stocks with high discount rate volatilities—**my first year paper shows that it's not in reality.**
- Stocks whose cash flow and discount rate shocks are negatively correlated

If these are not the case, then

1. **Cash flow shocks may be skewed enough**, while discount rate shocks may not (new evidence, need to further check if it is different at an aggregate level)
2. Because investors pursue lottery-like payoffs, **they only appreciate cash flow volatilities**