Abstract

We develop a volatility decomposition derived from flexible and robust local projections to quantify the relative contributions of expected discount rates and cash flows to the variation of dividend yields. Local projections enable the incorporation of large information sets, the use of monthly data along with annual data, and to consider time variation in the volatility decomposition. While the variation of expected discount rates remains the dominant contributor to market volatility, we find that the contribution of expected cash flows is non-negligible when moving beyond the standard model with the dividend yield as the single state variable.

Methodology

Campbell-Shiller (1988) log-linear present value model:

\[ dp_t = E_t \sum_{j=1}^{k} \rho_j^{-1} r_{t+j} - E_t \sum_{j=1}^{k} \rho_j^{-1} \Delta d_{t+j} + E_t \rho^k dp_{t+k} \]

\[ \equiv \delta_t^{(r,k)} - \delta_t^{(d,k)} + \delta_t^{(dp,k)} \]

Dividend yield \( dp_t \) has three components: (i) expected returns \( \delta_t^{(r,k)} \), (ii) expected dividend growth \( \delta_t^{(d,k)} \), (iii) expected dividend yield \( \delta_t^{(dp,k)} \).

Objective: measure relative importance of expected discount rate and cash flow variation, at different horizons \( k \):

\[ \sigma_{(d,r)}^{(k)} = \frac{\text{Std}(\delta_t^{(d,k)})}{\text{Std}(\delta_t^{(r,k)})} \]

Conventional VAR approach: estimate \( \delta_t^{(r,k)} \) and \( \delta_t^{(d,k)} \) by extrapolating expectations from VAR. E.g. Cochrane (2008): \( \sigma_{(d,r)}^{(k)} \approx 0 \), for long horizons \( k \).

Is all volatility due to variation of discount rates or is VAR a poor model for dividend expectations?

This paper: Local projections (Jordà, 2005) – Horizon-specific regressions:

\[ \sum_{j=1}^{k} \rho_j^{-1} r_{t+j} = \alpha_t^{(r,k)} + X_t^{(r,k)} \beta_t^{(r,k)} + \epsilon_t^{(r,k)} \]

\[ \sum_{j=1}^{k} \rho_j^{-1} \Delta d_{t+j} = \alpha_t^{(d,k)} + X_t^{(d,k)} \beta_t^{(d,k)} + \epsilon_t^{(d,k)} \]

\[ \rho^k dp_{t+k} = \alpha_t^{(dp,k)} + X_t^{(dp,k)} \beta_t^{(dp,k)} + \epsilon_t^{(dp,k)} \]

Possible to select state variables \( X_t \) locally at horizon of interest. Allows for time-varying parameters.

Estimate \( \delta_t^{(r,k)}, \delta_t^{(d,k)} \) and \( \delta_t^{(dp,k)} \) as the fitted values of local projections, for different state variables \( X_t \).

Empirical results

Single state variable: \( X_t = dp_t \). For \( k = 15 \) years, almost all variation is discount rate variation, \( \sigma_{(d,r)}^{(15\text{years})} = 0.10 \):

Three state variables: \( X_t = (r_t, \Delta d_t, dp_t) \). Larger role for expected cash flows, \( \sigma_{(d,r)}^{(15\text{years})} = 0.27 \):

LASSO: select \( X_t \) from large set of possible state variables, \( \sigma_{(d,r)}^{(15\text{years})} = 0.50 \).

Time-varying volatility decomposition: Cash flows at times dominate discount rates. \( \sigma_{t,(d,r)}^{(180\text{months})} \) from recursively estimated local projections:

Conclusion

Static models with a single state variable suggest that discount rates are the only determinant of market volatility. After allowing for time-varying parameters and/or state variables beyond the lagged dividend yield, cash flow expectations emerge as a significant contributor to volatility.