Discussion of:

Predictable Price Pressure

by

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NBER Asset Pricing - November 2021

This Paper

- Show that anticipated demand/supply shocks generate price pressure.
- Return on aggregate market is high on days where aggregate dividend payments are large. Reinvestment of dividends → Demand shock.
  - Return is higher by 6bps for each of top fifty dividend-payment days in a year.
  - High return during payment day and next few days. Slow and partial reversal.
  - Effect holds internationally.
  - Effect is smaller towards end of year, when mutual funds pay out dividends as cash rather than reinvesting them.
  - Effect is larger when VIX is higher.
- Return on firms with large stock grants to employees is low on days after earning announcements. Employees allowed to sell → Supply shock.
  - Return is -120bps for firms above 95% percentile of stock grants.
- Price multiplier implied by dividend reinvestment effect is between 1.5-2.3.

Comments

- Round-trip arbitrage and transaction costs.
- Trade-timing arbitrage and bird-in-the-hand effect.
- Price multipliers (a.k.a. price impact, Kyle's lambda) of anticipated and unanticipated shocks.
  - Model and comparative statics.
  - Quantification.
- Related papers.

Round-Trip Arbitrage and Transaction Costs

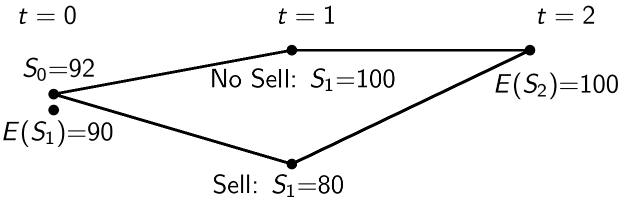
- Can dividend reinvestment effect be turned into profitable trading strategy?
  - Commission for S&P 500 futures is 0.25bps and price impact for a $100M order is 1.25bps.
    `https://www.cmegroup.com/trading/equity-index/report-a-cost-comparison-of-futures-and-etfs.html`
  - $\rightarrow$ Round-trip cost is 3bps.
  - $\rightarrow$ Profit is 3bps (=6-3) for each of top fifty dividend-payment days.
  - $\rightarrow$ Return during the year is 150bps. Relatively small.
- Stock grant effect seems more profitable.

Trade-Timing Arbitrage and the Bird-in-the-Hand Effect

- Transaction costs weaken round-trip arbitrage but not trade-timing arbitrage.
- Trade-timing arbitrage:
  - Market order to buy S&P 500 on day before large aggregate dividend payment.
  - Why should a trader take other side rather than wait to sell at higher price on the next day?
  - $\rightarrow$ Price should not be rising predictably.

Bird-in-the-Hand Effect.

- Why should a trader buy ahead of a large sell order, rather than wait to buy at a lower price when sell order materializes?
- Answer:
  - Current price has dropped in anticipation of sell order.
  - $\rightarrow$ Buying asset offers an attractive long-run return.
  - Waiting to buy at a lower price risks that attractive return may disappear.
- Example from Vayanos-Woolley (RFS 2013, VW):



  - Buy at $t = 0 \rightarrow$ lock-in expected return of 8.
  - Buy at $t = 1 \rightarrow$ Gamble for expected return of 20 or 0.
- Anticipated demand/supply shocks in VW generate return momentum.

Price Multipliers of Anticipated and Unanticipated Shocks

- Why do anticipated shocks impact prices?
- What drives their price multiplier?
- How does their price multiplier compare to that of anticipated shocks?
- Two approaches:
  - Traders do not anticipate shocks $\rightarrow$ Price multiplier is same as for unanticipated shocks.
  - Traders anticipate shocks $\rightarrow$ **This discussion.**

Model

- Discrete time $t = 0, 1, \ldots$.

- Constant riskless rate r.

- Risky asset pays dividend d_t at time t and is in supply of $\theta > 0$ shares. Dividend follows random walk

$$d_{t+1} = d_t + \epsilon_{d,t+1},$$

where $\epsilon_{d,t} \sim \mathcal{N}(0, \sigma_d^2)$ and independent across periods.

- Competitive investor with CARA utility over intertemporal consumption

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \exp(-\alpha c_t - \beta t).$$

- At time $t_0 > 0$, anticipated supply shock of u shares, where $u \sim \mathcal{N}(\bar{u}, \sigma_u^2)$.

- Supply shock reverts to zero at rate κ_u.

No Supply Shock

- Set $\bar{u} = \sigma_u = 0$.

- Investor's value function is

$$-\exp(-AW_t - B),$$

where $A = \frac{r\alpha}{1+r}$ and B is a constant.

- Price of risky asset is

$$S_t = \frac{d_t}{r} - Z.$$

- Expected return of risky asset in excess of riskless asset is

$$\mathbb{E}_t(R_{t+1}) = \mathbb{E}_t\left(d_{t+1} + S_{t+1} - (1+r)S_t\right) = rZ = A\theta\frac{(1+r)^2}{r^2}\sigma_d^2.$$

Expected excess return is positive and constant over time.

Supply Shock – Dynamics After the Shock

- Shock at time $t \geq t_0$ is $u_t = (1-\kappa_u)^{t-t_0} u$.

- Investor's value function for $t \geq t_0$ is

$$-\exp(-AW_t - B - B_u u_t - B_{uu} u_t^2),$$

  where (A, B) are as before and (B_u, B_{uu}) are constants.

- Price of risky asset is

$$S_t = \frac{d_t}{r} - Z - Z_u u_t,$$

  where Z is as before and

$$Z_u = \frac{1}{r+\kappa_u} A \frac{(1+r)^2}{r^2} \sigma_d^2.$$

  Price drops when shock hits $(u > 0)$ and gradually rises to no-shock value.

- Expected return of risky asset in excess of riskless asset is

$$\mathbb{E}_t(R_{t+1}) = A(\theta + u_t) \frac{(1+r)^2}{r^2} \sigma_d^2.$$

  Expected excess return rises when no shock hits and gradually drops to no-shock value.

Price Multiplier of Unanticipated Shock

- Suppose that shock is unanticipated.
- Price drops by $Z_u u_t$, where

$$Z_u = \frac{1}{r+\kappa_u} A \frac{(1+r)^2}{r^2} \sigma_d^2$$

  is price multiplier.
- Price multiplier increases in:
  - Risk aversion (A).
  - Dividend risk (σ_d).
  - Persistence of shock ($\frac{1}{\kappa_u}$).

Supply Shock – Dynamics Before the Shock

- Investor's value function for $t < t_0$ is

$$-\exp(-AW_t - B - b_t),$$

where (A, B) are as before and b_t is a deterministic function of t.

- Price of risky asset is

$$S_t = \frac{d_t}{r} - Z - z_t,$$

where Z is as before,

$$z_t = \begin{cases} \frac{z_{t_0-1}}{(1+r)^{t_0-1-t}} & \text{for } t < t_0 - 1 \\ \frac{Z_u \bar{u}}{1+r} \frac{1}{1+x} & \text{for } t = t_0 - 1 \end{cases}$$

and

$$x = \frac{r + \kappa_u}{r + 2\kappa_u - \kappa_u^2} A Z_u \sigma_u^2.$$

Price drops gradually in anticipation of shock ($\bar{u} > 0$) but not fully ($z_{t_0-1} < \frac{Z_u \bar{u}}{1+r}$). Bird-in-the-hand effect.

Price Multiplier of Anticipated Shock

- Expected price drop in period t_0 is

$$\mathbb{E}_{t_0-1}(S_{t_0}) - (1+r)S_{t_0-1} = -Z_u \bar{u} \frac{x}{1+x}.$$

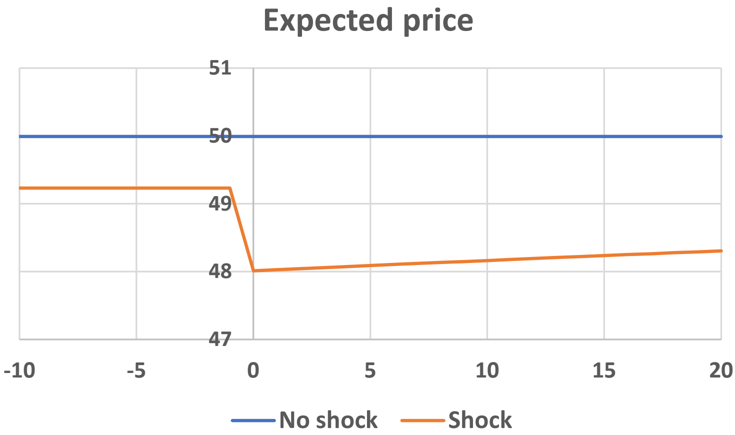
- Price multiplier of anticipated shock is coefficient of $\bar{u}$.

- Ratio of price multipliers:

$$\frac{\text{Price Multiplier Anticipated Shock}}{\text{Price Multiplier Unanticipated Shock}} = \frac{x}{1+x}.$$

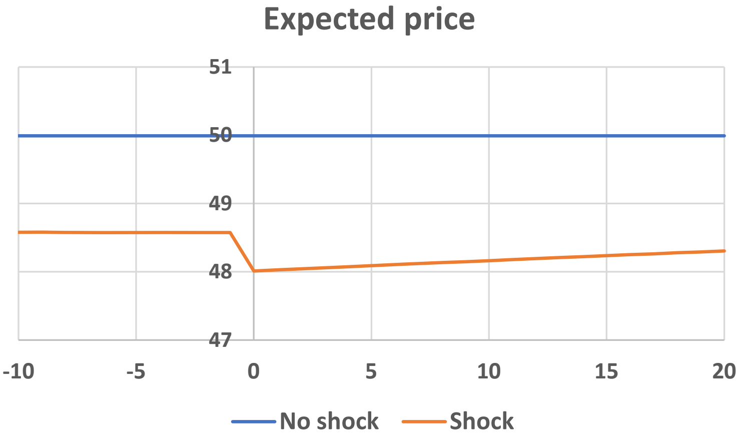
- Ratio increases in $x = \frac{r+\kappa_u}{r+2\kappa_u-\kappa_u^2} A Z_u \sigma_u^2$, and thus in:
  - Risk aversion (A).
  - Price multiplier of unanticipated shock (market illiquidity) (Z_u).
  - Uncertainty about shock (σ_u).

Price Graph



- Ratio of price multipliers is 61%.
- $\frac{\sigma_u}{\bar{u}} = 2.5$.

Price Graph for Lower σ_u



- Assume σ_u is half as large. $\frac{\sigma_u}{\bar{u}} = 1.25$.
- Ratio of price multipliers drops to 29%.

Quantification

- Calibrate VW so that fraction of return variance, at industry-sector level, due to flows is 15%.
- Ratio of price multipliers is 25%.
- Price multiplier of 1.5-2.3 of anticipated shocks implies multiplier of 6-9.2 of unanticipated shocks.

Related Papers on Bonds

- Lou-Yan-Zhang (RFS 2013) show price impact of anticipated shocks in government bond market.
  - Prices drop predictably around auctions.
  - Effect is 9.07bps for 2-year notes, 16.81bps for 5-year notes, and 18.43bps for 10-year notes.
  - Compute price multiplier. What is relevant asset supply?
- See also large literature on QE, e.g., D'Amico-King (JFE 2013).

Conclusion

- Convincing evidence that anticipated shocks in the stock market generate price pressure.
- Useful to understand why the effect arises and what determines the price multiplier.
- Compare to other estimates within and outside the stock market.