The Leverage Effect without Leverage: An Experimental Study

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Outline

- Leverage Effect, Down Market Effect (Panic Effect)
- Commodities and the Inverse Leverage Effect
- Basic setup of the experiment
- Results and Conclusions
Leverage Effect

- Black (1976) and Christie (1982) volatility and prices correlated

- Reason: Modigliani and Miller’s (1958); for a firm issuing stocks and bonds, its debt to equity ratio changes when, *ceteris paribus*, the stock price moves and thus its leverage changes.

- Leverage is generally interpreted as an indicator of a company riskiness: more leverage more risk

- stocks have financial leverage and stochastic dividends; up to now emphasis on the financial leverage to explain the leverage effect
Down Market Effect

- They argue further that the firm’s leverage is a level rather than a change.
  -> ”down market effect”
Inverse Leverage Effect (Commodities)

- For electricity prices: Rnittel and Roberts (2001): An inverse leverage effect is also found, where positive shocks to the price series result in larger increases in volatility than negative shocks.

- For soybeans: Richter and Soerensen (2002): This reflects that the volatility tends to be high when soybean spot prices are high and in which case supplies/inventories tend to be scarce and the arrival of new supply or demand information may have significant effects on prices.

- For gold: Inverse leverage effect is observed for daily returns.
Figure 1: Leverage effect of daily NASDAQ returns February 1971 to June 2001. $L(\tau)$ is the correlation function between price change at time $t = \tau$ and a measure of volatility, which is $r^2$ in this example.
Inverse Leverage Effect of Gold

Figure 2: Leverage effect of daily gold returns January 1988 to May 2006. $L(\tau)$ is the correlation function between price change at time $t = \tau$ and a measure of volatility, which is $r^2$ in this example.
The Basic Setup of the Experiment

- eight to 24 traders interact with each other using an electronic trading system; double auction; traded asset is a single stock that pays a dividend at the end of each period lasting 120 seconds.
- dividend process stochastic; initial endowment (10,000 Gulden and 5 shares of a single risky asset); reward
- experiment time is random
- no financial leverage in the underlying asset
Experiment Data

Figure 3: Price series together with the dividend, return and liquidity series of market 1.
Experiment Data

Figure 4: Same as Figure 3 but for market 2.
**Leverage Effect**

- Cont (2001), defines the leverage effect of lag $\tau$ as $L(\tau) = \text{Corr}(r_{t-\tau}, r_t^2)$, where $\text{Corr}(a, b)$ is the (linear) correlation between $a$ and $b$, and $r_t^2$ is used as a measure of volatility at time $t$.

- The leverage is present when $L$ is significantly negative, so that past returns and future volatility are negatively correlated. Inverse leverage: when $L$ is positive.
For the four markets the correlations of lag one, $L(1)$, are: -0.26 (0.0158), -0.44 (0.0000), -0.52 (0.0000), and -0.39 (0.0026); (p-values).

- all correlations are negative although no financial leverage effect at all.
Conclusion

- leverage effect in stock markets well known stylized fact
- volatility and returns negatively correlated
- In all experimental markets we explore, we find a significant leverage effect although the underlying asset does not exhibit a leverage at all.
- stocks have financial leverage and stochastic dividends; up to now emphasis on the financial leverage to explain the leverage effect
- leverage effect when financial leverage changes