The Response of Stock Prices to Permanent and Temporary Shocks to Dividends

Author: Bong-Soo Lee
Presenter: Omar Salomon
### Abstract

**The What**
- Paper investigates the response of stock prices to dividend shocks in a bivariate model of stock prices and price-dividend spreads.

**The Findings**
- The stock market responds significantly not only to permanent shocks to dividends, but also to temporary shocks to dividends.
- Initial responses of stock prices to the temporary shocks are as strong as those to the permanent shocks.

**The Conclusions**
- Empirical support for the imperfect information hypothesis that emphasizes the failure of investors to clearly distinguish between the two components of dividends.
- Suggest that observed mean-reverting behavior of stock returns should be explained by incorporating a significant temporary component into stock prices.
Introduction

Efficient Market Hypothesis

Impossible to "beat the market" because stock market efficiency causes existing share prices to always incorporate and reflect all relevant information.

Inefficient Market Hypothesis

Securities are not always accurately priced, market forces sometimes drive asset prices above or below their true value.

Relation to Paper

- If stock prices do not follow a random walk, then they contain a temporary component so that stock prices (or returns) can be predictable from past prices (returns).

- Wang (1989) claims that existence of uninformed investors, who partially attribute change in the temporary component of dividends to change in the permanent (or growth) component, causes stock prices to deviate from their fundamental values and to become very volatile.
Introduction

Studies show the decomposition of stock prices and dividends helps explain the behavior of asset prices.

Stock price and dividend series are found to follow a nonstationary process. This suggests that stock prices may be affected by more than one type of disturbance and justifies modeling stock price and dividend series as the sum of permanent and temporary components. The two components of stock prices and dividends may not behave independently.

One way to relate stock prices to dividends is to use the stock price valuation (present value) model—stock price equals the present discounted value of future dividends—so that the two components in stock prices are related to those in dividends.
Introduction

Studies show the decomposition of stock prices and dividends helps explain the behavior of asset prices.

Stock price and dividend series are found to follow a nonstationary process.

This suggests that stock prices may be affected by more than one type of disturbance and justifies modeling stock price and dividend series as the sum of permanent and temporary components.

The two components of stock prices and dividends may not behave independently.

One way to relate stock prices to dividends is to use the stock price valuation (present value) model—stock price equals the present discounted value of future dividends—so that the two components in stock prices are related to those in dividends.
Introduction

Studies show the decomposition of stock prices and dividends helps explain the behavior of asset prices.

Stock price and dividend series are found to follow a nonstationary process. This suggests that stock prices may be affected by more than one type of disturbance and justifies modeling stock price and dividend series as the sum of permanent and temporary components.

The two components of stock prices and dividends may not behave independently.

One way to relate stock prices to dividends is to use the **stock price valuation (present value) model**—stock price equals the present discounted value of future dividends—so that the two components in stock prices are related to those in dividends.
Model Development

1. Develop Equation
   - Model to integrate derivatives, stock prices, and their temporary and permanent components

2. Develop Restriction
   - Helps identify permanent and temporary components in a BMAR of stock prices and price-dividend spreads

3. Loglinear Version
   - Shows that the same kind of identifying restriction holds for the loglinear version of the stock price valuation model
## Model Development

### Cointegration Theory
- Cointegration theory developed by Engle and Granger (1987), Campbell and Shiller (1987) show that stock price and dividend series are cointegrated when they are related by the stock price valuation (present value) model that stock price equals the expected present value of future dividends.

### BMAR Model
- BMAR model consisting of the first difference in stock prices, $\Delta P_t$, and the stock price-dividend spreads, $S_t$.
- The spread $S_t$ is measured by $P_t - \theta D_t$, the deviation of stock prices from a multiple of the dividends, where $\theta$ is given as $\frac{\theta}{(1 - \theta)}$.

### First Differences
- The previous equation states that the spread is proportional to the expected present value of future changes in dividends.
- First difference in stock prices, $\Delta P_t$, is then given by the equation below:

\[
\Delta P_t = \beta (1 - \beta)^{-1} \Delta D_t + \Delta S_t.
\]
Dividend and stock price series can be modeled as being affected by more than one type of disturbances. Two kinds of disturbances in dividend and stock price processes: **permanent** and **temporary** disturbances.

**ΔDt**

\[
ΔD_t = (1 - L)D_t = ΔD^p_t + ΔD^i_t
\]

\[
= r(L)e_{1t} + (1 - L)q(L)e_{2t}.
\]

**ΔPt**

\[
ΔP_t = β(1 - β)^{-1} ΔD_t + ΔS_t
\]

\[
= B_{11}(L)e_{1t} + B_{12}(L)e_{2t},
\]

\[
B_{11}(L) = β(1 - β)^{-1} r(L) + (1 - L)B_{21}(L),
\]

\[
B_{12}(L) = (1 - L) \left[ q(L) + B_{22}(L) \right].
\]

**St**

\[
s_t = (1 - β)^{-1} E_t \sum_{i=1}^{∞} β^i \left( ΔD_{t+i}^p + ΔD_{t+i}^i - D_{t+i-1} \right)
\]

\[
= B_{21}(L)e_{1t} + B_{22}(L)e_{2t},
\]
Model Development

Loglinear Model

- Section shows that even when one uses logged stock price and dividend series, one obtains the same kind of restrictions on the BMAR.

- More convenient to work with logged series than with nonlogged series because, with logged series, the first difference in dividend-adjusted stock prices will be stock return and the spread will be dividend yield.

\[ \Delta p_t = \Delta d_t + \Delta \delta_t \]

\[ = [r(L)e_{1t} + (1 - L)q(L)e_{2t}] + (1 - L) [B_{21}(L)e_{1t} + B_{22}(L)e_{2t}] \]

\[ = B_{11}(L)e_{1t} + B_{12}(L)e_{2t}, \quad B_{11}(L) = r(L) + (1 - L)B_{31}(L), \quad \text{and} \]

\[ B_{12}(L) = (1 - L) [q(L) + B_{22}(L)]. \]
Empirical Results

### Importance of Each Component at Various Forecasting Horizons

The temporary shock, $e_{2t}$, explains substantial future variation in stock prices throughout all forecast horizons. Results show that the stock market does not clearly distinguish between the two shocks and prices respond significantly not only to the permanent shocks but also to the temporary shocks.

In contrast, the spreads, either $\delta_t$ or $S_t$, are explained primarily by temporary shocks.

#### Variance Decomposition: Percentage of Forecast Error Variance Explained by Permanent Shock to Dividends

<table>
<thead>
<tr>
<th>Horizons</th>
<th>$\Delta P_t$</th>
<th>$P_t$</th>
<th>$\Delta P_t$</th>
<th>$P_t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Qtr.</td>
<td>41.0% (0.2)</td>
<td>41.0% (0.2)</td>
<td>58.6% (0.1)</td>
<td>58.6% (0.1)</td>
</tr>
<tr>
<td>2</td>
<td>41.0% (0.2)</td>
<td>40.0% (0.3)</td>
<td>58.6% (0.1)</td>
<td>58.1% (0.2)</td>
</tr>
<tr>
<td>3</td>
<td>41.0% (0.2)</td>
<td>39.2% (0.3)</td>
<td>58.6% (0.1)</td>
<td>58.0% (0.2)</td>
</tr>
<tr>
<td>4</td>
<td>41.0% (0.2)</td>
<td>41.6% (0.4)</td>
<td>59.1% (0.1)</td>
<td>58.7% (0.2)</td>
</tr>
<tr>
<td>8</td>
<td>40.9% (0.2)</td>
<td>47.0% (0.5)</td>
<td>58.5% (0.1)</td>
<td>61.9% (0.3)</td>
</tr>
<tr>
<td>12</td>
<td>40.7% (0.2)</td>
<td>51.8% (0.5)</td>
<td>58.4% (0.1)</td>
<td>64.9% (0.3)</td>
</tr>
<tr>
<td>24</td>
<td>40.6% (0.2)</td>
<td>62.7% (0.7)</td>
<td>58.3% (0.1)</td>
<td>70.8% (0.4)</td>
</tr>
<tr>
<td>36</td>
<td>40.5% (0.2)</td>
<td>69.5% (0.7)</td>
<td>58.2% (0.1)</td>
<td>74.5% (0.5)</td>
</tr>
<tr>
<td>48</td>
<td>40.8% (0.2)</td>
<td>74.0% (0.8)</td>
<td>58.2% (0.1)</td>
<td>76.8% (0.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Horizons</th>
<th>$S_t$</th>
<th>$\delta_t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Qtr.</td>
<td>15.6% (0.4)</td>
<td>0.0% (0.1)</td>
</tr>
<tr>
<td>2</td>
<td>12.9% (0.3)</td>
<td>9.6% (0.2)</td>
</tr>
<tr>
<td>3</td>
<td>11.2% (0.3)</td>
<td>11.8% (0.2)</td>
</tr>
<tr>
<td>4</td>
<td>11.6% (0.3)</td>
<td>17.1% (0.2)</td>
</tr>
<tr>
<td>8</td>
<td>9.0% (0.3)</td>
<td>16.1% (0.2)</td>
</tr>
<tr>
<td>12</td>
<td>7.9% (0.3)</td>
<td>15.8% (0.2)</td>
</tr>
<tr>
<td>24</td>
<td>6.9% (0.3)</td>
<td>15.7% (0.3)</td>
</tr>
<tr>
<td>36</td>
<td>6.9% (0.3)</td>
<td>15.7% (0.3)</td>
</tr>
<tr>
<td>48</td>
<td>6.9% (0.3)</td>
<td>15.7% (0.3)</td>
</tr>
</tbody>
</table>

$P_t$ = real stock price series; $S_t = P_t - dD_t$, the stock price-dividend spread; $P_t = \log(P_t)$; $d_t = \log(D_t)$; and $\delta_t = P_t - d_t$. 

The temporary shock, $e_{2t}$, explains substantial future variation in stock prices throughout all forecast horizons.

Results show that the stock market does not clearly distinguish between the two shocks and prices respond significantly not only to the permanent shocks but also to the temporary shocks.

In contrast, the spreads, either $\delta_t$ or $S_t$, are explained primarily by temporary shocks.
Empirical Results

Response of $\Delta P$

Permanent shock initially has a strong positive effect on changes in stock prices, but that after the second quarter its effect is mostly negative (except for the fourth quarter) and becomes very weak.

Temporary shock also has a strong positive effect on price changes initially, and after two quarters its effect is weakly negative.

Response of $S$

Temporary shock have relatively stronger effects on the stock price-dividend spreads ($S_t$) than do permanent shocks, but their effects dissipate gradually as the time horizon increases.

Spreads are explained primarily by the temporary shocks and that the temporary shocks have strong positive effects on $S_t$ implies that, in response to the temporary shocks to dividends, stock prices respond excessively relative to dividends.
Conclusions

1. Stock market responds significantly not only to the permanent shocks to dividends but also to the temporary shocks to dividends.

2. Findings that the price-dividend spreads are primarily explained by the temporary shocks and that the temporary shocks have strong positive effects on the spread suggest excessive responses of prices relative to dividends.

3. Initial responses of stock prices to the temporary shocks are as strong as those to the permanent shocks. Substantial variation in prices is due to the temporary shocks.

4. Evidence in favor of the imperfect information hypothesis that emphasizes the failure of investors to clearly distinguish between the two types of shocks.
Thank You