Discussion of “Real-time forward-looking skewness over the business cycle”

James D. Hamilton, UCSD
Summarizing conditional distribution

Conditional mean $E_t y_{t+1}$
(↓ says distribution center of mass shifted left)

Conditional variance $E_t (y_{t+1} - E_t y_{t+1})^2$
(↑ says something big may happen)

Conditional skew $E_t (y_{t+1} - E_t y_{t+1})^3/[E_t (y_{t+1} - E_t y_{t+1})^2]^{3/2}$
(↓ says higher probability of left-tail event)
U.S. News-based Economic Policy Uncertainty

Data source: Baker, Bloom and Davis, QJE 2016
www.PolicyUncertainty.com
Distribution of annual sales growth across U.S. firms

Source: Salgado, Guvenen, and Bloom, “Skewed business cycles”
Distribution of real GDP quarterly growth (at annual rates) in NBER expansions and contractions (1947:Q2-2019:Q4)

<table>
<thead>
<tr>
<th></th>
<th>Expansions</th>
<th>Contractions</th>
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</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.0</td>
<td>-1.4</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>3.0</td>
<td>3.5</td>
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<tr>
<td>Skew</td>
<td>0.9</td>
<td>-1.6</td>
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Growth in expansions: $N(\mu_1, \sigma^2)$
Growth in recessions: $N(\mu_2, \sigma^2)$

$\mu_1 = 4.0$, $\mu_2 = -1.4$, $\sigma = 3.0$

Probability of recession: $\pi$

Density of next quarter’s growth:

$$\pi \cdot N(\mu_2, \sigma^2) + (1 - \pi) \cdot N(\mu_1, \sigma^2)$$
Distribution of GDP growth when probability of recession = 0.05

mean = 3.7, std dev = 3.2, skew = -0.2
Distribution of GDP growth when probability of recession = 0.2

mean = 2.9, std dev = 3.7, skew = -0.3
Distribution of GDP growth when probability of recession = 0.5

mean = 1.3, std dev = 4.0, skew = 0
Skew as a function of the probability that next quarter economy is in recession
Dew-Becker uses stock option prices to calculate:

- **Firm-level skew**
  - Calculate skew for individual stock return, then take weighted average.

- **Market-level skew**
  - Take weighted average of individual stock returns, then calculate skew.

- **Firm-level skew** procyclical, **market-level skew** acyclical.
• Weighted average of individual random variables that satisfy mixing condition would tend toward a Normal distribution (zero skew)
• However, stock returns are not mixing (there is a factor common to all)
• Weighted average uncovers this factor
\[ r_{it} = \text{individual stock return} \]
\[ r_{mt} = \text{market return} \]
Dew-Becker: \[ r_{it} = r_{mt} + \varepsilon_{it} \]
alternative: \[ r_{it} = \beta_i r_{mt} + \varepsilon_{it} \]
Consider an asset that has a factor loading of 2 on the GDP recession factor $N(\mu_1, \sigma^2)$ in expansion.

$2 \cdot N(\mu_2, \sigma^2)$ in recession.
Skew as a function of the probability that next quarter economy is in recession

![Graph showing skew as a function of the probability of recession. The graph has two curves: one blue labeled 'normal' and one red labeled 'cyclically sensitive'. The x-axis represents the probability of recession ranging from 0 to 1, and the y-axis represents skew values ranging from -1.5 to 0.5. The graph shows a significant decrease in skew as the probability of recession increases.]
• This might describe cyclical skew of fundamentals
  – Sales or dividend growth
• Cecchetti, Lam and Mark (AER, 1990)
  – If dividend growth shifts between two distributions, then stock returns shift between four distributions
  – In expansion, in recession, or transition up or down
• James Hamilton, “Why you should never use the Hodrick-Prescott Filter,” REStat, 2018
Why you *should* use HP

1. Everybody else does it
2. Main conclusions don’t change if I do it the right way
3. I have to do something (skew is nonstationary)
4. HP is something
   Conclusion: I have to use HP
• Autocorrelations and cross-autocorrelations of HP-filtered skew are summarizing properties of filter, not properties of skew
• Can easily calculate whether error I make forecasting firm skew 2 years ahead is correlated with error I make forecasting market skew 2 years ahead