Jul 22nd, 11:30 AM - 12:00 PM

The Behavior of Interest Rates and Exchange Rates: Assessing the merits of Monetary Policy Coordination Among Emerging Economies

Semih Cekin

Menelik Geremew

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Transitory Movements, Inflation Trends and Volatilities during the Great Recession

Semih E. Çekin and Victor J. Valcarcel

The Great Recession brought:

- Increased macroeconomic volatility
- The Zero Lower Bound (ZLB)
- Threat of deflation

⇒ End of the Great Moderation?
⇒ Should inflation targets be raised?
Inflation and inflation volatility have positive relation
During Great Recession, inflation rate decreased but inflation volatility increased.
Question of Paper

- Is the increase in inflation volatility due to permanent effects or transitory effects?

- Is the relationship between inflation and its volatility weaker or even negative at very low levels of inflation?
Methodology

- Decompose inflation into permanent and transitory components.

- Analyze whether relation between inflation and inflation volatility has changed using,
  - Simple regression
  - Markov-switching estimation
  - MI(xed) Da(ta) S(ampling) (MIDAS) Regression
Simple Regression

\[ \hat{\sigma}_t^\pi = \alpha + \beta_t \hat{\pi}_t + u_t \]

- Estimate using two time periods
  - 1965:1-2015:3
  - 2008:1-2015:3

⇒ Analyze whether simple regression can find a "break" in \( \beta_t \)
Simple Regression

**Table:** Linear relationship where \( \hat{\sigma}_t^{\pi} = \sigma_t^{\pi} \)

\[
\hat{\pi}_t = \pi_t \\
\hat{\pi}_t = \pi_t^{HP} \\
\hat{\pi}_t = \pi_t
\]

<table>
<thead>
<tr>
<th>Parameter/Period</th>
<th>Full sample</th>
<th>post-2008</th>
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</tr>
</thead>
<tbody>
<tr>
<td>( \beta )</td>
<td>0.156**</td>
<td>-0.057</td>
<td>0.202**</td>
<td>-0.506**</td>
<td>0.329**</td>
<td>-0.428**</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.026)</td>
<td>(0.013)</td>
<td>(0.121)</td>
<td>(0.009)</td>
<td>(0.078)</td>
</tr>
<tr>
<td>( \text{Corr}(\hat{\sigma}_t^{\pi}, \hat{\pi}_t) )</td>
<td>0.482</td>
<td>-0.248</td>
<td>0.541</td>
<td>-0.440</td>
<td>0.822</td>
<td>-0.543</td>
</tr>
</tbody>
</table>

(***), (*) denote significance at 1% and 5% respectively.

**Table:** Linear relationship where \( \hat{\sigma}_t^{\pi} = \sigma_t^{HP\text{Trend}} \)

\[
\hat{\pi}_t = \pi_t \\
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</tr>
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<tbody>
<tr>
<td>( \beta )</td>
<td>0.09**</td>
<td>-0.002</td>
<td>0.11**</td>
<td>-0.013</td>
<td>0.21**</td>
<td>0.046</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.011)</td>
<td>(0.03)</td>
<td>(0.06)</td>
<td>(0.01)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>( \text{Corr}(\hat{\sigma}_t^{\pi}, \hat{\pi}_t) )</td>
<td>0.390</td>
<td>-0.127</td>
<td>0.409</td>
<td>-0.288</td>
<td>0.727</td>
<td>-0.646</td>
</tr>
</tbody>
</table>

**Table:** Linear relationship where \( \hat{\sigma}_t^{\pi} = \sigma_t^{HP\text{Cycle}} \)

\[
\hat{\pi}_t = \pi_t \\
\hat{\pi}_t = \pi_t^{HP} \\
\hat{\pi}_t = \pi_t
\]

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<th>Full sample</th>
<th>post-2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta )</td>
<td>0.066**</td>
<td>-0.043*</td>
<td>0.091**</td>
<td>-0.370**</td>
<td>0.124**</td>
<td>-0.319**</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.019)</td>
<td>(0.007)</td>
<td>(0.093)</td>
<td>(0.006)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>( \text{Corr}(\hat{\sigma}_t^{\pi}, \hat{\pi}_t) )</td>
<td>0.411</td>
<td>-0.284</td>
<td>0.489</td>
<td>-0.472</td>
<td>0.610</td>
<td>-0.556</td>
</tr>
</tbody>
</table>
Simple Regression: Implications

- Results of simple regression suggest that a break might be present after 2008.
  - Volatility of transitory part of inflation experiences strong "break".
  - Volatility of permanent part of inflation experiences weak "break".

Drawback: sample chosen arbitrarily, not endogenously.

⇒ Utilize Markov-switching estimation to determine breaks endogenously.
Markov-Switching Estimation

\[ \hat{\sigma}_t^\pi = \alpha S_t + \beta S_t \hat{\pi}_t + uS_t \]

- Analyze full period 1965:1-2015:3
- Assume two regimes such that \( S_t = \{1,2\} \) is the prevailing regime at time \( t \).
- Does the relationship between inflation and its volatility switch after Great Recession?
**Markov-Switching Estimation**

**Table:** Non-linear relationship with variance switch where $\hat{\sigma}_t^\pi = \sigma_t^\pi$

<table>
<thead>
<tr>
<th>Parameter/Regime</th>
<th>Regime 1</th>
<th>Regime 2</th>
<th>Regime 1</th>
<th>Regime 2</th>
<th>Regime 1</th>
<th>Regime 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta$</td>
<td>0.11**</td>
<td>0.15**</td>
<td>0.12**</td>
<td>0.19**</td>
<td>0.32**</td>
<td>0.29**</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>0.67**</td>
<td>0.23**</td>
<td>0.67**</td>
<td>0.21**</td>
<td>0.31**</td>
<td>0.24**</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.02)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.003)</td>
<td>(0.02)</td>
</tr>
</tbody>
</table>

**Figure:** ($\hat{\sigma}_t^\pi = \sigma_t^\pi$ and $\hat{n}_t = n_t$)
Markov-Switching Estimation

Table: Non-linear relationship with variance switch where $\hat{\sigma}_{t}^{\pi} = \sigma_{t}^{\text{HP Trend}}$

<table>
<thead>
<tr>
<th>Parameter/Regime</th>
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<th>Regime 1</th>
<th>Regime 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta$</td>
<td>$-0.07^{**}$</td>
<td>$0.08^{**}$</td>
<td>$-0.09^*$</td>
<td>$0.08^{**}$</td>
<td>$0.14^{**}$</td>
<td>$0.10^{**}$</td>
</tr>
<tr>
<td></td>
<td>$(0.002)$</td>
<td>$(0.004)$</td>
<td>$(0.01)$</td>
<td>$(0.01)$</td>
<td>$(0.004)$</td>
<td>$(0.004)$</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>$0.58^{**}$</td>
<td>$0.20^{**}$</td>
<td>$0.56^{**}$</td>
<td>$0.20^{**}$</td>
<td>$0.54^{**}$</td>
<td>$0.17^{**}$</td>
</tr>
<tr>
<td></td>
<td>$(0.005)$</td>
<td>$(0.02)$</td>
<td>$(0.01)$</td>
<td>$(0.01)$</td>
<td>$(0.003)$</td>
<td>$(0.02)$</td>
</tr>
</tbody>
</table>

Figure: ($\hat{\sigma}_{t}^{\pi} = \sigma_{t}^{\text{HP Trend}}$ and $\hat{\pi}_{t} = \pi_{t}$)

Figure: ($\hat{\sigma}_{t}^{\pi} = \sigma_{t}^{\text{HP Trend}}$ and $\hat{\pi}_{t} = \pi_{t}$)
# Markov-Switching Estimation

Table: Non-linear relationship with variance switch where $\hat{\sigma}_t^\pi = \sigma_t^{HPCycle}$

<table>
<thead>
<tr>
<th>Parameter/Regime</th>
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<th>Regime 1</th>
<th>Regime 2</th>
<th>Regime 1</th>
<th>Regime 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta$</td>
<td>0.01*</td>
<td>0.05**</td>
<td>0.04**</td>
<td>0.11**</td>
<td>0.04**</td>
<td>0.12**</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.004)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.009)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>0.25**</td>
<td>0.14**</td>
<td>0.23**</td>
<td>0.14**</td>
<td>0.25**</td>
<td>0.12**</td>
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<td>(0.005)</td>
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<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.003)</td>
<td>(0.02)</td>
</tr>
</tbody>
</table>

Figure: $(\hat{\sigma}_t^\pi = \sigma_t^{HPCycle}$ and $\hat{\pi}_t = \pi_t)$

Figure: $(\hat{\sigma}_t^\pi = \sigma_t^{HPCycle}$ and $\hat{\pi}_t = \pi_t)$
Markov Switching: Implications

- Markov-switching estimation implies a break for $\beta_t$:
  - Volatility of transitory part of inflation experiences switches after Great Recession.
  - Volatility of permanent part of inflation experiences no break after Great Recession.

$\Rightarrow$ Break in relation likely to be the result of switch in volatility of transitory part of inflation.
MIDAS Regression

- Data used for LR and MS uses monthly data.
- Can the use of daily inflation data enhance/confirm results?
- Apply MIDAS to see whether negative relation can be captured.

\[
\sigma_t^{\pi M} = \alpha_0 + \sum_{j=1}^{p_1} \alpha_j \sigma_{t-j}^{\pi M} + \phi_0 \pi_t^M + \beta \sum_{i=0}^{N_D-1} \bar{\omega}_{N_D-i}(\theta^D) \tilde{\pi}_{N_D-i,t}^D + u_t
\]
MIDAS Regression

Table: MIDAS regression \( \hat{\sigma}_t^\pi = \sigma_t^\pi \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>( \hat{\pi}_t = \pi_t )</th>
<th>( \hat{\pi}_t = \pi_t^{HP} )</th>
<th>( \hat{\pi}_t = \bar{\pi}_t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha_0 )</td>
<td>0.0154* (0.012)</td>
<td>0.0123 (0.012)</td>
<td>-0.0147 (0.020)</td>
</tr>
<tr>
<td>( \alpha_1 )</td>
<td>1.8820** (0.054)</td>
<td>1.8925** (0.044)</td>
<td>1.8155** (0.066)</td>
</tr>
<tr>
<td>( \alpha_2 )</td>
<td>-0.8879** (0.059)</td>
<td>-0.9236** (0.044)</td>
<td>-0.8279** (0.067)</td>
</tr>
<tr>
<td>( \phi_0 )</td>
<td>-0.0028** (0.013)</td>
<td>0.0217** (0.009)</td>
<td>0.0159** (0.006)</td>
</tr>
<tr>
<td>( \beta )</td>
<td>-0.3225** (0.157)</td>
<td>-0.3456** (0.153)</td>
<td>-0.3018** (0.154)</td>
</tr>
</tbody>
</table>

(**), (*) denote significance at 1% and 5% respectively.

⇒ Results similar qualitatively and quantitatively when \( \sigma_t^{HP} \) is used as volatility measure.
MIDAS Regression: Implications

- Inflation volatility is a highly persistent process.

- Correlation between inflation and its volatility is:
  - Negative when monthly or daily inflation rate is used,
  - Positive when slow moving measures of inflation are used.

⇒ Correlation is different for high-frequency vs. low-frequency measures of inflation.

⇒ Confirms MS result that long-term considerations of monetary policy have likely not changed.
Increase in inflation volatility probably attributable to transitory effects:

- Great Moderation is not necessarily over.
- Long term considerations of monetary authority have probably not changed significantly.
- Raising inflation target not necessarily optimal strategy (supporting the result of Coibion et al. (2012)).

⇒ Break in relation likely to be the result of switch in volatility of *transitory* part of inflation.
THANK YOU!