Global Factors and Trend Inflation

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The views do not necessarily represent those of the Bank for International Settlements and the Reserve Bank of New Zealand

ECB Conference
Understanding Inflation
Lessons from the Past, Lessons for the future?
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Inflation Co-Moves a Lot!
Introduction

1. Extensively verified (Ciccarelli and Mojon, 2010; Neely and Rapach, 2011; Mumtaz and Surico, 2012)

2. Why?
   - Common shocks (i.e. commodities)
   - Policy (Cecchetti and Watson 2007)
   - Global slack hypothesis (Borio & Filardo, 2007; Bianchi and Civelli 2015)
Monetary Policy Implications

It depends...

Issue of whether global factors are more permanent or transitory

cf. central banking doctrine to "look through" one-off or transitory movements in inflation

Theoretically, foreign shocks can affect inflation in the long run only if they are systematically accommodated

What We Do

Set up a model to estimate trend inflation

Decompose trend inflation and the inflation gap into components driven by foreign and domestic shocks
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What We Do

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- Decompose trend inflation and the inflation gap into components driven by foreign and domestic shocks
More Precisely...

- We study the role of foreign shocks on inflation dynamics on a group of 5 advanced inflation targeters (Australia, Canada, New Zealand, Norway, and Sweden) and another 10 heterogeneous Asian economies.
  - We construct trend inflation and the inflation gap consistent with a FAVAR forecasting model.
  - We quantify the effect of foreign shocks on trend inflation and the inflation gap.
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  - We quantify the effect of foreign shocks on trend inflation and the inflation gap

Three Key Results

1. Foreign shocks are more important for the inflation gap than trend inflation (i.e. they are more transitory in nature)
2. A large share of foreign shocks reflects commodity price, and especially oil price, shocks.
3. Inflation targeting may have negated the effect of foreign shocks on trend inflation.
What we are NOT doing

1. We are not evaluating Globalization hypothesis (ala Borio and Filardo)
   Though one may think about extending our framework in that direction

2. We are not estimating global Philips Curves
   ...but we take a broader view of foreign shocks

3. We are not claiming global shocks do not matter for inflation determination
   Though we are claiming that they may matter less for policy if one mostly cared about the trend
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Concept of Trend Inflation

- We extract trend inflation consistent with the permanent component of a Beveridge-Nelson (1981) decomposition
  - We will assume inflation evolves as a driftless random walk.
  - Long run expectation of the cycle is zero
  - \( \tau_t = \lim_{j \to \infty} E_t \pi_{t+j} \)
  - Inflation gap: \( \tilde{\pi}_t = \pi_t - \tau_t \)
  - Concept of trend is identical to “trend” from a Unobserved Components model (e.g. Stock and Watson 2007, Mertens 2016)
- Forecasting model is an international FAVAR with some bells and whistles
The BN Decomposition

Consider the forecasting model in companion form (e.g. AR(p), VAR(p), VECM)

\[ y_t = B y_{t-1} + H \nu_t \]

Let \( \Delta \pi_t \) be the \( k^{th} \) variable in \( y_t \), therefore (see Morley, 2002)

\[
\begin{align*}
\tau_t &= \pi_t + e_k B (I - B)^{-1} y_t \\
\tilde{\pi}_t &= -e_k B (I - B)^{-1} y_t.
\end{align*}
\]

Iterating will yield (see Morley and Wong, 2017)

\[
\begin{align*}
\Delta \tau_t &= e_k (I - B)^{-1} H \nu_t \\
\tilde{\pi}_t &= -e_k \left\{ \sum_{i=0}^{t-1} B^{i+1} (I - B)^{-1} H \nu_{t-i} \right\} - e_k B^{t+1} (I - B)^{-1} e_k' \Delta \pi_0.
\end{align*}
\]
Two Interpretations of the Multivariate BN Representation (Morley and Wong, 2017)

\[ \Delta \tau_t = e_k (I - B)^{-1} H \nu_t \]

\[ \tilde{\pi}_t = -e_k \left\{ \sum_{i=0}^{t-1} B^{i+1} (I - B)^{-1} H \nu_{t-i} \right\} - e_k B^{t+1} (I - B)^{-1} e_k' \Delta \pi_0. \]

1. Sources of information
   - All the variables feed into the estimate of trend inflation and the inflation gap through their forecast errors

2. Structural Interpretation
   - Overlay standard structural VAR tools (i.e. replace \( \nu_t = A \epsilon_t \)).
   - We can tell what drives (opposed to just modeling) the trend and cycle (e.g. UC models).
   - We will identify our foreign shocks through using standard SVAR tools.
   - This representation allows us to do variance decompositions, historical decompositions and decompose inflation between two arbitrary periods through the shocks
Model Overview

- 2 Main Blocks, 4 Sub-blocks
  2. Principal components from large dataset of U.S., U.K., Japan, France and Germany
  3. Principal components from large dataset of domestic variables
  4. Common stochastic trend between CPI and CPIxFE

- We apply standard BVAR shrinkage given sample size and number of variables

- Block exogeneity identify foreign shocks (e.g. Zha 1999; Justiano and Preston 2020).

- We will decompose the share of foreign and domestic shocks on the constructed BN trend and cycle

Sample: 1994Q1 - 2016Q4 for Australia, 1992Q1 - 2016Q4 for the other four benchmark inflation targeters (Canada, New Zealand, Norway and Sweden)
Overview of our model

- **Commodities**
- **Foreign Principal Components**

**Foreign Block**

**Domestic Block**

- **Domestic Principal Components**
- **CPI inflation and CPI ex food and energy**

**Block Exogenous**
Trend Inflation (Benchmark)
New Zealand Trend Inflation
New Zealand Trend Inflation
Trend Inflation (Benchmark)

- **Australia**
- **Canada**
- **NZ**
- **Norway**

Legend:
- Red dashed line: Year on Year Inflation
- Black solid line: Trend Inflation

Years: 2008 to 2016
Decompose $\Delta \tau_t$
Decompose $c_t$
FEVD Inflation Gap

Recall $\tilde{\pi}_t \approx -e_k \left\{ \sum_{i=0}^{t-1} B^{i+1} (I - B)^{-1} H \nu_{t-i} \right\}$

where $\Delta \pi_t$ be the $k^{th}$ variable and the foreign shocks be the first $N^*$ shocks, $\epsilon_t = A^{-1} \nu_t$. 
FEVD Inflation Gap

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where $\Delta \pi_t$ be the $k^{th}$ variable and the foreign shocks be the first $N^*$ shocks, $\epsilon_t = A^{-1} \nu_t$.

$\tilde{\pi}_{t+h} - E_{t-1} \tilde{\pi}_{t+h} = e_k \left\{ \sum_{i=0}^{h} B^{i+1}(I - B)^{-1} H \nu_{t+h-i} \right\}$

$\text{Var}(\tilde{\pi}_{t+h} - E_{t-1} \tilde{\pi}_{t+h}) = e_k \left\{ \sum_{i=0}^{h} B^{i+1}(I - B)^{-1} H \Sigma_{\nu}((I - B)^{-1})'(B^{i+1})' \right\} e_k'$.

$FEVD_{\text{gap}} = \frac{\sum_{j=1}^{N^*} \left[ e_k \left\{ \sum_{i=0}^{\infty} B^{i+1}(I - B)^{-1} \right\} H A e_j' \right]^2}{e_k \left\{ \sum_{i=0}^{\infty} B^{i+1}(I - B)^{-1} H \Sigma_{\nu}((I - B)^{-1})'(B^{i+1})' \right\} e_k'}.$
FEVD Trend Inflation

Recall $e_k(I - B)^{-1}H \nu_t$
FEVD Trend Inflation

Recall $e_k(I - B)^{-1}H\nu_t$

$$Var(\Delta \tau_t - \mathbb{E}_{t-1}\Delta \tau_t) = e_k(I - B)^{-1}H\Sigma_{\nu}((I - B)^{-1})'e_k'.$$

$$FEVD^{\Delta \tau} = \frac{\sum_{j=1}^{N^*} \left[ e_k(I - B)^{-1}HAe_j' \right]^2}{e_k(I - B)^{-1}H\Sigma_{\nu}((I - B)^{-1})'e_k'}. $$
Share of Foreign Shocks

Asian Countries

Benchmark

- Inflation Gap
- Trend Inflation

Countries Compared:
- Australia
- Canada
- New Zealand
- Norway
- Sweden
Share of Foreign Shocks

- Commodity Price Shocks
- Other Foreign Shocks

- Oil Price Shocks
- Other Commodity Price Shocks
- Other Foreign Shocks

Australia, Canada, New Zealand, Norway, Sweden
Decompose two low inflation periods

1. Great Recession: 2008Q1 - 2009Q1
2. Oil Price Collapse: 2014Q3 - 2016Q1

\[ \pi_t = \tau_t + \hat{\pi}_t \]
Decompose two low inflation periods

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\[ \pi_t = \tau_t + \hat{\pi}_t \]

\[ \pi_{t+h} - \pi_t = [\tau_{t+h} + \hat{\pi}_{t+h}] - [\tau_t + \hat{\pi}_t] \]
Decompose two low inflation periods

1. Great Recession: 2008Q1 - 2009Q1
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$$\pi_t = \tau_t + \hat{\pi}_t$$

$$\pi_{t+h} - \pi_t = \left[\tau_{t+h} + \hat{\pi}_{t+h}\right] - \left[\tau_t + \hat{\pi}_t\right]$$

$$= \left[\tau_{t+h} - \tau_t\right] + \left[\hat{\pi}_{t+h} - \hat{\pi}_t\right]$$

$$= \sum_{j=0}^{h} \Delta \tau_{t+j} + \left[\hat{\pi}_{t+h} - \hat{\pi}_t\right]$$

$$= \sum_{j=0}^{h} \Delta \tau^F_{t+j} + \left[\hat{\pi}^F_{t+h} - \hat{\pi}^F_t\right] + \sum_{j=0}^{h} \Delta \tau^D_{t+j} + \left[\hat{\pi}^D_{t+h} - \hat{\pi}^D_t\right]$$

from foreign shocks from domestic shocks
Extending to a Group of Asian Countries

- More heterogeneous
- Robustness/Comparison
- Data is more limited
- Data quality is more of a concern
Share of Foreign Shocks

Benchmark

- China
- Hong Kong
- India
- Indonesia
- Japan

- Korea
- Malaysia
- Philippines
- Singapore
- Thailand

Inflation Gap
Trend Inflation
Share of Foreign Shocks
Comparing the Inflation Targeting Benchmark Group Against the Asian Countries

Two main conclusions seem to hold more generally

1. Foreign shocks matter more for the inflation gap than trend inflation.
2. Foreign shocks reflect commodity price and oil price shocks.
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Does inflation targeting matter?

- Natural test for whether inflation is a domestic monetary phenomenon.
Does Inflation Targeting Matter?

Notes: Results for benchmark sample are for the five countries with samples beginning in the 1990s. Full sample refers to estimation for the benchmark countries estimation beginning in: Australia 1990Q1, Canada 1984Q3, New Zealand 1986Q2, Norway 1981Q2, Sweden 1987Q2.
Conclusions

We ask

1. Do foreign shocks matter for inflation?
2. If so, what are the monetary policy implications
Conclusions

We ask

1. Do foreign shocks matter for inflation?
2. If so, what are the monetary policy implications

We develop an open economy model of trend inflation and find

- Foreign shocks are more important for the inflation gap than trend inflation (i.e. they are more transitory in nature).
- A large share of foreign shocks reflects commodity price, and especially oil price, shocks.
- Inflation targeting may have negated the effect of foreign shocks on trend inflation.
Returning to Our Question...

“... are central banks still masters of their domestic monetary destinies?
Or have they become slaves to global factors?”
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“... are central banks still masters of their domestic monetary destinies? **YES!**
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*Inserted by Kamber and Wong...*
Returning to Our Question...

“... are central banks still masters of their domestic monetary destinies? YES!
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– Carney

“Inflation is always and everywhere a (domestic)* monetary phenomenon ...” – Friedman
*Inserted by Kamber and Wong...
The Priors

VAR slope coefficients

\[ \mathbb{E}(\beta_{i,j}^p) = 0 \]  
\[ \text{Var}(\beta_{i,j}^p) = \begin{cases} 
\lambda^2/p^2, & \text{if } i = j \\
\frac{\lambda^2}{p^2} \frac{\sigma_i^2}{\sigma_j^2}, & \text{otherwise}
\end{cases} \]  

Error correction term

\[ \mathbb{E}(\beta^{ec}) = -0.5 \]
\[ \text{Var}(\beta^{ec}) = \lambda^2 \]

- Estimation using Bayesian estimation with fairly “standard” Minnesota-type prior to obtain shrinkage
- \( \lambda = 0.2 \) (see Sims and Zha, 1998; Carriero et al., 2015)
Low Inflation Post 2008
Brent Crude Oil Price