

On October 25<sup>th</sup> 2013, the CERDI-IDREC organized the **9<sup>th</sup> International Conference on the Chinese Economy** in Clermont-Ferrand. The theme of this conference was “China as a leader in the world economy: implications for the political economy”.

The conference invited well-known specialists on China: Wing Thye Woo (University of California, Davis), Scott Rozell (Stanford University), Harry X. Wu (Hitotsubashi University) and Eric Girardin (Aix Marseille University).

Sandrine Lunven, quantitative economist at TAC, presented research on monetary policy in China entitled “Understanding the monetary policy rule in China: what is the role of inflation”.

More information on: <http://www.cerdi.org/chine2013.html>



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9<sup>th</sup> International Conference on the Chinese Economy  
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# **Understanding the monetary policy rule in China: what is the role of inflation?**

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# Outline

1. Motivations
2. Literature review
3. Measuring monetary policy in China
4. Methodology and data
5. Empirical results
6. Conclusions

# 1. Motivations

- Impressive medium term economic performance in China
  - Low inflation (1.8%) over 1997–2011; matching performance of explicit Asian inflation targeters (Filardo and Genberg, 2009)
- Potential sources of changes in the monetary policy rule
  - Multiple gradual reforms, financial market developments, and globalisation
  - Evolving role of the PBC and its objectives, frameworks, and instruments
- Properly measuring monetary policy in China
  - Need of *discrete* variable construction.
  - Accounting for price/quantity-based instruments and unobserved policy changes: GFC dovish policy but no instrument move
- Understanding the evolving role of inflation in the conduct of monetary policy since the mid-1990s
  - A recursive hybrid (backward/forward) model with time-varying aspects

## 2. Taylor-rule reaction function

- Multiple extensions of the Taylor rule (1993) by Evans (1998), Clarida, Gali and Gertler (2000), Rudebusch (2002) etc.
- The smoothed hybrid (backward- and forward-looking) rule is expressed as:

$$i_t = \beta_0 r^* + \beta_1 i_{t-1} + \beta_2 y_{t-1} + \beta_3 (\pi_{t-1} - \pi^*) + \beta_4 (E_t \pi_{t+1} - \pi^*)$$

$r^*$  = the equilibrium level of the real interest rate ;  $i_t$  = nominal interest rate

$y_{t-1}$  = lagged output gap ;  $\pi_{t-1}$  = lagged inflation ;

$\pi^*$  = target inflation ;  $E_t \pi_{t+1}$  = expected future inflation

- Potential instability or non-linearity can arise from
  - The preference function of the authorities
  - The structure of the economy

## 2. Taylor-rule reaction function

- Kim and Nelson (2006) and Boivin (2006):
  - Forward-looking time-varying parameter specification
  - To highlight structural changes in the conduct of U.S. monetary policy
- Dueker (1999), and Monokroussos (2010):
  - Account for discrete changes in (U.S.) target Fed funds rate
  - Allow use of the standard specification of the Taylor rule
  - Rely on the Markov Chain Monte Carlo literature (MCMC)

## 2. Case studies on China's monetary policy rule

<b>Two main groups</b>	Chen and Huo (2009), Zheng et al. (2012)	He and Pauwels (2008), Shu and Ng (2010), and Xiong (2012)
<b>Methodology</b>	Time-varying parameter model	Implicit index of monetary policy from observed changes in policy instruments
<b>Advantages</b>	Evolving coefficients of reaction function	More appropriate measure of monetary policy in China
<b>Drawbacks</b>	Money supply changes = insufficient measure of monetary policy	Constant parameter. No effect of changing economic structure on conduct of monetary policy

**We combine these two approaches**

## 2. Chinese economic transformation

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### Gradual Chinese Reforms and Structural Changes since the mid-1990s

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Mid-1990s	Labor market Privatization Price liberalization for both goods and services
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1995	Confirmation of the legal status of the PBC as a central bank
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Since mid-1990s	Gradual financial liberalisation and financial market developments
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Since 2001	WTO accession, rapid trade expansion
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2002	QFII program
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Since July 2005	Managed floating exchange rate regime
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Since April 2006	QDII program
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Since 2009	Trade settlements in RMB and offshore RMB market
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# 3. Measuring monetary policy in China

## challenges and strategy

- Challenges of measuring monetary policy in China
  - No single policy rate as operating target
  - Multiple tools: price, quantity and administrative
  - An evolving mix of such policy instruments
- Our strategy is to construct a new composite **Monetary Policy Index** (MPI) beyond conventional “3-pronged” measures
  - Converting a given instrument change into a “27 basis points equivalent change in the policy rate”
  - Pooling these equivalents into a monthly aggregate change in the overall monetary policy

### 3. Converting into a “27bps equivalent” change in the policy rate

Number of changes for each monetary policy instrument	Table 2		
	1995–2001	2002–June 2011	“Equivalent 27 bps” change
Lending and deposit rates	7	17	27bps (then 25bps)
Interest rate on required reserves	7	2	27bps
Lending rate to refinancing	9	5	27bps
RRR	2	34	50bps
Open market operations <sup>1</sup>	0	20	...

<sup>1</sup> For open market operations, the number of changes corresponds to all monthly net liquidity injections or withdrawals that are caused by these operations and larger than 260 billion RMBs in absolute terms (see Table 3 for further explanation).

Source: CEIC.

- All interest rate changes regarded as equal
- Converting 50 bps in RRR into a 27bps rate equivalent
- Converting net OMO according to a percentile rule
- **Unobserved window guidance** in absence of changes in observed policy instruments (if YoY loan growth > 20%)



# 3. Evolving policy style

- **Before 2002: blunt**
  - 80% of the moves  $\geq$  an equivalent 54 bps change in policy rate
  - 2.6 monthly moves per annum
- **After 2002: incremental** (reforms and Zhou governorship)
  - two thirds of the steps  $\leq$  27bps equivalent
  - 6 monthly moves a year on average

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Number of changes in the monetary policy index (MPI)

In absolute terms

Table 4

	<27bps	27bps	54bps	>54bps	Total
1995–2001	1	2	3	12	18
2002–June 2011	0	40	14	7	61
<b>Whole period (1995-June 2011)</b>	<b>1</b>	<b>42</b>	<b>17</b>	<b>19</b>	<b>79</b>

Source: Authors' computation.

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### 3. Key features of our benchmark MPI

- Our MPI accounts for more instruments than before
- Equal weight to all instrument changes
  - What is important is presence of policy change itself
  - The maximum instrument variation is retained for each month
- Enables us to interpret coefficients in a similar way as in the Taylor rule, as it captures magnitude of instrument changes
- Alternative pooling rules generate very similar MPIs that boost confidence and permit robustness testing later

## 4. Methodology and data

### Estimation of the Taylor rule

Approach similar to Dueker (1999) and Monokroussos (2010), relying on the Markov-Chain Monte Carlo literature (MCMC):

- Step 1: Backward-looking rule

$$MPI_t = \beta_{0,t} + \beta_{1,t}MPI_{t-1} + \beta_{2,t}\pi_{t-1} + \beta_{3,t}y_{t-1} + \varepsilon_{1,t}$$

- Step 2: Hybrid (backward- and forward-looking) rule

$$MPI_t = \beta_{0,t} + \beta_{1,t}MPI_{t-1} + \beta_{2,t}\pi_{t-1} + \beta_{3,t}y_{t-1} + \beta_{4,t}E_{t-1}\pi_{t+3} + \varepsilon_{2,t}$$

$$\varepsilon_{i,t} \sim N(0, \sigma_t^2)$$

## 4. Data

- Monthly data: January 1995 to June 2011 (source: NBS)
- Industrial output growth: filtered from Chinese New Year effect (from CEIC)
- CPI inflation (from NBS)
- Expectation of future price index from the PBC quarterly depositors' survey (published in Quarterly China Monetary Policy Report)
- Raw data are used instead of output gap and deviations from inflation target:
  - Official targets are not true objectives (as in G3 countries), more guidance
  - In general,  $\text{output} > \text{output target}$  and  $\text{inflation} < \text{inflation target}$

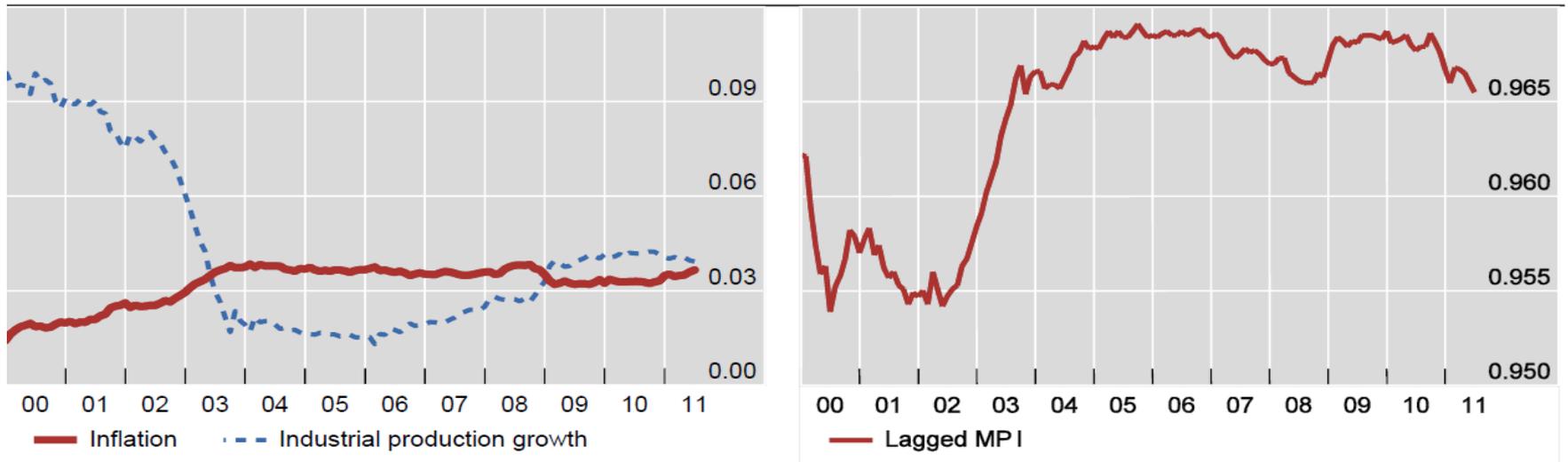
# 5. SR coefficients for backward-looking rule

- Substantial differences in monetary policy between pre- and post-2002 periods.
- 1995-2001: dominant role of output growth
- 2002-onwards: increase in the weight put on inflation and lagged MPI, and fall in the coefficient of output growth

Recursive estimation of the pure backward-looking model

Short-term coefficients of inflation, output and lagged MPI

Graph 4



Source: Authors' computation.

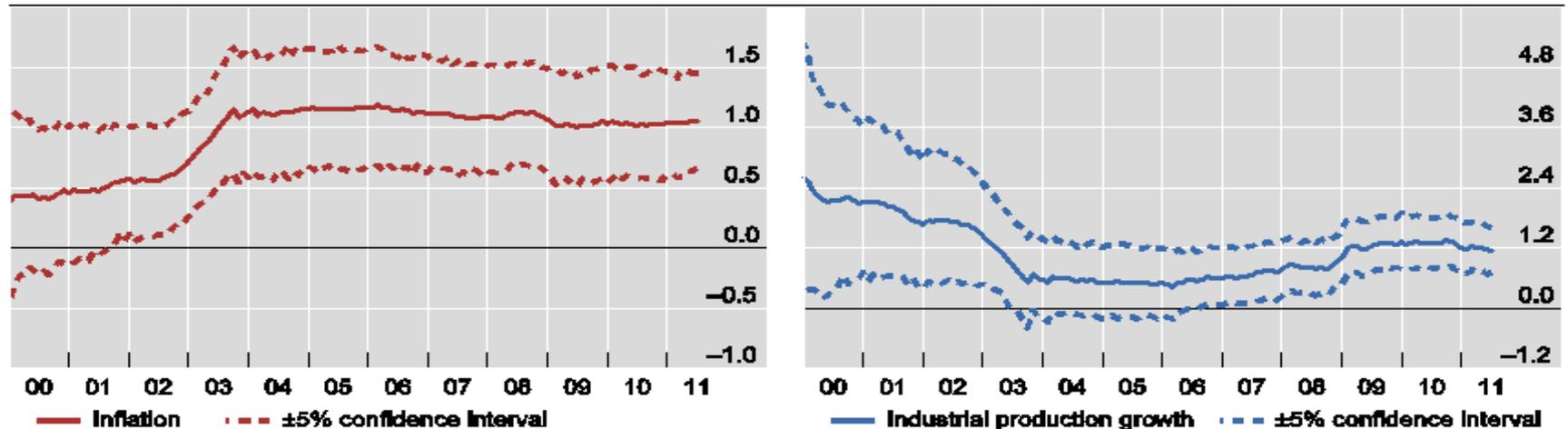
# 5. LR coefficients for backward-looking rule

- First sub-period (1995-2001), inflation-accommodating policy
  - Long-term coefficient of inflation lower than unity and of output larger than two.
- Second sub-period (2002-2011), rise in the recursive weight on inflation to a level above one
  - Converging towards international benchmarks
  - But weight on output remains high (above unity)
  - Implicit flexible inflation targeting

Recursive estimation of the pure backward-looking model

Long-term coefficients and confidence interval

Graph 4



Source: Authors' computation.

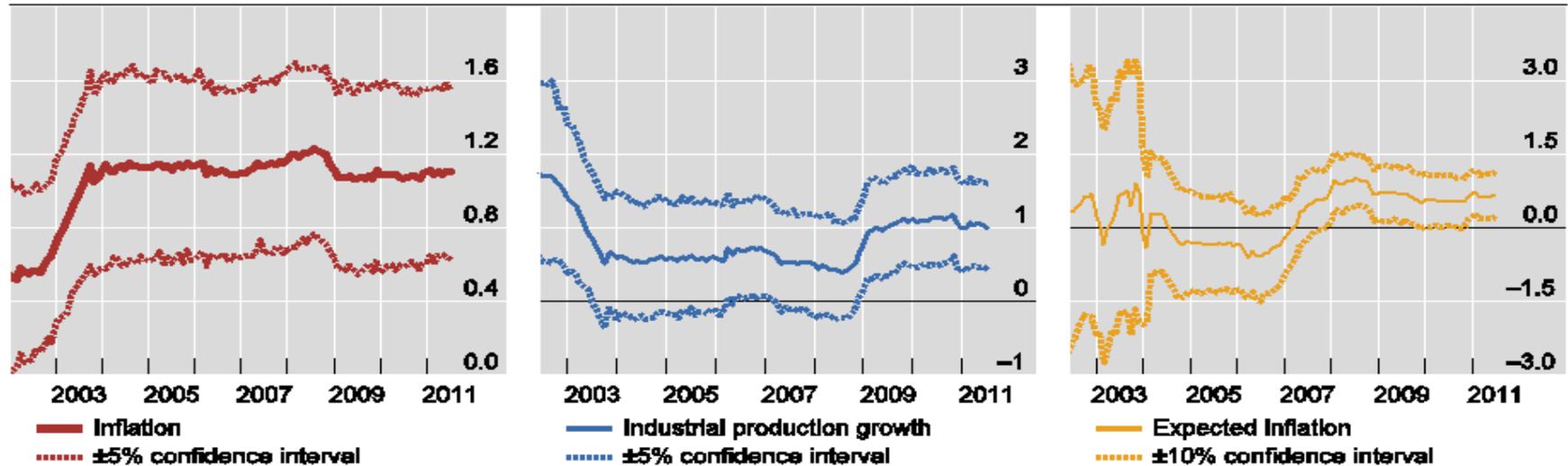
# 5. Hybrid monetary policy rule

- Gradual shift towards a hybrid reaction function,
  - initially more backward-looking
  - but increasingly taking into account forward-looking aspects, from 2008 onwards.

Recursive estimation of the hybrid model

Long-term coefficients and their confidence intervals

Graph 5



Source: Authors' computation.

# 5. China's policy rule

Long-term coefficients of the hybrid reaction function for China

Table 6

<b>PBC monetary policy</b>	<b>Inflation (1)</b>	<b>Expected inflation (2)</b>	<b>Total inflation (1) + (2)</b>	<b>Output</b>
Pre-Zhou period (1995–2001)	0.6	...	<b>0.6</b>	<b>1.8</b>
Zhou Governorship (2002–2011)	1.1	0.8	<b>1.9</b>	<b>1.2</b>
Whole period (1995–June 2011)	1.1	0.6	<b>1.7</b>	<b>1.0</b>

Short-term intercept respectively (-0.7), (-0.6), (-0.4),  $\alpha$  and lagged MPI respectively at (0.95), (0.97), (0.97) for each of the periods.

Source: Authors' computation.

- Increase in long-term inflation coefficient above 1 from 2002
- Weight on output growth decreased during the 2000s, but still high
- Shift towards a hybrid reaction function: backward- and forward looking

# 5. International perspective

Long-term coefficients in G3 reaction functions

Table 7

	Inflation <sup>1</sup>	Output <sup>2</sup>
<b>US Fed reaction function</b>		
Pre-Volcker period (1969–August 1979) <sup>3</sup>	0.5	2.2
Volcker-Greenspan period (August 1979–mid-1998) <sup>3</sup>	1.9	0.5
Volcker-Greenspan period (October 1982–December 1994) <sup>4</sup>	1.8	0.6
<b>Other G3 reaction functions</b>		
Bundesbank (April 1979–December 1993) <sup>4</sup>	1.3	0.25
Bank of Japan (April 1979–December 1994) <sup>4</sup>	2.0	0.1

<sup>1</sup> Expected inflation as independent variable. <sup>2</sup> Output gap as independent variable. <sup>3</sup> MCMC estimation by Monokroussos (2010). <sup>4</sup> GMM estimation by Clarida, Gali and Gertler (1998).

Sources: Clarida, Gali and Gertler (1998) and Monokroussos (2010).

- Pre-2002 period in China similar to pre-1979 period in G3 countries: accommodating-inflation policy + strong reaction to output
- Anti-inflationary policy in post-2002 in China and post-1979 in G3
- Still high output weight typical of emerging economies (such as India...)

## 6. Conclusion

- Our new composite MPI suggests two distinct regimes
  - Before 2002: mostly easing, bigger but infrequent policy moves
  - After 2002: mostly tightening, frequent but smaller policy steps
- Consistent with:
  - Gradual liberalisation and market developments in the 1990s
  - Strong growth and emerging price pressures in the 2000s
  - New policy orientation and style of the PBC since 2002 under the Zhou Governorship

## 6. Conclusion

- Informal flexible inflation-targeting
  - Greater weight on inflation post 2002
  - Initially backward looking, but increasing role of forward-looking aspects in the 2000s.
- Monetary policy has aimed at the “state-of-the-art” monetary policy rule:
  - Inflation accommodation initially, and later aggressive vis-à-vis inflation, post-2002 for PBC, as post-1979 for the G3
  - Still large weight on output as in emerging economies

**Thank you for your attention!**