An underlying inflation gauge (UIG) for China

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Abstract

Inflation in China is driven by volatile yet persistent changes in food and energy prices, making it difficult for policymakers and investors to gauge the underlying inflation trend. Traditional core inflation measures either neglect or down-weight the more volatile subcomponents of the CPI and thus risk excluding information that is helpful in gauging current and future trends in inflation. Therefore, economists at the PBoC and BIS have jointly explored and developed a novel underlying inflation gauge (UIG) for China, to complement the traditional core inflation measures. By extracting the persistent part of the common component in a broad data set of price and non-price variables, the UIG avoids the excess volatility reduction that plagues traditional core measures in China's case. Further, the UIG outperforms traditional core inflation measures in forecasting the headline CPI over different samples.

Keywords: Inflation, dynamic factor models, core inflation, monetary policy, forecasting, China

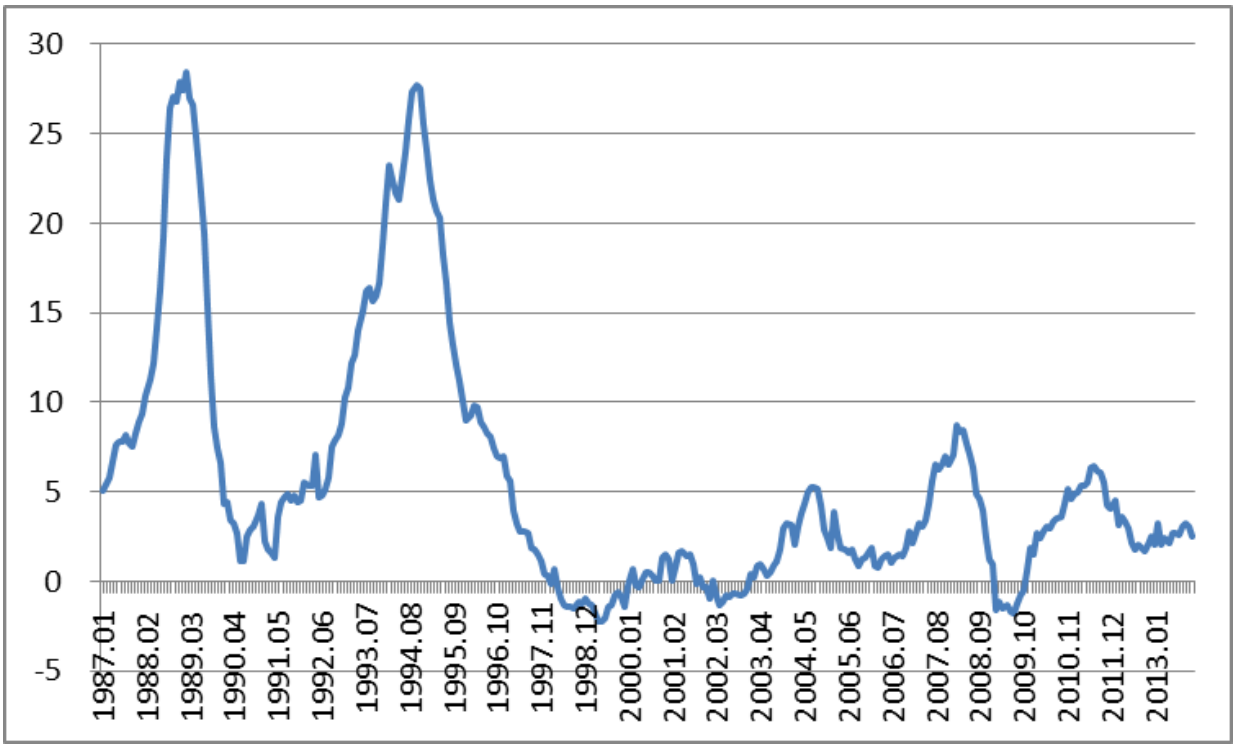
JEL classification: C13, C33, C43, E31, E37, G15

Inflation in China is driven by volatile yet persistent changes in food and energy prices, making it difficult for policymakers and investors to gauge the underlying inflation trend. Traditional core inflation measures either neglect or down-weight the more volatile subcomponents of the CPI and thus risk excluding information that is helpful in gauging current and future trends in inflation. Therefore, economists at the PBoC and BIS have jointly explored and developed a novel underlying inflation gauge (UIG) for China, to complement the traditional core inflation measures. By extracting the persistent part of the common component in a broad dataset of price and non-price variables, the UIG avoids the excess volatility reduction that plagues traditional core measures in China's case. Further, the UIG outperforms traditional core inflation measures in forecasting the headline CPI over different samples.

Chinese inflation dynamics

China's inflation has become lower and less volatile over the past two decades (Graph 1). Between 1987 and 2000, the mean and standard deviation of the monthly year-on-year inflation were 8.8% and 8.7%, respectively. During 2001 and June 2012, however, they dropped to 2.5% and 2.4%, respectively. In this latter period, the Chinese economy experienced three full "well behaved" inflation cycles. Inflation in these three post-2000 cycles was much lower and less volatile than the inflation cycles seen in the 1980s and 1990s. Moreover, China's post-2000 inflation dynamics appear to be more associated with domestic and external cyclical shocks and less related to liberalisation of administered prices.

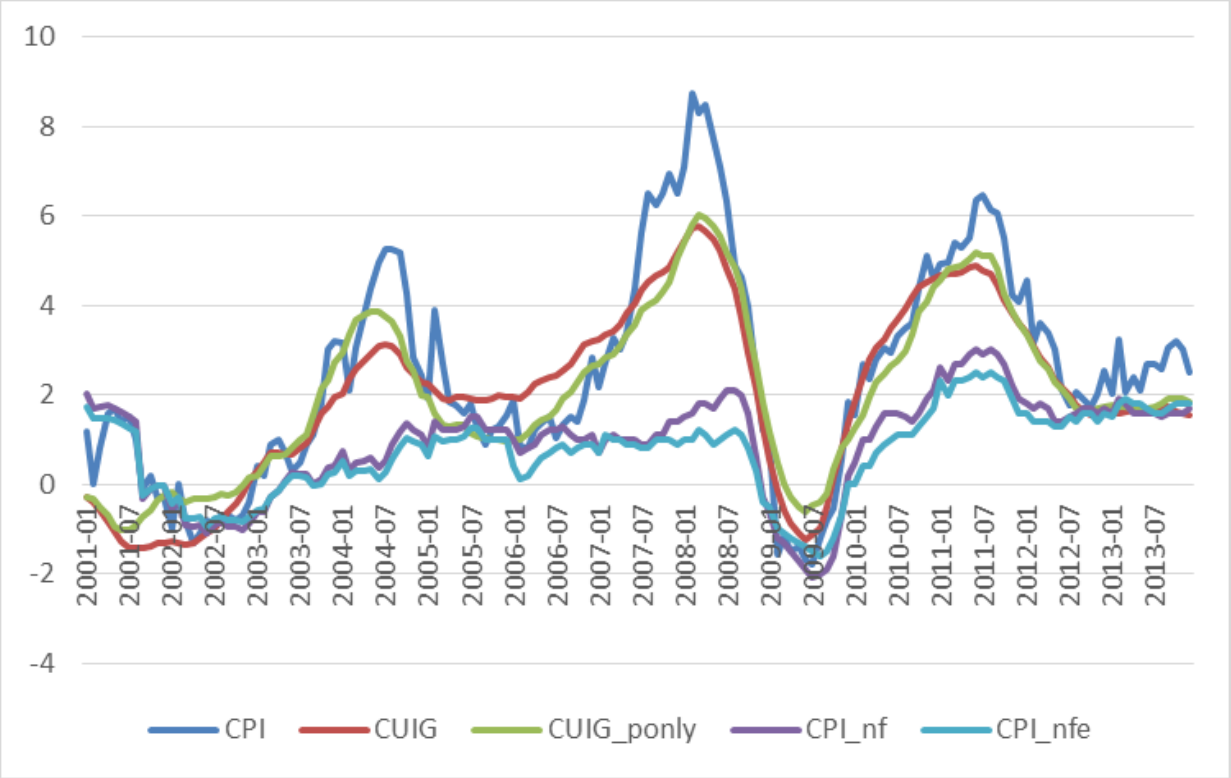
China's CPI inflation dynamics (1987–2013, monthly and year-on-year) Graph 1



Underlying trend in Chinese inflation

Current and prospective inflation matters a lot to monetary policymakers and market participants. Yet headline inflation can be excessively noisy, making it difficult to judge whether a sudden up or down move in the most recent CPI observation should be considered as temporary noise or a change in trend. This has led to the development of core inflation measures, which either fully exclude or down-weight volatile subcomponents of the CPI, such as energy and food prices. However, in the case of China, and in most other emerging markets, food and energy account for a heavy weighting and play an important role in inflation dynamics. Excluding these components may lead to an *excess volatility reduction*. As Graph 2 shows, from 2004 to 2008, China's official core inflation measures such as the CPI excluding food (CPI_nf) and the CPI excluding food and energy (CPI_nfe) stayed close to around 1%, while the CPI itself fell from 5% to 1% and then moved back up to 8%. After getting rid of these volatile but important components, the traditional core measures show little movement, and their usefulness in signalling changes in the CPI is thus limited.

Headline and core inflation measures and underlying inflation gauge for China Graph 2



Therefore, economists at the PBoC and BIS have jointly explored and constructed a novel underlying inflation gauge for China (Amstad, Ye and Ma (2014, 2015)). This "Underlying Inflation Gauge (UIG) for China" adds instead of discards information that potentially could be useful to gauge the trend of inflation. The UIG is essentially an indicator that summarises a broad data set of price, real activity and financial variables that potentially matter for future inflation but retains only the persistent part of such

information. The data set starts in 2001, has a total of 473 variables and consists of five major categories: prices (48%), economic activity (35%), the labour market (9%), money and credit (8%), and the financial market (6%). As these variables are updated regularly and throughout the month, the UIG can also be updated regularly and intra-monthly. This feature is particularly useful in times of quick but persistent changes in inflation – the times when policymakers most need guidance. A version of the UIG based on a narrower data set of CPI subcomponents only (UIG_ponly) is also considered.

Technically, the UIG is an application of a dynamic factor model based on Forni et al (2000, 2005). The model summarises the lead and lag relationship of all included variables against inflation in the so-called common component. Stock and Watson (1999) have popularised dynamic factor models. The model type used for UIG retains only the persistent part in the common component, to assure a smooth and non-noisy signal.

This approach has already been applied at a number of the OECD central banks, such as Cristadoro et al (2001) for European inflation and Amstad and Fischer (2009) at the Swiss National Bank. An underlying inflation gauge for the United States has been calculated daily at the Federal Reserve of New York since 2005 (Amstad and Potter (2009), Amstad et al (2016)).

The UIG for China outperforms traditional inflation core measures on several matrices. While the UIG is highly correlated with and smoother than headline CPI inflation, it does not suffer from the excess volatility reduction when compared to core measures. As measured by standard deviation, its volatility of core measures is only 40–50% of that in the headline inflation, while the UIG retains 83% (Table 1). More importantly, the UIG forecasts headline inflation better than traditional core measures, with high statistical significance (Table 2). These results have been robust in classical forecasting exercises (horse races), over different sample horizons and across various partitions of the broad data set. Taken together, this illustrates that *a change in the UIG is not due to noise but can be interpreted as a signal that the underlying trend in inflation is changing*. So, while traditional core measures are easy to construct and communicate, it seems advantageous for policymakers to also follow the complementary UIG that could provide an early, non-noisy signal, especially when inflation dynamics are about to change.

Standard deviation

Sample: January 2001–December 2013 Table 1

	CPI	UIG	UIG_ponly	UCPI	CPI_nf	CPI_nfe
S.D.	2.34	1.95	1.81	1.47	1.12	0.95
Portion (%)	100%	83%	77%	63%	48%	40%

Note: S.D. is Standard Deviation. CPI_nf = CPI excluding food. CPI_nfe = CPI excluding food and energy. UIG_ponly = UIG using only price data. Source: Amstad et al (2014, 2015).

Forecasting performance

Table 2

	Forecasting full period 2006–13 (estimation period:2001–05)			Forecasting crisis period 2008–13 (estimation period:2001–07)		
	RMSE[1]	DM stat[2]	DM p-value[3]	RMSE[1]	DM stat[2]	DM p-value[3]
UIG	2.63	Na	na	2.83	Na	na
UIG_ponly	3.03	2.40	0.01	3.15	1.76	0.04
CPI_nf	3.43	2.70	0.00	3.33	2.91	0.00
CPI_nfe	3.29	1.88	0.03	3.10	1.18	0.12
UCPI	3.74	3.17	0.00	3.59	3.09	0.00
CPI_LAG12	4.11	3.41	0.00	4.28	2.59	0.00

[1] Root Mean Square Errors (RMSE). [2] Diebold-Mariano (DM) statistics. [3] Diebold-Mariano likelihood (DM p-value).

Note: CPI_nf = CPI excluding food. CPI_nfe = CPI excluding food and energy. UIG_ponly = UIG using only price data.

Source: Amstad et al (2014, 2015).

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