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# POLICY NOTE

# Robust Measures of Core Inflation for Vietnam

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*The paper develops robust measures of core inflation for Vietnam that can be used in policy-making. These core inflation measures (CIMs) are based on an analytical evaluation of the inflation process in the country, and use a filtering approach to narrow down potential measures that satisfy certain empirically desirable criteria. The study finds that commonly used exclusion-based measures (EBMs) do not perform well against these empirical criteria; trimmed mean measures (TMMs) do better. Among TMMs, "one trim does not fit all periods" — periods of high and variable inflation require larger trims, and vice versa. The econometric computer programmes employed in the paper allow for quick and timely replication of CIMs as new data become available, making them valuable tools for the State Bank of Vietnam. These procedures and programmes can also be helpful to other central banks in their policy making process.*

**Keywords:** Vietnam, core inflation, monetary policy, exclusion-based measures, trimmed mean measures.

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## 1. Introduction

During the last decade, the State Bank of Vietnam (SBV) responded to high inflation episodes in 2008 and 2011 by raising policy rates. Was this response warranted, or warranted to the extent that it was undertaken? Contrarian as it may appear, there are valid reasons — theoretical and practical — to ask this question. First, a substantive part of the headline inflation in both episodes was associated with global rice and oil price movements. Also, headline inflation rose and fell quickly over six to eight

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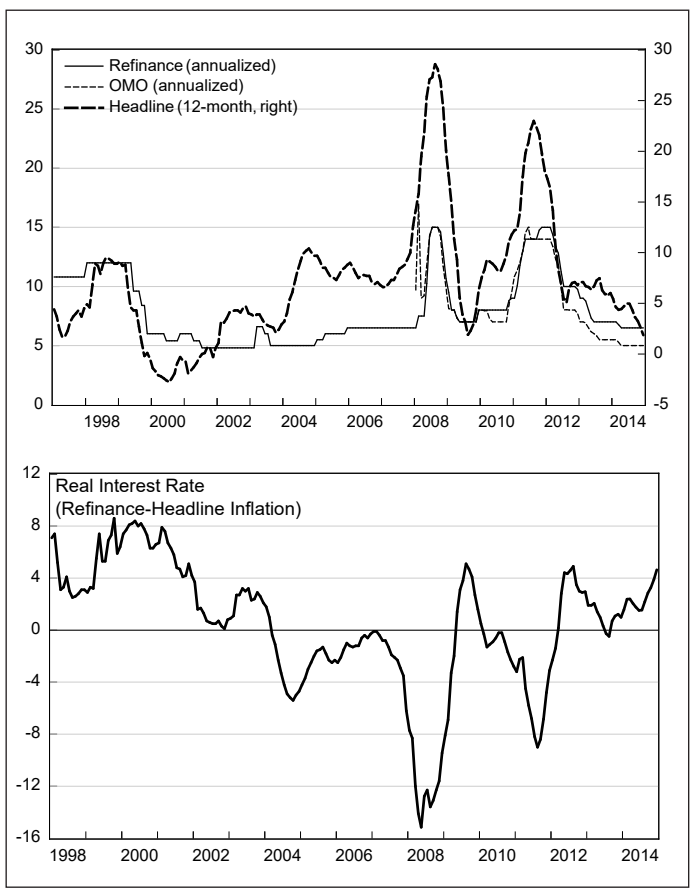
months, suggesting that, as a first approximation, these changes may have been more of the nature of temporary, external supply shocks than persistent, domestic demand shocks. Were underlying inflation pressures more muted? Second, the increases in the policy rates and those in the deposit and lending rates in the banking system lagged headline inflation and generated large swings in real interest rates. These large increases in real interest rates substantially raised the funding costs of enterprises and affected the balance sheets of financial institutions. Should the central bank have responded less to headline inflation and more to underlying inflation pressures? In the future, what underlying measure of inflation could SBV focus on as guide to policy-making? This paper addresses these analytical and policy questions. The primary objective of this study is to construct and evaluate alternative measures of core inflation in an empirically rigorous manner to identify robust measures that can guide central bank policy-making.

The extensive theoretical literature on inflation does not provide a unique definition of core inflation. Okun (1970) views core inflation as "a condition of generally rising prices"; Flemming (1976) as "the

FIGURE 1
Vietnam: Inflation and Policy Rates
(in percentage)




SOURCES: Vietnam authorities; and authors' calculations.

rate at which the general level of prices in [the] economy is changing"; and Eckstein (1981) as "the trend increase of the cost of the factors of production". Quah and Vahey (1995) define core inflation as a "component of measured inflation that has no medium- to long-term impact on real output". Roger (1998) divides the various definitions into two views of core inflation: persistent and generalized. Silver (2006) provides an overview of statistical measurement issues relating to alternative measures of core inflation. In other approaches, core inflation is judged to be the systemic component of inflation which is demand-determined, and hence should be the target of monetary policy management. The remaining part of inflation is attributed to idiosyncratic shocks, both from the demand and supply sides. Along these lines, when central bank policy management targets core inflation, as the idiosyncratic shocks dissipate, headline inflation reverts to core inflation over the medium run. More recent contributions to this literature include studies by Crone et al. (2012) and Stock and Watson (2015) that offer a somewhat different view of the inflation process in advanced economies and the relative roles of core and headline inflation in policy-making (in this case, the United States).

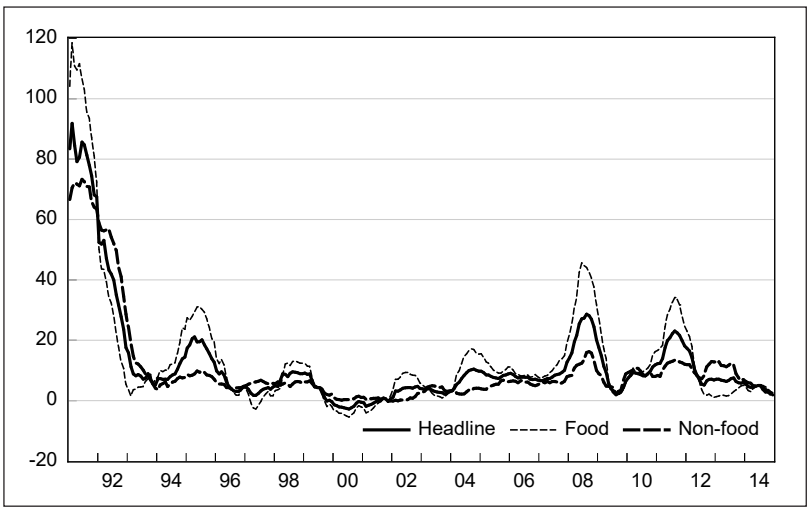
For purposes of this paper, we rely on the earlier literature which emphasizes core inflation as the operational tool for central bank decision-making. This is mainly because several components of headline inflation may exhibit high volatility and hence should be "factored" out when monetary policy decisions are made. In doing so, we acknowledge that the paper does not establish the primacy of core over headline inflation as the relevant goal of monetary policy for Vietnam. Rather, it arrives at this conclusion based on the empirical properties of the two indices, and carries over this logic to choosing among various indices of core inflation. Moreover, in the construction of the core inflation indices, we do not start from an analysis of the volatility properties of the consumer price index (CPI) subcomponents. While studying the subcomponents' interactions and contribution to headline inflation would be a useful exercise, it would require a considerable expansion of the scope of this paper. To keep the paper manageable, we rely on *a priori* assumptions in the literature about the properties of the subcomponents, refer to past evaluations, and use established procedures. Despite these confines, we conduct an extensive empirical investigation of the inflation process and carry out a rigorous comparative analysis of the CIMs.

The remainder of this paper is organized as follows. The next section provides an overview of the inflation process in Vietnam over a longer time horizon to extract the key determinants of inflation. The third section has a selected literature survey, including definitions and construction of core inflation measures (CIMs). The fourth section constructs and evaluates CIMs for Vietnam. The final two sections offer recommendations and concluding remarks, respectively. As part of the recommendations, the paper identifies CIMs that the SBV could use for internal analytical and policy-making purposes and others that may be better suited for external communications. Over the longer term, reliable CIMs could form the foundation for a shift to an inflation-targeting regime in the country. The procedures and programmes constructed with Vietnam's data can, of course, be replicated for other countries to provide guidance for central bank policy-making in those countries as well.

## 2. The Inflation Process in Vietnam: Key Elements

Vietnam has experienced high and variable inflation over the last three decades. Several factors — domestic and external — have played a role in shaping the inflation dynamics. After the failure of the 1985 reform package, hyperinflation ensued and twelve-month headline inflation peaked at 775 per cent by the end of 1986.[1] With *Doi Moi* in 1986, and several measures — including higher interest rates, cuts in subsidies to SOEs, significant moderation of wage increases, and cuts in budget expenditure/deficits — inflation was brought down to two-digit levels, and then fell to the single-digit territory for the first time in 1993. Inflation stayed at high levels in the intervening period. Between 1996 and 2007, it remained in the single digits.

FIGURE 2
Vietnam: CPI Inflation
(12-month percentage change)




SOURCES: Vietnam authorities; and authors' calculations.

Under pressures from rapid growth, droughts, avian flu, and a combination of loose domestic macroeconomic policies and external shocks, inflation rose rapidly again in 2007, peaking at 28.5 per cent year on year in August 2008. It then fell quickly to single-digit levels six months later as global rice and oil prices fell.

A similar episode occurred once again in 2011, although of a smaller magnitude. Headline inflation edged up to 23 per cent year on year in August 2011, but then declined to single digits in a space of about eight months. Since then, inflation has stayed stable at around 5 per cent for most of 2013 and 2014. This was because government policies prioritized macroeconomic stability and the economy sagged under the weight of past balance sheet excesses in the banking and corporate sectors. Muted inflation in China may also have contributed to the lower inflation in Vietnam.

### *2.1 Statistical Properties*

For a long time, Vietnam's headline inflation was higher and more variable than several comparator countries. Between 2000 and 2014, twelve-month inflation was greater than 7.5 per cent — with a range of over 30 per cent and standard deviation of 6.75 per cent. This was over three times the inflation in Asian newly industrialized economies, and substantially higher than ASEAN-4 and a wider set of emerging and developing countries. Moreover, as noted above, inflation was high and more variable in the pre-1996 and post-2008 subsamples. This difference in the behaviour of inflation has a bearing on the choice of CIMs (as shown in section 4). In this section, CIMs are constructed for the full sample 1999–2014, as well as for two subsamples (1999–2007 and 2008–14). The two subsamples differ noticeably in that inflation was low and less variable in the first; whereas the second subsample saw two bouts of high inflation and inflation was also more volatile during this period.

In Vietnam, stable seasonality in monthly headline inflation is related to *Tet* celebrations during January/February when inflation is high (averaging 1–2 per cent) and about 0.5 per cent until November

TABLE 1
Headline Inflation: Cross-Country Comparison
(12-month percentage change, average 2000–14)

| | *Mean* | *Median* | *Maximum* | *Minimum* | *Std. Dev.* |
|---|---|---|---|---|---|
| Newly Industrialized Economies (NIEs) | 2.1 | 1.8 | 6.4 | –1.0 | 1.6 |
| Emerging and Developing Asia | 4.1 | 4.0 | 8.6 | 0.8 | 1.7 |
| ASEAN-4 | 4.1 | 3.9 | 9.9 | –0.5 | 1.8 |
| Vietnam | 7.6 | 6.8 | 28.3 | –2.7 | 6.7 |

NOTE: NIEs: Hong Kong, South Korea and Singapore; ASEAN-4: Indonesia, Malaysia, The Philippines and Thailand; Emerging and Developing Asia (29 countries): Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Fiji, India, Indonesia, Kiribati, Lao P.D.R., Malaysia, Maldives, Marshall Islands, Micronesia, Mongolia, Myanmar, Nepal, Palau, Papua New Guinea, The Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, and Vietnam.
SOURCE: IFS database.; and authors' calculations.

when inflationary pressures rise again in December in the run-up to *Tet*. Food inflation in the country is very highly correlated with global rice prices. As in several other nations, the distribution of component inflation is positively skewed and leptokurtic. The absence of normality in the component series plays a key role in the construction, evaluation and choice of CIMs.

## 3. Literature Survey

### *3.1 Core Inflation: Conceptual Issues*

*3.1.1 Definition.* On the measurement of core inflation, alternative approaches in the literature include: exclusion-based methods; imputation methods; limited influence estimators; reweighting; and economic modelling. To fix notation, consider the CPI index $P_t$ in period $t$ as the weighted sum of $n$ individual component series $P_{it}$ where the weights $\alpha_i$ sum to 1. Then, inflation $\pi_t$ is a weighted sum the component inflations $\pi_{it}$ with *time varying* weights.

$$P_t = \sum_{i=1}^{n} \alpha_i P_{it}; \quad \sum_{i=1}^{n} \alpha_i = 1 \tag{1}$$

$$\pi_t = \sum_{i=1}^{n} \omega_{it} \pi_{it}; \quad \sum_{i=1}^{n} \omega_{it} = 1 \tag{2}$$

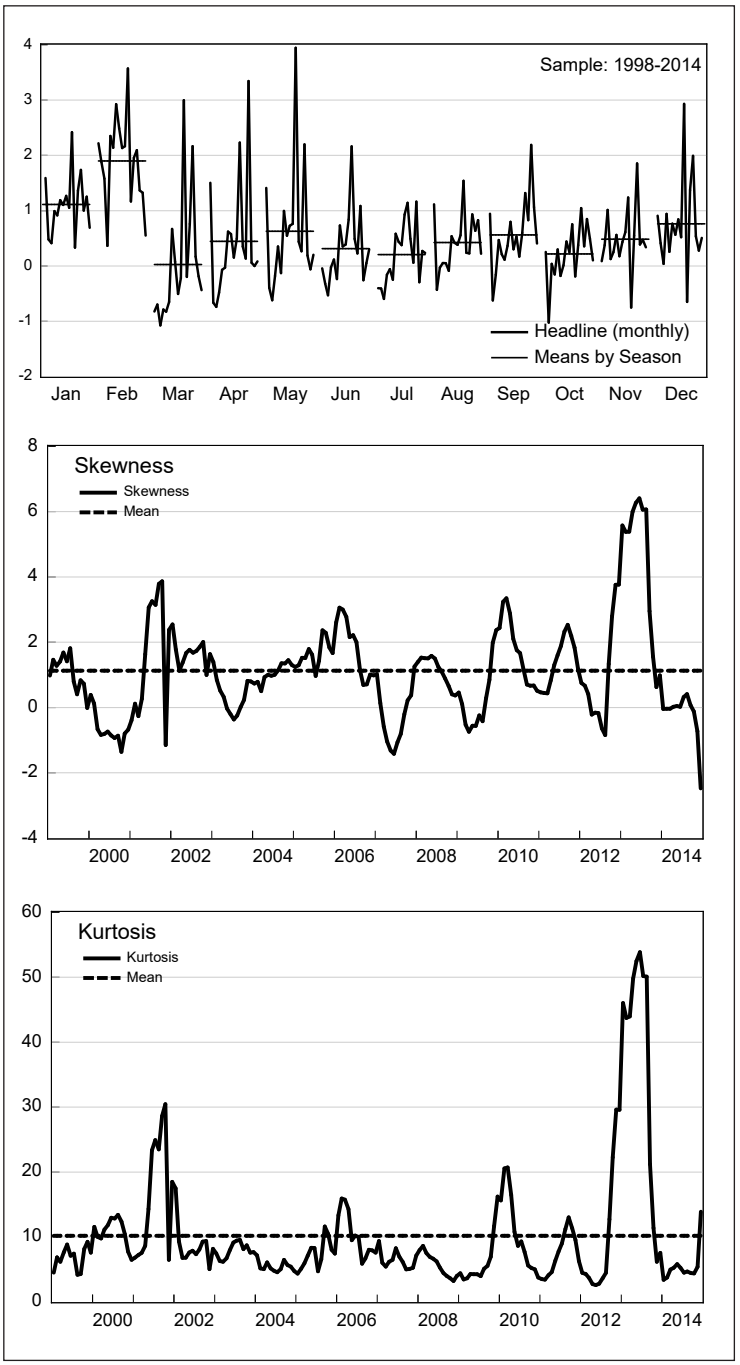
Component inflation can be understood as being driven by two parts: core inflation ($\pi^*_t$) and commodity-specific shocks ($v_{it}$). Headline inflation is the sum of core inflation ($\pi^*_t$) and an error term $u_t$. Under specific assumptions on $v_{it}$, $u_t$ is normal, mean zero and stationary.

$$\pi_{it} = \pi^*_t + v_{it} \tag{3}$$

$$\pi_t = \pi^*_t + u_t;\ u_t \sim \textit{Normal}, \textit{mean zero}, \textit{stationary} \tag{4}$$

*3.1.2 Construction.* Examples of core inflation as the persistent component of inflation include filtering or smoothing techniques which equate core inflation with the trend component, or use a univariate regression model. Core inflation as generalized inflation consists of two main methodologies: exclusion-based measures (EBMs) and limited influence measures (LIMs).

FIGURE 3
Characteristics of CPI Inflation




SOURCES: Vietnam authorities; and authors' calculations.

EBMs are, by far, the most commonly used approach by central banks, given the ease of computation, timeliness, replicability, and transparency. A popular measure is the Consumer Price Index (CPI) excluding components like food (because of weather conditions, *inter alia*) and energy (considered volatile and subject to supply shocks or seasonality). Administered prices, indirect taxes, interest (mortgage) payment are also often excluded as they are erratic and endogenous to policy making. In the computation of EBMs, weights of excluded items are reduced to zero, and the weights of the remaining included items are increased proportionately (to sum up to 1). Continuing with the notation as above, an EBM of core inflation which excludes food and energy would be:[2]

$$\pi^*_t = \sum_{i=3}^{n} \tilde{\omega}_{it}\pi_{it}, \tag{5}$$

*where* $\omega_{it} = 0$ *for food* (1) *and energy* (2) *and* $\sum_{i=3}^{n} \tilde{\omega}_{it} = 1$

However, exclusion should be carried out with caution. It is important to distinguish between signal and noise in the inflation data. For example, given that food often accounts for a large portion of CPI basket, exclusion of the whole group may lead to the loss not only of noise, but also a substantial part of the signal. In such a scenario, exclusion of a narrower group — such as raw food — may be more appropriate, especially if it is the main source of volatility.

LIMs (or stochastic estimators) are measures that exclude a specific proportion at the tail of the distribution of price changes in the components of the CPI basket. The set of "trimmed" items changes each month, depending on which items display extreme price movements. The most common LIMs are *weighted median* and *trimmed means*. The weighted median is the value of the middle price change when price changes are ranked based on expenditure shares. Trimmed (*symmetric*) means omit predetermined upper and lower tails of the distribution of price changes. For example, a CPI1010 would exclude 10 per cent of the weight at the top and bottom of a (ranked) distribution of price changes. The weighted median is an extreme type of trimmed symmetric mean. In notation, trimmed mean CIMs take the form:

$$\pi^*_t = \sum_{i=j}^{n-k} \tilde{\omega}_{it}\pi_{it}, \tag{6}$$

*where* $\omega_i = 0$ *for* $i < j$ *and* $i > k$; $\pi_{1t} < \pi_{2t} < \ldots < \pi_{jt} < \ldots < \pi_{kt} < \ldots < \pi_{nt}$ *and* $\sum_{i=j}^{n-k} \tilde{\omega}_{it} = 1$

One advantage of LIMs is the robustness to price shocks. Moreover, inflationary trends relative to "noise" are broadly well captured by these measures. However, the distribution of CPI component price

TABLE 2
Cross-Country Practices: Exclusion-based CIMs

| *Excluded components* | *Country* |
|---|---|
| 1. Food and Energy | Thailand, Korea, Canada, USA, Norway (energy), Japan (food), Spain and Portugal (energy and food), the Netherlands (fruits, vegetables and energy) |
| 2. Indirect taxes | Czech Republic, Norway, Canada |
| 3. Administered prices | Czech Republic |
| 4. Interest, interest rate mortgage loan, housing rental | UK, Australia, New Zealand, Ireland, South Africa |

Sources: National authorities.

changes is often non-normal — usually skewed to the right and leptokurtic. This requires the construction of *asymmetrically* trimmed means which shave off a larger/smaller percentage of the CPI basket at the upper/lower end of the distribution of price changes. The rationale for this comes from a view that each price change in a component of the CPI basket consists of trend inflation and an idiosyncratic relative price shock. If the distribution of relative price shocks is normal, then the weighted average based CPI would be a reasonably good estimator of trend inflation.

These CIMs are not without problems. They are harder to communicate to the public. Moreover, transitory shocks are not always separated from persistent shocks, so that noise and signal may again be mixed up. In addition, these measures are relatively sensitive to the level of aggregation of data selected, and the length of time series over which price changes are taken.

### *3.2 Empirical Literature on Core Inflation Measures for Vietnam*

There is very limited empirical literature on CIMs for Vietnam. As part of the International Monetary Fund's technical assistance programme, the development of CIMs was proposed in a series of reports. These reports suggested that EBMs (especially CPIxF and CPIxFEA; explained later) could potentially serve as CIMs (given their transparency and timeliness), but did not conduct any formal tests. These reports also suggested construction of Trimmed Mean Measures (TMMs) as they are theoretically "smoother" and hence useful for policy purposes. Again, several of these properties were not empirically tested. The sample period for CIMs constructed under this initiative was January 1998 to October 2006.

Lai (2013) provides a more recent attempt to evaluate CIMs for Vietnam. It evaluates five measures of core inflation: excluding food price; trimmed-mean; weighted median; exponentially smoothed; and output-neutral inflation. These CIMs are evaluated empirically for tracking the trend, predictive power and co-integration with headline inflation. The key finding is that the output-neutral inflation satisfies almost all the evaluation criteria, and could be used for analytical purposes — in conjunction with either the trimmed-mean or weighted median for communication purposes due to their relatively simple construction. The analysis in this paper uses a significantly longer sample period than Lei (2008Q1–2013Q1) and employs a different set of evaluation criteria. Specifically, the study uses the "attractor" conditions proposed by Marques, Neves and Sarmento (2003) to evaluate the alternative core inflation measures.

## 4. Robust Core Inflation Measures for Vietnam

### *4.1 Data and Construction of CIMs*

Monthly CPI data for Vietnam is compiled and announced by the General Statistics Office (GSO). We use this data to compute CIMs, both EBMs and TMMs. Since the methodology of CPI compilation in Vietnam is in accordance with international standards, the credibility and transparency of the CPI data are a good starting basis for the construction of CIMs. We first splice the following four different segments into a single headline CPI and component CPI series for the period January 1998 to December 2014:[3]

1. Period 1: January 1998 to June 2001, base year 1995, with 300 components;
2. Period 2: July 2001 to April 2006, base year 2000, including 390 components;
3. Period 3: May 2006 to October 2009, base year 2005, including 496 components; and
4. Period 4: November 2009 to December 2014, base year 2009, with 572 components.

CIMs are constructed for twelve-month price changes. The procedure can similarly be applied to other horizons. The full sample period is January 1999 to December 2014. Table 3 provides definitions and excluded weights for eight EBMs analysed in this paper. Of these, two measures — CPIxF and CPIxFEA — were recommended by the SBV-GSO Inter-ministerial Working Group on Core Inflation based on IMF technical assistance. Later, Health Care Services and Education Services were among the "excluded items" groups given large changes (especially since 2010 and in 2012–13) as Vietnam moved to marketization of these services.

For TMMs, the monthly CPI was broken down into eighty-six components at the two-digit level. This is a higher level of disaggregation than has been used in any previous study. Several TMM measures — symmetric and asymmetric — were constructed with the left and right trims ranging between 15 per cent and 30 per cent, at 1 per cent intervals, so that a total of 225 TMMs were constructed and evaluated. The procedure was repeated for two subsamples: 1999–2007 and 2008–14.

### *4.2 Evaluation*

Silver (2006) sets key criteria for choosing among alternative CIMs. These include: credibility; control; deviations from a smoothed reference series; volatility; predictive ability; causality and co-integration tests; and correlation with money supply.

The empirical cross-country literature, however, does not generate a unique, preferred CIM. Silver (2006) concludes that country practice differs in how the various statistical approaches are implemented

TABLE 3
Exclusion-based CIMS: Definitions and Excluded Weights

| *CIM* | *1998M1: 2001M6* | *2001M7: 2006M4* | *2006M5: 2009M10* | *2009M11: 2014M12* |
|---|---|---|---|---|
| CPIxA (excludes 4 items of administered prices: water, electricity, public transport services). | 2.1 | 3.2 | 5.0 | 3.7 |
| CPIxAHE (excludes 4 items of administered prices, health care services and education services). | 3.9 | 6.2 | 11.6 | 12.4 |
| CPIxE (excludes electricity, gas, and fuel). | 6.7 | 5.4 | 8.5 | 8.3 |
| CPIxF (excludes 8 items of raw food: rice, wheat cereal, fresh meat, eggs, fresh seafood, vegetables, and fruits). | 43.5 | 29.6 | 26.5 | 24.1 |
| CPIxFA (excludes 8 items of raw food and 4 items of administered prices). | 45.5 | 32.8 | 31.5 | 27.7 |
| CPIxFE (excludes 8 items of raw food, electricity, gas, and fuel) | 50.1 | 35.0 | 35.0 | 32.3 |
| CPIxFEA (excludes 8 items of raw food, 3 items of energy, and 4 items of administered prices) | 50.7 | 36.1 | 36.6 | 33.5 |
| CPIxFEAHE (excludes 8 items of raw food, 3 items of energy, 4 items of administered prices, health care services, and education services) | 52.5 | 39.1 | 43.1 | 42.2 |

SOURCE: GSO; and authors' calculations.

and how their appropriateness is assessed. There is little consistency in the results of cross-country studies to readily suggest guidelines on accepted methods. Moreover, a country may have various measures that are used for different purposes. For instance, some measures may be useful for analytical purposes but difficult to explain to the public; others may not be fully "accurate" for policy purposes, but very easy for the central bank to communicate and for the public to comprehend. Furthermore, the chosen CIM may differ depending on the policy horizon. In summary, across countries, there may not be a clear cut "winner" which satisfies all purposes when choosing a CIM.

In the remainder of the paper, we use a three-step evaluation criterion to narrow down potential CIM choices. First, a CIM must satisfy certain necessary conditions as an "attractor" for headline inflation. For this, we use the Marques, Neves and Sarmento (2003) conditions. Intuitively, these conditions require "co-movement" between headline inflation and the CIM over the medium run, and imply the reversion of headline inflation to the CIM. Second, the measures that satisfy the "attractor" conditions are compared for deviations against a reference series. Here, we use Root Mean Square Deviation (RMSD) or Mean Absolute Deviation (MAD). A twelve-month centred moving average of CPI inflation ($MA(\pi_t)$) is typically used in the literature as the reference series. In addition, while a CIM is generally expected to be less variable than headline inflation, this may not necessarily be the case. We therefore compute the standard deviation (SD) and coefficient of variation (CV) of the CIMs against that of headline inflation. Third, we examine the CIMs' ability to "forecast" headline inflation at different horizons using Cogley (2002) tests.

*4.2.1 Marques, Neves and Sarmento "Attractor" Conditions.* Marques, Neves and Sarmento (2003) introduces three testable, empirical conditions for evaluating CIMs:

*Condition 1:* Headline inflation and a CIM should not exhibit systematically divergent trends. This can be tested with the following two conditions:

*Condition 1a:* Headline inflation and core inflation should be co-integrated with unit coefficient, i.e., $u_t$ should be stationary with zero mean.[4] This condition essentially means that $\pi_t$ and $\pi^*_t$ cannot exhibit a systematically non-vanishing difference in the long run. If $u_t$ does not have zero mean, then $\pi^*_t$ does not capture the persistent component of inflation. This condition is one of the alternative tests for unbiasedness proposed in the literature (see Roger 2008).

*Condition 1b:* Even if $u_t = (\pi_t - \beta\pi^*_t)$ is stationary but $\beta \neq 1$, headline inflation and the CIM tend to drift apart. One way to examine this property is by testing the hypothesis given $\beta = 1$ given $\alpha = 0$ in equation (7).

$$(\pi_t - \pi^*_t) = \alpha + (1 - \beta)\pi^*_t + \mu_t \tag{7}$$

*Condition 2:* $\pi^*_t$ is an attractor of $\pi_t$. This formalizes the assumption that headline inflation converges to core inflation in the long run. This condition can be tested using equation (8):

$$\Delta\pi_t = \sum_{j=1}^{m} \phi_j \Delta\pi_{t-j} + \sum_{j=1}^{n} \xi_j \Delta\pi^*_{t-j} - \gamma(\pi_{t-1} - \pi^*_{t-1}) + \varepsilon_t \tag{8}$$

This requires the existence of an error correction representation for $\pi_t$ which is satisfied if the null hypothesis ($\gamma = 0$) is not accepted. The implication of this condition is that headline inflation may diverge from core inflation in the short run, but is "attracted back" in the long run.

*Condition 3:* $\pi_t$ should *not* be an attractor of $\pi^*_t$. This condition ensures Condition 2 does not occur the other way around which can be evaluated by using the ECM for $\pi^*_t$.

$$\Delta\pi^*_t = \sum_{j=1}^{r} \delta_j \Delta\pi^*_{t-j} + \sum_{j=1}^{s} \theta_j \Delta\pi_{t-j} - \lambda(\pi_{t-1} - \pi^*_{t-1}) + \eta_t \quad (9)$$

*Condition 3a:* Weak exogeneity of the CIM requires ($\lambda = 0$).

*Condition 3b:* Strong exogeneity of the CIM requires ($\theta_1 = \theta_2 = \ldots = \theta_s = 0$) given $\lambda = 0$.

If Condition 3 is satisfied, then changes in CIM can simply be written as an autoregressive process:

$$\Delta\pi^*_t = \sum_{j=1}^{r} \delta_j \Delta\pi^*_{t-j} + \eta_t \quad (10)$$

*4.2.2 Cogley Tests.* Cogley (2002) proposes comparing CIMs by investigating their predictive power for subsequent changes in inflation. This involves testing the relationship between the current "core deviation" ($\pi_t - \pi^*_t$) and subsequent inflation changes ($\pi_{t+H} - \pi_t$) using (11):

$$\pi_{t+H} - \pi_t = \alpha_H + \beta_H (\pi_t - \pi^*_t) + \zeta_{t+H} \quad (11)$$

The tested hypothesis is ($\alpha_H = 0$ and $\beta_H = -1$). While ($\alpha_H = 0$) implies that core deviations and subsequent inflation changes are mean zeros (for sufficiently large $H$, the restriction ($\beta_H = -1$) means a one-for-one "correction" in future headline inflation if it moves away from its underlying level). Since the core deviation at time $t$ is considered as current transient component, any negative $\beta_H$ larger/smaller than 1 in absolute value could "understate"/"overstate" the magnitude of the current transients. The $R^2$ of (11) provides information about the goodness-of-fit of the model in which current transients help to forecast subsequent inflation. Cogley also checks for robustness by combining several CIMs and integrating macroeconomic variables in (11).

### *4.3 Empirical Tests*

We examine CIMs for twelve-month inflation over the full sample period 1999–2014, focusing first on EBMs and then on TMMs. Following this evaluation, we break the sample period into two sub-samples: 1999–2007 and 2008–14, for reasons stated in section 2.

#### *4.3.1 Sample Period: 1999–2014.*

*4.3.1.1 EBMs.* The evaluation of the EBMs is reported in Table 4 and has several notable features. None of the EBMs satisfy all the Marques, Neves and Sarmento (2003) conditions. Strong exogeneity is especially problematic for many of them. This is an important result as it means that, for Vietnam, the dynamics of most popularly used EBMs are affected by headline inflation, possibly through an (adaptive) expectations channel. Two EBMs (CPIxA and CPIxAHE) do not satisfy the basic co-movement condition. This implies that the two indices and CPI diverge over the long run. This divergence among the indices is most likely the result of differences in the underlying data generating processes. In particular, while the overall index is driven by market pricing, the CIMs exclude the administered prices and pricing in the health and education sectors (through first and second round effects) and likely miss an important part of the determinants of headline inflation. Two EBMs (CPIxE and CPIxAHE) are not "attractors" for CPI, although they satisfy the strong exogeneity condition. With regard to variability and smoothness, not all EBMs are necessarily less variable or smoother than headline inflation. In particular, the commonly used CPIxF and CPIxFE are less variable but also less smooth (relative to $MA(\pi_t)$) than $\pi_t$. This final result is

TABLE 4
Evaluation on Exclusion-based CIMs (12-month) — Sample: 1999–2014

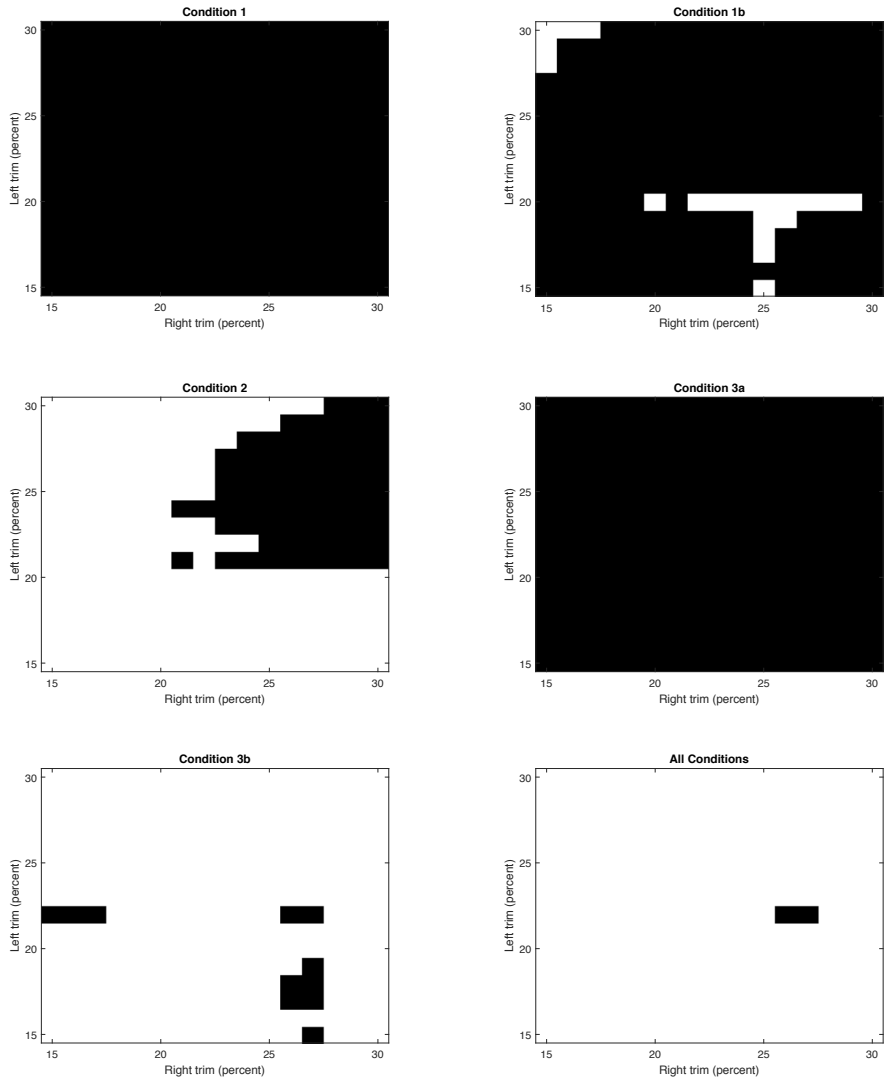
| | *CPI* | *CPIxF* | *CPIxE* | *CPIxA* | *CPIxAHE* | *CPIxFE* | *CPIxFA* | *CPIxFEA* | *CPIxFEAHE* |
|---|---|---|---|---|---|---|---|---|---|
| **Marques, Neves and Sarmento (2003) Conditions** | | | | | | | | | |
| ***Condition 1a. (HI-CI) is a zero-mean stationary*** | | | | | | | | | |
| t-stat | | –3.4 | –4.4 | –2.0 | –1.1 | –2.7 | –3.3 | –2.8 | –3.1 |
| Prob (t-stat) | | 0.0 | 0.0 | 0.3 | 0.7 | 0.1 | 0.0 | 0.1 | 0.0 |
| Null: unit root, not accepted means OK | | Yes** | Yes*** | No | No | Yes* | Yes** | Yes* | Yes** |
| ***Condition 1b. Cointegration with unit coefficient*** | | | | | | | | | |
| t-stat | | 0.8 | 0.9 | –0.2 | 0.5 | 1.3 | 0.8 | 1.4 | 2.1 |
| Prob (t-stat) | | 0.4 | 0.3 | 0.8 | 0.6 | 0.2 | 0.4 | 0.2 | 0.0 |
| Null: alpha=0 given beta=1, accepted means OK | | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes* |
| ***Condition 2. CI is an attractor for HI*** | | | | | | | | | |
| t-stat | | –2.4 | –0.5 | 3.2 | 1.4 | –2.9 | –2.3 | –2.9 | –3.1 |
| Prob (t-stat) | | 0.0 | 0.6 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| Null: gamma=0, not accepted means OK | | Yes** | No | Yes*** | No | Yes*** | Yes** | Yes*** | Yes*** |
| ***Condition 3a. Weak exogeneity*** | | | | | | | | | |
| t-stat | | 0.3 | –0.5 | –3.4 | –1.8 | 0.1 | 0.2 | 0.1 | 0.1 |
| Prob (t-stat) | | 0.8 | 0.7 | 0.0 | 0.1 | 1.0 | 0.8 | 1.0 | 1.0 |
| Null: lambda=0, accepted means OK | | Yes*** | Yes*** | No | Yes** | Yes*** | Yes*** | Yes*** | Yes*** |
| ***Condition 3b. Strong exogeneity*** | | | | | | | | | |
| F-stat (Wald test) | | 12.9 | 1.9 | 2.0 | 1.0 | 8.4 | 13.3 | 8.3 | 14.1 |
| Prob (F-stat) | | 0.0 | 0.1 | 0.1 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Null: thetas=0 given lambda=0, accepted means OK | | No | Yes*** | Yes*** | Yes*** | No | No | No | No |
| **Volatility** | | | | | | | | | |
| Standard deviation | 6.5 | 4.7 | 6.6 | 6.8 | 7.2 | 4.5 | 4.8 | 4.5 | 4.7 |
| Coefficient of variation | 0.9 | 0.7 | 0.9 | 0.9 | 1.0 | 0.7 | 0.7 | 0.7 | 0.8 |
| **Smoothness vis-as-vis MA12(CPI)** | | | | | | | | | |
| RMSD | 1.5 | 2.3 | 1.5 | 1.7 | 2.2 | 2.6 | 2.3 | 2.6 | 2.4 |
| MAD | 1.0 | 1.9 | 1.1 | 1.2 | 1.5 | 2.1 | 1.9 | 2.1 | 2.0 |
| **Summary statistics** | | | | | | | | | |
| Mean | 7.4 | 6.7 | 7.3 | 7.5 | 7.3 | 6.4 | 6.7 | 6.3 | 6.0 |
| Median | 6.8 | 6.3 | 6.7 | 6.7 | 5.8 | 6.1 | 6.2 | 6.0 | 5.6 |
| Standard deviation | 6.5 | 4.7 | 6.6 | 6.8 | 7.2 | 4.5 | 4.8 | 4.5 | 4.7 |
| Skewness | 1.2 | 0.9 | 1.2 | 1.3 | 1.4 | 0.8 | 1.0 | 0.8 | 1.1 |
| Kurtosis | 4.5 | 3.5 | 4.5 | 4.7 | 4.9 | 3.2 | 3.8 | 3.2 | 4.0 |

SOURCE: Authors' calculations.
1/ *** significant at 1 per cent level; ** significant at 5 per cent level; * significant at 10 per cent level.
2/ Yes/No indicates whether a measure satisfies a criterion (along with Null hypothesis).

noteworthy as it implies that monetary policy decisions based on these CIMs will generate a less smooth path for interest rates than headline inflation over the longer horizon, with attendant consequences for the financial sector.

*4.3.1.2 TMMs.* Figure 4 captures the test results of the Marques, Neves and Sarmento (2003) conditions for TMMs. Once again, the strong exogeneity condition is difficult to satisfy. The attractor condition

FIGURE 4
Twelve-month TMMs: Marques, Neves and Sarmento "Attractor" Conditions — Sample: 1999–2014



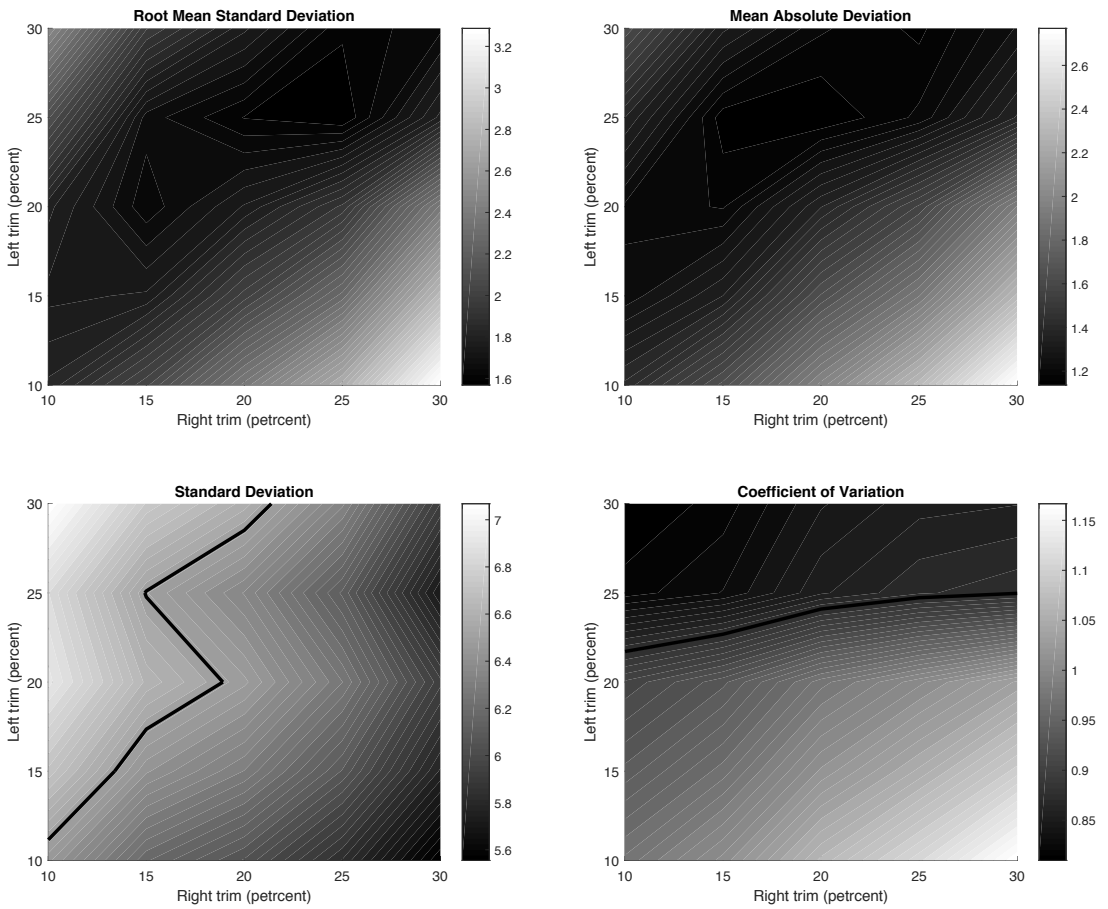

NOTE: Darker areas mean that the condition is satisfied.
SOURCES: Vietnam authorities; and authors' calculations.

(Condition 2) requires trims at both the left and right tails, and large trims at the right tail reflecting the skewness of the component inflations discussed above. There is a wide range of combinations that satisfy Conditions 1 and 2, with almost all of them lying in the northeastern quadrant. Among these TMMs, only two — TMM2226 and TMM2227 — satisfy all the conditions.

Figure 5 compares the smoothness and variability properties of the TMMs to those of headline inflation. Here too, the results are interesting. Several of the TMMs are smoother and less variable than headline inflation, but the two TMMs that satisfy the Marques, Neves and Sarmento (2003) conditions are both less smooth and more variable.

*4.3.2 Sub-samples: 1999–2007 and 2008–14.* Re-evaluation of the CIMs over two subsamples (1998–2007 and 2008–14) not only provides a robustness check, but also reveals additional properties of the inflation process. Headline inflation was low in the first sample period (mean inflation and standard

FIGURE 5
Twelve-month TMMs: Smoothness and Volatility — Sample: 1999–2014




NOTE: The solid contour lines are values for headline inflation.
SOURCES: Vietnam authorities; and authors' calculations.

deviation were 4.5 per cent and 4 per cent, respectively); the latter sample period includes two bouts of high inflation (mean inflation and standard deviation were 11 per cent and 7.25 per cent, respectively).

Once again, the EBMs fare rather poorly in satisfying the Marques, Neves and Sarmento (2003) conditions (Tables 5 and 6). Several of them do not exhibit co-movement with headline inflation, or are not strongly exogenous in the first sub-sample; none of them satisfies the "attractor" property. The results are similar in the latter sub-sample, except that two EBMs — CPIxFE and CPIxFEA — satisfy all conditions except co-movement. With a low power of the ADF test, these EBMs could potentially be considered as useful measures of core inflation, but only during periods of high inflation.

Looking at the TMMs, the results are more encouraging. For the first subsample, two trims (TMM1407 and TMM1408) satisfy the Marques, Neves and Sarmento (2003) conditions. For the latter subsample, several trims satisfy the conditions. But there are differences among the two subsamples. The trims required in the first subsample are smaller, and larger on the left tail of the distribution. This is consistent with the lower average skewness of the component inflation in the first sub-sample (0.92; 1.39 in the latter subsample; 1.13 in the full sample). Given that multiple TMMs are available, further choice can be made using additional criteria. The evaluation of the TMMs with regard to the satisfaction of Marques, Neves and Sarmento (2003) conditions is shown in Figure 6 (for 1999–2007) and Figure 8 (for 2008–14). Indeed, the results for the full sample period are driven by the properties of the component inflation during the latter subsample. The smoothness and variability properties of the TMMs are charted in Figures 7 and 9.

*4.3.3 Cogley Tests and Reversion Horizons.* Cogley tests provide additional information on the time horizons over which headline inflation reverts to CIMs (Figure 10). However, this reversion horizon is valid only if the null hypothesis of equation (11) — ($\alpha_H = 0$ and $\beta_H = -1$) — is satisfied. Table 7 presents the *F*-statistics of the Wald test for three TMMs: TMM2226 for the full sample period; TMM147 for the earlier sample period; and TMM2119 for the latter sample period over 1–12 month horizons.

## 5. Policy Rate and CIMs

Several conclusions emerge from the forgoing evaluation of CIMs. First, in general, EBMs do not satisfy the postulated statistical conditions for admissible CIMs. TMMs perform better. Second, among the TMMs, admissible TMMs depend on the sample period. These sample periods, in turn, reflect the properties of the inflation process, component inflations, and the shocks that affect the inflation process. Periods with low inflation, in the case of Vietnam, are associated with low skewness and smaller outliers in the component inflations, allowing for TMMs to be constructed with smaller trims. Conversely, periods with higher and more variable inflation are associated with higher skewness in the component inflations which require larger trims to generate admissible CIMs. In short, "one trim does not fit all times".

A comparison of the admissible TMMs with a commonly used EBM (CPIxFE) is shown in Figure 11. We use the sample specific TMMs. In all cases, headline inflation traces the TMMs more closely than the EBM. The figure also provides a measure of the extent to which the EBMs under- or overpredict underlying inflation pressures, on the premise that the TMMs are the "true" measures of these pressures; the under/over-prediction was significant during the 2008–14 period ranging between –8 and 6 per cent.

A critical aspect of the comparison between the EBM and TMMs is the speed with which underlying inflation rises and falls. The EBM suggests a slower increase and fall in core inflation than the TMMs. This has an important implication for the changes in the policy rates. The difference is especially marked in the latter subsample. Using the TMM2226, policy rates need to have been raised earlier and brought down faster than would be warranted if the EBM were to be used as a guide (Figure 12). The difference is noticeable in 2012 and 2013, when the SBV brought down the policy rates — justifiably — at a rapid pace, while the EBM suggested that a more cautious approach was appropriate. Indeed, during

TABLE 5
Evaluation on Exclusion-based CIMs (12-month) — Sample: 1999–2007

| | *CPI* | *CPIxF* | *CPIxE* | *CPIxA* | *CPIxAHE* | *CPIxFE* | *CPIxFA* | *CPIxFEA* | *CPIxFEAHE* |
|---|---|---|---|---|---|---|---|---|---|
| **Marques, Neves and Sarmento (2003) Conditions** | | | | | | | | | |
| ***Condition 1a. (HI-CI) is a zero-mean stationary*** | | | | | | | | | |
| t-stat | | –2.3 | –3.6 | –2.8 | –1.2 | –1.8 | –2.3 | –1.9 | –2.1 |
| Prob (t-stat) | | 0.2 | 0.0 | 0.1 | 0.7 | 0.4 | 0.2 | 0.3 | 0.3 |
| Null: unit root, not accepted means OK | | No | Yes*** | Yes* | No | No | No | No | No |
| ***Condition 1b. Cointegration with unit coefficient*** | | | | | | | | | |
| t-stat | | 0.6 | 2.8 | –0.1 | –0.7 | 1.2 | 0.7 | 1.2 | 1.2 |
| Prob (t-stat) | | 0.5 | 0.0 | 1.0 | 0.5 | 0.3 | 0.5 | 0.2 | 0.2 |
| Null: alpha=0 given beta=1, accepted means OK | | Yes*** | No | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| ***Condition 2. CI is an attractor for HI*** | | | | | | | | | |
| t-stat | | 0.7 | 0.5 | 1.4 | 0.4 | 0.8 | 0.8 | 0.8 | 0.9 |
| Prob (t-stat) | | 0.5 | 0.6 | 0.2 | 0.7 | 0.4 | 0.4 | 0.4 | 0.4 |
| Null: gamma=0, not accepted means OK | | No | No | No | No | No | No | No | No |
| ***Condition 3a. Weak exogeneity*** | | | | | | | | | |
| t-stat | | –2.5 | –1.4 | –2.0 | –0.6 | –2.3 | –2.6 | –2.4 | –2.7 |
| Prob (t-stat) | | 0.0 | 0.2 | 0.1 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Null: lambda=0, accepted means OK | | Yes* | Yes*** | Yes** | Yes*** | Yes* | Yes* | Yes* | No |
| ***Condition 3b. Strong exogeneity*** | | | | | | | | | |
| F-stat (Wald test) | | 14.0 | 1.0 | 0.1 | 0.1 | 18.0 | 14.3 | 18.7 | 19.1 |
| Prob (F-stat) | | 0.0 | 0.4 | 0.9 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| Null: thetas=0 given lambda=0, accepted means OK | | No | Yes*** | Yes*** | Yes*** | No | No | No | No |
| **Volatility** | | | | | | | | | |
| Standard deviation | 3.9 | 2.6 | 4.0 | 4.1 | 4.2 | 2.4 | 2.7 | 2.5 | 2.6 |
| Coefficient of variation | 0.9 | 0.6 | 0.9 | 0.9 | 0.9 | 0.7 | 0.7 | 0.7 | 0.7 |
| **Smoothness vis-as-vis MA12(CPI)** | | | | | | | | | |
| RMSD | 0.7 | 1.9 | 0.8 | 0.7 | 0.8 | 2.0 | 1.9 | 2.0 | 2.0 |
| MAD | 0.5 | 1.6 | 0.7 | 0.6 | 0.7 | 1.8 | 1.6 | 1.8 | 1.8 |
| **Summary statistics** | | | | | | | | | |
| Mean | 4.6 | 4.0 | 4.3 | 4.6 | 4.6 | 3.6 | 4.0 | 3.6 | 3.6 |
| Median | 4.4 | 3.9 | 4.5 | 4.4 | 4.5 | 3.6 | 3.7 | 3.5 | 3.3 |
| Standard deviation | 3.9 | 2.6 | 4.0 | 4.1 | 4.2 | 2.4 | 2.7 | 2.5 | 2.6 |
| Skewness | –0.3 | 0.0 | –0.3 | –0.3 | –0.2 | –0.1 | 0.1 | –0.1 | –0.0 |
| Kurtosis | 1.9 | 1.6 | 1.9 | 1.9 | 1.9 | 1.5 | 1.6 | 1.5 | 1.5 |

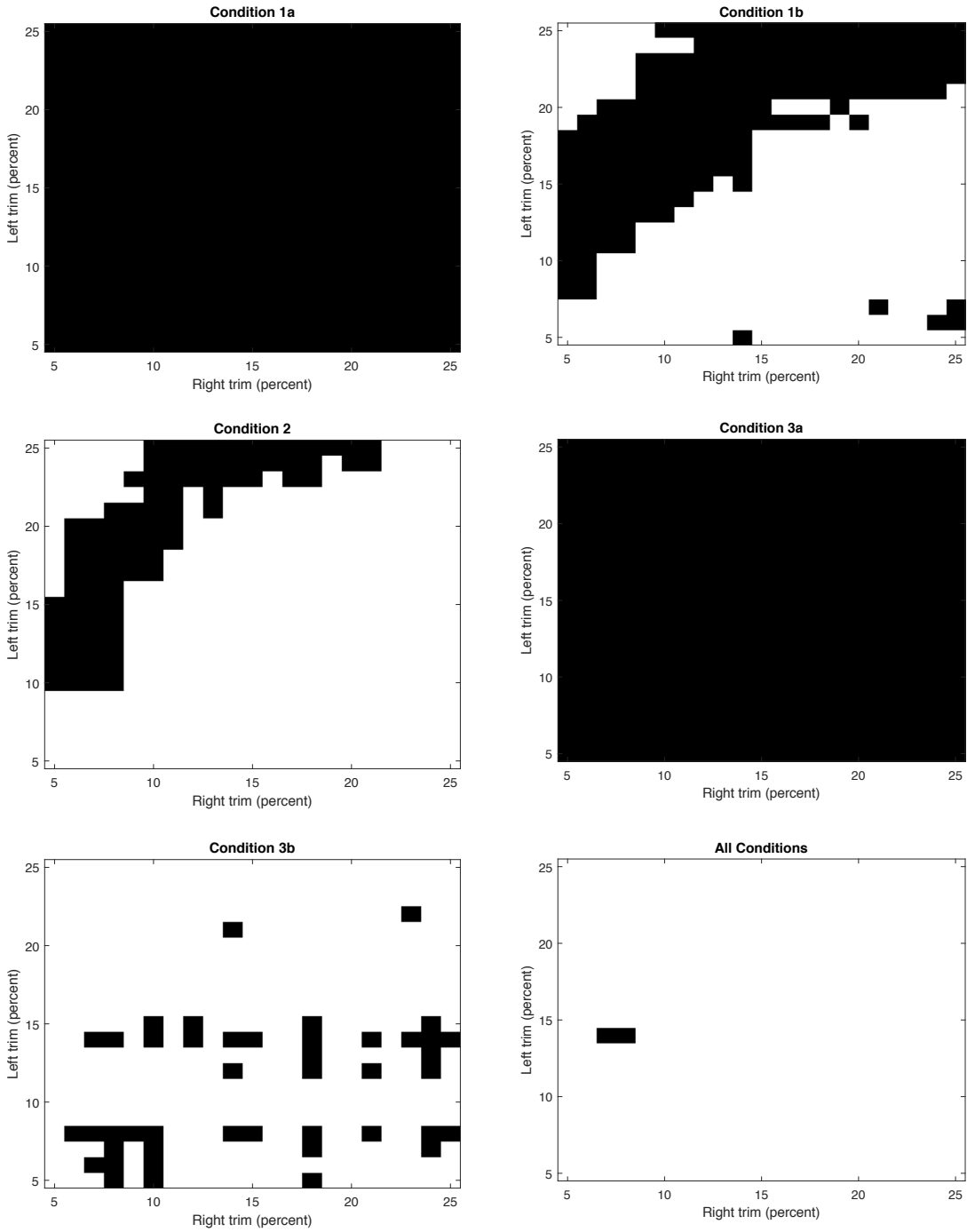
SOURCE: Authors' calculations.
1/ *** significant at 1 per cent level; ** significant at 5 per cent level; * significant at 10 per cent level.
2/ Yes/No indicates whether a measure satisfies a criterion (along with Null hypothesis).

TABLE 6
Evaluation on Exclusion-based CIMs — Sample: 2008M01 2014M12

| | *CPI* | *CPIxF* | *CPIxE* | *CPIxA* | *CPIxAHE* | *CPIxFE* | *CPIxFA* | *CPIxFEA* | *CPIxFEAHE* |
|---|---|---|---|---|---|---|---|---|---|
| **Marques, Neves and Sarmento (2003) Conditions** | | | | | | | | | |
| ***Condition 1a. (HI-CI) is a zero-mean stationary*** | | | | | | | | | |
| t-stat | | –2.3 | –3.2 | –1.9 | –2.5 | –2.5 | –2.2 | –2.5 | –2.7 |
| Prob (t-stat) | | 0.2 | 0.0 | 0.4 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 |
| Null: unit root, not accepted means OK | | No | Yes** | No | No | No | No | No | Yes* |
| ***Condition 1b. Cointegration with unit coefficient*** | | | | | | | | | |
| t-stat | | 0.3 | –0.1 | 0.3 | 1.1 | 0.3 | 0.4 | 0.3 | 1.1 |
| Prob (t-stat) | | 0.8 | 0.9 | 0.7 | 0.3 | 0.8 | 0.7 | 0.8 | 0.3 |
| Null: alpha=0 given beta=1, accepted means OK | | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| ***Condition 2. CI is an attractor for HI*** | | | | | | | | | |
| t-stat | | –3.7 | –0.6 | 4.5 | 1.6 | –3.8 | –3.4 | –3.8 | –3.8 |
| Prob (t-stat) | | 0.0 | 0.6 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Null: gamma=0, not accepted means OK | | Yes*** | No | Yes*** | No | Yes*** | Yes*** | Yes*** | Yes*** |
| ***Condition 3a. Weak exogeneity*** | | | | | | | | | |
| t-stat | | 1.8 | –0.2 | –4.4 | –2.0 | 1.6 | 1.7 | 1.6 | 1.8 |
| Prob (t-stat) | | 0.1 | 0.8 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Null: lambda=0, accepted means OK | | Yes** | Yes*** | No | Yes* | Yes*** | Yes*** | Yes*** | Yes** |
| ***Condition 3b. Strong exogeneity*** | | | | | | | | | |
| F-stat (Wald test) | | 10.3 | 0.7 | 5.0 | 1.9 | 2.0 | 10.6 | 1.8 | 5.6 |
| Prob (F-stat) | | 0.0 | 0.6 | 0.0 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 |
| Null: thetas=0 given lambda=0, accepted means OK | | No | Yes*** | No | Yes*** | Yes*** | No | Yes*** | No |
| **Volatility** | | | | | | | | | |
| Standard deviation | 7.3 | 4.6 | 7.3 | 7.7 | 8.7 | 4.1 | 4.8 | 4.1 | 5.0 |
| Coefficient of variation | 0.7 | 0.5 | 0.7 | 0.7 | 0.8 | 0.4 | 0.5 | 0.4 | 0.5 |
| **Smoothness vis-as-vis MA12(CPI)** | | | | | | | | | |
| RMSD | 2.0 | 2.2 | 1.9 | 2.3 | 3.1 | 2.4 | 2.1 | 2.4 | 2.3 |
| MAD | 1.6 | 1.9 | 1.4 | 1.7 | 2.6 | 2.0 | 1.9 | 2.0 | 1.9 |
| **Summary statistics** | | | | | | | | | |
| Mean | 11.1 | 10.1 | 11.1 | 11.2 | 10.8 | 9.9 | 10.1 | 9.9 | 9.2 |
| Median | 8.3 | 9.4 | 7.5 | 8.0 | 8.3 | 9.4 | 9.4 | 9.4 | 7.7 |
| Standard deviation | 7.3 | 4.6 | 7.3 | 7.7 | 8.7 | 4.1 | 4.8 | 4.1 | 5.0 |
| Skewness | 0.9 | 0.5 | 0.9 | 0.9 | 0.9 | 0.5 | 0.6 | 0.5 | 0.7 |
| Kurtosis | 2.5 | 2.5 | 2.6 | 2.7 | 2.6 | 2.4 | 2.7 | 2.4 | 2.4 |

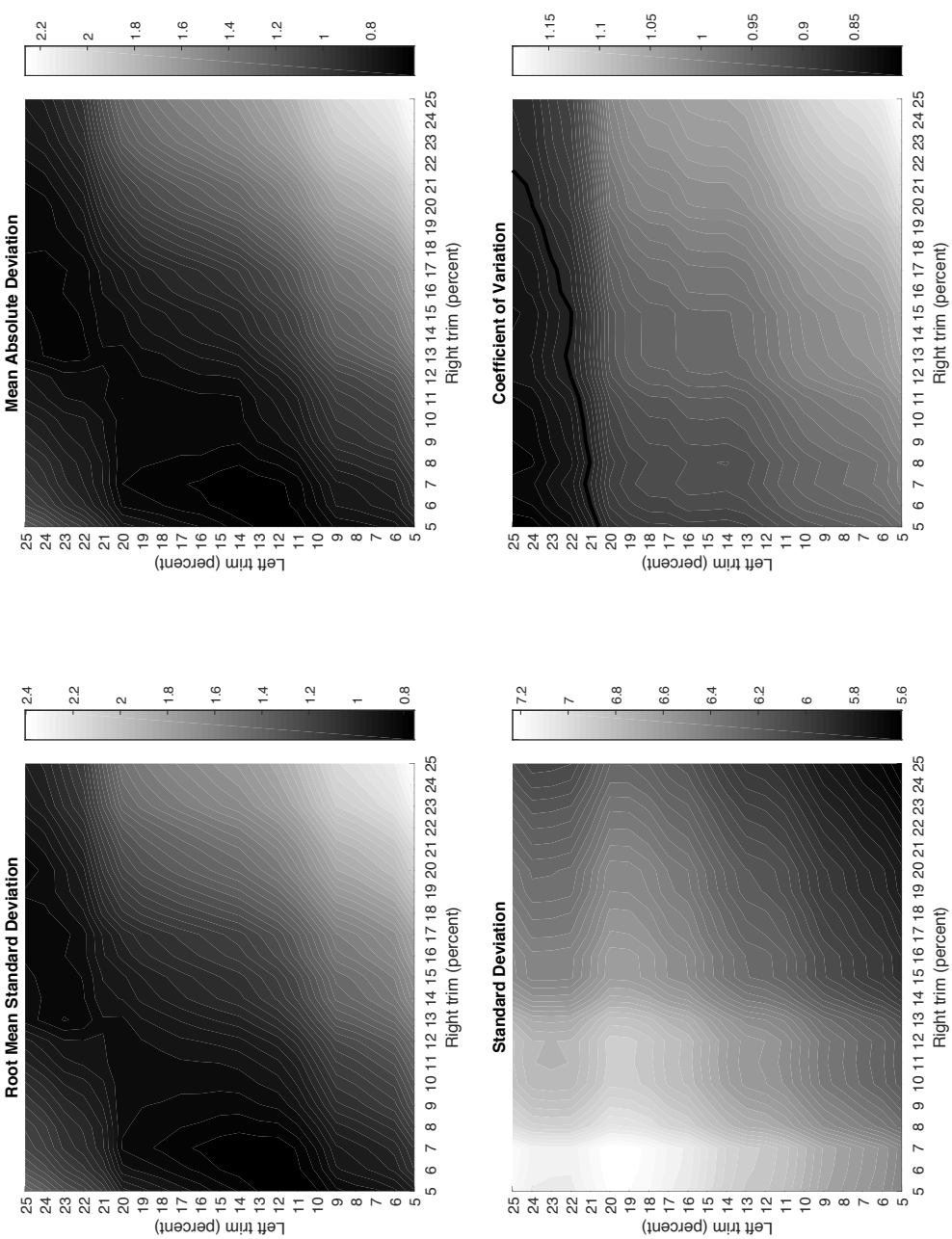
SOURCE: Authors' calculations.
1/ *** significant at 1 per cent level; ** significant at 5 per cent level; * significant at 10 per cent level.
2/ Yes/No indicates whether a measure satisfies a criterion (along with Null hypothesis).

FIGURE 6
Twelve-month TMMs: Marques, Neves and Sarmento "Attractor" Conditions — Sample: 1999–2007



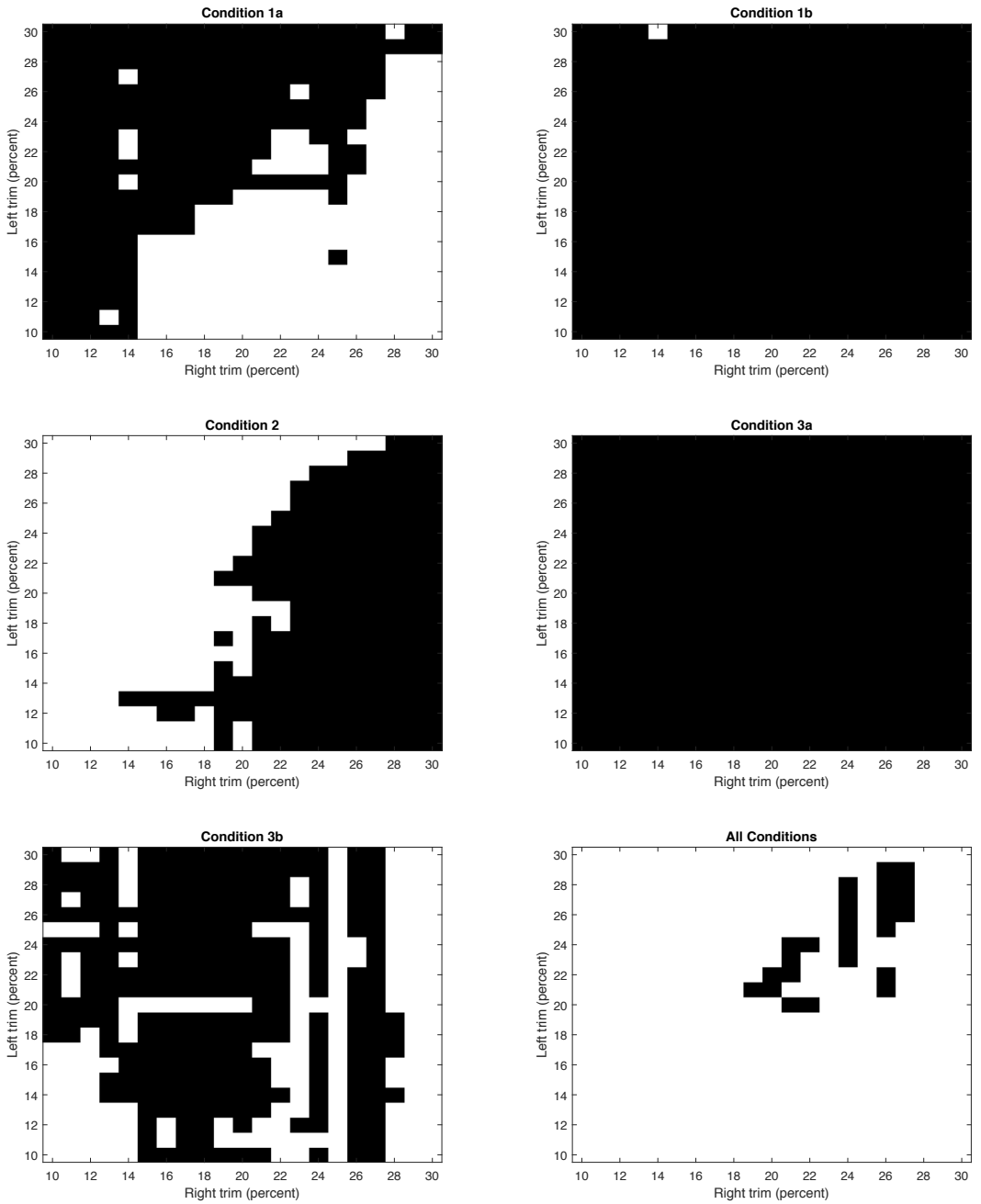

NOTE: Darker areas mean that the condition is satisfied.
SOURCES: Vietnam authorities; and authors' calculations.

FIGURE 7
Twelve-month TMMs: Smoothness and Volatility — Sample: 1999–2007



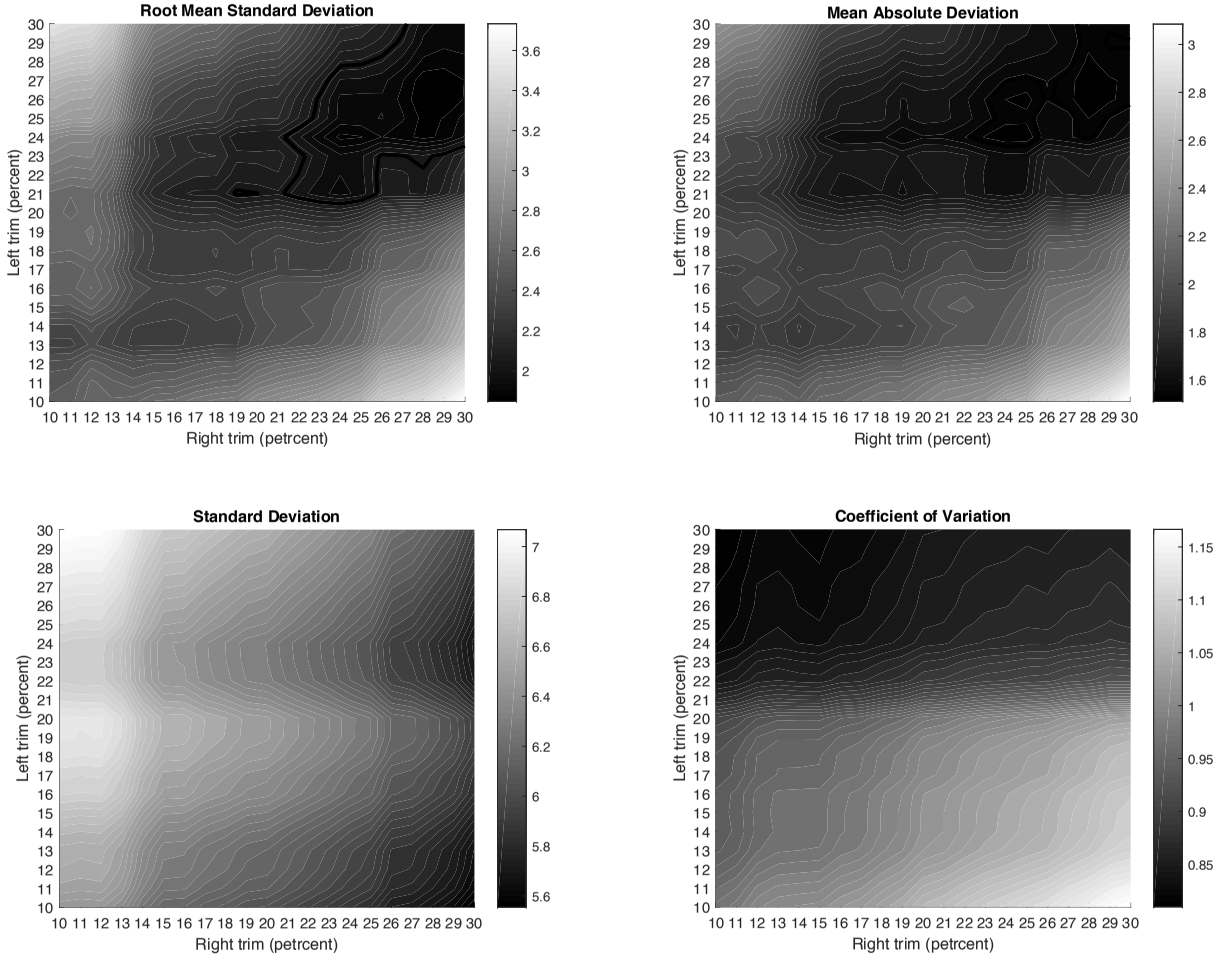

NOTE: The solid contour lines are values for headline inflation.
SOURCES: Vietnam authorities; and authors' calculations.

FIGURE 8
Twelve-month TMMs: Marques, Neves and Sarmento "Attractor" Conditions — Sample: 2008–14



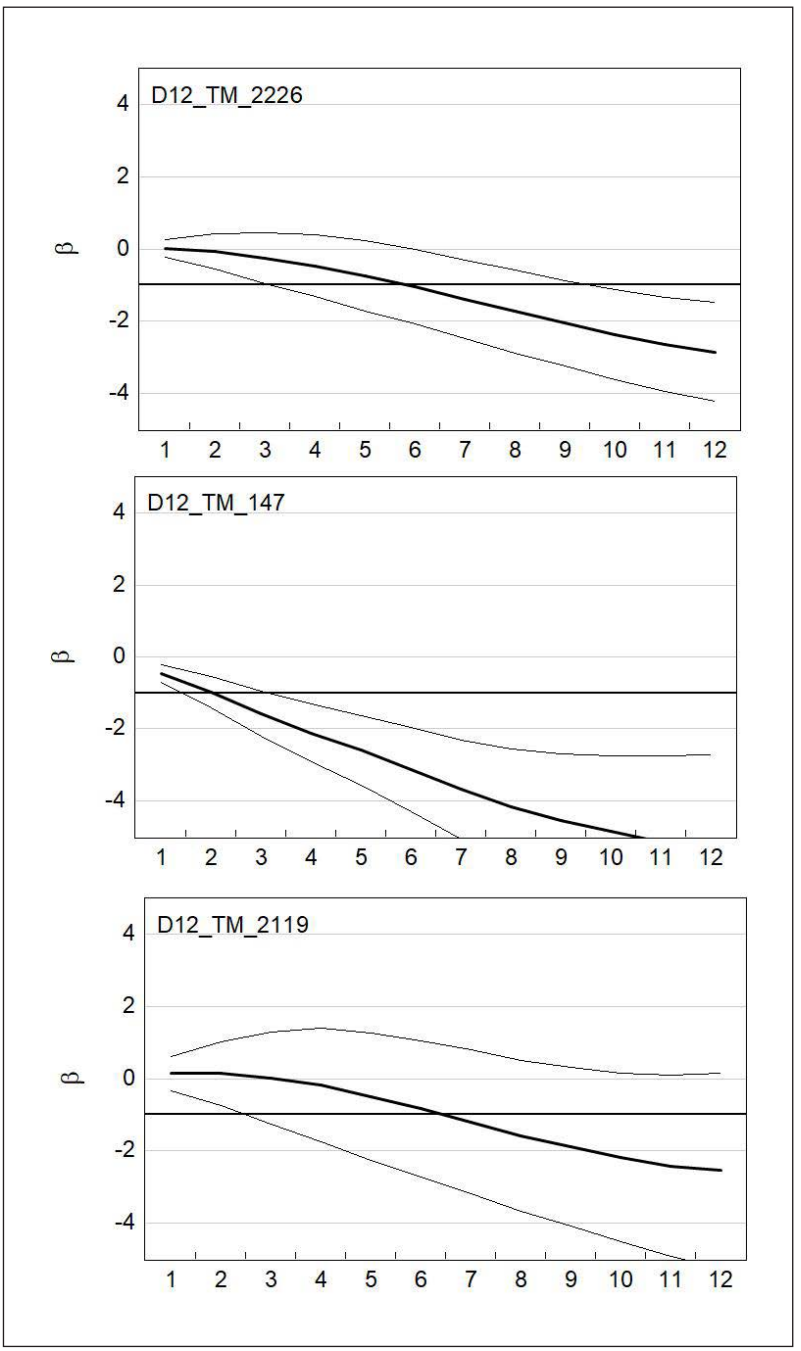

NOTE: Darker areas mean that the condition is satisfied.
SOURCES: Vietnam authorities; and authors' calculations.

FIGURE 9
Twelve-month TMMs: Smoothness and Volatility — Sample: 2008–14




NOTE: The solid contour lines are values for headline inflation.
SOURCES: Vietnam authorities; and authors' calculations.

FIGURE 10
Cogley Tests for TMM βX




NOTE: Confidence interval at 95 per cent significance.
SOURCES: Vietnam authorities; and authors' calculations.

TABLE 7
Cogley Test Wald F-Statistics
(Null Hypothesis: $\alpha_H = 0$ and $\beta_H = -1$)

| | *Sample/TMM* | | |
|---|---|---|---|
| *Horizon* | *1999–2014 TMM2226* | *1999–2007 TMM147* | *2008–14 TMM2119* |
| 1 | 0.00 | 0.00 | 0.00 |
| 2 | 0.00 | 0.39 | 0.05 |
| 3 | 0.07 | 0.17 | 0.28 |
| 4 | 0.31 | 0.03 | 0.52 |
| 5 | 0.54 | 0.01 | 0.72 |
| 6 | 0.54 | 0.00 | 0.80 |
| 7 | 0.37 | 0.00 | 0.74 |
| 8 | 0.20 | 0.00 | 0.58 |
| 9 | 0.11 | 0.00 | 0.41 |
| 10 | 0.06 | 0.00 | 0.27 |
| 11 | 0.04 | 0.00 | 0.19 |
| 12 | 0.03 | 0.01 | 0.16 |

SOURCE: Authors' calculations.

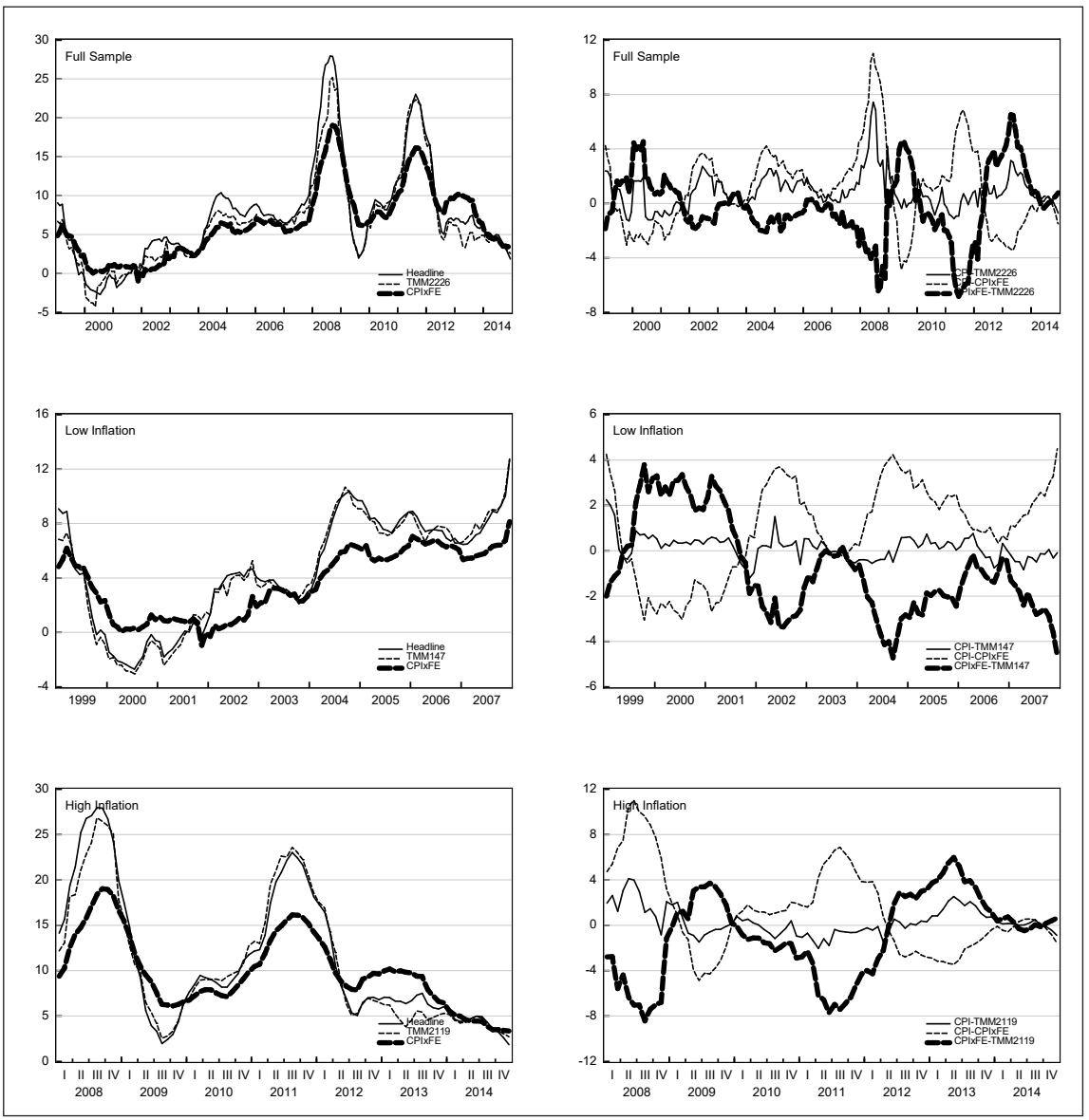
2012H2 and 2013H1, the EBM continued to suggest that core inflation was high and in the double digits while TMM2226 would have suggested that core inflation had subsided markedly into the single digits. Similarly, during the earlier bout of inflation in 2008, the magnitude and speed with which inflation subsided appears to have been underestimated by the EBM, as was the increase in the run up to the inflationary bout in 2011.

## 6. Concluding Remarks

Over the past few years, the State Bank of Vietnam has responded to high inflation episodes (in 2008 and 2011) by raising policy rates. These policy decisions were driven, in large measure, by past headline inflation, and supplemented with a basic intuition of the underlying inflation pressures — past and prospective. Exclusion-based core inflation measures formed a key part of the policy decisions, although not formally stated.

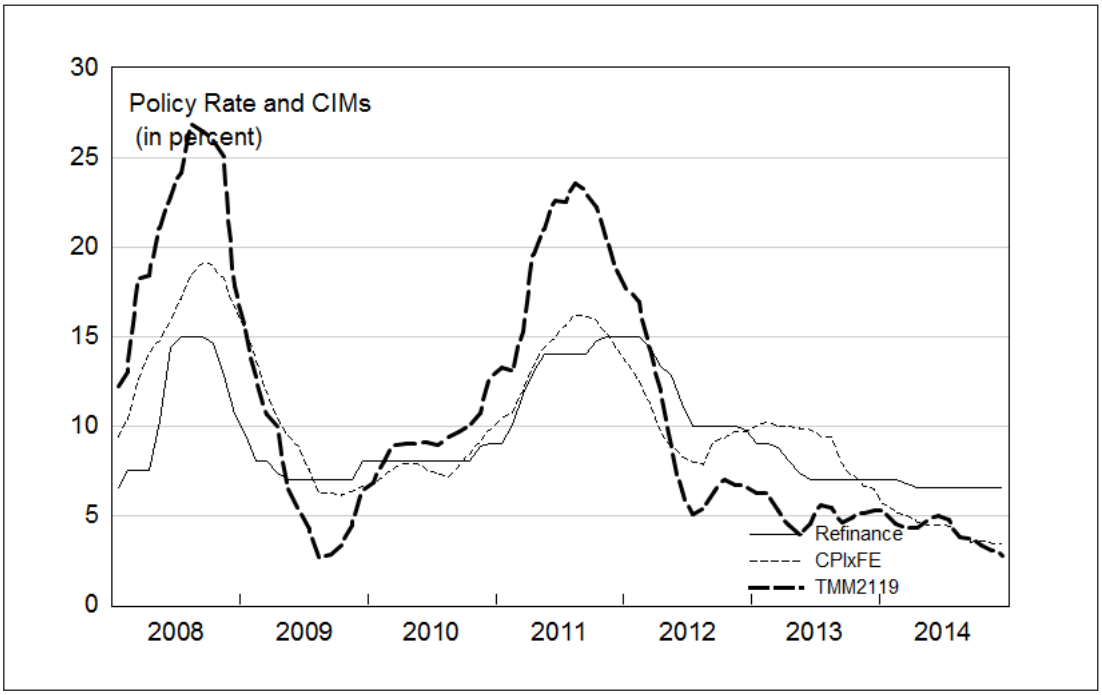
This paper examined Vietnam's inflation process over two decades to construct robust core inflation measures (CIMs) that can be used to inform the policy-making process. To this end, the paper overviewed the inflation process and identified key determinants of inflation. The paper then used a filtering approach to narrow down potential CIMs that satisfy certain empirically desirable criteria. The paper finds that commonly used exclusion-based measures (EBMs) do not perform well against statistical criteria for admissible CIMs; trimmed mean measures (TMMs) do better. However, even among TMMs, the same TMM may not be appropriate for all periods, i.e., "one trim does not fit all periods". Going forward, over the longer term, reliable CIMs could form the foundation of a shift to an inflation targeting regime in Vietnam. The procedures proposed in this paper could also be useful to other central banks in their policy making process.

FIGURE 11
Headline Inflation, EBMs and TMMs




SOURCES: Vietnam authorities; and authors' calculations.

FIGURE 12
Policy Rate and CIM




SOURCES: Vietnam authorities; and authors' calculations.

From a policy standpoint, the results of the paper imply that while EBMs may be useful indicators for communication (to public) purposes, they may not be the most suitable guides for policy action. This may be a result of Vietnam's experience with external shocks and the composition of the inflation index which is still weighted heavily towards food and fuel, but the result may well carry over to other countries with similar economic structures. From an analytical standpoint — and a policy formulation perspective — the results suggest that policymakers and advocates need to test CIMs on an ongoing basis to form a firmer basis for policy actions. These conclusions stand well with the analytical literature and policy making across countries.

NOTES

1. The package was called "Adjustment of Price, Wage and Money" (see Nguyen, Cavoli and Wilson 2012).
2. Several studies suggest exclusion/adjustment for the impact of other policies, such as changes in indirect taxes, on the CPI index in constructing CIMs. However, these issues are not easy to tackle empirically. Equally, others such as Wynne (2008) argue that it might be better not to make these adjustments if the objective is to capture the "true cost-of-living".
3. The 87th component (sewing machine) appears only in Period 1 with negligible weight and was dropped.
4. Assuming headline inflation and CIM are I(1).

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