Inflation, Monetary Policy and the Sacrifice Ratio:

The Case of Southeast Asia

Leef H. Dierks

The South East Asian Central Banks (SEACEN) Research and Training Centre
198201000672 (80416-M)
Kuala Lumpur, Malaysia

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Leef H. Dierks[1]

Abstract

Motivated by the 2022 uptick in headline inflation and the marked shift towards more restrictive monetary policies globally, this paper examines the sacrifice ratio, i.e., the percentage cost of actual production lost to every one percentage point decrease in (trend) inflation, for selected Southeast Asian economies. Results indicate that upon adopting a contractive monetary policy, GDP growth dropped by up to 0.5%, confirming that monetary authorities' disinflationary policies typically trigger declines in both output and employment. However, as even minor adjustments to the way of determining the sacrifice ratio lead to varying results, caution ought to be applied when deriving potential (monetary) policy recommendations.

Keywords: Monetary Policy, Interest Rates, Inflation, Sacrifice Ratio, (Trend) Output

JEL Codes: E31, E52, E58, E65, E71.

1. Introduction

After several years of a globally accommodative, i.e., a historically unprecedented low interest rate environment, 2022 was marked by the beginning of an aggressive rate hike cycle that continues to this very day. Rate hikes have occurred in response to the sharp and persistent rise in headline inflation in virtually all industrialised economies; a phenomenon which can, in particular, be attributed to higher energy and food prices as well as a simultaneous supply and demand shock. Further, an increasingly restrictive monetary policy aims at preventing potential second-round effects, i.e., most notably the wage-price spiral. From a Southeast Asian perspective, the shift towards increasingly contractionary monetary policies also serves the purpose of preventing possible capital outflows, particularly in light of the hitherto unparalleled 475 basis point (bp) increase in the fed funds rate between March 2022 and May 2023. Further rate hikes in the US are imminent.

However, reducing the inflation rate comes at a cost: a shift towards a more restrictive, i.e., disinflationary, monetary policy is usually accompanied by a decline in economic growth. Monetary authorities, consequently, are confronted with a trade-off between ensuring price stability on the one hand, and stimulating economic growth on the other. The corresponding sensitivity can be determined by means of the sacrifice ratio (SR); a measure which indicates the percentage cost of actual production lost to every one percentage point decrease in (trend) inflation.

So far, Southeast Asian economies have not been affected by an increase in headline inflation to the same extent as many industrialised economies. Estimates for 2023 and 2024 are indicative of higher economic growth amid lower inflation in the region. Still, more often than not, inflation expectations exceed central banks and monetary authorities' inflation targets. Against this background, and as (advanced) economies have become considerably less sensitive to interest rate changes over time, the extent of a more aggressive monetary policy stance and the inevitable economic (and social) consequences that this entails, need to be carefully weighed. Disinflations are habitually considered to be a or even *the* major cause for an economic downturn.

This paper is structured as follows. Section 2 discusses current inflation dynamics, inflation expectations, some stylised facts and GDP growth in selected Southeast Asian economies. Section 3 reviews different methodologies in determining a sacrifice ratio, among them Ball's (1994) fundamental concept, which is limited to disinflationary periods. Section 4 offers a specification of the sacrifice ratio and discusses the results, followed by concluding remarks in Section 5.

2. Inflation and Monetary Policy

2.1. Headline Inflation in Southeast Asia

Headline inflation in most Southeast Asian economies has mostly remained stable and at moderate levels between 2017 and 2021, typically averaging between 0.0% and 3.0% y/y (Figure 1).

Figure 1. Headline Inflation 2017-2023
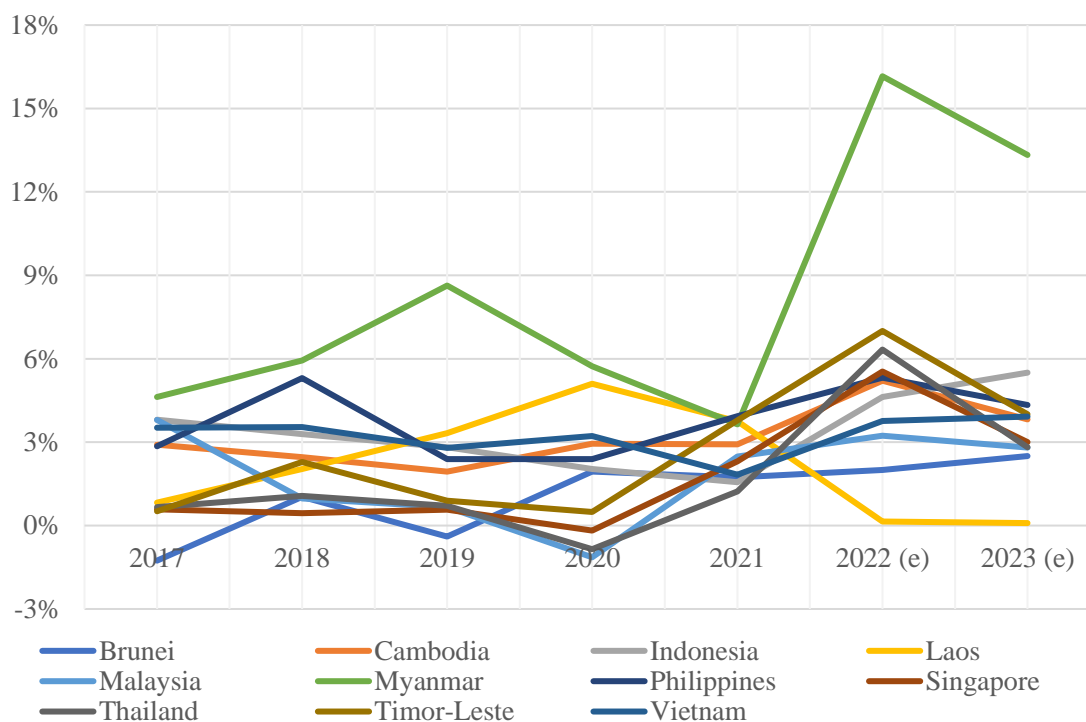
Note: (e) = expected.
Source: World Bank (2023), ADB (2022).

Notwithstanding minor deviations, these developments are broadly in line with the respective monetary authorities' targets. However, spurred by more persistent than expected supply and demand imbalances related to the COVID-19 pandemic, global supply chain disruptions and a spike in energy prices after Russia's attack on Ukraine in February 2022[2], headline inflation started gaining momentum (Bernanke and Blanchard, 2023). At the time of writing, most Southeast Asian economies reported higher than envisaged inflation rates with estimates pointing towards 5.1% y/y for 2022 and 4.5% y/y for 2023 (Figure 2) (Asian Development Bank (ADB), 2022).

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[2] Driven by robust demand, this development had already become apparent earlier (Dierks, 2023).

Figure 2. Headline Inflation 2023
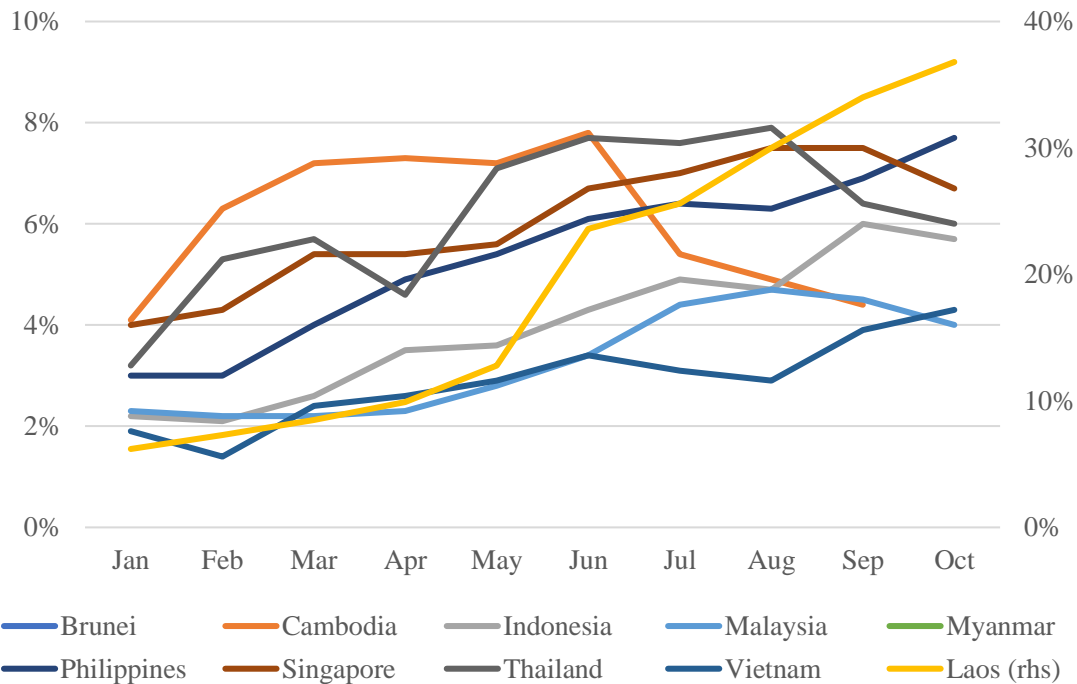
Source: World Bank (2023), ADB (2022).

The increase in inflation was driven both by demand- and supply-side factors. On the demand side, consumption expenditures of private households proved to be more resilient than initially expected once the COVID-19 pandemic subsided (supported by the unexpectedly rapid recovery of the global economy after the recession related to the pandemic). Further, during the pandemic, household demand shifted from services to consumer goods. As a result, industrial production fell short of demand, further intensifying price dynamics in both intermediate and final goods (Dierks, 2023).

Also, over the course of the pandemic, several Southeast Asian economies resorted to expansive fiscal policies, e.g., cash aid programmes in Malaysia, Singapore and Indonesia, among others. These measures, effects of which, might well unfold countercyclically due to (unavoidable) time lags, will likely further stimulate headline inflation.

On the supply side, spurred by a revival of protectionist trade policies, markets are experiencing an ongoing period of de-globalisation. This has triggered a decline in global trade volumes coupled with a mounting scarcity of supply; a development which is exacerbated by logistics and supply chain restrictions that have persisted to this day as a result of the COVID-19 pandemic.
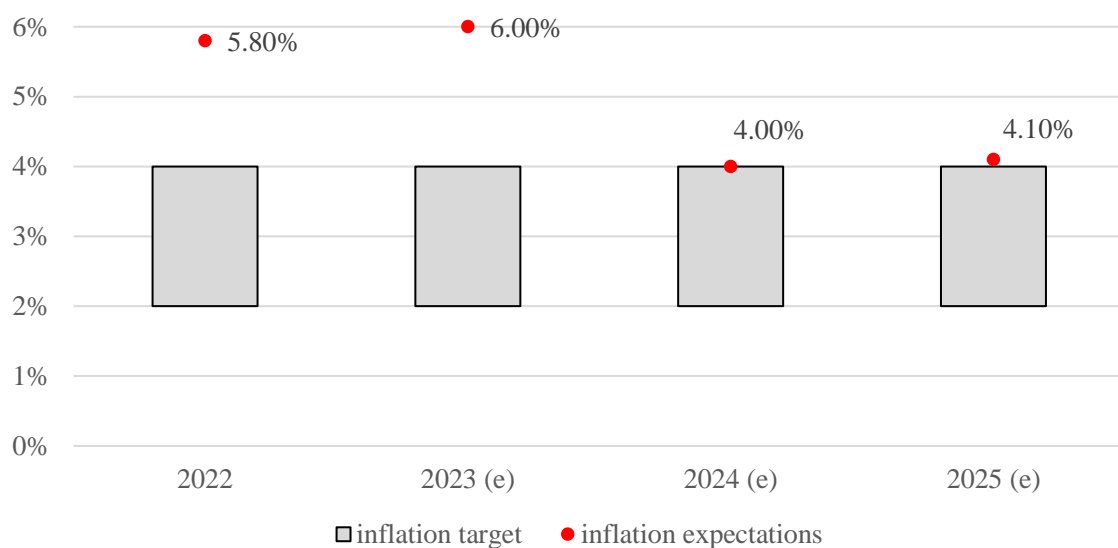
2.2. Inflation Expectations

Not least because of the importance of inflation expectations on (future) price developments, current inflation dynamics can trigger a self-fulfilling prophecy. To the extent that market participants base their economic decisions on expectations that inflation rates will

continuously be above monetary authorities' targets in the years ahead, wage demands (and ultimately price developments) will be affected.[3] It is up to the central bank to carefully weigh when to act against inflationary tendencies. This also applies if, as in the case of an external shock (e.g., an increase in commodity prices), the central bank cannot directly influence the causes of a price shock (Dierks, 2022).

At the time of writing, monthly headline inflation appears to have peaked. Growth rates of global energy and food prices have declined from the levels observed in 2022. Still, price developments remain on elevated levels, pushing estimated average headline inflation in Southeast Asia to 5.5% y/y in 2022 compared with 3.3% y/y in 2021. 2023 estimates indicate a modest decline to 4.7% y/y (ADB, 2022). Notwithstanding these developments, headline inflation has persistently remained above the usual levels in several economies across the region and remains vulnerable to potential supply disruptions and price shocks.

This increasingly affects market participants' inflation expectations, which have risen noticeably in recent months. A February 2023 Bangko Sentral ng Pilipinas (BSP) survey, for example, indicates that private households expect inflation to edge upwards to 6.0% y/y in 2022, 4.0% y/y in 2023 and 4.1% y/y in 2024; levels which are geared towards the upper limit of the BSP's inflation target of 2.0% to 4.0% (Figure 3) (Source: BSP, 2023).

Figure 3. Inflation Target versus Expectations, Philippines 2022/23

Note: (e) = expected.
Source: Bangko Sentral ng Pilipinas, 2023.

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[3] Inflation expectations affect future inflation, i.e., if market participants expect prices to significantly increase in the future, they will advance their purchases of goods and services. The increase in aggregate demand will trigger a rise in inflation. Further, households eventually demanding higher (nominal) wages in response to accelerating consumer prices might start a wage-price spiral. Recent research (Alvarez et al., 2022) indicates that a period of falling real wages and tightening labour market conditions tends to be followed by a declining (headline) inflation and nominal wage growth increases – thus allowing real wages to catch up. An acceleration of nominal wages should not necessarily be seen as a sign that a wage-price spiral is about to start. This implies that keeping inflation expectations aligned with the inflation target supports a stable inflation.

2.3. The Response of Monetary Policy – A Cycle of Interest Rate Hikes

In an attempt to curb inflation, preserve financial stability and mirror (aggressive) rate hikes in the US and Europe, practically all Southeast Asian monetary authorities started raising their main refinancing rates in 2022, generally leading to considerably tighter financial conditions in the region (Figure 4).

Figure 4. Monetary Policy Rate Changes (in basis points)
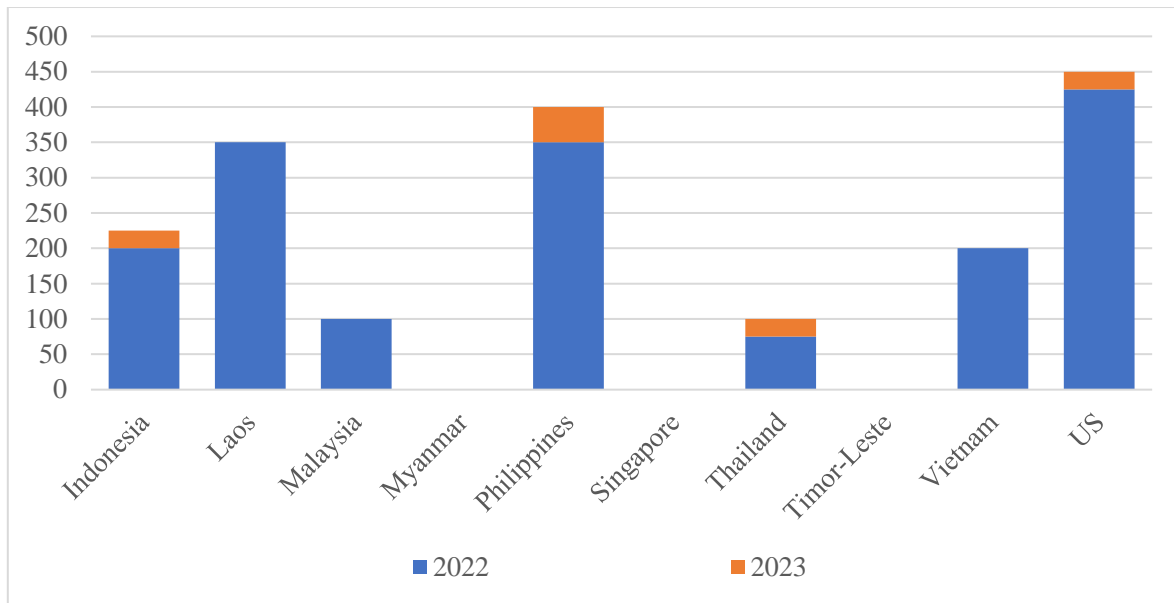
Note: As per 1 March 2023.
Source: Bloomberg, 2023.

This development will likely continue in response to rising global interest rates, a potential currency depreciation across the region, and eventually, capital outflows. *Ceteris paribus*, any such rate hikes will adversely affect economic growth. Notwithstanding other factors, among them subdued global economic conditions, estimates point towards a generally more modest GDP growth forecast across the region with numbers ranging from 2.3% y/y (Singapore) to 6.3% y/y (Vietnam) in 2023. Southeast Asia's overall GDP growth is expected to average around 4.7% y/y in 2023, i.e., considerably less than the 5.5% y/y observed in 2022 (ADB, 2022).

Figure 5. GDP Growth 2021 – 2023 (in annual percentage change)
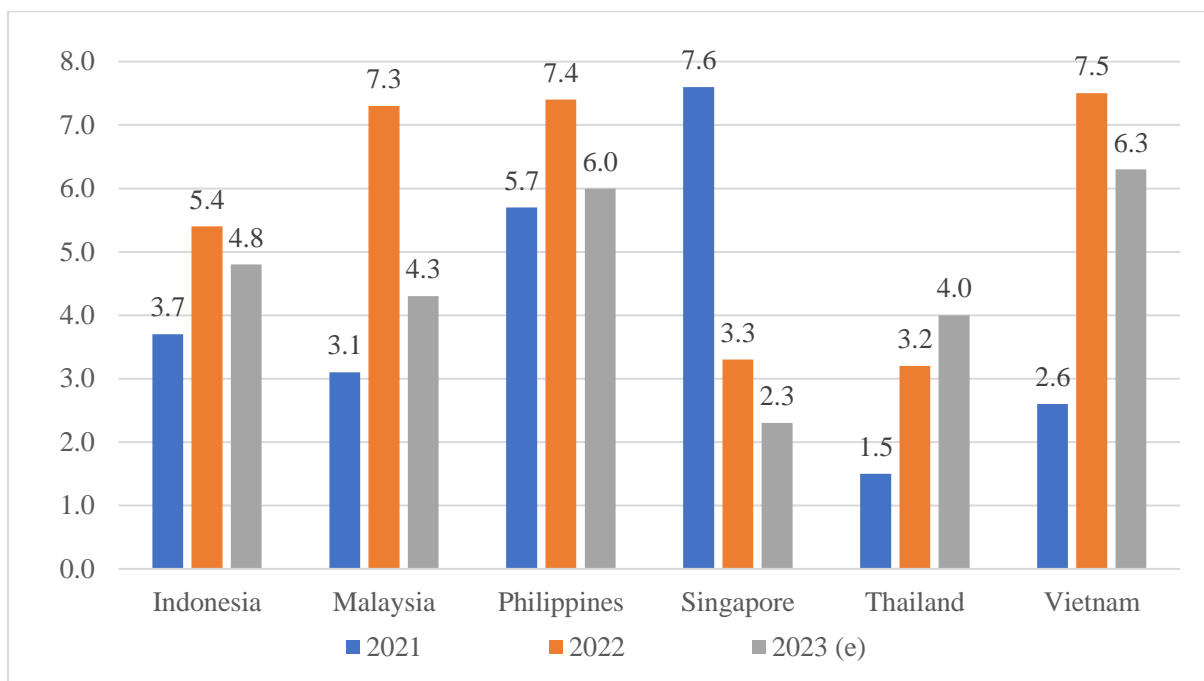
Note: (e) = expected.
Source: World Bank (2023), ADB (2023).

3. The Sacrifice Ratio

3.1. Trade-off Between Disinflationary Monetary Policy and Economic Growth

Conventional monetary policy is confronted with a trade-off between a disinflationary stance and a reduction in output (GDP) in the case of an inflation rate exceeding the monetary authorities' target (Alvarez and Dizioli, 2023). The interim economic costs of such a disinflationary monetary policy can be assessed by means of the sacrifice ratio (SR). The concept gained prominence in the late 1970s and 1980s during which contractive monetary policies predated a period characterised by both disinflationary and recessionary developments in several developed economies such as the US, among others.

Essentially, there is no *one* sacrifice ratio. Rather, this concept, which provides information on how the loss of output sustained by an economy to achieve a reduction in the long-run inflation by one percentage point, can take on different forms. What these have in common – notwithstanding their (pronounced) methodological differences – is that they indicate by how much real GDP growth will decline (typically accompanied by an increase in unemployment) in order to reduce (trend) inflation by one percentage point. Such a quantification of output loss due to a disinflationary monetary policy is important as disinflation is typically considered to be one of the main causes of recessions in industrialised economies (Ball, 1994).

3.2. Methodological Differences

Originally, sacrifice ratios were derived from a modified Phillips curve, which illustrates the relationship between unemployment and inflation. The concept was introduced by Okun (1978) and subsequently refined by Gordon and King (1982) (Mitra et al., 2015).[4]

A period of modest inflation typically has a favourable impact on economic growth and is thus assumed to (at least partially) offset the output losses related to the (previous) tightening of monetary policy. Within the framework of an expectations-augmented Phillips curve (which assumes that if actual inflation rises, expected inflation will also increase), a reduction in inflation (in the short-term) is either attributable to a moderation in inflation expectations or a decline in the current period's output. As outlined above, however, market participants' inflation expectations usually are (firmly) anchored in the short-term. It can thus be assumed that a decline in inflation is related to a moderation in economic activity. Only if inflation starts falling over the course of time and steadies on lower levels, inflation expectations will adjust downwards, with output eventually declining to its potential. It consequently is in the long-term (and mostly through the expectations channel) that monetary policy affects inflation (Dierks, 2023, and Mitra et al., 2015, among others). As a consequence, the long-term Phillips curve is vertical and the impact of monetary policy on output (as on any other real variable) fades over time.

Yet, determining the sacrifice ratio on the basis of a Phillips curve is problematic. This arises as the trade-off between inflation and output is identical in both inflationary and disinflationary phases. To rectify this issue, Ball (1994) developed a method for determining the sacrifice ratio which is exclusively based on disinflation phases instead of a Phillips curve. Such an approach makes it possible to separate disinflationary phases induced by monetary policy from fluctuations attributable to external shocks. Total output losses, i.e., the deviation of actual from potential output during a disinflationary phase are then determined by combining the output gaps for each time point within the period. The ratio between aggregate losses and the decline in inflation corresponds to the period's sacrifice ratio. As there is no *one* consensus on the definition of a sacrifice ratio, estimates can vary vastly across jurisdictions, periods and, of course, estimation methods.

3.3. (Reducing) the Cost of Disinflation

The pace with which expectations adapt to an adjustment (tightening) of monetary policies has a decisive influence on the economic costs related to disinflation. In the case of adaptive expectations, i.e., supposing that announcements on behalf of monetary authorities are not (fully) reflected in market participants' expectations, the latter will assume that the inflation rate remains on current levels (or that of the previous period). Accordingly, they do not react to the adjustment immediately but rather, with a time lag. If the inflation rate then declines (in contrast

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[4] Whereas Gordon and King (1982) assumed a linear Phillips Curve, Filardo (1998) allowed for non-linearity by assuming different slope coefficients of the output gap during different phases of the economic cycle (Mitra et al., 2015).

to expectations), a surprise disinflation occurs. Consequently, as laid out in Ball (1994), output falls.

In the case of rational expectations, however, inflation expectations adjust immediately to a change in monetary policy; thereby implying there were no costs. Real effects would only occur (in the short-term) if households and corporates did not have complete information. This comes as uncertainty with regard to how adjustments ought to be interpreted prevails among market participants; eventually leading to short-term deviations.

The literature (among others, Börner, 2019) distinguishes between three measures to reduce the (economic) costs of a disinflation.

1. A monetary authority's reputation and credibility
   Most economists agree that the costs related to a disinflation can be reduced in the case where monetary authorities had previously adopted a (credible and comprehensive) monetary policy which allowed market participants to adjust their inflation expectations accordingly. The costs related to a disinflation can also be reduced in the case where monetary authorities commit to a target of price stability and enhance the transparency of their decisions. Publishing estimates of economic developments as well as the envisaged monetary policy measures is an effective means to reduce the costs of a disinflation as market participants can better gauge (future) inflation so that prices and wages can faster adjust. Market participants can comprehend the extent to which deviations from the target are the result of an external shock or a surprise inflation.

2. The pace of adjustment processes: cold turkey versus gradualism
   In order to discuss the impact of the pace of disinflation on its (economic) costs, it needs to be assumed that monetary policy can influence real variables in the short-term. The question then is whether the aforementioned costs can be minimised by means of triggering a faster or slower disinflationary processes. Ball (1994) distinguishes between gradualism and going cold turkey.
   A literature review (Mazumder, 2014) indicates that the faster the disinflationary process, the lower the aggregate output losses for the respective economy. In view of this, a cold turkey approach might well represent a justifiable strategy for a sustainable reduction of the inflation rate. Further, the potential costs (economic as well as social) of acting too hesitantly, i.e., only at a time when a high inflation rate is already reflected in market participants' expectations, lends support for decisive countermeasures. Gradualism, however, has the advantage of spreading losses over a longer period. For as long as the social loss function of an economy is not known, an unambiguous answer is impossible.

3. Flexibilisation

   Another means to reduce the costs related to a disinflation is a higher flexibility of labour contracts. Rigidities in prices and wages in the cost of price level adjustments is among the major drivers of the costs of price changes. A flexibilisation of labour

contracts reduce nominal rigidities and thus costs. If this was not the case, adjustments would prove to be difficult as labour unions would not accept lower than the contractually agreed upon pay rises (Börner, 2019).

In summary, the cost of disinflation presents market participants with a dilemma - on the one hand, inflation needs to be reduced and on the other, a recession should be avoided. However, it should be noted that while the costs of a decline in output are usually temporary, the costs related to inflation are permanent (Samuelson and Solow, 1960). In the long-run, the benefits of a lower inflation typically exceed the inevitable costs related to a disinflation.

4. Applying the Sacrifice Ratio

4.1. Methodology

Within the scope of the analysis, a tightening of monetary policy predates any disinflationary period.[5] With reference to Ball (1994), disinflation is defined as a period in which trend inflation, expressed as the centred, nine-quarter moving average of actual inflation, declines substantially. Formally, trend inflation in quarter t corresponds to the average of the inflation from $t - 4$ through $t + 4$, thus effectively smoothening actual inflation. A period t in which the inflation rate is higher (lower) than in the previous four and following four quarters represents a local maximum or 'peak' (minimum or 'trough'). A disinflation then is defined as a period that begins with a maximum and ends with a minimum - and within which a disinflation of at least two percentage points can be observed.[6] This approach is essentially uncontroversial and usually leads to unambiguous results (in the case of Ball's (1994) assessment of OECD economies). Equivalent benchmarks for non-OECD countries still remain subject to discussion, i.e., so far, it remains unclear to what extent the two-percentage point threshold can also be applied to non-OECD economies.

In a second step, the sum of output losses, i.e., the deviation between actual and potential output (trend level) is determined. This is necessary to estimate the output losses attributed to the disinflation. Technically, the difficulties in estimating the trend rate of output are considerably greater than those involved in estimating the trend rate of inflation. Specifically, it remains unclear whether GDP fluctuates around a stable linear or a changing trend, or whether GDP growth is completely unpredictable (Neely and Waller, 1997).

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[5] Disinflationary periods can be induced by monetary policy or other external shocks. Methodically, the approach outlined above is meant to separate any policy-induced shifts from fluctuations arising from external shocks. Assuming that the tightening of monetary policy is the *sole* factor of a disinflationary period, however, remains a highly critical assumption (Andersen and Washer, 1999).

[6] As Ball (1994) highlights, the sacrifice ratio can be determined on both a quarterly and an annual basis. Methodologically, both concepts are identical. In the case where output data is only available on an annual basis, Ball defines one year as the basic time unit. Trend inflation for the year is then the eight-quarter moving average centered at the year, i.e., an average over the four quarters of the year as well as the two previous and the two following quarters. Year t is an inflation maximum (minimum) in the case where trend inflation at t is higher (lower) than trend inflation at $t - 1$ or $t + 1$, i.e., maximums and minimums are defined with reference to a year (rather than four quarters) on each side. Trend output is determined by connecting output at the inflation maximum to output one year after the minimum. Finally, disinflation occurs when trend inflation drops by at least 1.5 (rather than two) percentage points.

Ball (1994) bases his concept on three largely plausible assumptions. First, output is at its trend (or natural) level at the beginning of a disinflation period, i.e., when inflation peaks. This comes as the change in inflation at a peak is zero. The natural level of output is often understood to be the output level consistent with stable inflation. Second, output returns to its trend level four quarters after an inflation minimum. This comes as, in line with the above assumption, output supposedly returns to trend at the inflation minimum, where the change in inflation is zero again.[7] Third, trend output is assumed to change log-linearly between the points when actual equals trend output. Graphically, trend output can be determined by linearly connecting the respective points on the log output series. The numerator of the sacrifice ratio is the sum of deviations between this fitted line and log-output. It can be determined in (Eq. 1) as follows:

$$SR = \frac{cost\ of\ production\ lost}{percentage\ change\ in\ inflation} = \frac{fluctuations\ in\ real\ output}{(\pi_{max} - \pi_{min})} \qquad \text{(Eq. 1)}$$

$$SR = \frac{\Sigma(change\ in\ actual\ output - trend\ output)}{(\pi_{max} - \pi_{min})} \qquad \text{(Eq. 2)}$$

Put differently, whereas the sacrifice ratio's numerator is the cost of production lost, its denominator corresponds to the percentage change in trend inflation, i.e., the difference between a period's maximum ('peak') and the minimum ('trough'). Essentially, the sacrifice ratio is the sum of the deviations between the regression of the trend growth of output and the actual output, divided by the change in the inflation rate in the same period.

This description rests on two assumptions. First, demand shifts are the only source of changes in headline inflation, i.e., supply shocks are neglected. A contraction in aggregate demand is the main cause of disinflation. Still, it is likely that during some episodes, both supply and demand shifts occur. Further, supply shocks will affect the size of output losses and changes in inflation. This implies that the sacrifice ratio for any given disinflation is possibly an (partially) inexact measure of the effects of demand contraction (Ball, 1994).

4.2. Output Hysteresis

Second, the above featured concept of a sacrifice ratio is based on the assumption that trend output remains unaffected by disinflation. This simplification is necessary to the extent that shifts in aggregate demand could permanently reduce output. A disinflationary monetary policy can trigger both a temporary deviation from trend as well as a permanent decline in trend output. Put differently, a potential (output) hysteresis, i.e., a situation in which deficient aggregate demand (attributed to an incomplete stabilisation of a temporary shortfall in demand) can cause a permanent loss in output, is disregarded within the scope of the analysis (Garga and Singh, 2019).[8]

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[7] In practice, the effects of disinflation are persistent, i.e., output is assumed to return to its trend with a time lag. Usually, four quarters is a (conservative) estimate of a time-lag in a disinflation period. The return to trend is spurred by above-average economic growth in the years after an inflation minimum.
[8] The relevance of this constraint is attributed to the fact that at any interest rate (significantly) above the zero lower bound (ZLB), monetary policy will seek to reduce output hysteresis as far as possible.

4.3. Data

Determining the sacrifice ratio requires data on main refinancing rates, inflation rates and GDP growth. Table 1 describes the variables used in the analysis, along with the frequency and time span for which they were collected, the number of economies for which they are available and their sources. In light of obvious limitations, i.e., the occurrence of a disinflationary period which is predated by the tightening of monetary policy, the analysis is initially based on a total of six Southeast Asian economies.

Table 1: Variable Description

Indicator	Unit	Frequency	*N**	Sources
Economic growth	GDP growth	Annual, 2000-2022	6	World Bank
Inflation	Consumer prices	Annual, 2000-2022	6	World Bank
Inflation	Headline consumer price index	Quarterly, 2000:Q1-2022:Q2	6	World Bank

Note: * In light of the available data, emphasis is placed on Indonesia, Malaysia, Philippines, South Korea, Thailand and Vietnam.

Data from the World Bank is prioritised as the primary source. Details on the measurement of inflation and GDP growth are presented below. Inflation is computed on a quarterly level and measured as the year-on-year (y/y) growth of the consumer price index (CPI). The CPI series is obtained from the World Bank using International Monetary Fund (IMF), International Financial Statistics and data files. GDP growth is computed as the annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2015 prices, expressed in US dollars. The GDP growth series is obtained from the World Bank using World Bank national accounts data, and OECD national accounts data files.

4.4. Results

Even though results (strongly) differ across the region, it can be concluded that, as expected, sacrifice ratios indicate that periods of disinflation, predated by a tightening of monetary policy, commensurate with a decline in economic growth (Table 2).

In case of (nominal) main refinancing rates constrained at the ZLB of zero percent, strict inflation targeting might eventually lead to an output hysteresis. However, with main refinancing rates typically considerably higher than their ZLB at the time of writing, this limitation is of little practical relevance for Southeast Asian economies.

Table 2: Sacrifice Ratios in Selected Southeast Asian Economies

Jurisdiction	Rate Hike	Disinflationary Period*	Sacrifice Ratio
Indonesia	2014 (+175bp)	2014 – 2020	–0.02
Malaysia	2018 (+25bp)**	2018 – 2021	0.24
Philippines	2014 (+50bp)	2014 – 2016	0.19
South Korea	2010/11 (+125bp)	2010 – 2015	0.25
	2017/18 (+50bp)	2017 – 2019	0.56
Thailand	2011 (+225bp)	2011 – 2015	0.48
Vietnam	2011 (+800bp)	2011 – 2015	0.29
		2017 – 2021	2.69***

Note: *Most recent price developments, e.g., inflationary pressures observed throughout 2022, are not reflected in the analysis due to the time lags in the publication of the available data. ** Malaysia: no meaningful change in monetary policy as headline inflation increased only modestly. *** Vietnam. The State Bank of Vietnam did not adopt any contractive monetary policies in between 2017 and 2021. Source: Author's calculations.

As illustrated in Table 2, GDP growth in selected Southeast Asian economies declined by up to roughly 0.5% in the four quarters following a central bank's/monetary authority's adoption of a contractive monetary policy. In other words, the shift towards a disinflationary monetary policy appears to trigger a decline in both output and employment. However, results vary greatly.

In the case of India, a restrictive monetary policy was not adopted until early 2022 when the Reserve Bank of India (RBI) lifted its benchmark repo policy rate off the 4.00% level it had maintained since mid-2020. At the time of writing, no corresponding data had been published. Results published by Mitra et al. (2015), however, indicate a sacrifice ratio of around 2.3 in the September 2004 to September 2008 period of the RBI's contractionary monetary policy.

Bank Indonesia (BI) aggressively raised its key interest rate to 7.75% in November 2014 from 5.75% in May 2013. Accounting for (inevitable) time lags, (annualised) inflation markedly contracted to 1.84% in 2020 from 6.49% in 2014, yielding a (rather implausible) sacrifice ratio of –0.07. However, results are likely overshadowed by the June 2018 to November 2018 rate hikes of the BI seven-day reverse repo rate. Adjusting the period under investigation leads to a (implausible) sacrifice ratio of –0.22, i.e., results cannot convincingly demonstrate that the restrictive monetary policy adopted in Indonesia in 2013/14 triggered a decline in economic growth.

In Malaysia, no meaningful change in monetary policy occurred during the analysed period as, according to official numbers, headline inflation increased only modestly. Theoretically, the 25bp rate hike in 2018 led to a (plausible) sacrifice ratio of 0.24, yet it seems questionable to what extent the 25bp rate hike is the only cause of the 501bp reduction in the 2018 to 2021 period.

Bank of Korea (BoK) raised its base rate by a total of 125bp in 2010 and 2011. Whereas the inflation rate fell by some 330bp until 2015, GDP growth fell by 88bp. This development corresponds to a sacrifice ratio of 0.25. Further, in 2017 and 2018, the BoK raised its base rate by 50bp. In between 2017 and 2019, the inflation rate fell by some 92bp with GDP growth contracting by 155bp. The respective sacrifice ratio stood at (a plausible) 0.56.

Over the course of 2011, the Bank of Thailand (BoT) raised rates by an aggregate 225bp, predating a disinflationary period which lasted until 2015. With the inflation rate falling to 0.22% in 2015 from 3.40% in 2011 and real GDP growth slowing to 3.44% p.a. from 7.24% p.a. in the same period, the sacrifice ratio of 0.48 indicates that real GDP growth declined by 48bp for every 100bp reduction in (trend) inflation.

The State Bank of Vietnam did not adopt any contractive monetary policies between 2017 and 2021, i.e., the (marked) reduction in inflation cannot be attributed to any monetary policy actions.

For the United States, research (Cecchetti and Rich (2001) featuring various models) estimating the sacrifice ratio imply that a permanent one percentage point reduction in inflation entails a loss of 1.3 to as much as 10.0%. As Cecchetti and Rich (2001) emphasise, however, "*the high degree of imprecision associated with the estimates suggests that our knowledge about the actual impact of monetary policy on the behaviour of the economy is quite limited.*"

Clearly, notwithstanding these results, the causality of the relationship between contractive monetary policies, periods of disinflation and stalling economic growth as considered in the sacrifice ratio remain subject to further research.

The sacrifice ratio will react rather sensitively to any changes in the assumptions made when estimating trend output and (albeit to a lesser extent) trend inflation, i.e., estimates are theoretically objectionable and shown to be very fragile to minor changes in technique. Consequently, their robustness is an issue. The true sacrifice ratio may be overestimated in the case where the impact of a real shock on the economy is ignored or the true costs of a disinflationary monetary policy may be underestimated. The fact that any other estimate of trend output could potentially alter findings, illustrates that the sacrifice ratio is subject to a high degree of uncertainty (Neely and Waller, 1997).

Ultimately, even minor adjustments to the way of determining the sacrifice ratio's numerator can lead to (strongly) varying results. Further, as the sacrifice ratio strictly speaking is an *ex-post* analysis, caution is advised when extrapolating the data. Even if a trade-off between disinflation and a drop in economic growth predated by a tightening of monetary policy can (in retrospect) be established, it cannot necessarily be concluded that any such relationship will hold in the future. Not least for this reason, no (monetary) policy recommendations based on the results of a sacrifice ratio should be made.

Generally speaking, estimates of a sacrifice ratio tend to provide a very unreliable guide for assessing the output cost of a disinflation monetary policy.

5. Concluding Remarks

The objective of this contribution is to estimate the sacrifice ratios for selected Southeast Asian economies. Numbers indicate that the estimate of the cost of a one percentage point reduction in headline inflation is between roughly zero and 0.5% of GDP, confirming that disinflationary monetary policies typically trigger (sharp) declines in output and employment. However, these results cannot be randomly generalised, as the contraction in economic growth across the region turns out to be quite different. Further, caution is required when interpreting the data, as the influence of other (macroeconomic) factors on the development of inflation rates ought to be taken into consideration. Among the factors potentially affecting Southeast Asian monetary policies, especially against the background of potential adjustments in regional capital flows, is US monetary policy (notwithstanding a succession of several rate hikes), which is likely to maintain a rather conservative stance for the time being.

Future research should provide a regional and temporal extension of the analysis. What is more, the impact of factors other than regional monetary policies ought to be included in order to assess the causality of these other factors in determining the sacrifice ratio. Among these are, possibly, the pace of disinflation, the initial inflation level or a central bank's independence. Finally, emphasis should be placed on assessing the (economic) benefits of disinflation.

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