

## *The Cost of Disinflation: The Sacrifice Ratio*

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### Price Stability is Important

Price stability is an imperative in economics. Independent central banks have therefore been encouraged by the IMF in all countries with a clear mandate to achieve a low inflation target. It is well accepted that long run sustained growth requires a stable low inflation environment (Barro, 1996 and Feldstein, 1996).

Curbing inflationary pressures is not costless. The tradeoff between growth and inflation is well known ever since the famous Phillips curve. The recessionary impact of IMF programs at least in their early stages is also well known (Haque and Khan, 1998). Studies also show that disinflation is associated with possibilities of a recession in United States of America (Romer and Romer, 1989) and Japan (Fernandez, 1992) among other countries.

Yet in most economies there is no clear growth target, nor an agency for attaining it.

One approach to measuring the tradeoff between growth and inflation is the *Sacrifice Ratio* (SR) which is defined by the ratio of accumulated loss in real GDP during a particular episode of disinflation to the overall fall in inflation during this particular episode (See Box 1). Several methodologies are suggested by the existing literature for the calculation of SR (see Box 2)

#### Box 1: Definition of Sacrifice Ratio (SR)

It is well accepted that disinflation produces output losses. The quantification of these losses due to disinflation is termed as SR. More clearly, SR is used to gauge the cost of disinflation in terms of accumulated loss in real gross domestic product (GDP) due to monetary policy.

#### Box 2: Sacrifice Ratio Methodology

There are four well known methodologies to calculate SR

##### 1. Philips Curve Methodology

Okun (1978) and Gordon and King (1982) document that the theoretical foundations of SR are based on the expectations augmented Phillips curve.

$$(y - y^p) = \beta(\pi_t - \pi_{t-1}) + \varepsilon_t$$

where  $y$  is actual output,  $y^p$  is potential output,  $\pi_t$  is inflation,  $\beta$  is cost of disinflation and  $\varepsilon$  is error term.

##### 2. Ball (1994) Methodology

Ball (1994) argues that the SR is identical in each and every episode of the disinflation in Philips Curve methodology and this is not a plausible assumption. Ball (1994) introduces episode specific concept of SR.

$$SR = \frac{\sum (y - y^p)}{(\pi_t - \pi_{t-1})}$$

Here  $(\pi_t - \pi_{t-1})$  is change in inflation rate from start to end in an *identified episode* of disinflation.

##### 3. Zhang (2005) Methodology

Zhang (2005) notes that the effects of a disinflation can be more persistent than it was assumed by Ball (1994). The major difference between Ball (1994) and Zhang (2005) is the calculation of potential output. Zhang (2005) assumes that output at its potential at the beginning of the disinflation episode instead of each period.

##### 4. Structural Vector Autoregressive (SVAR) methodology

Cecchetti (1994) criticizes Ball (1994) and Zhang (2005) methodologies for not incorporating the other important dynamics of economy, e.g., monetary policy. Therefore, Cecchetti and Rich (2001) suggest that each country should specify a SVAR model according to the dynamics of its economy to measure the output loss of disinflation.

In this *Knowledge Brief*, we will:

- Review estimated SR in various countries.
- Develop estimates of the SR for Pakistan based on Ball (1994).

## SR around the World

Estimates of SR from many emerging markets are presented in Table 1.<sup>1</sup> In understanding these estimates the following considerations should be borne in mind.

- Estimates may vary with specifications.
- The SR may vary with the level of inflation and its history.

We will also examine the determinants of the SR such as speed of disinflation, length of episode from inflation to disinflation, credibility and independence of monetary authority to pursue disinflation policy, initial level of inflation in later studies (see Box 3).<sup>2</sup> This particular study discusses the size of SR.

### Box 3: Determinants of Sacrifice Ratio

The literature on the loss of output due to disinflation suggests that the size of SR depends on several factors. These include speed of disinflation, trade openness, central bank independence, inflation targeting, governance and political regime. It appears that SR ratio will be lower in

- a quick disinflation episode (Ball, 1994),
- a stable political regime (Caporale, 2011). and
- more open economies (Temple, 2002 and Bowldler, 2009),
- the presence of good governance (Caporale and Caporale, 2008)

The role of central bank independence and inflation targeting in determining the size of SR is less clear.

- Brumm and Krashevski (2003) and Diana and Sidiropoulos (2004) and Daniels et al. (2005) suggest that SR will be lower where the central banks are more independent whereas Fischer (1996), Jordan (1997), and Down (2004) find evidence to the contrary.
- Goncalves and Carvalho (2008, 2009) find lower SR in the countries which are pursuing inflation targeting while Brito (2010) notes that the sample of Goncalves and Carvalho (2008, 2009) is based on only low inflationary OECD countries. If the sample is expanded, then the inflation targeting does not matter a lot for a lower SR.

<sup>1</sup> We present the findings which are based on Ball (1994) methodology to allow us to capture a larger comparable sample of countries.

<sup>2</sup> As mentioned earlier, we only present the size of SR. This note will follow Senda and Smith (2008) by taking the average SR for every country.

Table 1

*Episode-Wise and Average SR by Using Ball (1994) Methodology*

Country	Episode	SR	Average	Country	Episode	SR	Average	Country	Episode	SR	Average	Country	Episode	SR	Average
Australia	60–62	1.68	0.70	Denmark	62–64	0.94	0.60	Italy	63–67	2.41	1.39	Sweden	66–68	0.42	1.24
	74–78	0.54			67–69	-0.39			74–78	2.79			76–78	2.65	
	82–84	1.06			74–76	0.81			80–87	1.37			80–82	0.41	
	86–88	-0.20			80–86	1.18			90–93	0.19			83–86	-0.34	
	89–92	0.74			88–90	0.46			95–98	0.22			90–97	3.08	
	95–97	0.36													
Austria	64–66	0.02	1.03	Finland	63–65	-0.78	1.44	Japan	62–64	3.01	1.14	Switzerland	66–68	1.35	0.89
	74–78	1.47			67–69	0.95			65–66	-0.01			74–77	1.77	
	80–82	1.25			74–78	1.45			70–71	1.23			81–83	1.70	
	84–86	-0.17			80–86	0.64			74–78	0.40			84–86	-1.16	
	92–98	2.55			89–94	4.92			80–87	1.84			90–94	0.78	
Belgium	65–67	0.52	0.90	France	62–66	-0.83	0.00	The Netherlands	65–67	1.53	2.47	United Kingdom	61–63	2.03	1.07
	74–78	0.60			74–77	1.54			75–78	-1.19			74–78	0.69	
	82–87	1.59			81–86	0.23			80–86	2.74			80–83	0.60	
					89–94	-0.93			91–97	6.78			84–86	0.35	
Canada	68–70	0.28	1.23	Germany	65–67	1.22	2.33	New Zealand	75–78	1.79	0.51	United States	89–93	1.69	2.55
	74–76	0.41			73–78	3.86			80–83	0.54			69–71	2.70	
	81–85	1.90			80–86	1.91			86–88	-0.91			74–76	1.41	
	90–93	2.34			75–78	-0.70			89–92	2.14			79–83	1.98	
--	--	--	--	Norway	81–85	1.31	1.30		94–98	-1.00		89–94	4.11		
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*Note:* Source Senda and Smith (2008). The ‘average’ is the arithmetic mean of all episode of the specific country. Several other studies estimate average SR for developing countries like Direkcedil (2011) for Brazil (0.43), Sethi et al (2018) for China (0.49), Reyes (2003) for Colombia (0.92), Roux and Hofstetter (2014) for Czech Rep. (0.68), Roux and Hofstetter (2014) for Greece (2.15), Mitra (2015) for India (2.3), Sethi et al (2018) for Indonesia (1.15), Sethi et al (2018) for Malaysia (4.95), Roux and Hofstetter (2014) for Portugal (0.24), Sethi et al (2018) for South Africa (0.72), Sethi et al (2018) for Sri Lanka (0.67) and Roux and Hofstetter (2014) for Turkey (0.39). These estimates also show that the disinflation is costly in developing countries as well.

Table 1 reports 77 episodes of disinflation of 17 different countries. It is observed that the ratio is positive in 64 of 77 cases. This suggests that disinflation is usually costly<sup>3</sup>. More clearly, on average there is 0.7 percent accumulated loss in real GDP during a particular episode of disinflation to the overall 1 percent fall in inflation during in the case of **Australia**. It is also evident from the table 1 that there is a huge variation in the SR of different countries<sup>4</sup>. One can infer that the cost of disinflation may vary from country to country. However, it is also important to note that the direct comparison among countries is not sensible due to several reasons (see Box 4).

### Sacrifice Ratio in Pakistan

We calculate SR by well-known Ball (1994) methodology using HP filter method for potential real output and three years centered moving average inflate rate from period of 1973 to 2018. We find four episodes of inflation in the case of Pakistan (see table 2). It is evident that from the table that SR is different for all four episodes. It ranges from 0.458 to 0.903 and the average of all four episodes is 0.662. It implies that on average 0.662 percent of the real GDP will be forgone for the permanent reduction of one percent of inflation. However, these findings are highly sensitive to measuring of SR and real output loss.

#### Box 4: Interpretation of Sacrifice Ratio

As mentioned earlier, SR is a ratio of *accumulated* loss in real GDP during a particular episode of disinflation to the *overall* fall in inflation during this particular episode. By definition, there are two major parts of the ratio. First, the *loss* in real output (relative to trend) in the numerator and the *slowing* of the consumer price index in the denominator. Therefore, the magnitude of SR can be determined by two different elements.

- First, the accumulation of output loss (numerator) and
- second, the slowing of consumer price index (denominator).

It simply implies that the magnitude of SR will be different with a different denominator even if the nominator (loss of output) is same for each country and vice versa. Suppose, a country has a smaller difference between start and end of the disinflation episode of a country as compared to any other country, then the SR of this country will be higher even with the same loss of output. This means that the SR of two different countries are not directly comparable. We must take care of a number of issues.

**First, the numerator.** The numerator is the accumulated difference between potential output and actual output. It is well accepted in the literature that calculation of potential output is sensitive to the methodology. Therefore, the SR may differ due to the change in the methodology of calculating the potential GDP.

**Second, the denominator.** There are several concerns in the denominator like the definition of the episode of disinflation, length of the disinflation episode, peak and trough of inflation in that particular episode and speed of disinflation.

Therefore, we must have same elements/assumptions both in numerator and denominator to calculate a comparable SR for different countries.

Table 2

#### Sacrifice Ratio for Pakistan

Episode	Sacrifice Ratio Ball (1994) Method
1974-78	0.797
1980-86	0.458
1995-02	0.903
1998-17	0.491
<b>Average</b>	<b>0.662</b>

<sup>3</sup> The negative SR may imply that the disinflation may have a positive impact on economic growth.

<sup>4</sup> Cecchetti and Rich (2001) is a good read in this context. Their estimates range from about 1 to nearly 10, suggesting that somewhere between 1% and 10% of one year's GDP must be sacrificed for inflation to fall one percentage point only in the case of United States based on the different specifications of SVAR.

## Concluding Remarks.

This note serves two purposes. First, it reviews the literature on the estimated size of SR for several countries. Second, it estimates SR for Pakistan, based on the most prominent methodology of Ball (1994). We estimate that the average SR is 0.667 in the case of Pakistan which implies that the disinflation is costly in the case of Pakistan as well. Disinflation will, therefore, be costly as expected.

It must be noted that this estimate is not an argument against disinflation. This estimate merely informs policymakers of what to expect for growth and employment in an adjustment program. With an employment elasticity of 0.1, we can expect that employment will be reduced by 0.06% (Zulfiqar and Choudhry, 2008). Policy must seek structural reform in a disinflation episode (adjustment program) to generate some growth momentum in the economy, if costs of disinflation are to be mitigated.

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