

Six Sigma Approach to Exchange Rate Management

"If at first, the idea is not absurd, then there is no hope for it"— Albert Einstein

The Committee on Fuller Capital Account Convertibility has endorsed the recommendations of the 1997 committee on exchange rate management around Real Effective Exchange Rate (REER). The 1997 Committee recommended that: *"the RBI should have Monitoring Exchange Rate Band of +/- 5.0 percent around the neutral REER. The RBI should ordinarily intervene as and when the REER is outside the band. The RBI should not intervene when the REER is within the band. The RBI could, however, use its judgment to intervene even within the band to obviate speculative forces and unwarranted volatility. The committee further recommends that the RBI should undertake a periodic review of the neutral REER which could be changed as warranted by fundamentals."* The report states that RBI has not accepted this recommendation.

The Real Effective Exchange Rate (REER) is the weighted average of Nominal Effective Exchange Rate (NEER) adjusted by the ratio of domestic price to foreign price. NEER is the weighted geometric average of the bilateral nominal exchange rates of the home currency in terms of foreign currencies

In November 2005 RBI announced the replacement of its five-country indices of REER /NEER with new six-currency indices and also the revision of its thirty-six country indices with new 36-currency indices. These revisions were due mainly to (a) introduction of Euro with effect from Jan 2002 (b) significant shift in India's trade towards developing and emerging economies and (c) change in the base year of WPI (wholesale price index of India).

The detailed methodology of compilation of REER/NEER was published in the RBI Bulletin for December 2005. It was stated in the article that despite the appreciating trend witnessed in the recent months in the REER trade indices, both the six-currency and the 36-currency revised REER indices have remained around the benchmark over long horizon during the sample period 1993-94 to 2005-06 (so far).

While RBI publishes these indices regularly as part of its communication policy and to aid researchers and analysts, the CAC committee stresses that the REER should also be a valuable input into the formulation of the RBI's exchange rate policy.

In a much-liberalized capital account regime there could be large capital inflows and outflows resulting in sharp appreciation or depreciation. These upward and downward movements, which are nearly impossible to control, at times, could result in dire consequences. An exchange rate policy, apart from managing the volatility issues should also monitor the level of the exchange rate. Adopting REER as a tool has been suggested with appropriate refinements from time to time.

Looking at exchange rate management as a process brings some insight to the vexed question—can we ever manage the currency exchange fluctuations and levels? In industrial production and business processes, output variation as compared to customer specification is treated as the enemy to be controlled. There are many tools and techniques to identify, control and monitor variations in processes. Among those, Six-Sigma has come to occupy a leading position for quite sometime. The popularity may be probably due to the robust methodology and breakthrough improvement opportunities arising from its deployment.

The concept of Six Sigma is to eliminate defects /variations in processes with respect to customer requirement. Achieving a six-sigma level quality means that processes produce only 3.4 defects per million opportunities (DPMO). Six-Sigma in addition to being a methodology for improving process



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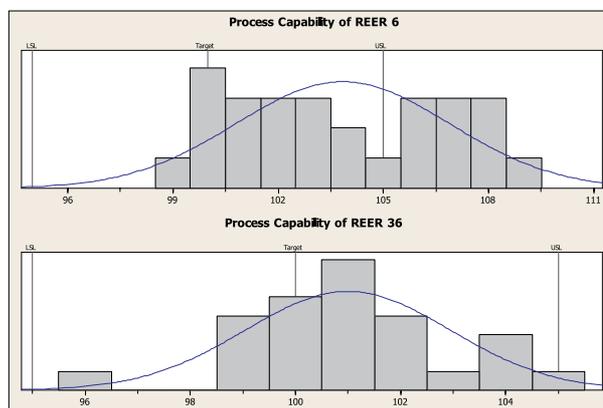


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capability is also viewed as a philosophy that leads to perfection on a continuous basis. The capability index, DPMO and the implied performance at select levels are given below for ready reference.

Capability index	DPMO	Implied performance
6 sigma	3.4	World class
5 sigma	233	
4 sigma	6210	Average
3 sigma	66807	
2 sigma	308537	Non competitive
1 sigma	691462	

Monthly data	Z bench	Z LSL	Z USL	Mean	STD dev
REER 6	0.38	2.90	.38	103.84	3.04
REER 36	2.03	3.07	2.05	100.99	1.95



Generally high sigma levels of six and beyond are aimed at for high-risk processes. While continuous improvement is the focus of adopting six sigma, general business processes operating between four to five sigma, though not excellent may be considered reasonably good.

Let us try to arrive at the Sigma value of the process 'Exchange rate management' based on the REER index. The data points considered are for the period April 2004 to June 2006.

Considering the Monitoring Exchange Rate Band of +/- 5%, the process sigma for the period is as follows:

Mean of REER 36 at 100.99 is closer to the target of 100 than the REER 6. With a smaller Standard deviation, REER 36 reflects a process sigma of 2.03 whereas the REER 6 has a process sigma of only 0.38. The process is better managed with reference to lower specification limit (LSL) than the upper specification limit (USL). In other words currency depreciation is better managed than its appreciation around the benchmark indices with the specified variation +/- 5%.

There is an accepted convention to adjust the long-term process sigma by adding another 1.5 sigma to accommodate process shifts and drifts to arrive at the short-term capability. Thus the short-term sigma for REER 36 and REER 6 works out to 3.53 and 1.88 respectively.

Let us look at the yearly indices between the periods 1993-94 to 2005-06 (so far) to get an overall process capability in the band width of +/- 5%;

Yearly indices	Z bench	Z LSL	Z USL	Mean	STD dev
REER 6 -base2004-05	1.15	1.48	1.60	99.80	3.25
REER 6 -base1993-94	1.03	1.87	1.17	101.15	3.29
REER 36 Export Based	1.23	1.34	2.08	98.91	2.92
REER 36 Trade Based	1.30	1.44	2.04	99.13	2.88

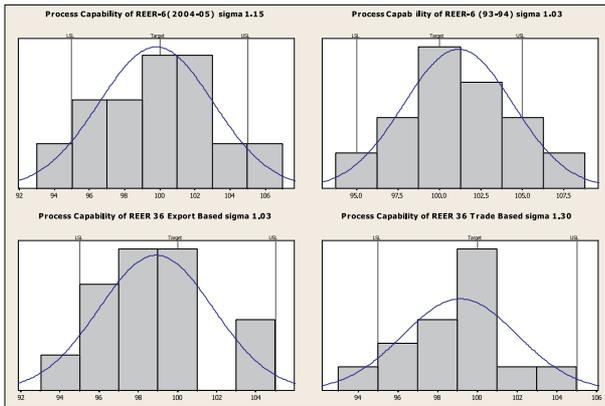
Overall capability of all indices, as can be seen from the above, is around one sigma; REER 36 reflects a better sigma level at upper specification limit, implying a better management of currency appreciation than its depreciation.

With the given data it is possible to calculate the sigma levels between different bands to see the process behavior in those limits. For this purpose let us take three more bands increased by an additional +/-5% to see the outcomes at 10%, 15% and 20%. The resultant Sigma values are shown in the table on the next page.

As can be seen from the table on the next page the process sigma increases with the increase in

Yearly indices	Z bench at various bands			
	+/- 5%	+/- 10%	+/- 15%	+/-20%
REER 6 -base2004-05	1.15	2.85	4.46	6.03
REER 6 -base1993-94	1.03	2.65	4.19	5.72
REER 36 Export Based	1.23	3.03	4.76	6.48
REER 36 Trade Based	1.30	3.15	4.91	6.65

the band. While the process achieves a capability of Six-Sigma in +/- 20% band, this is far from the desired band of +/- 5% suggested by the CAC Committee.



One could probably try to target to achieve a six sigma level in a +/- 10% band and then work towards tighter bands of +/- 5%. There would be less intervention by the monetary authorities in a market determined rate regime and at the same time this would ensure a goal oriented and disciplined approach to the process of exchange rate management.

REER as an output from the exchange management process depends on several variables. The basic equation that defines the relationship between the dependent variable REER (Y) and independent variables (the X's) are specified in the methodology. In sum REER has four parameters/variables pertaining to country/currency coverage (n), relative prices (P/P_i), weights(^{wi}) and exchange rates(e/e_i).

$$REER = \prod_{i=1}^n [(e/e_i) (P/P_i)]^{w_i}$$

In order to achieve breakthrough improvement we need to set our goals first. We need to study the 'as is process' and come out with suggestions that

could dramatically improve the capability levels.

In the present set of data there were few data points in the periods, which have crossed the specified process limits. We may need to do some root-cause analysis to identify those causes that have contributed substantially to

the variation. We may set new goals for exports /trade with those areas to bring our exchange rate management process within the desired band. Each and every factor that makes up the REER needs to be monitored and influenced from time to time to obtain the desired results. However, such statements are easier made than achieved

As highlighted in the CAC II report, the Indian exchange rate regime is classified by the IMF as a "managed float with no predetermined path for the exchange rate". This classification implies that the monetary authority attempts to influence the exchange rate without having a specific exchange rate path or target. Indicators for managing the rate are broadly judgmental (e.g., balance of payments position, international reserves, parallel market developments), and adjustments may not be automatic. Intervention may be direct or indirect.

REER among other things is a tool to facilitate competitiveness. CAC committee has recommended that RBI should have monitoring exchange rate band of +/-5 per cent around the neutral REER. RBI has not accepted the recommendation. Managing within a band of +/-5% would call for frequent intervention, which may be contrary to the spirit of market-dominated economics. By taking a process approach and leveraging on Six Sigma methodology one can try to set a time bound practical objective to balance the impact of several variables to some extent. The goal line for REER 36 and REER 6 may initially be set at 4.5 Sigma (presently at 2.03 for REER 36 based on monthly data) and 4.0 Sigma (presently less than 1 for REER 6) in an appropriate and practical bandwidth (say +/-10%). Many leading corporates world over have deployed Six Sigma for strategy and monitoring processes and have achieved substantial gains. Why not India Inc? □