

## Impact of credit guarantee on the output gap: A panel data analysis of Asian sovereigns

**Mohammad MUSTAFA**

Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE), Mumbai, India  
md.mustafa.research@outlook.com

**Abstract.** *This paper aims to assess the impact of financial variables on output gap in a group of middle-income Asian countries such as India, Indonesia, Republic of Korea, Malaysia, and Thailand. In order to improve on the previous methodologies, this study followed a different approach by considering a binary nature of dependent variable. In order to explore role of credit guarantee, this paper considered credit guarantee to credit offtake ratio as an explanatory variable in defining output gap. Moreover, in order to get a clear picture on influence of monetary and fiscal policy, we have included revenue deficit and debt to GDP ratio along with real interest rate and inflation rate. Our Probit model ultimately proves that credit guarantee is an important factor for identifying output gap. Additionally, output gap is found to be neutral towards the movement of other financial variables.*

**Keywords:** output gap, GDP, credit guarantee, financial variable, Asia.

**JEL Classification:** O4, O49, H81.

## Introduction

Arguably, credit guarantee schemes have grown from strength to strength over the years since their formal implementation in the 1960s as MSME enablers. To measure the effectiveness of these schemes, numerous studies have been conducted across financial institutions and think tanks. However, the focus of most of these works has been narrow, studying the impact on the MSME sector alone. Even in country wide assessments, previous papers seem to operate within the confines of the sector per se, i.e. employment generated (Veiga and McCahery, 2019) cost of funding (Liang et al., 2017), SME collaterals and small enterprise development (Samujh et al., 2012).

The purpose of this paper is to therefore expand the horizon and see the bigger picture, through the lens of the scheme. Consequently, we attempt to gauge whether the credit guarantee scheme (at a sovereign level) can be an effective explanatory variable that can explain macroeconomic trends.

Moving forward, we began our methodology by first trying to identify the best possible dependent variable, which in turn meaningfully represents the state of an economy. It was inferred that the identified variable(s) must essentially be a proxy of macro stability and wellbeing. Eventually, Output Gap was found to be the best fit as it embodies the research requirement and best gauge the performance consistency of any economy in transition. Rath, Mitra and John (2017) argue in their paper that policymakers consider potential output as a key benchmark and use output gap as an input to adjust policy stance to reduce possible macroeconomic imbalances and control aggregate fluctuation. On the side of independent variables in our regression tool, we followed a panel data approach given the fact that in the light of considered nominal GDP sizes ranging between \$0.4-2.93 trillion (as on FY2018) among the sample, the quantum guaranteed by the scheme would have appeared inconsequential. Hence it was assessed that the scheme's impact is analyzed as part of a panel comprising of other important macro variables.

Various studies argue that credit supply is an instrumental in firm's productivity. In a most recent study, Manaresi and Pierri (2019) observed that contraction in credit supply could impair firm's total factor productivity (TFP) and thereby harm IT-adoption, innovation and acceptance of superior management practices. In addition, higher credit cost may adversely impact R&D investment of a firm and thereby lower the potential output. Aghion (2010) states that firms with tight credit constrain may reduce R&D expenditure being scared to liquidity risk. In contrast, Field (2003) believes that lack of resources may increase firm's productivity as it creates a circumstance to innovate for survival resulting in a higher potential output. Convinced by the finding of previous researchers, the paper therefore attempts to further examine how Credit Guarantee as a ratio of credit offtake is a relevant macroeconomic variable that can explain output gap.

To the best of the author (s) knowledge, no previous study has attempted to see Credit Guarantee as a macroeconomic determinant of output gap.

### **Output gap: A conceptual framework**

Estimating potential GDP and output gap are vital from an economic policy viewpoint. Due to various factors such as those pertaining to the developments in the financial and

monetary policy, actual output often time differs from its potential level; we know this condition as 'output gap'. However, defining potential GDP is a major challenge; we therefore rely on H-P filter in our assessment.

Earlier literature argues that financial cycle is crucial in driving the output gap and consequently excess credit may lead to misallocation of resources. At the same time, credit unavailability can restrict the growth in actual output. Therefore, credit behaviour can deviate actual output from the potential level as argued by Drehmann, (2012). It is further observed that cited literature gives higher importance to the financial sector in output gap. Here, the observations of (Borio et al., 2013) come to mind; the authors state that the output may be expanded at an unsustainable pace when financial imbalance is created thereby causing a disequilibrium between actual and potential output.

Further, it is known that during an unsustainable financial boom, economic parameters are shored up in the short term. This results in the economic outlook appearing deceptively healthy. Law and Singh (2014) debate that financial sector can have an adverse impact on output growth due to misallocation of resources and therefore, financial sector can benefit the economic growth until a certain point is reached. On the other hand, Claessens, Kose and Terrones (2015) argue that financial and business cycles are highly integrated.

Some studies claim that a gap between actual and potential output is reflected in terms of inflation rate. The assumption is that an economy experiences higher inflation rate when actual output is above the potential output and vice-versa (Woodford, 2003 and Mishkin, 2007). A condition which in turn is created when the demand supply equilibrium is disturbed by a preceding financial boom. An alternate viewpoint pertains to the fact that inflation may be a function of higher currency in circulation/new money as globalization of capital aided financial boom increases actual output beyond potential. It is further argued that inflation rate remains stable when output gap is closed as argued by Friedman (1968).

Given this background, in the earlier literature, studies have consequently considered inflation rate, growth in credit offtake and interest rate as the key explanatory variables of output gap.

### **Methodology for assessing output gap**

In order to assess the behaviour of output gap, Borio et al. (2013) have considered inflation rate, real interest rate, credit growth, and property price and lagged output gap for a panel regression. Another study, Felipe, Sotocinal, and Dacuycuy (2015) estimates the output gap using the same variables as proxy for financial cycle. Following the previous studies, this paper examines the indicator output gap with a group of five middle-income economies in Asia, namely, India, Indonesia, Republic of Korea, Malaysia, and Thailand. India, Thailand, Indonesia and Malaysia are taken as peers under the OECD Development Centre definition of Emerging Asia. Countries under this grouping are characterized by a resilient private consumption, strong economic growth and trade. South Korea, even though not part of the OECD definition of emerging- is added because the country represents similar characteristics seen in Emerging Asia apart from having a significant presence of the credit guarantee scheme.

In the literature, absolute value of output gap was considered as a dependent variable. However, as the lagged variable of the output gap is considered as an independent variable, from a model specification point of view, we are defining the dependent variable in a binary form. In addition, our primary concern is negative output gap where actual output remains below the potential level. Therefore, a binary variable is created where '1' is assigned whenever actual output is below its potential level and '0' otherwise. This is expected to give a robust result in identifying the influence of financial cycle on output gap. In addition, this paper considered credit guarantee to credit offtake ratio as an important explanatory variable instead of growth in credit offtake. Moreover, in order to get a clear picture on influence of monetary and fiscal policy, we have included revenue deficit and debt to GDP ratio along with real interest rate and inflation rate.

The rest of the paper is divided into three parts. Part II, pertains to the Data and Methodology. Part III, pertains to the Empirical Analysis of the study. Finally, Part IV comprises of the Conclusion of this paper.

## 1. Data and methodology

### 1.1. Data

For an empirical analysis on a cross-country level data, this study has considered output gap, consumer inflation, revenue deficit, fiscal deficit, debt to GSDP, real interest rate and credit guarantee to offtake ratio. Output gap is estimated using H-P model. The countries are included in the study are India, Indonesia, Korea Republic of, Malaysia and Thailand. A major challenge for the study is getting recent data on credit guarantee. Credit guarantee data for some countries is not available publicly. Therefore, the Asian countries (under the Emerging Asia bucket) are chosen based on the availability of most recent data. The cross-country level data has been collected from International Monetary Fund (IMF), World Bank, Small Industrial Development Bank of India (SIDBI), Annual Report 2018 of Korea Credit Guarantee Fund, Bank Indonesia, Annual Report 2018 of Credit Guarantee Corporation of Malaysia, Small Business Credit Guarantee Corporation of Thailand, Asia SME Finance Monitor 2014 of Asian Development Bank (ADB). This study has considered a time period from FY2011 to FY2018 as all data available for the considered countries.

### 1.2. Methodology

The empirical study is based on a Probit panel regression. Objective of this research is to examine the impact of financial variables including credit guarantee on output gap. First, output gap is measured using the Hodrick-Prescott (HP) filter method. Further, in order to make it fit into the model, the output gap is assigned '1' if the gap is negative and '0' otherwise.

Model 1:

$$Y_{it} = \beta_1 Z_{it} + \beta_2 X_{it} + \mu_i + v_i + e_{it} \quad (1)$$

Where,  $y$  is a binary variable – assigned ‘1’ if the actual output is less than potential output and ‘0’ otherwise.

The output gap is estimated as deviation of actual output in log form ( $Y_t$ ) from its potential level ( $\bar{Y}_t$ ). The potential output is estimated using the H-P filter. There are several methods to obtain output gap. However, the earlier literature suggests that no method can be claimed to be superior over another. Therefore, the study has chosen H-P filter to estimate the output gap. This method is suggested by Felipe et al. (2015) and Bhoi and Behera (2016) for India as well as for Asia specific study. Podpiera et al. (2017) argue that H-P filter is simpler and more transparent.

Model 2:

$$\text{Min} \sum_{t=1}^T (y_t - y_t^*)^2 + \lambda \sum_{t=2}^{T-2} \left[ (y_{t+1}^* - y_t^*) - (y_t^* - y_{t-1}^*) \right]^2 \quad (2)$$

Where,  $Y_t$  is actual GDP,  $Y_t^*$  is potential output,  $\lambda$  is a weighting parameter for smoothening the trend pertaining to output gap.  $\lambda$  assigns greater weight close to the beginning and end of the sample period.

## 2. Empirical analysis

Before heading for a panel regression test, we have presented descriptive statistics and correlation matrix. The descriptive statistics for 40 observations for five countries shows that there is no outlier in the series.

### Summery statistics

		Mean	Std. Dev.	Min	Max	Observation
CGO	Overall	1.19	1.18	0.03	3.34	N= 40
	Between		1.24	0.09	2.83	N= 5
	Within		0.36	0.1	2.12	T= 8
Interest rate	Overall	4.02	2.28	-0.47	9.22	N= 40
	Between		1.9	2.61	7.00	N= 5
	Within		1.49	0.48	6.72	T= 8
Inflation rate	Overall	3.37	2.52	-0.9	10.00	N= 40
	Between		2.15	1.49	6.39	N= 5
	Within		1.58	0.41	6.98	T= 8
$Y_{t-1}$	Overall	0.08	0.94	-1.64	1.98	N= 40
	Between		0.05	-0.04	0.08	N= 5
	Within		0.94	-1.60	2.02	T= 8
RD	Overall	-2.01	3.01	-8.35	2.57	N= 40
	Between		3.26	-7.21	1.38	N= 5
	Within		0.60	-3.34	-0.91	T= 8
Debt	Overall	45.19	15.00	22.96	68.77	N= 40
	Between		16.42	26.25	67.81	N= 5
	Within		1.98	40.33	49.03	T= 8

**Note:** CGO is credit guarantee to offtake ratio,  $Y_{t-1}$  is lagged output gap, Interest rate is lending rate adjusted with GDP deflator, which express real interest rate, Inflation rate is change in consumer price index, RD is revenue deficit to GDP ratio, Debt is debt to GDP ratio.

### Correlation matrix

The correlation matrix shows that revenue deficit is highly correlated with inflation rate (66%) and debt (76%). Apart from these pairs, no pairs have correlation coefficient more than 50%.

	CGO	Y <sub>t-1</sub>	Inflation rate	Interest rate	RD
CGO	1.00				
Y <sub>t-1</sub>	0.08	1.00			
Inflation	-0.45	-0.01	1.00		
Interest rate	-0.36	0.33	0.26	1.00	
RD	0.11	0.03	-0.66	-0.28	1.00
Debt	0.09	-0.01	0.26	-0.21	-0.76

### Panel Regression Result (Probit Random Effect)

Dependent Variable: Output gap – A binary variable was created such that when actual output is less than the potential GDP then 1 is assigned otherwise 0.

	M1	M2	M3	M4	M5
CGO	-0.3842*** (0.071)	-0.3527** (0.045)	-0.403*** (0.064)	-0.3583*** (0.078)	-0.4468 ** (0.045)
Y <sub>t-1</sub>		-0.5369*** (0.079)	-0.5477** (0.041)	-0.5283** (0.048)	-0.5883** (0.033)
Interest rate	-0.2200** (0.036)	-0.1538 (0.167)	-0.1450 (0.197)	-0.1587 (0.173)	-0.1133 (0.334)
Inflation	-0.0416 (0.664)		-0.0601 (0.545)		-0.1033 (0.350)
RD				-0.0110 (0.887)	
Debt					0.0168 (0.311)
Constant	1.4387** (0.048)	0.9576 (0.126)	1.1770 (0.107)	2.2961*** (0.341)	0.4903** (0.311)
rho	0.00	0.00	0.00	0.00	0.00
Sigma_u	0.0002	0.00004	0.0003	0.00004	0.0002
χ <sup>2</sup>	5.66	9.08**	9.40***	9.07***	10.08***
Obs	40	40	40	40	40
No. of group	5	5	5	5	5

**Note:** \*\* indicates significant at 5% level, \*\*\* indicates significant at 10% level; p-value is given in the parenthesis.

In order to examine the role of financial variables in output gap, this study has considered various combinations of financial variables such as real interest rate, credit guarantee to credit offtake ratio (CGO), inflation rate, revenue deficit to GDP ratio (RD), debt to GDP ratio (Debt). For all the models, variable CGO is significant at 5 or 10 percent level with negative sign. This indicates the probability of output gap to be negative is higher if the credit guarantee to credit offtake declines and vice-versa. Similarly, one period lagged output gap is used as proxy for growth cycle. The explanatory variable is significant at 5 percent level in the last three models. In order to examine the monetary impact, the research has included real interest rate as proxy for monetary policy. Consequently, for fiscal policy, revenue deficit to GDP ratio and debt to GDP ratio has been considered. However, these variables are found to be insignificant. This indicates that when CGO and lag output are considered the gap is neutral to the monetary and fiscal policy determinants.

## Conclusion

In this paper, we attempt to gauge the significance of the credit guarantee scheme as a macroeconomic determinant. Even though credit guarantee scheme is operational in several countries across the world, we focused our attention on Asian emerging nations. The countries thus included in the study are India, Indonesia, Republic of Korea, Malaysia and Thailand, which are effectively peers by way of GDP size.

In order to have a different approach, the dependent variable (output gap) is converted into binary form and applied with a Probit panel regression model. It was observed that the financial variables such as inflation rate, interest rate along with RD and Debt are found to be insignificant, which is in line with the earlier literature (Felipe et al., 2015). Credit guarantee to offtake ratio and lagged output gap, on the other hand are found to be statistically significant. The model therefore proves the high probability of actual output remaining below its potential level whenever the credit guarantee to offtake ratio falls and vice-versa. Therefore, from a policy perspective, in order to maintain actual output close to its potential level, credit guarantee scheme can be used as an instrument.

As mentioned in the data and methodology section, credit guarantee data for most countries is publicly not available. Moreover, the data is available in annual frequency from 2011 onwards only; a reason why this study was compelled to proceed with annual frequency. The researchers are aware that the output gap with a quarterly frequency for the considered time frame would have thrown more robust results. Additionally, a country specific dummy could have been more insightful.

---

## References

---

- Aghion, P., Angeletos, G.M., Banerjee, A. and Manova, A., 2010. Volatility and Growth: Credit Constraints and the Composition of Investment, *Journal of Money Economics*, 57(3), pp. 246-265.
- Bhoi, B.K. and Behera, H.K., 2016. India's Potential Output Revisited, RBI Working Paper, No. 05. Reserve Bank of India.
- Borio, C., Disyatat, P. and Juselius, M., 2013. Rethinking Potential Output: Embedding Information about the Financial Cycle, BIS Working Paper No. 404. Bank of International Settlements.
- Claessens, S., Kose, M.A. and Terrones M.E., 2011. How Do Business and Financial Cycles Interact?, IMF Working Paper 11/88, International Monetary Fund.
- Drehmann, M., 2012. Characterising the financial cycle: don't lose sight of the medium-term, BIS Working Papers, No. 380, Bank of International Settlements.
- Felipe, J., Sotocinal, N. and Dacuycuy C.B., 2015. The Impact of Financial Factors on the Output Gap and the Estimation of Potential Growth, ADB Economics Working Paper 457, Asian Development Bank.
- Field, A.J., 2003. The Most Technological Progressive Decade of the Century, *The American Economic Review*, 93 (4), pp. 1399-1413.
- Friedman, M., 1968, The Role of Monetary Policy, *American Economic Review*, 58(1), pp. 1-17.

- Law, S.H. and Singh, N., 2014. Does too much Finance Harm Economic Growth? *Journal of Banking and Finance*, 41 (C), pp. 36-44.
- Liang, L., Huang, B., Liao, C. and Goa, Y., 2017. The impact of SMEs' lending and credit guarantee on bank efficiency in South Korea, *Review of Development Finance*, 7, pp. 134-141.
- Manaresi, F. and Pierri, N., 2019. Credit Supply and Productivity Growth, IMF Working Paper 17/107, *International Monetary Fund*.
- Mishkin, F., 2007. Estimating potential output, Speech delivered at the Conference on Price Measurement for Monetary Policy, Federal Reserve Bank of Dallas, 24 May.
- O'Bryan III, W.E., 2010. An Analysis of Small Business Guarantee Funds, Community and Regional Planning Program, University of Nebraska, Lincoln.
- OECD Emerging Asia Economic Outlook, 2019. Retrieved from: <[https://www.oecd.org/development/asia-pacific/01\\_SAE02019\\_Overview\\_WEB.pdf](https://www.oecd.org/development/asia-pacific/01_SAE02019_Overview_WEB.pdf)>
- Podpiera, J., Raci, F. and Stepanyan, A., 2017. A Fresh Look at Potential Output in Central, Eastern, and Southeastern European Countries, IMF Working Paper 17/37, *International Monetary Fund*.
- Rath, D.B., Mishra, P. and John, J., 2017. A Measure of Finance-Neutral Output Gap for India, RBI Working Paper No. 05/2016. Reserve Bank of India.
- Samujh, R.H., Twiname, L. and Reutemann, J., 2012. Credit Guarantee Schemes Supporting Small Enterprise Development: A Review, *Asian Journal of Business and Accounting*, 5(2), pp. 21-40.
- Veiga, M.G. and McCahery J.A., 2019. The Financing of Small and Medium-Size Enterprises: An Analysis of the Financing Gap in Brazil, *European Business Organization Law Review*, 20, pp. 633-664.
- Woodford, M., 2003. *Interest and prices: Foundations of a theory of monetary policy*, Princeton University Press, pp. 143-188.