

Original Research Article

Monetary policy shocks and industrial output in Nigeria

ABSTRACT

This study investigated the impact of monetary policy shocks on industrial output in Nigeria using Vector Auto Regressive (VAR) model and Granger causality test. In doing this, data on the manufacturing and solid minerals sub-sectors was used for the analysis. Results show that contribution of manufacturing sector to GDP responded positively to shocks in monetary policy and exchange rates, while contribution of solid minerals sector to GDP responded positively to shocks in all the monetary policy variables used in the study after the second year. On the other hand, the causality test result indicated a unidirectional causality running from monetary policy rate and exchange rate to the contribution of manufacturing sector to GDP on the one hand, and commercial bank credit to the industrial sector and exchange rate to the contribution of solid mineral sector to GDP on the other. The recommendations included; proper evaluation by the central bank of Nigeria of the possible responses of the different subsectors of the in its decision regarding choice of monetary policy channel; the need for extreme caution to be taken in the management of the exchange rate, and the need for CBN to do more to encourage commercial banks to allocate more of their loans to small scale investors in the manufacturing sector.

Keywords: Monetary policy shocks, industrial output, Vector Auto Regression, Granger causality test.

1. INTRODUCTION

While the primary objective for the implementation of monetary policy is the maintenance of price stability, the promotion of economic growth is also a major objective of monetary policy, albeit a secondary one. In this regard, monetary policy actions are sometimes used by central banks to promote the growth of economic activities in desired sectors of the economy. In doing this, the central bank is driven by the associated effects of monetary policy on the real sector.

In writing on monetary policy and its impact on the economy, [1] posited that changes in monetary aggregates will eventually have an impact on the real sector and that central banks are indeed mindful of such impacts. In a similar vein, [13] observed that there is a general agreement, based on empirical

studies, concerning the effect of monetary shocks on output, and that such effects are persistent, though delayed, with the general impulse response having output peaking six to eight quarters after a monetary policy shock.

However, while several studies have been carried out to examine the output effects of monetary policy shocks on the overall economic growth in economies such as the Nigerian economy, few studies exist on the sectoral impacts. Traditionally and in line with the aggregate analysis in economics, it is assumed that the effects of monetary policy on the real economic activities are uniform. However, this view does not take into account the possible differences that might exist in the responses of different sectors in an economy to monetary policy [7]. Recent empirical evidence indicates that different sectors vary in their response to monetary shocks. This has serious implications for the conduct of monetary policy which must be taken into account by central banks because while a particular monetary policy innovation might have favourable output effects on the economy as a whole, the individual sectors might react differently to this [2]. In particular, special attention has to be given to the impact of monetary policy on the output of sectors such as the industrial sector. This is based on the fact that any adverse effects of monetary policy on the industrial sector will usually be transmitted to the rest of the economy. Given the importance of the industrial sector to the growth of the Nigerian economy, the need to evaluate the impact of monetary policy shocks on industrial outcomes cannot be over emphasised. In view of this, this study investigates the impact of monetary policy shocks on the industrial sector in Nigeria by examining the output responses of four sub-sectors of the industrial sector. The study is divided into four sections which include; the introduction, review of literature, empirical model and methodology, conclusion and policy recommendations.

2. REVIEW OF RELATED LITERATURE

The output effect of monetary policy has been an issue of interest to central banks and researchers for a long time [5], [11]. In particular, researchers have given emphasis to evaluating the effects of monetary policy innovations on the performance of macroeconomic variables so as to provide information necessary for enhancing monetary policy formulation and implementation. For instance, a study by [10] used the VAR method to examine the impact of post-war monetary policy shocks in G-7 countries. The study found out that changes in output were associated with monetary policy shocks in the short run, though, on a trivial basis. It was thus concluded that output fluctuations of G-7 countries during the post war were not primarily determined by the shocks in monetary policy.

[14] Assessed the correctness of the conclusions from the study by [13] which showed that the effect of monetary policy shocks on output and prices depends on the shock's timing. [13] Found that in the United States of America, a monetary policy shock that takes place in the first half of the year has a larger effect on output than on prices, while the opposite is true in the second half of the year. Based on this [13]

argued that a greater fraction of wage rates are re-contracted in the second half of the year, implying that wages (and prices) are less flexible in the first half. The results of [14] assessment of the aforementioned study indicated that the within-year differences in the responses of output and prices following a monetary policy shock are not more pronounced in the service-producing sector, where labour costs account for a large portion of total production costs. The results of the study also revealed that price instability following a monetary shock tends to lead wage changes. Based on the results, the study concluded that factors other than uneven wage adjustment could be responsible for the differential within-year effect of monetary policy shocks as portrayed in [13].

Another study by [4] used the VAR model to assess the effect of monetary policy shocks on output and employment in Turkey. The study found that shocks in the broad money supply impacted the level of employment and output through the credit stock. [8] Assessed the impact of monetary policy shocks in New Zealand. The study found that the “New Zealand producer price index (PPI) responds more sluggishly than consumer price index (CPI)” to monetary shocks. It was concluded that this was “due to a restrictive domestic monetary stance; suggesting the differences between the exchange rate pass-through of monetary policy shocks to CPI and PPI resulting from exporters’ different pricing strategies”.

On the other hand, [2] used the VAR approach to evaluate the sectorial effects of monetary policy in Pakistan. The results of the study revealed that differences exist in the responses of the different sectors to monetary tightening. In particular, it was observed that performance of finance and insurance, retail and wholesale trade, as well as the manufacturing sector deteriorated as a result of shocks in interest rate. On the other hand, the mining and quarrying sector, as well as agricultural sector was found to be insensitive to changes in interest rate.

The results of a similar study by [15] on the Turkish economy revealed that the output of all sub-sectors of the manufacturing sector declined in response to contractionary monetary policy shocks. However, degree of decline in output differed between the sectors. [7] sought to unravel the effects of monetary policy on industry value added in India using the VAR model. The study’s result showed that differences exist in the response of the different sectors to monetary tightening. Furthermore, it was found that interest rate and accelerator variables were the main causes of these trend.

With respect to the Nigerian economy, a study was carried out by [16] to examine the effects of asymmetric monetary policy shocks on fluctuations in real output using the modified GARCH. The study was based on the use of several measures of output such as; GDP, the output of the agricultural, industrial and services sectors. The study found that the monetary policy had a negative and insignificant impact on most of the aggregate measures of output used. In particular, it was found that expansionary monetary policy resulted in a reduction in the level of output.

On the other hand, [12] used the VAR model and Granger causality test, and quarterly data to examine the sectoral output effects of monetary policy transmission channels in Nigeria between 1986 and 2009. The study found “interest rate channel as the most effective in transmitting monetary policy to Agriculture and Manufacturing sectors, while, exchange rate channel was most effective for transmitting monetary policy to Building/Construction, Mining, Services and Wholesale/Retail sectors”. Based on the results, it was concluded that the exchange rate and interest rate channels were the most effective for the promotion of productivity increases in Nigeria.

Another study by [6] evaluated the responsiveness of the real sector output to monetary policy shocks in Nigeria through the use of the VAR model. The study found that private sector credit and investment had faster effect on output. The real GDP was observed to have a higher response rate to Monetary Policy Rate (MPR) and CPI shocks, and own innovations in the long-run. Furthermore, the study found that while interest rate MPR were direct and instantaneous on the real sector, they did so indirectly via the investment and credit channels.

Using the SVAR approach, [5] examined the impact of monetary policy shocks in Nigeria. The results indicated that broad money supply shocks had small output and price effects with rapid speed of adjustment. Conversely, shocks in the monetary policy and real exchange rates had neutral and fleeting output effects. It was concluded that broad money supply is the most potent instrument of monetary policy in Nigeria

In a similar vein, [17] assessed the price and output impacts of monetary policy in Nigeria using an ARDL model. The study found a significant positive relationship between anticipated monetary policy changes and output, as well as prices in Nigeria. On the other hand, unanticipated changes in monetary policy were found to not have substantial impact on the variables.

The main conclusions from the review of literature in this study is that, whereas a number of studies have been conducted to test the output impact of monetary policy shocks, very few have investigated the impacts of such shocks on the sub-sectors within the various sectors in an economy. This is especially true of studies on the Nigerian economy. The implication of this lack of attention on monetary policy shocks and the respective responses of sub-sectors is that there is limited information for central banks for efficient monetary policy formulation. This study seeks to address this issue by investigating the impact of monetary policy shocks on two of the key sub-sectors in the industrial sector in Nigeria. While the study by [12] examined the impact of monetary shocks on the output of the manufacturing, building/construction and mining sectors, this study extends their work by widening the scope of analysis from 1970 to 2013. The study also differs from that of [12] because it utilizes the contribution of the manufacturing and solid mineral sectors to the GDP as measures of the output of these sectors. Finally,

the study also considers the effect of shocks in the commercial bank credit to industrial sector which is not captured in the study by [12].

3. METHODOLOGY AND EMPIRICAL MODEL

This study is based on the use of the vector auto-regressive (VAR) model. The choice of this model is based on the fact that the results it yields via the impulse response function provide insights which are easily readable [3]. The Granger Causality test is also used to investigate the existence of causal relationships among the variables involved. However, before this is done, the data used for the study is subject to unit root testing through the use of the Phillips-Perron unit root test.

Three main monetary policy variables are used in this study. These are: the *monetary policy rate (MRA)*, *exchange rate (ERR)* and *bank credit to the industrial sector (BID)*. On the other hand, the study utilizes the *contribution of the manufacturing sector to the GDP (MOT)* and the *contribution of the solid mineral sector to the GDP (PSM)* to capture the level of output in the industrial sector. The VAR model for the study is given as follows:

$$(I) \quad MOT_t = \sum \delta_1 MOT_{t-1} + \sum \lambda_1 PSM_{t-1} + \sum a_1 MRA_{t-1} + \sum \beta_1 BID_{t-1} + \sum \eta_1 ERR_{t-1} + U_{1t}$$

$$(II) \quad PSM_t = \sum \delta_2 MOT_{t-1} + \sum \lambda_2 PSM_{t-1} + \sum a_2 MRA_{t-1} + \sum \beta_2 BID_{t-1} + \sum \eta_2 ERR_{t-1} + U_{2t}$$

4. EMPIRICAL RESULTS

4.1 Unit Root Test

The Phillips Perron test result indicates that all variables, with the exception of the contribution of the manufacturing sector to the GDP are stationary after first differencing. The contribution of the manufacturing sector to the GDP is stationary after second differencing and as such, is integrated of the second order.

Table 1. Phillips-Perron (PP)

Variable	PP Test Statistic	Critical V. (5%)	Decision
MRA	-9.201588	-3.518090	I(1)
ERR	-6.324583	-3.518090	I(1)
BID	-14.28610	-3.518090	I(1)
MOT	-7.244394	-3.518090	I(2)
PSM	-3.848910	-3.518090	I(1)

Source: Authors' computation

4.2. Var Results

4.2.1. Impulse response: Equation 1 (MOT)

The impulse response function for the manufacturing sector performance model indicates that the response of Manufacturing sector- GDP ratio (MOT) to its own shocks was positive up to the third year. The contribution of the manufacturing sector to the GDP declines after the second year, becoming negative by the sixth year.

On the other hand, manufacturing sector-GDP ratio responded negatively to shocks in the monetary policy rate (MRA) up to the second year. Thereafter, the response of MOT to MRA shocks is positive. In a similar vein, the response of manufacturing sector-GDP ratio to exchange rate (ERR) shocks is positive throughout the study period. Finally, the response of manufacturing sector-GDP ratio to shocks in the credit to the manufacturing sector is negative up to the eight year. Thereafter, it is positive.

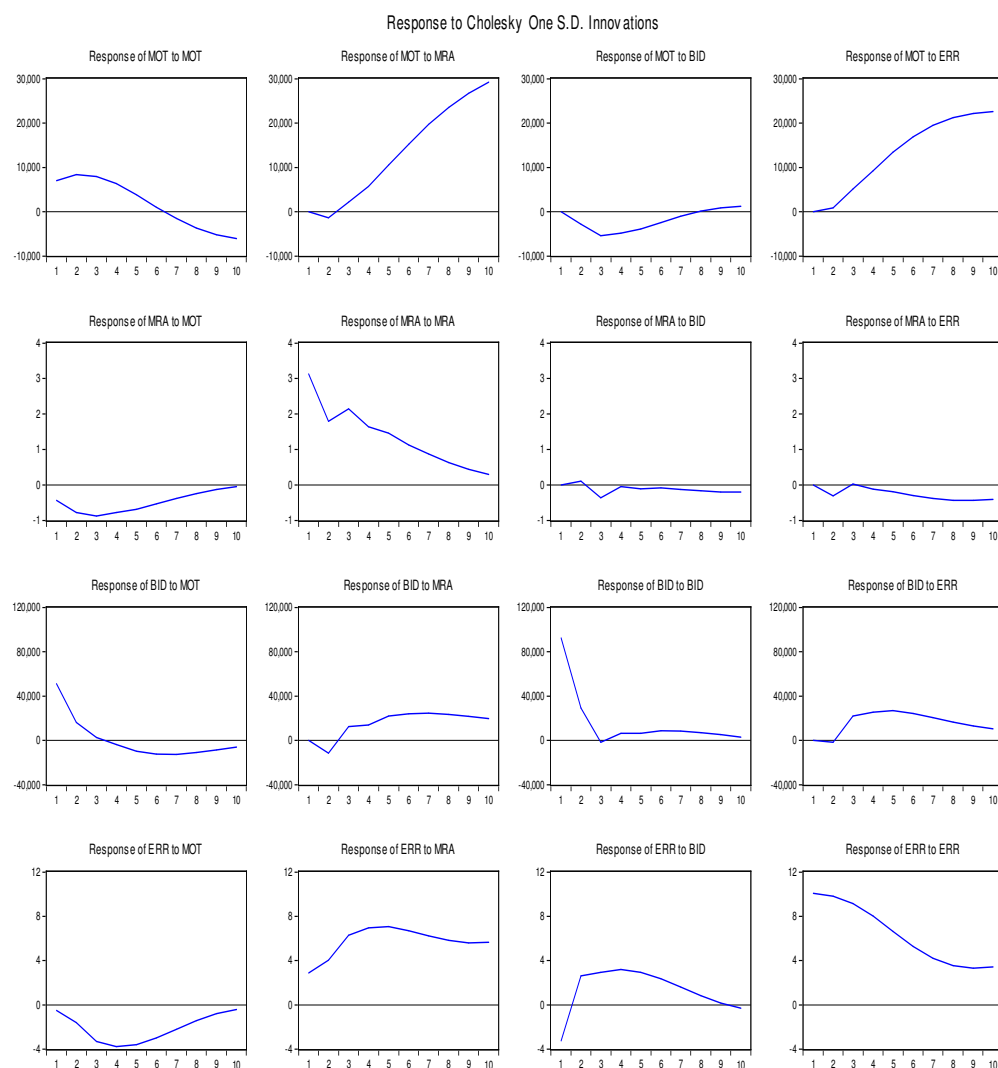


Fig. 1. Impulse response: Equation 1 (MOT)
Source: Authors` computation

4.2.2. Impulse response function: Equation 2

The results in fig 2 shows that the response of the contribution of the solid mineral sector to the GDP (PSM) to its own shocks is positive throughout the study period. However, this response declines after the second year. Similarly, the response of PSM to shocks in the credit to the manufacturing sector is positive throughout the study period.

On the other hand, PSM responds negatively to shocks in the monetary policy rate (MRA) up to the fourth year, after which it responds positively. In a similar vein, the response of PSM to exchange rate shocks is negative up to the second year. Thereafter, it is positive.

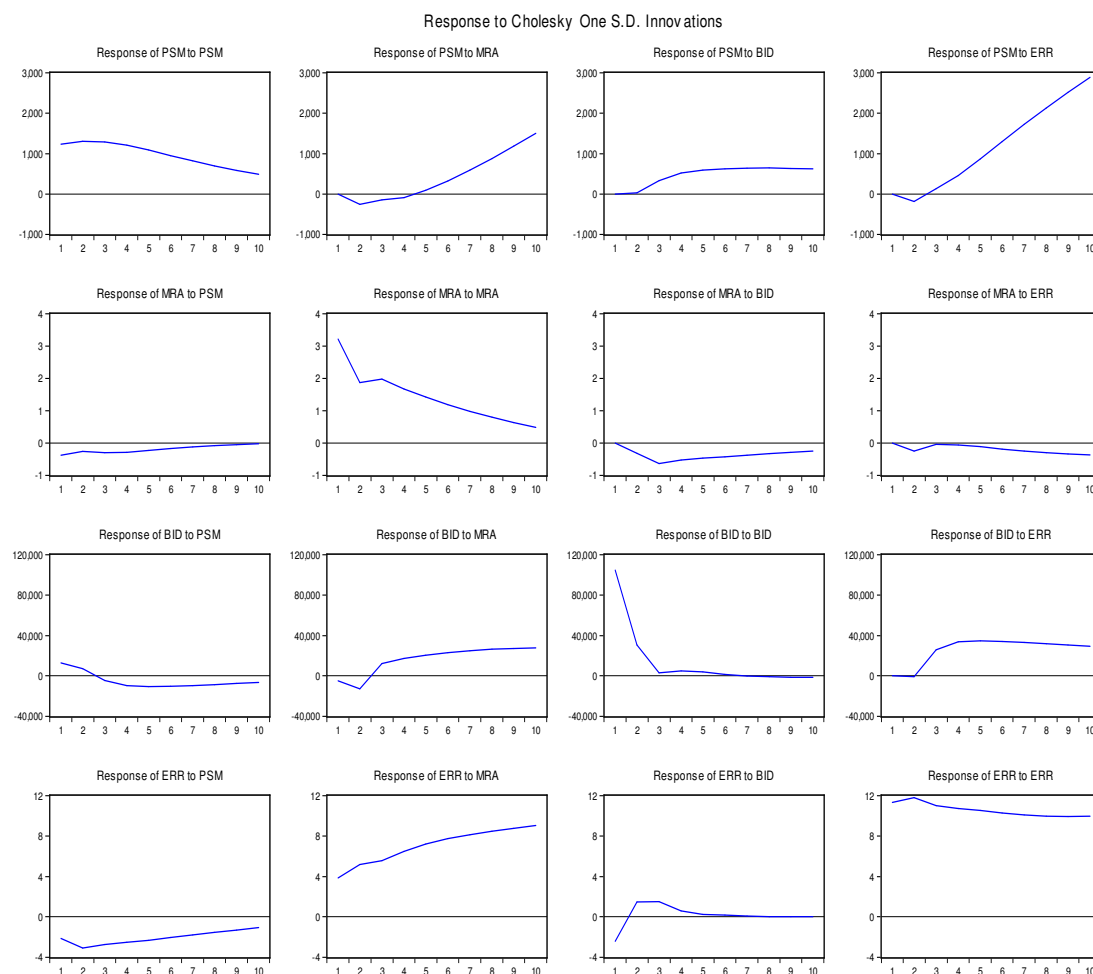


Fig. 2. Impulse response function: Equation 2 (PSM)
Source: Authors' computation

4.2.3. Variance error decomposition: Equation 1

The variance decomposition shows the “proportion of the forecast error variance of a variable which can be attributed to its own shocks and the innovations of the other variables”. The variance decomposition for the contribution of the manufacturing sector to the GDP (MOT) in fig 2 shows that the variation in the sectors contribution to the GDP during the first five years was largely due to its own shocks. Thereafter, shocks in monetary policy variables such as the monetary policy rate (MRA) and exchange rate (ERR) accounted for an increasingly larger portion of the variation in the contribution of the manufacturing sector to the GDP. For instance, by the seventh and tenth year, MRA accounted for 37.49 and 50.698 percent of the variation in the manufacturing sector's contribution to the GDP, while ERR shocks accounted for 46.749 and 42.218 per cent. However, while the impact of MRA increased over time, the impact of ERR declined after the seventh year. This is consistent with the results of the impulse response function. On

the other hand, commercial bank credit to the manufacturing sector (BID) accounted for less than 15 per cent of the variation in the sectors contribution to the GDP with the ten year period.

Table 2. Variance decomposition: Equation 1 (MOT)

Period	S.E.	MOT	MRA	BID	ERR
1	6997.896	100.0000	0.000000	0.000000	0.000000
2	11369.02	91.66651	1.387745	6.426710	0.519032
3	15860.91	72.02408	2.554631	14.91932	10.50197
4	20831.25	51.00938	8.944512	14.10920	25.93691
5	27476.35	31.21362	19.75822	10.16245	38.86571
6	35766.38	18.50032	29.78216	6.469378	45.24814
7	45273.63	11.66913	37.49139	4.090483	46.74900
8	55362.72	8.251091	43.12762	2.735986	45.88530
9	65548.88	6.521055	47.36695	1.969701	44.14229
10	75531.32	5.574962	50.69831	1.508728	42.21800

Source: Authors' computation

4.2.3. Variance error decomposition: Equation 2

The variance decomposition for the contribution of solid mineral sector to the GDP (PSM) indicates that exchange rate (ERR) shocks only accounted for a significant portion of the variation in the sectors performance from the sixth year. For instance, prior to the sixth year, ERR shocks accounted for 10.8 per cent of the variance in PSM (in the fifth year). The results show that after the fifth year, ERR shocks accounted for 33.64, 52.42 and 58.14 per cent of the variation in PSM during the sixth, ninth and tenth years respectively.

On the other hand, shocks in the monetary policy rate (MRA) and bank credit to the industrial sector (BID) did not account for a significant portion of the variation in the contribution of solid mineral sector to the GDP within the period under consideration. In this regard, MRA and BID only accounted for 11.7 and 6.398 per cent of the variation in PSM in the tenth year.

Table 3. Variance decomposition: Equation 2 (PSM)

Period	S.E.	PSM	MRA	BID	ERR
1	1228.761	100.0000	0.000000	0.000000	0.000000
2	1820.045	96.98179	1.939554	0.017285	1.061374
3	2263.731	95.12099	1.703234	2.171387	1.004393
4	2659.724	89.51274	1.353765	5.456759	3.676735

5	3060.734	80.22466	1.110100	7.847889	10.81735
6	3529.533	67.60720	1.667715	9.039407	21.68568
7	4105.930	53.93848	3.295899	9.120244	33.64538
8	4802.949	41.52029	5.769579	8.455753	44.25438
9	5617.862	31.43647	8.686884	7.454388	52.42225
10	6540.750	23.75117	11.70637	6.398764	58.14370

Source: Authors' computation

4.3 GRANGER CAUSALITY TEST

4.3.1. Equation 1

The Granger causality test results in table 4 indicate the rejection of the hypothesis that monetary policy changes have no effect on manufacturing sector-GDP ratio. The result indicates the existence of a unidirectional causality running from MRA to MOT. This also holds for the exchange rate.

On the other hand, the results reveal that commercial bank credit does not Granger cause changes in the contribution of the manufacturing sector to the GDP. Rather, there is unidirectional causality running from MOT to BID. In essence, MOT Granger causes BID.

Table 4. Pair wise Granger causality test: Equation 1

Null Hypothesis:	Obs	F-Statistic	Prob.
MRA does not Granger Cause MOT	42	5.94812	0.0058
MOT does not Granger Cause MRA		0.97256	0.3876
BID does not Granger Cause MOT	42	2.78177	0.0749
MOT does not Granger Cause BID		5.35138	0.0091
ERR does not Granger Cause MOT	42	15.2074	2.E-05
MOT does not Granger Cause ERR		1.07784	0.3508
BID does not Granger Cause MRA	42	0.90491	0.4133
MRA does not Granger Cause BID		0.92733	0.4046
ERR does not Granger Cause MRA	42	0.52106	0.5982
MRA does not Granger Cause ERR		0.47022	0.6285

ERR does not Granger Cause BID	42	8.56386	0.0009
BID does not Granger Cause ERR		1.70191	0.1963

Source: Authors` computation

4.3.2. Equation 2

The results in table 5 show that changes in the contribution of the solid minerals sector to the GDP are independent of changes in the monetary policy rate. On the other hand, there is unidirectional causality running from commercial bank credit to the industrial sector and the exchange rate to the contribution of the solid minerals sector to the GDP.

Table 5. Pairwise Granger causality test: Equation 2

Null Hypothesis:	Obs	F-Statistic	Prob.
MRA does not Granger Cause PSM	42	2.56863	0.0902
PSM does not Granger Cause MRA		0.43982	0.6475
BID does not Granger Cause PSM	42	5.27477	0.0096
PSM does not Granger Cause BID		1.61958	0.2117
ERR does not Granger Cause PSM	42	9.43333	0.0005
PSM does not Granger Cause ERR		0.14815	0.8628
BID does not Granger Cause MRA	42	0.90491	0.4133
MRA does not Granger Cause BID		0.92733	0.4046
ERR does not Granger Cause MRA	42	0.52106	0.5982
MRA does not Granger Cause ERR		0.47022	0.6285
ERR does not Granger Cause BID	42	8.56386	0.0009
BID does not Granger Cause ERR		1.70191	0.1963

Source: Authors` computation

5. CONCLUSION AND POLICY IMPLICATIONS

This study investigated the impact of monetary policy shocks on industrial output in Nigeria using the contribution of the manufacturing and solid mineral sectors to the GDP. In doing this, the VAR and Granger causality models were estimated, the results of which yield interesting findings. For instance, variance decomposition and impulse response function for the contribution of the manufacturing sector to the GDP model revealed that monetary policy and exchange rate shocks caused major changes in the contribution of the sector to the GDP. In particular, the variance decomposition results indicated that a significant proportion of the variation in the contribution of the manufacturing sector to the GDP after the third year was explained by variations in the exchange rate, while changes in the monetary policy rate accounted for a significant portion of the variation of the sectors contribution to the GDP after the fifth year. These findings are further buttressed by the Granger causality test results which revealed a unidirectional line of causality running from monetary policy rate and exchange rate to the contribution of the manufacturing sector to the GDP. Conversely, shocks in commercial bank credit to the industrial sector were found to not exert any significant impact on the contribution of the manufacturing sector to the GDP. The Granger causality test also indicated that manufacturing sector performance was the main cause of the flow of commercial bank credit to the industrial sector.

The results of the impulse response function for the second model revealed that the contribution of the solid minerals sector to the GDP responded positively to shocks in commercial bank credit to the industrial sector throughout the study period. It also responded positively to shocks in the monetary policy rate after the fourth year and exchange rates after the second year. The results of the variance decomposition also showed that only variations in the exchange rate accounted for a significant portion of the variation in the contribution of the solid mineral sub-sector to the GDP. On the other hand, the Granger causality test results indicated that both commercial bank credit to the industrial sector and the exchange rate Granger cause changes in the contribution of the solid mineral sector to the GDP, while the performance of the sector was independent of changes in the monetary policy rate.

The results obtained in this study have serious implications. For instance, they generally bring to fore monetary policy and exchange rates as the most effective instruments for stimulating the improvements in the performance of the manufacturing sector. As such, any changes in the rates, such as the recent devaluation of the Naira will have serious impacts on the sector. This finding is in line with those of [12]. The relevance of the exchange rate may be largely due to the fact that manufacturing activities in Nigeria, especially with regards to textiles, plastics and electrical appliances, depend on foreign sources for their inputs. Furthermore, improvements in the performance of the manufacturing sector were found to be necessary for the attraction of commercial bank credit to the sector. This is not surprising in view of the unwillingness of Nigerian banks to lend to manufacturing concerns. It also raises questions as to the effectiveness of the CBN's effort towards the promotion of investment in small and medium scale enterprises.

299
300 On the other hand, the exchange rate and commercial bank credit to the industrial sector are found to be
301 the most relevant instruments for the promotion of growth in activities in the solid mineral sector. These
302 findings are also in line with those of [12], which identified the exchange rate channel as a dominant
303 channel of monetary policy transmission to the solid minerals sector. The causality test results confirm the
304 results of the VAR analysis. The result indicated a unidirectional causality running from exchange rate
305 and commercial bank credit to the industrial sector to manufacturing sector-GDP ratio.

306
307 Based on the findings, the study concludes that shocks in monetary policy have had a significant impact
308 on the industrial sector in Nigeria. However, in line with the findings of [2], the results confirm that
309 differences exist in the response of the different sub-sectors of the industrial sector to shocks in the
310 different monetary policy variables. This indicates the need for the proper evaluation of the possible
311 responses of the different subsectors in the choice of a monetary policy channel. This is primarily
312 germane for the actualization of monetary policy goals. Furthermore, exchange rate shocks were found to
313 exert a significant impact on the two industrial sub-sectors used in the study. As such, the study
314 recommends that extreme caution should be taken in the management of the exchange rate. Finally, the
315 study also recommends that the central bank of Nigeria do more to encourage commercial banks to
316 allocate more of their loans to small scale investors in the manufacturing sector.

317 318 319 REFERENCES

- 320
321 [1] Adeoye, B. W. & Saibu, O. M. (2014). Monetary policy shocks and exchange rate volatility in Nigeria.
322 *Asian Economic and Financial Review*, 4(4), 544-562. Retrieved from [http://aessweb.com/journal-](http://aessweb.com/journal-detail.php?id=5002)
323 [detail.php?id=5002](http://aessweb.com/journal-detail.php?id=5002)
324
325 [2] Alam, T. & Waheed, M. (2006). Sectoral effects of monetary policy: Evidence from Pakistan. *The*
326 *Pakistan Development Review*, 45(4), 1103–1115.
327
328 [3] Angelopoulou, E. (2007). The narrative approach for the identification of monetary policy shocks in a
329 small open economy. *Bank of Greece, Working Paper No. 55*. Retrieved from
330 <http://www.Bankofgreece.gr/BogEkdoseis/Paper200755.pdf>
331
332 [4] Cambazoğlu, B. & Karaalp, H. S. (2012). The effect of monetary policy shock on employment and
333 output: The case of Turkey. *International Journal of Emerging Sciences*, 2(1), 23-29.
334
335 [5] Chuku, C. A. (2009). Measuring the effects of monetary policy innovations in Nigeria: A structural
336 vector autoregressive (SVAR) approach. *African Journal of Accounting, Economics, Finance and*
337 *Banking Research*, 5(5), 112-129.
338
339 [6] Edoumiekumo, S. G., Karimo, T. M. & Amaegberi, M. (2013). Real sector responsiveness to monetary
340 policy shocks in Nigeria. *JORIND*, 11(2), 269-277. Retrieved from
341 <http://www.transcampus.org/journals>
342
343 [7] Ghosh, S. (2009). Industry effects of monetary policy: Evidence from India. *Munich Personal RePEc*
344 *Archive (MPRA) Paper No. 17307*. Retrieved from <http://mpra.ub.uni-muenchen.de/17307/>

- [8] Karim, S., Lee, M. & Gan, C. (2011). Price effects of monetary policy: The case of a small open economy of New Zealand. *Economic Analysis & Policy*, 41(3), 253-271.
- [9] Khan, S. M. (2010). *The design and effects of monetary policy in sub-Saharan African countries*. In Imoughale, L. E. & Ismaila, M. Empirical investigation of the impact of monetary policy on manufacturing sector performance in Nigeria (1986 – 2012). *International Journal of Education and Research*, 2(1).
- [10] Kim, S. (1999). Do monetary policy shocks matter in the G-7 countries? Using common identifying assumptions about monetary policy across countries. *Journal of International Economics* 48, 387–412.
- [11] Mumtaz, H. & Zanetti, F. (2013). The impact of the volatility of monetary policy shocks. *Journal of Money, Credit and Banking*, 45(4), 535-558.
- [12] Nwosa, P. I. & Saibu, M. O. (2012). The monetary transmission mechanism in Nigeria: A sectoral output analysis. *International Journal of Economics and Finance*, 4(1), 204-212. doi:10.5539/ijef.v4n1p204
- [13] Olivei, G. & Tenreyro, S. (2007). *The timing of monetary policy shocks*. In Peneva, E. V. Effects of monetary policy shocks across time and across sectors. Finance and Economics Discussion Series Divisions of Research & Statistics and Monetary Affairs Federal Reserve Board, Washington, D.C.
- [14] Peneva, E. V. (2013). *Effects of monetary policy shocks across time and across sectors*. Finance and Economics Discussion Series Divisions of Research & Statistics and Monetary Affairs Federal Reserve Board, Washington, D.C.
- [15] Sahinöz, S. & Cosar, E. E. (2010). Understanding sectoral growth cycles and the impact of monetary policy in the Turkish manufacturing industry. *Central Bank of the Republic of Turkey, Working Paper No: 10/13*.
- [16] Saibu, M. O. & Oladeji, S. I. (2007). Asymmetric policy shocks and real output fluctuations in Nigeria (1960-2004). *The International Journal of Applied Economics and Finance*, 1(2), 88-96.
- [17] Tolulope, A. O. & Ajilore, T. (2013). A bound test analysis of effects of monetary policy shocks on output and prices in Nigeria 2000-2010. *Journal of Economics and Behavioural Studies*, 5(3), 136-147.