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Research Article

## The Effect of Unconventional Monetary on the Algerian Economy: An Empirical Study

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**Abstract:** Algeria resorted to the option of unconventional monetary policy (Printing Money), where it printed 2189 billion DZ during September and November 2017 representing 15% of GDP compared to 30% and 21% for more than 8 years in both the United State and the European Union. The goal of this study to investigate of unconventional monetary policy on the Algerian economy, and exactly the output and the price gap, using the co-integration relationship and SVARX model. Results show that management money behavior in Algeria generally provoke a positive response on CPI and a slowdown in the output gap, which implies that a negative response and a relative economic recession from the money supply during the period shock.

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**Keywords:** Unconventional Monetary Policy, Algerian Economy, Money Supply, Output Gap, Structural Vector Autoregression with Exogenous Variables (SVARX)

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## INTRODUCTION

At the end of 2014, oil prices collapsed to below \$100 per barrel, after having recorded high levels that reached \$174 per barrel in 2008, alongside which the Algerian economy witnessed the greatest financial abundance it had ever experienced. Indeed, the level of the Revenue Regulation Fund—a wealth fund holding the surplus above the reference oil price used in the budget—reached an amount estimated at 4,408.5 billion DZD at the end of 2014, before declining in 2015 by 120%, with the balance of the Revenue Regulation Fund reaching 2,072.5 (billion DZD, and this fund became entirely empty as of February 2017, amid the collapse of oil prices from the end of 2014 to the present day, recording an average level of \$45 in 2016 and \$54 in 2017.

Among the other significant effects of the decline in oil prices was the rise in the budget deficit from 7% to 15% in 2015, and to around 12% in 2018. The economic situation also witnessed a decline in exchange rates, from around 100 DZD per euro in 2013 to around 140 DZD per euro in 2018 on the official market, while the parallel exchange rate fell to around 210 DZD per euro in early 2018, compared to 130 DZD per euro in 2013. All of this contributed to the worsening of the economic situation, leading to the transformation of the balance-of-payments surplus of 2013 into large deficits estimated at \$27 billion in 2016 and \$21 billion in 2017. All of this was in turn reflected in the state's wealth represented by foreign exchange reserves, which fell from \$194 billion at the end of 2013 to \$96 billion at the end of 2017.

As a result of this situation, Algeria entered an exceptional economic circumstance, as the scarcity of its resources forced a choice between international borrowing or resorting to unconventional methods and the use of quantitative easing (money printing), along with the addition of Article 45 bis, amending Order 03-11, which entered into force in September 2017. Under this amendment, the central bank was required to directly purchase, for a period of five years, financial securities in order to finance treasury bonds needed to cover treasury requirements, estimated for 2017 at 500 billion DZD, in addition to financing public debt, which consists of the debts of economic institutions strategic to the Algerian economy, such as Sonelgaz and Sonatrach.

The debts settled were estimated at 1,235 billion DZD as of November 2017, in addition to financing the National Investment Fund (FNI). Central bank lending to the public treasury reached, by the end of November 2017, an amount of 2,189 billion DZD, representing 15% of GDP—this after only two months from the launch of this measure and following the amendment of the Money and Credit Law—whereas this measure did not exceed 30% of GDP over more than four years of its use in the United States, and 17% in the European Union.

Our study aims to examine the effect of unconventional financing (money printing) on the Algerian economy, specifically on inflation and GDP, since money printing constitutes an increase in the money supply without a corresponding increase in production, which is consistent with the idea that an increase in the quantity of money raises price levels. However, the extent to which this mechanism operates is what we shall attempt to investigate in this study, using quarterly data, in order to understand the relationship between money supply, inflation, and economic growth. Before doing so, we will review the most important statistical data on the Algerian economy under the circumstances surrounding the use of money printing, then review the most important prior studies in developing and developed countries that made use of this quantitative easing, followed by the study methodology and its main findings.

### **Contents of the Study**

To achieve the objectives of this study, we will divide it into two chapters following the IMRAD method. The first chapter concerns the theoretical framework, consisting of the literature and empirical studies from various regions of the world, according to the experiences of different countries in using money printing—or what we refer to here as unconventional financing—this being done in order to more easily identify the most important effects relative to the chronological use of these practices. The second chapter, concerning the applied or econometric framework, will first review the most important statistical data on the Algerian economy under the circumstances surrounding the use of money printing, and second, review the most important prior studies in developing and developed countries that employed this quantitative easing, followed by the study methodology and its main findings.

### **Circumstances of Unconventional Financing (Money Printing)**

**Budget Deficit Ratio:** A number of countries have used unconventional financing to escape economic contraction and as a solution to financial crisis. The United States printed an estimated 31% [of GDP] over eight years of pursuing this policy, and the European Union printed around 25% of GDP. The evolution of this monetary expansion worldwide, as shown in Figure 1, increased on a monthly basis from 2007 to 2009, reaching its peak at nearly 7% for countries worldwide, before this printing declined following the contraction of the crisis and the return of economic growth, particularly in developed countries, though it remained at an average of 4% until 2017, which marked approximately the end of money printing for many developed and developing countries; the figure clearly shows how the growth of money printing contracted and became negative growth.

Whereas the reason for money printing in developed countries and some developing countries was to confront the repercussions of the financial crisis caused by the mortgage crisis, and its effects on the economy, recession, and a state of price deflation, the Algerian central bank has been lending to the government because of the budget deficit, which is itself due to the decline in oil prices that had financed 93% of treasury savings in 2013, a ratio that fell in 2017 to no more than 10%, along with the Revenue Regulation Fund reaching its minimum level and becoming completely empty in February 2017.

All of this led the government to resort to bank overdraft in the summer of 2017, representing 10% of previous revenues, and then to money printing, with the amount printed under Article 45 bis of the Money and Credit Law alone reaching 2,185 billion DZD by November 2017, representing 15% of GDP—and this in the first year alone. We know that money printing is set to continue for five years as required by law, and if oil prices remain below \$60 per barrel, this could reach around 53% of GDP—a ratio greater than what was used by either the United States or the European Union to resolve their economic crises, including the debt crisis that struck several European countries [1].

Unconventional financing continues to be used to cover the deficit in operating expenditures, which represent 66% of the general budget, along with a significant portion allocated to paying the debts of national institutions, whose debts approach 2,000 billion DZD—an amount greater than the 2018 budget deficit itself. Consequently, money printing will not be used to fund new investments that would stimulate effective demand, but rather to pay wages and settle economic debts, which will weaken growth rates that do not exceed 3% at best, while debt continues to grow at a rate greater than the economic growth rate.

### **Balance of Payments Deficit**

As mentioned in the introduction, the balance of payments recorded successive deficits beginning in 2014, and this deficit continued alongside the decline in oil prices. The trade balance is the largest component responsible for the balance of payments, recording a large deficit due to import resistance—that is, a decline in final value to levels close to

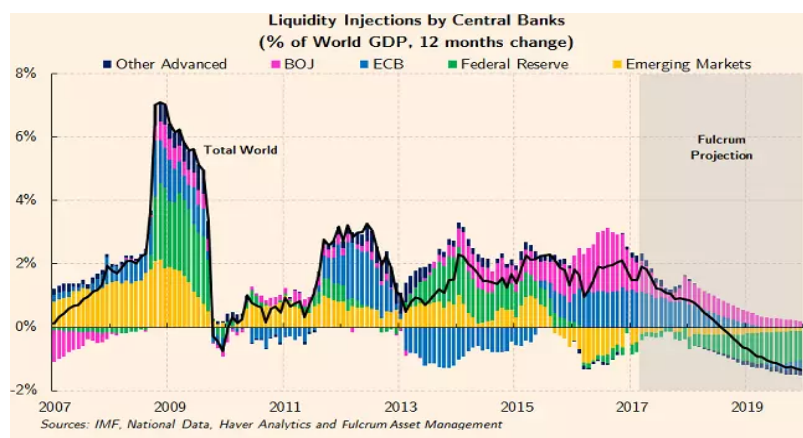


Figure 1: Money Printing by Central Banks

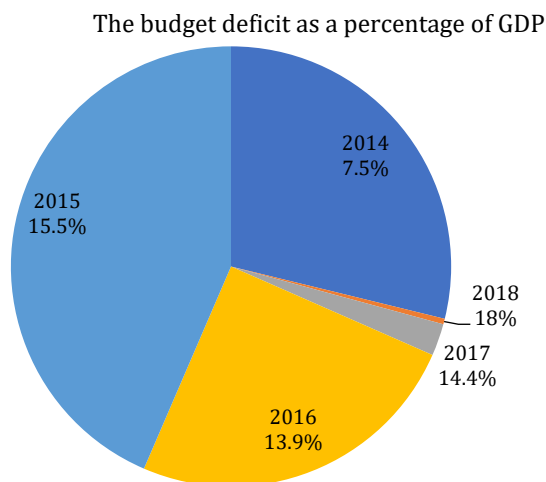


Figure 2: Budget Deficit in Algeria

Source: National Statistics Office

fifty billion dollars—despite restrictive measures such as import quotas, import licenses, and even the measure banning 800 products that entered into force in 2018, since it is not possible to use a set of administrative rather than economic tools successively or simultaneously, given that, as is known, most restrictive measures take a medium term exceeding five years before local products and nascent industries, if they exist, can substitute for imports.

### Treasury and Money

The financial savings of the treasury (total revenues minus operating expenditures) no longer exceeded 10% in 2016, after having been 95% in 2013, and around 15% in 2018—indicating the structural deficit of the Algerian economy, which requires reform to address effective demand. As for the money supply growth rate, it recorded a significant decline, also due to the fall in oil prices, given that deposits, which constitute a significant portion of the money supply, are oil-related deposits.

### Exchange Rate

During the period of the oil shock, the management of the exchange rate regime shifted from a managed exchange rate to an exchange rate pegged against the dollar, which is itself floating against all other currencies; consequently, any decline in the dollar against other currencies constitutes a decline in the dinar, and vice versa—this being what the Figure 2 of the euro-dinar exchange rate represents. However, exchange rate management remains weak, since pegging the dinar to the dollar during the crisis represents a drain on the currency and a loss of fiscal policy flexibility that could otherwise cover substantial amounts ranging from 7 to 9 percent of expenditure levels.

### Previous Studies

The study by [2] examined the effect of unconventional financing policy on a small open economy—specifically the Canadian economy—using a Bayesian structural vector autoregression (BSVAR) model, employing the zero lower bound (ZLB) interest rate policy as a measure of the effect of unconventional financing policy. The study's results found that the expanded use of unconventional financing policy leads to a decline of 0.013% in the impulse response of Canadian industrial production during the period in which unconventional financing was used. The study's effects were not limited to industrial production, but also estimated the impact on the impulse response functions of the exchange rate, prices, and the current account, with the results of these responses varying across the study's variables (Figure 3).

Likewise in the United States, numerous studies tested the effect of unconventional financing policy on macroeconomic variables, the most important of which is the study by [3], which divided unconventional financing policy into two programs: the first quantitative easing program (QE1), extending from 2008 to 2009, and the second quantitative easing program (QE2), extending from 2010 to 2011. This study also examined the effect of both programs on interest rates and addressed the most important transmission channels of this policy, concluding that the most important transmission tools consisted of liquidity, inflation, and corporate lending risk, in addition to the transfer resulting from the purchase of toxic assets, which played a decisive role in reducing the effects of the mortgage crisis and lowered the risks of these loans, which in turn had a positive long-term effect on the returns of mortgage companies and agencies in mitigating the crisis.

The study by Churm *et al.* [4] addressed the effect of unconventional methods, including quantitative easing (QE) and the Funding for Lending Scheme (FLS), on the British economy during the study period 2011 to 2012, using both a Bayesian vector autoregression (BVAR) model and an autoregressive distributed lag (ARDL) model. The study's results found that the use of both unconventional policies had a positive effect on economic activity, represented by GDP, and on inflation, with the study estimating that £175 billion was injected under the quantitative easing policy and £41.9 billion under the unconventional lending finance policy. Empirically, the study concluded that a 1% increase in unconventional financing leads to an increase in GDP of between 0.5% and 0.8% in Britain during the study period, while simultaneously helping to address price deflation with an estimated increase of 0.6%.

The study by [5] adopted a Markov-switching vector autoregression methodology, relying on daily data for the period extending from 2012 to August 2014, for Japan, in order to test the effect of unconventional financing policy on the economy, specifically on interest rates and inflation rates. The study's results found that increased purchases under the unconventional policy tend to boost stock returns and increase foreign investment demand for the Japanese market.

Both Wieladek and Garcia [6] tested the effect of unconventional policy in the European Union area during the period extending from 2012 to 2016. The study's results found that purchasing treasury bonds at a rate of one percent leads to an increase in the impulse response to the shock of between 0.07% and 0.15% in the output gap, and a rise in inflation rates of between 0.05% and 0.1%. In the same region, the study by Burriel and Galesi found that every 25-basis-point decline leads to an increase in the output gap of 2.5% and an increase of 0.1% in inflation, this being based on a vector autoregression model.

### Study Methodology and Results

The first monetary and real symptom that appears with the use of money printing (unconventional financing) is the expansion of the money supply and the decline of economic growth in the short term. Since the emptying of the Revenue Regulation Fund in February 2017, the money supply stood at around 14,100 billion DZD, and with the start of money printing this supply rose to 150,000 billion DZD (sic), i.e., around 6%. As for the printing itself, it represented a rate of 15% of GDP in the first two months of printing, amounting to 2,185 billion DZD, whereas the growth of the money supply from February 2016 to February 2017 had been only around 100 billion DZD [7], with money supply growth not exceeding 1%—its weakest level.

As for GDP, it recorded its weakest level since 2009 (the mortgage crisis), with a growth rate of 2.1%. In light of this, it becomes clear that uncovering the relationship between money and the real sector is essential to understanding and anticipating the effect of unconventional financing on the Algerian economy, through purchasing power, monetary management, and the performance of economic activity. To achieve this final objective, we will attempt to understand and test the relationship between money, the real sector, and prices, through two gaps—the output gap and the inflation gap—and their relationship to money during the recent period, using quarterly data drawn from the National Statistics Office.

### Output Gap and Inflation Gap

The output gap reflects the extent of the imbalance between supply and demand in economic activity—that is, between actual output and expected output over time. Theory assumes that this gap narrows in the long run owing to rebalancing, and it reflects the logarithm of the expected output gap, calculated as follow [8].

$$\min_{\tau} \left( \sum_{t=1}^T (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2 \right).$$

Positive rates also reflect a demand gap, and the reverse holds true on the negative side [9], and the output gap is largely determined by changes in oil prices, which are responsible for economic activity in rentier states. As for the inflation gap, it represents the worst point of Algerian monetary policy, as the targeted point and the announced target diverge from reality, for several reasons, the most important of which is the dominance of fiscal policy and the transmission of inflation through the pass-through effect rather than through monetary inflation see [10], which is what the Figure 4 illustrates.



Figure 3: Evolution of the Algerian Dinar Exchange Rate against the Euro

Source: [fxtop.com/fr/historique-taux-change.php](http://fxtop.com/fr/historique-taux-change.php)

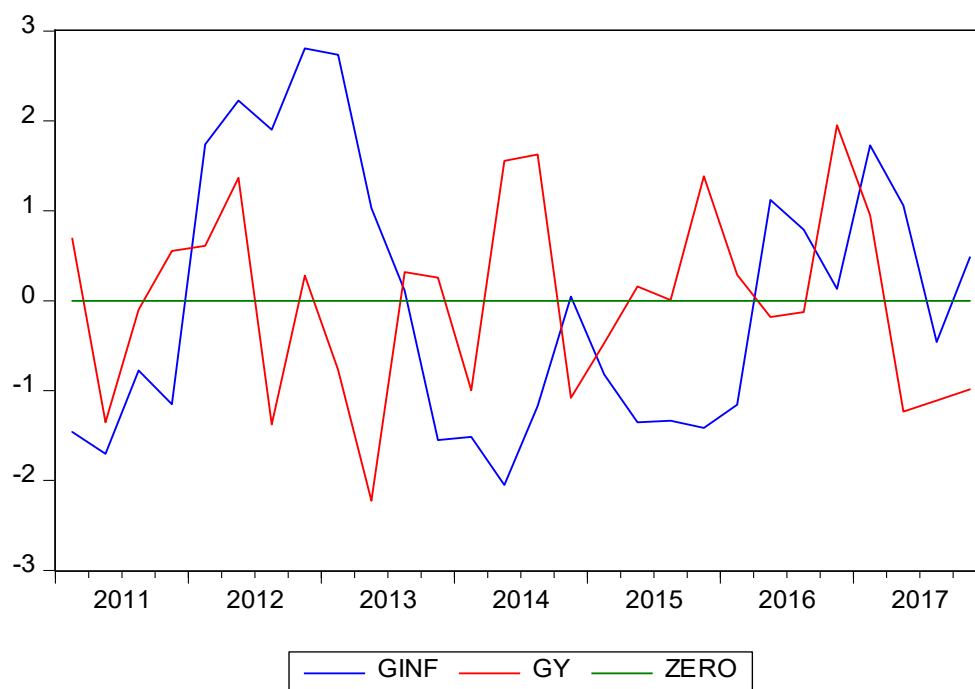


Figure 4: Relationship between the Output Gap and the Inflation Gap

Source: EvIEWS output based on ONS data

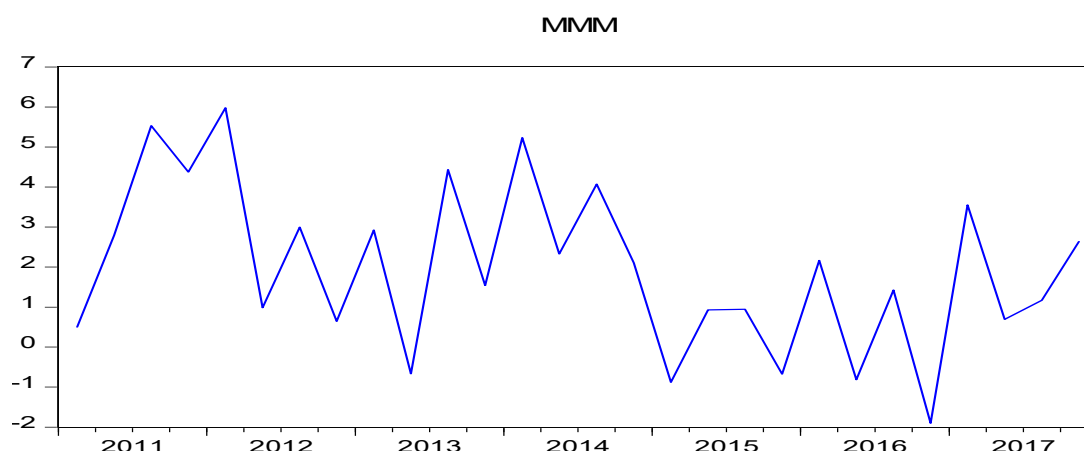


Figure 5: Money Supply Growth

Source: National Statistics Office

Table 1: Balance of Payments Deficit in Algeria, in Billions of Dollars

|       |       |
|-------|-------|
| 2014  | -9.27 |
| 2015  | -27.5 |
| 2016  | -26   |
| 2017  | -21   |
| *2018 | -14   |

Source: National Statistics Office

Table 2: Broad Money Growth Rate

|      |      |
|------|------|
| 2015 | 0.13 |
| 2016 | 0.76 |
| 2017 | 8    |
| 2018 | 14   |

Source: National Statistics Office

## Money Growth Rate

We note that broad money growth in Algeria from 2010 to December 2017 exhibits considerable volatility due to the inability of monetary policy to control the money supply, as expressed in the Figure 5 and Table 1-2, where the standard deviation was greater than 2, compared to less than 1 and 1.2 for inflation and real output, respectively.

At the outset, we will attempt to uncover the relationship between money (mmm) and the inflation gap (gapinf) and the output gap (gy), each separately. To this end, we will first use the two-step cointegration approach, given that inflation (inf) [11]—a price index based on 2010 as the base year—is stationary of order one (I(1)), which is likewise the case for the logarithm of money (logm). The relationship shows the existence of at least one cointegrating relationship between the two variables (see appendix). Even using an ARDL model [12] between the inflation variable, stationary of order one, and the money supply growth variable, stationary of order zero—that is, at level—we obtained the same result, namely the existence of a cointegrating relationship between inflation and money supply (the model is free of specification errors), even when using a model [in which] inflation can be considered a monetary phenomenon—this being contrary to the findings of prior studies by the same researcher [1,7].

This may be attributable to the nature of the period used—first, the 2010–2017 period and the type of quarterly variables, which yield better results than annual variables—and also to the change in monetary policy, which had relied on a de jure managed exchange rate, compared to the period of the [earlier] study, which mostly relied on a monetary policy based on a de facto exchange rate closer to a fixed peg, such as a crawling peg system [13].

## CONCLUSION

This study has attempted to examine the Algerian economy's response to movements in money supply in times of shock, using descriptive data and econometric modeling over the contemporary period extending from 2011 onward, using quarterly data. The study's results found a separation between the real sector and the monetary sector, and that there

is a relationship between monetary management and inflation. In light of these findings, economic policymakers must pursue the optimal printing of money in Algeria in order to contain inflation.

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