Liquidity Issues in Indian banking system due to non-performing assets: searching alternatives in fiscal deficit and or interest rates

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Abstract
The Non-Performing Assets (NPA) in Indian banks had crossed 11% of the total loan outstanding in the year 2018, causing liquidity concerns for the Indian banking system. The supply of money to bridge the liquidity gap may be made through two routes, 1) By infusing capital into banks by the government (even at the cost of expanding fiscal deficit), 2) Raising interest rates by banks. However, both the routes will have negative impact on the economic growth of India (through Wealth, Trade and Keynesian effects). The challenge is to minimize this negative impact while bridging the liquidity gap. This study addresses the issue in 3 stages. 1) Study the Fiscal Deficit and Interest rates on Liquidity gap and the Impact of Interest rates, Fiscal deficit on Economic Growth by applying Econometric methods 2) Based on inputs provided by the causality analysis, interventions on Fiscal deficit and Interest rates shall be designed so as to bridge the liquidity gap and minimize the negative impact on the economic growth of the country using calculus. 3) The work further tests for the Ricardian equivalence of funding the fiscal deficit through debt or interim taxes, by applying Econometric methods and explore reasons in case contradictory observations are found. It is found that fiscal deficit has no significant impact on liquidity deficit of Indian banking system while interest rates on deposits have their impact. Fiscal deficit, Taxes and interest rates have negative impact on economic growth. Contradicting Ricardian equivalence debt of government has positive effect showing that borrowings by government are net wealth to the economy. One solution to liquidity deficit could be that government can borrow money and lend to banks in their productive business venture which could create surpluses that deal with losses stemming from the existing nonperforming assets. The findings will help policy makers in addressing the NPA issues more effectively.

Introduction
The Indian banking system facing an escalating Non-Performing Asset problem is being exposed to liquidity risk in gradual increasing manner as noted by Bawa.et.al (2019). The findings of Bawa et al (2019) are corroborated by the “Financial Stability Report” published by Reserve Bank of India in July 2018. The liquidity risk in the banking sector is on continuous rise since March 2013 and the quantum of risk contributed by asset quality to the overall risk is also found to be on the rise during the same period. (See Table-1)
* Note: Increase in indicator value shows lower stability. The width of each Dimension signifies its contribution towards risk.

If such a correlation is found to be true, the government and the banking system must inject liquidity into the system to deal with the liquidity shock arising out of NPA. Existing literature and repository of banking interventions show that there are three ways to solve the issue. 1) Expand Fiscal Deficit and inject liquidity into the Banking System. The role of fiscal interventions to ease liquidity crisis has been highlighted by the works of Keynes (1936). Niemann and Pichler (2017) talk about the role of Public debt in tax smoothing and as an instrument to provide liquidity when needed thereby reducing the friction in economy. 2) Banks themselves can attract more funds from other capital markets by raising interest rates for a longer period locking. (Liquidity Preference Theory Keynes-1936) 3) Liquidate near liquid assets. Banks could reduce their current asset holdings under Statutory Liquid Ratio (SLR) to increase liquidity. As on March 31-2018 the holdings of all scheduled commercials banks under SLR was around 30 percent of demand term liabilities. (Liabilities and Assets of Scheduled Commercial Banks of India RBI -2018). This 30 percent was against the mandated 19.5 percent (weekly statistical supplement Reserve Bank of India 2019) which shows the holdings under SLR in scheduled commercial banks was in excess of 10 percent of the mandated requirements. If the banks choose to reduce their current holdings in SLR to increase liquidity than High quality liquid assets (HQLA) will reduce thereby sustaining the vulnerability on Liquidity front. In move that is similar to the one discussed in this category the reserve bank of India brought 5 billion USD by pumping liquidity to the tune of ₹345Billion into banking system (RBI Rupee Dollar SWAP notification-March 2019). But such interventions may become unsustainable as the sellers of dollars in the swap will have to square their position by the end of three years as per the agreement, which will suck out rupee from the banking system. The government on the other hand can bridge the expanded fiscal deficit in 2 ways a) by rising interim taxes b) through debt. Ricardian Equivalence says that the choice does not impact the net aggregate national wealth (Barro-1974). Whichever the way the Fiscal Deficit is bridged, it is bound to have negative impact of the growth of Indian economy through Keynesian effect (As prices increase they create upward pressure on interest rates leading to reduction of investments as cost of money goes up). Wealth effect (As prices go up consumption is bound to come down), Trade effect (Increase in prices encourages substitution by import). Rise in Interest rates too has similar negative impact in the national economic growth. The challenge therefore is to minimize this negative impact while bridging the liquidity gap. This study would address the issue in 2 stages 1) Study the causality amongst NPA, Liquidity gap, Indian Economic Growth, Interest rates, Fiscal deficit, using Econometric models. 2) Based on inputs provided by the causality analysis interventions on fiscal deficit and Interest rates shall be designed so as to bridge the liquidity gap and minimize the negative impact on the economic growth of the country. The work would further test the Ricardian equivalence of funding the fiscal deficit through public debt or taxes and explore reasons in case contradictory observations are found.

### Literature Review

The existing body of literature shows what factors in the banking system have contributed to liquidity crisis and what are its repercussions, suggestions on how to deal with it. Such literature can be broadly classified into four categories. 1) Factors contributing to liquidity crisis and repercussions 2) Monetary policy solutions 3) Fiscal policy solutions 4) Joint solutions.

### Literature around factors and repercussions of liquidity risk/crisis

The impact of economic crisis on public debt management in Croatia is discussed by Badurina and Švaljek (2012) inferring that fiscal stimulus provided to deal with economic crisis have further distorted the fiscal imbalances. They infer interrelationship between currency liquidity and interest rate risk of Croatia. Karlilaid, Talpseppand and Vaarmets (2014) talk about the implication of liquidity crisis on fiscal and monetary policy, but do not discuss the optimal balance of the 2 policies in dealing with the problem. They merely record the response of the reactions in terms of policy but do not analyze why the reaction happened the way and which is the optimal way. They observe that change in Interest rates, Money supply and GDP have been so fast in the crisis period that there was no time for gradual restructuring of the economy to deal with the problem. The postulate that NPA exacerbates liquidity problems is tested and confirmed in Bosnia and Herzegovina by Almir and Cho (2015), contradictory to this finding, Ahmad Al-Harbi (2017) explores the factors that influence liquidity in the geopolitical context of Islamic Countries.
and infers that credit risk is not a strong predictor of liquidity risk as much as off balance sheet activity is. Mohammadi and Anvari (2017) discuss the impact of liquidity and credit risk on productivity and efficiency of the banks. These works are limited to the factors that influence liquidity risk and the fiscal and monetary repercussions of such risks. These works however, do not discuss conscious interventions to address the problem of liquidity deficit, nor do they discuss the repercussions of such interventions.

The fiscal policy View

Niemann and Pichler (2017) talk about the role of Public debt in tax smoothing and as an instrument to provide liquidity when needed thereby reducing the friction in economy. Debt positions in terms national output are sustainable in spite of default options. When default happens, liquidity is impaired. The work finds that moderate levels of debt has positive impact on welfare function provided that government bonds are used as collateral for business with high returns on investment. This work refers about liquidity outside banking system, where as our focus is liquidity in banking system. Piergallini (2017) infers that fiscal policy need not be unsustainable to deal with liquidity issues while avoiding disinflation that are convergent to zero liquidity problem.

The monetary policy views

Moumni and Nahhal (2014) discuss how liquidity can impact the efficiency of monetary policy transmission but does not discuss how monetary policy influences liquidity in banking system. They also infer in Morocco market that monetary policy transmission is inversely related to the liquidity i.e. less efficient in excess liquidity whereas liquidity shortage makes monetary policy more efficient.

Joint optimization

Arouba and Chugh (2010) study that when friction for liquidity raises the value of money, Friedman rule (Friedman rule in 1969 advocates Nominal interest rates to be zero for the economy to be socially optimal) is not optimal and long-term capital income tax is not zero. Niemann (2011) observes “For environments where a non-negative steady state level of government debt (assets) emerges in the absence of conservatism and impatience, monetary conservatism induces accumulation of a higher stock of liabilities (assets) and has adverse (positive) welfare implications”. In this work the objective of optimization is welfare rather than economic growth. The optimal balance of fiscal and monetary policies has been discussed by Bi and Kumhof (2011) where such a trade-off had to be made when the liquidity of agents in the economic system were constrained. The objective of the work was to maximize the welfare of the given liquidity constraints by making interventions in fiscal and monetary policy. The work further studied the effect of fiscal policy intervention on the welfare of both the kinds of households who are either constrained or not constrained by liquidity. Interventions on Fiscal policy had bigger effect as per the paper. In an earlier but similar study by the same authors, Bi and Kumhof (2009), the constraint was borrowing instead of liquidity with rest all parameters being the same. Cui (2016) uses a model with endogenous asset liquidity to understand the monetary and fiscal interactions with liquidity friction. An optimal Debt to GDP is arrived as an output but the objective function is to maximize welfare with a zero nominal interest as lower bound. Liquidity friction here is represented by asset liquidity while this work is focused on Liquidity issues of a financial intermediary that is a bank. Since the objective of the study is the welfare function of the economy as whole the question of finding an interest rate for one component of the economy was not dealt. Jarocinski and Mackowiak (2018) design a model that captures features of monetary and fiscal policy with no default by government which, to gives higher simulated output than the empirical data.

The solutions in the literature do not address the liquidity problem with national growth in view, nor do they point which is a better option within fiscal policy(Debt or Future Taxation).This work attempts to address liquidity deficit through fiscal deficit and interest rates while minimizing the negative impact on GDP. Moreover, the work uses Ricardian equivalence to suggest how the deficit needs to be funded (Debt or Future Taxation)

Theoretical Framework and Research Design

Theoretical Framework

Bridging the liquidity gap by making optimal interventions on fiscal deficit and interest rates

Niemann and Pichler (2017) talk about the role of Public debt in tax smoothing and as an instrument to provide liquidity when needed thereby reducing the friction in economy. Equation-1 is
based on Keynesian 2 philosophies 1) Liquidity preference theory (keynes-1936) which proposes linear relation between Money Supply and Interest rates. 2) Application of Keynesian fiscal stimulus policy (1936) to overcome the liquidity crisis in the banking. The two theories are used to study the impact of fiscal deficit and interest rates on liquidity deficit. Equation-2 is based on wealth effect, trade effect, Keynesian effect as discussed in section 1 where Nominal Gross Domestic Product is hypothesized to be negatively impacted by rising interest rate and taxes. These two equations are considered in order to reduce the liquidity gap while minimizing the negative impact of Nominal GDP.

LD=β₁*FD+ β₂*Int  ------------------------ Equation-1
LD = Liquidity Deficit FD = Fiscal Deficit and Int= Interest rates
β₁ and β₂ are regression coefficients
GDP=β₃*FD+ β₄*Int------------------------ Equation-2
GDP = Nominal GDP FD = Fiscal Deficit (quarterly) and Int= Interest rates (Quarterly)
β₃ and β₄ are regression coefficients
The optimization problem is solved by defining 2 objectives
Min (LD=β₁*FD+ β₂*Int) ------------------------Objective -1
Max (GDP=β₃*FD+ β₄* Int) ------------------------Objective-2
Where Min stands for minimize and Max stands for maximize.

Testing for the Ricardian equivalence

Ricardian Equivalence says that in the long run bridging the fiscal deficit through future taxation of borrowing does not impact the net aggregate national wealth (Barro1974). This equivalence is tested to make comments on how the fiscal deficit should be bridged either through future taxation or through debt. For this purpose, equation -3 has been applied to check the Ricardian equivalence.

GDP=β₅*BR+ β₆*TX+C-------------------------------Equation-3
Where BR= borrowings by the government, TX= Government revenue through taxes, GDP=Nominal GDP of the economy.
β₅ and β₆ are regression coefficients.
To account for the unequal time periods of the data where Ricardian equivalence is being tested on data right from 1981 to 2018 while the rest of the models are trained on data from 2012-2018. Threshold Auto Regression (TAR) is used to demarcate between the time regimes that are taken or not taken in building the earlier models. We use a structural variable (dummy variable) called break to make the demarcation and for years after the 2012 the value is one and for the years before and equal to 2012 the value is zero. This structural break is provided because there is a drastic dip in GDP growth rate from 2011-12 to 2012-2013. The real GDP dropped from 6.60% to4.47% (Community.Gov.in-2019). So, in order to differentiate the impact created by such a break the structural break is taken in the year 2012.

Data Collection

The data collection process has been split into 2 phases. 1) To study the impact of fiscal deficit and interest rates on liquidity deficit of Indian Banking system and GDP2) To study the impact of borrowings by the government and taxes on the GDP of the nation. For the first phase Monthly data is taken for fiscal deficit from 2012 -Nov till March 2019. For interest rates liquidity deficit monthly averages are taken for dates within the same range as mentioned before. Liquidity injected by Reserve bank of India is taken proxy for liquidity deficit. For the second phase Annual data for taxes, government internal borrowings and GDP are taken from financial year 1980-81 to Year 2018-19. Interest on 1-3-year deposit is considered as proxy for Interest rates because this category of deposits holds the maximum percentage of source of funds in deposits. As per RBI report maturity profile assets and liabilities 2018 this category accounts for 25 % of the total term deposits mobilized and is the largest. Only term deposits have been explored as demand liabilities are volatile and unreliable source of money by nature and definition
Data Description

Table-2 shows the variables and the proxies taken for those variables (in applicable cases only) along with their frequency, treatment to convert the high frequency data to low frequency for analysis, count, mean and standard deviation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Proxy</th>
<th>Available Frequency</th>
<th>Transformed frequency</th>
<th>Method of frequency transformation</th>
<th>Count after frequency transformation</th>
<th>Average after frequency transformation</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD</td>
<td>Liquidity injected by the Reserve bank of India</td>
<td>Daily</td>
<td>Monthly quarterly</td>
<td>Average</td>
<td>74 (Monthly)</td>
<td>₹76.67 Billion (Monthly)</td>
<td>₹506.75 Billion (Monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25(Quarterly)</td>
<td>₹419.20 Billion (Quarterly)</td>
<td>₹428.36 Billion (Monthly)</td>
</tr>
<tr>
<td>Interest rates</td>
<td>1-3-year Term deposit interest rate</td>
<td>Weekly</td>
<td>Monthly</td>
<td>Average</td>
<td>74(Monthly)</td>
<td>8.01 percent (Monthly)</td>
<td>0.93 percent (Monthly)</td>
</tr>
<tr>
<td>(quarterly)</td>
<td></td>
<td></td>
<td>Quarterly</td>
<td>Average</td>
<td>25(Quarterly)</td>
<td>8.03 percent (Quarterly)</td>
<td>0.93 percent (Quarterly)</td>
</tr>
<tr>
<td>Nominal GDP Quarterly</td>
<td>Not applicable</td>
<td>Quarterly</td>
<td>Quarterly</td>
<td>Not applicable</td>
<td>25</td>
<td>₹30065.20 Billion</td>
<td>₹5564.97 Billion (Monthly)</td>
</tr>
<tr>
<td>BR</td>
<td>Not applicable</td>
<td>Annual</td>
<td>Annual</td>
<td>Not applicable</td>
<td>39</td>
<td>₹1842.99 Billion</td>
<td>₹2001.781 Billion</td>
</tr>
<tr>
<td>TX</td>
<td>Not applicable</td>
<td>Annual</td>
<td>Annual</td>
<td>Not applicable</td>
<td>39</td>
<td>₹4059.65 Billion</td>
<td>₹4912.80 Billion</td>
</tr>
<tr>
<td>Nominal GDP Annual</td>
<td>Not applicable</td>
<td>Annual</td>
<td>Annual</td>
<td>Not applicable</td>
<td>39</td>
<td>₹1183347.67 Billion</td>
<td>₹1410607.41Billion</td>
</tr>
<tr>
<td>Fiscal Deficit</td>
<td>Not applicable</td>
<td>Monthly</td>
<td>Quarterly</td>
<td>Average</td>
<td>74(Monthly)</td>
<td>₹473.33 Billion (Monthly)</td>
<td>₹590.52 Billion (Monthly)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25(Quarterly)</td>
<td>419.19 Billion Quarterly</td>
<td>₹428.34 Billion (Quarterly)</td>
</tr>
</tbody>
</table>
Analytical Methodology

The following flow chart describes the analysis method used in this work.

Findings

Data stationarity tests

We test for stationarity of LD, FD and Int using both ADF and Phillips Peron test. Both the tests confirm stationarity of all the three variables at 1st difference.

Relationship between Liquidity Deficit, Fiscal Deficit and Interest rates on fixed deposits.

Multi collinearity between fiscal deficit and interest rates are found very weak with the correlation coefficient of 0.0684. Hence, it may be considered that the impact of Fiscal deficit on interest rate is not significant in the successive analysis. Since all the data series is stationary at 1st difference we proceed ahead with Auto Regression with Distributed Lag (ARDL) regression. In order to proceed ahead with ARDL we determine Lag using Unrestricted VAR (Vector Auto Regression). The Lag in this case is 1as per Akaike Information Criterion (AIC). The Granger short run causality shows that the impact of D (FD) on D(LD) is significant whereas the rest are insignificant at the level of 5%. The Long-term relationship between Liquidity Deficit, Fiscal Deficit and Interest rates on fixed deposits is shown in Table -3

<table>
<thead>
<tr>
<th>Dependant Variable : D(LD)</th>
<th>Independent Variable</th>
<th>Lag</th>
<th>Coefficient</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(LD)</td>
<td></td>
<td>1</td>
<td>-0.25</td>
<td>0.0322*</td>
</tr>
<tr>
<td>D(FD)</td>
<td></td>
<td>0</td>
<td>0.00309</td>
<td>0.9963</td>
</tr>
<tr>
<td>D(Int)</td>
<td></td>
<td>0</td>
<td>-0.26.66</td>
<td>0.0656**</td>
</tr>
<tr>
<td>R Squared</td>
<td></td>
<td></td>
<td>0.099</td>
<td></td>
</tr>
<tr>
<td>Adjusted R Squared</td>
<td></td>
<td>0.066</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durbin Watson</td>
<td></td>
<td>1.960</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table -3 Note: * Indicates Significance at 5% level and ** Indicates Significance at 10% level.
Long Term Impact of Fiscal Deficit and Interest Rates on Liquidity Deficit

One can observe that change in liquidity deficit is in negative correlation with its previous term indicating the liquidity deficit is taking a dynamic equilibrium. Change in liquidity deficit has insignificant relation with fiscal deficit while hike in interest has negative impact of change in liquidity deficit.

Relation between GDP, Fiscal Deficit and Interest rates on fixed deposits

Checking for stationarity of Quarterly interest rates, GDP and FD using ADF test. Quarterly GDP and Quarterly Interest rates are stationary at second difference while FD is stationary at first difference. Therefore we choose cointegrating regression to find the impact of interest rates and fiscal deficit on GDP to optimize the choice in order to meet the fiscal deficit. Table-4 Shows the results

<table>
<thead>
<tr>
<th>Dependant Variable :D(D(GDP))</th>
<th>Independent Variable</th>
<th>Lag</th>
<th>Coefficient</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(FDM)</td>
<td>-0.46</td>
<td>-0.25</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>D(INTM)</td>
<td>988.94</td>
<td>0.000309</td>
<td>0.035</td>
<td></td>
</tr>
<tr>
<td>R Squared</td>
<td>0.150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R</td>
<td>0.071</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table-4 Long Term Impact of Fiscal Deficit and Interest Rates on Liquidity Deficit

One can see that fiscal deficit has negative impact on the rate at which the GDP growth rate changes while Interest rate too has negative impact.

Testing for Ricardian Equivalence

Nominal GDP is stationary at second difference while taxes and internal borrowings are stationary at level zero. Therefore, we go for cointegrating regression to study the impact of taxes and finance on the rate at which GDP growth rate is growing.

<table>
<thead>
<tr>
<th>Dependant Variable :D(D(GDP))</th>
<th>Independent Variable</th>
<th>Lag</th>
<th>Coefficient</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR</td>
<td>-242.35</td>
<td>-0.25</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>TAX</td>
<td>0</td>
<td>0.000309</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>R Squared</td>
<td>0.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R</td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table-5 Long term impact of Government Borrowing and Tax on GDP growth without structural break in data.

Threshold auto regression.

<table>
<thead>
<tr>
<th>Dependant Variable :D(D(GDP))</th>
<th>Independent Variable</th>
<th>Lag</th>
<th>Coefficient</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before and 2012</td>
<td>BR</td>
<td>0</td>
<td>2184.316</td>
<td>0.000</td>
</tr>
<tr>
<td>TAX</td>
<td>0</td>
<td>-1079.785</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>After 2012</td>
<td>BR</td>
<td>-0.6</td>
<td>-0.600</td>
<td>0.999</td>
</tr>
<tr>
<td>TAX</td>
<td>0.411</td>
<td>0.411</td>
<td>0.998</td>
<td></td>
</tr>
<tr>
<td>R Squared</td>
<td>0.4600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R Squared</td>
<td>0.4111</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table-6 Long term impact of Government Borrowing and Tax on GDP growth with structural break in year 2012
One observes that before and inclusive of year Borrowings had positive impact on GDP growth while taxation had a negative impact, however after 2012 both the variables have become insignificant towards GDP growth.

**Discussions and Conclusion**

It is found that in short run fiscal deficit has an impact of liquidity deficit but not in the long run with a lag of one month. In long run the impact is neutral indicating that bridging of fiscal deficit is well within the planned expenditure of the government and government need not create unplanned expenditure to bridge this gap. Liquidity deficit in the long run responds to hike in interest rate showing that liquidity in banking system can respond to monetary intervention. Growth in fiscal deficit and interest rates both contribute to inhibit the growth of the economy as their regression coefficients have negative sign in relation with GDP. Increase in fiscal deficit retarding the growth rate of the economy is a matter of concern because it indicates the government expenditure is not going into productive venues and is acting as transfer rather than value addition. When it comes to Ricardian equivalence from 1981 to 2012 it seems to be broke here in the sense that borrowings of the government are contributing to the growth of the economy while taxes are showing the opposite effect. The positive impact of borrowing on GDP indicates that borrowings by government is net wealth effect in terms of adding to the economy by facilitating new investments, increase in consumption. However, from 2012 onwards neither taxes nor government borrowings are showing significant impact, which could indicate fiscal policy’s neutrality to growth. We conclude that although liquidity deficit in the banking system can be addressed by boosting interest on term deposits, this has negative impact on GDP. The other solution is that government through its borrowings can fund or finance business ventures of banks. Such funding strategies need not be limited only to increase of government equity in banking system. Resorting to such strategies eliminates the negative impact of interest rate hike on GDP.

**Limitations and further scope**

This current work doesn’t address a scenario where there has been sovereign default. The work creates a future scope on various modes government can infuse liquidity into the banking system like equity, asset purchase, debt, various forms of debt like refinance, etc. The work is limited to taxation and borrowing part of funding fiscal deficit. It does not take sale of government assets, consumption of reserves, or printing money into consideration, the work takes Nominal GDP into consideration.

**References**


