Monetary Conditions Index as an Explanatory of Monetary Policy. Case for Georgia

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Abstract: The main focus of this article is to examine the effectiveness of monetary policy in Georgia through the use of the Monetary Conditions Index (MCI). This index combines interest rates and exchange rates into a single metric and can be used to evaluate the impact of monetary policy on the real sector. The authors of this paper aim to create an MCI for Georgia between 2011 and 2021 using quarterly data. In order to determine the relative importance of interest rates and exchange rates, the authors used the ADF test to test the stationarity of model estimates and applied Johansen's co-integration technique to establish the relationships among these parameters. The results of using the Monetary Conditions Index as an indicator indicate that it accurately reflects movements in interest rates and closely monitors changes in exchange rates. In this study, the calculation of the MCI for Georgia is carried out taking into account the years 2011-2021 on a quarterly basis. When calculating the MCI, almost all studies were carried out using constant weights for the interest rate and exchange rate variables, as is customary in the literature.

Keywords: Monetary Condition Index, Monetary Policy, real GDP growth rate, inflation.
JEL Classifications: G21, L26, O16.

1. INTRODUCTION

At the onset of the COVID-19 pandemic in early 2020, central banks in developed nations introduced an expansionary monetary policy to bolster the real sector. The pandemic caused significant real shocks that negatively impacted economic activity, and it also created widespread unpredictability that dealt a severe blow to global financial markets. Amidst this complex period, controlling inflation - one of the primary negative outcomes of the pandemic - is crucial. Therefore, in this context, we emphasize the significance of the connection between monetary policy and the MCI.

The decision of whether to implement an expansionary or contractionary monetary policy remains a key question for experts at Central Banks. The tools of monetary policy are crucial in terms of the interaction and communication between Central Banks and the real sector. The Monetary Conditions Index (MCI) gained popularity in the early 1990s, and many Central Banks analyze it in the context of the combined impact of short-term interest rates and exchange rates on aggregate demand. Accurate measurement of the size and direction of monetary policy changes is essential.

Various variables have been utilized globally to explain the effects of monetary policy, including GDP growth rates, growth of monetary aggregates and credit aggregates, short-term interest rates as suggested by Sims (1980), monetary policy index formed by utilizing the Vector Auto Regression (VAR) estimation technique with prior information from Central Banks, such as by Bernanke (1992) and Mihov (1998), and the index of minutes of the Federal Open Market Committee (FOMC), as used by Friedman and Schwartz (1963) and presented by Romer and Romer (1989). The Monetary Conditions Index (MCI), which is the focus of our paper, was initially developed by the Bank of Canada. The MCI considers the interest rate and exchange rate channels of the monetary policy transmission mechanism in a small open economy. It is believed that in the case of an open economy, the monetary policy affects the real sector and the rate of inflation - a primary goal of monetary policy - through two crucial transmission mechanisms: the exchange rate channel and the interest rate channel.

The main aim of this paper is to analyse and interpret the use of a Monetary Conditions Index (or MCI) in the carrying out of monetary policy in case of Georgia.

Central banks worldwide employ various variables to serve different purposes in conducting monetary policy. Nonetheless, the operation of monetary policy can be outlined, since central banks typically have the ultimate aim of achieving a goal such as price stability. To accomplish this, the central bank begins with policy instruments, such as open market operations, the discount rate, reserve requirements, and others. Due to long lags and the indirect relationship between the instrument and the end target, central banks utilize inter-

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mediary variables to position themselves between the end target and the instruments (Freedman, 1994). An intermediate goal is a variable that is closely related to the final goal but can be influenced by policy tools. This assists in adjusting the instrument more quickly and accurately in response to a system shock than if the central bank solely relied on the values of the final target.

Intermediate objectives include broad money or powerful money, credit, the exchange rate, and inflation prognosis. Targeting one of these parameters (such as broad money, which is known to affect inflation) helps the central bank react faster than expected to influence the ultimate goal. The operating target such as short-term interest rates and monetary aggregates were used by Poole (1970) and McCallum (2002) is usually treated as the instrument variable. Nonetheless, in the country with a floating exchange rate, it is preferable to use the index of monetary conditions as the operational policy benchmark rather than the short-term interest rate (Freedman, 1994).

MCI was initially proposed by the Bank of Canada during the 1990s and has since been widely adopted by several central banks as an operational benchmark for monetary policy (Freedman, 1994). In addition to the MCI, many other monetary indicators have been combined by central banks. For example, the Reserve Bank of New Zealand (RBNZ) adopted the MCI as an operational target in December 1996 (RBNZ, 1996). While the central banks of Norway (Norges Bank) and Sweden (Sveriges Riksbank) used the MCI as a tool to inform about policy changes, the Bank of Finland only used it internally (Mayes and Virèn, 2000).

The Monetary Conditions Index is counted from a linear function of the short-run interest rate and the exchange rate. Short-term interest rates and exchange rates are averages of their values in the base period. The weights show the relative influence of the respective MCI elements on aggregate demand. The main logic behind this concept is that in a small open economy with flexible exchange rates and capital mobility, monetary policy affects inflation and the real sector through the interest rate and the exchange rate channels.

The Monetary Condition Index (MCI) is known for its simplicity and ease of calculation, which makes it an attractive tool for policymakers to use in assessing the economy in a timely manner. It is also a better indicator than focusing solely on interest rates, as it takes into account the impact of exchange rates on an open economy. However, there are concerns about the construction of the index and its dynamics, particularly in relation to shocks that affect the exchange rate and the corresponding policy actions taken in response. These issues were highlighted by Eika, Ericsson and Nyomen in 1996.

In this study, the calculation of the MCI for Georgia is carried out taking into account the years 2011-2021 on a quarterly basis. When calculating the MCI, almost all studies were carried out using constant weights for the interest rate and exchange rate variables, as is customary in the literature.

2. LITERATURE REVIEW

The Monetary Conditions Index has various attractive features. The MCI is a simple and easy-to-calculate indicator that takes into account the effects of both interest rates and exchange rates on aggregate demand, which is especially relevant for small open economies. It can provide policymakers with a clear picture of the tightness or looseness of monetary conditions in the economy, which can inform their decisions on whether to adjust monetary policy.

The central banks of Canada, New Zealand, Norway, and Sweden have published MCIs and use their respective indices to varying degrees in their monetary policy. In addition, the International Monetary Fund (IMF) and the Organization for Economic Co-operation and Development (OECD) calculate MCI to assess the monetary policy of many countries; and firms such as Deutsche Bank, Goldman Sachs, JP Morgan, and Merrill Lynch publish MCI to determine the general monetary environment in various countries.

Previous studies on the Monetary Conditions Index (MCI) have been conducted by researchers such as Duguay (1994) in Canada, De-Simone, Dennis and Redwards (1996) in New Zealand, and Jore (1994) in Norway. The Bank of Canada has been utilizing the MCI as an operational target instead of monetary aggregates since 1990. The MCI framework developed by the Bank of Canada was based on Duguay's (1994) quarterly production estimates for the years 1980-1990. The short-term real and nominal MCI were computed using independent variables, such as real exchange rate, real interest rate and real output.

Numerous articles have explored the advantages and limitations of the MCI, with much input coming from central banks seeking to analyze the transmission mechanisms of monetary policy through interest rates and exchange rates. Early work focused on the theoretical basis of the monetary index, which is the combination of changes in short-term interest rates and the multilateral exchange rate from a base period. The academic literature acknowledges various econometric methods used to calculate the weights of the variables in the MCI, including single equation approaches of either price or output, trade elasticities, vector autoregressive (VAR) models, and Johansen's cointegrating models. The preference is given to the latter. The first studies on the construction of the MCI were developed in Canada (Duguay, 1994), where the MCI was used as a target for monetary policy, and extended to New Zealand (Nadal De-Simone, Dennis, and Edward, 1996).

Frochen (1996) developed an index of monetary conditions for five European countries (France, Germany, Spain, England, Italy) with a range of values including nominal short and long term interest rates and the effective exchange rate. Hataiseree (1998), in his study of Thailand, pointed out that the use of the MCI index has a positive image as an important indicator for characterizing short-term monetary conditions in the conduct of monetary policy, as well as for assessing the behavior of the inflation rate.

Kesrieli and Kochaker (1999) used a different approach to derive the weights for MCI in Turkey. They estimated the price equation instead of the aggregate demand equation because the exchange rate was found to be the main determinant of price level changes in Turkey. Moreover, the in the MCI are specified as reflecting the "relationship" between the operational goal and the ultimate goal. Gerlach and

Smets (2000) created a theoretical model showing that the monetary index could be written in terms of a suitable central bank feedback rule.

Hataiseree (2000) built an MCI for Thailand with an inflation function using a autoregressive distributed lag model to obtain the appropriate weights. This inflation model was formed by using variables interest rate, nominal effective exchange rate, import price index, agricultural price index, and government fiscal indicator. The calculated weight ratio for interest rate and exchange rate for Thailand is 3.3:1.

The response of central banks to changes in exchange rates differs, with the central banks of New Zealand and Canada reacting strongly, while the Australian central bank does not. Osborne-Kinch and Holton (2010) explain three methods for determining MCI weights: single-equation valuation, multi-equation MCI, and trade share-based MCI. The single-equation approach is the most commonly used, while multi-equation MCIs use macro econometric models or vector autoregressive relations to derive weights from equations relating to GDP, exchange rates, and interest rates. Trade share-based MCIs are simpler to obtain, with the exchange rate weight based on the long-term export-to-GDP ratio and the interest rate weight obtained per unit minus that ratio. However, these MCIs have been criticized for not providing sufficient information on how the relevant variables impact the economy.

Toroj (2008) used four empirical strategies (the IS and Phillips curve, the VAR model, and a small structural equation system) to assess the relative importance of the real interest rate and the real exchange rate in determining the output gap as the basis for calculating the Monetary Conditions Index (MCI) .

Generally, open standard macroeconomic models show that both interest rates and exchange rates are important in the transmission channels of monetary policy. (Hataiseree, 1998). Gerlach and Smets (2000) formed a theoretical model, and demonstrated that the “optimal feedback rule” could be written according to the MCI. In other words, the central bank can optimize its target functions by setting weighted average interest rates and exchange rates in accordance with macroeconomic conditions.

So, the current emphasis on MCI as a monetary indicator and financial condition, rather than a political goal, is especially applicable to fixed exchange rate economies. (Pong and Lang, 2005). Nonetheless, MCI is still an applicable tool for assessing a monetary condition.

Horry, Abadi, and Nejati (2018) calculated the MCI for the Iranian economy for the period 2001–2012 by applying the self-explanatory ARDL approach and applying the Eviews 9 software. The coefficients of the overall demand function were then estimated to calculate the index. After that, while evaluating the inflation equation, they compared the forecasting power of the nominal MCI with the real MCI.

As regards the use of the MCI as a monetary policy indicator, numerous studies have come to an analogous conclusion. Yaaba (2013) developed MCI for Nigeria and came to conclusion that MCI aligns with the policy direction of Central Bank of Nigeria and can serve as a leading indicator of the Bank's monetary policy stance. In addition, both Dennis (1997) and the Economics Department of the Reserve Bank (1996) constructed the MCI for New Zealand, and both of them concluded that the MCI represented the state of monetary condition better than any of its variables alone. From the discussion above, it can be concluded that the MCI can be used as an indicator. Poon, Azali and Habibulla's (2008) studies empirically explore the long-term relationship of real GDP components to estimate the MCI index using a bounding-checking approach.

Acci and Tasar (2016) investigated the feasibility of implementing the MCI for the Turkish economy by posing a research question. They tested their hypothesis using an empirical approach, analyzing data from January 2006 to September 2015. To identify long-term relationships in the data, they used unit root tests based on the Dickey-Fuller (1981) and Phillips-Perron (1988) methods, and Johansen's (1988) cointegration test. They then applied the Blanchard and Quah (1988) vector autoregression method based on the results.

Nucu and Anton (2018) constructed the MCI for four CEE countries (Czech Republic, Hungary, Poland and Romania) as a weighted average of the real short-term interest rate and the real effective exchange rate relative to their value in the base period.

3. METHODOLOGY

The Monetary Conditions Index can be used to assess countries' different monetary policy cycles. In other words, it is used for defining whether the policy is tight, easy or right. This measure is a benchmark to evaluate monetary policy which affects economic activity and inflation. The MCI can be defined as the weighted average sum of movement in the interest rates and the exchange rates considering the base period. MCI can be expressed as equation below.

$$MCI = w1\ (it - ib) + w2\ (et - eb), \text{ where } w1 + w2 = 1 \quad (1)$$

In this equation, w1 and w2 indicate weights of interest rate and exchange rate respectively. it is interest rate and et is exchange rate in period. ib and eb demonstrate interest rate and exchange rate in a given base period respectively.

The most important parameters for building an MCI are determining the interest rate and exchange rate weights. These parameters are very important for determining the impact of interest rates and the exchange rate on overall economic activity or inflation, which are the two main monetary regulatory channels used by central banks. In theory, econometric models are used in practice to determine these weights. The most commonly used methods are the aggregate demand or price equation which is used by IMF, OECD and some central banks. Aggregate demand equation can be expressed as below:

$$Yt = \mu 0 + \mu 1 * It + \mu 2 * Et + \varepsilon t \qquad (2)$$

Where Yt is aggregate demand, It is interest rate and Et is exchange rate in short-term term period, εt is the error term. To quantify relative weights of interest rate and exchange rate, firstly we used ADF test to test stationarity of model estimate parameters. We also applied Johansen’s co-integration technique to get relationship among these parameters. In countries with small economies such as Georgia, interest rates and exchange rates can be major monetary instruments. In addition, changes in interest rates and exchange rates are reflected in aggregate demand, inflation and real GDP.

4. MODEL SPECIFICATION

The variables selected to calculate the Monetary Condition Index, is real GDP growth rate, exchange rate, and monetary policy rate, contain data from the first quarter of 2011 to the third quarter of 2021. Information on the monetary policy rate was obtained from official statistics provided by the National Bank of Georgia. Data on real GDP growth rate and exchange rate are based on data provided by the National Statistical Office of Georgia. Data pre-processing operations were performed on the data of the 3 macroeconomic parameters mentioned for the construction of the model and all the data were brought to the quarterly basis. To calculate the quarterly exchange rate and monetary policy rate, the average of the months for each quarter was considered. The exchange rate is considered as the ratio of the local currency to the US dollar (Local Currency/Foreign Currency). In addition, it should be noted that the National Bank of Georgia has switched to inflation targeting since 2009. Therefore, this research paper allows us to assess the state of monetary policy pursued by the National Bank of Georgia from almost the adoption of the target inflation regime period to now.

5. FIGURES, TABLES AND SCHEMES

As mentioned earlier, one of our main objectives is to determine the weights of the parameters required to build the MCI model. We can rely on the following output model to determine the weights of the exchange rate and monetary policy rate.

$$RGDPt = \mu 0 + \mu 1 * IRt + \mu 2 * ERt + \varepsilon t \qquad (3)$$

Here, RGDP is the real GDP growth rate, IR is the interest rate of the National Bank of Georgia (the bank presents interest rate data as monetary policy rate), ER is the exchange rate of Georgian Lari as the dollar equivalent in t period. μn's are the parameters to be estimated and εn's are error terms.

5.1. Testing stationarity of the Data based on ADF

In order to test, whether time series such as GDP, interest rate and exchange rate are stationary or not, Augmented Dickey Fuller test (ADF Test) is used. The result reported in Table 1 indicate that interest rate and exchange rate series are not stationary proved by ADF test. However, GDP time series is stationary. According to ADF test, interest rate and exchange rate series are stationary at the first difference and at 1% significance level.

Eviews automatically made lag selection based on Schwarz information criterion - a criterion for model selection among a finite set of models.

Table 1. Unit Root Test.

Variable	Level	First difference
	t-stat, ADF	t-stat
Y	-6.686	
I_r	-3.373	-4.786***
Ex_r	-2.514	-4.931***

Note: *** indicate significance at 1, 5 and 10% respectively.
Source: Elaborated by the authors.

6. COINTEGRATION ANALYSIS.

As GDP time series is stationary and exchange rate and interest rate time series are stationary at the first difference, the possibility of co-integration relationship among above-mentioned data could be analyzed. At this point, Johansen technique is appropriate to test cointegartion.

Having used Akaike Information Criteria we identified the deterministic trend assumption of test, in other words, we allowed for linear deterministic trend in data – intercept and no trend in cointegration equation. At the same time, optimal lag intervals have been chosen as 2 based on unrestricted VAR.

Our Null Hypothesis is that there is not cointegration between variables, in other words there is not long-run association. However, as p-value is less than 5% and trace statistics is greater than critical value, we conclude that there is cointegration between variables. In the long-run GDP, interest rate and exchange rate have association.

Table. 2. Unrestricted Cointegration Rank Test.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.323777	33.40530	29.79707	0.0184
At most 1 *	0.283106	17.75600	15.49471	0.0224
At most 2 *	0.105126	4.442900	3.841465	0.0350

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

*Source: Elaborated by the authors based on the model results

Based on the normalized cointegrating coefficients, we shape equation as below:

Table 3. Normalized Cointegrating Coefficients (Standard Error in Parentheses).

Y	I_R	EX_R
1.000000	0.230743	-6.280551
	(0.93966)	(12.8794)

*Source: Elaborated by the authors based on the model results (from E-views program).

From this model, we conclude the weights of interest rate and exchange rate. Therefore, interest rate's weight is 0.04 and exchange rate weight is 0.96. The reason of the small impact of interest rate on GDP is explained by the limited transmission capacity of the monetary policy of the Central Bank of Georgia. In its turn exchange rate is more powerful to impact aggregate demand. In general, the Central Bank's transmission capacity is weak in countries that are new to inflation targeting. If we look at the parameters obtained, we see that the increase in the exchange rate has a negative effect on the aggregate demand, and the interest rate has a pos-

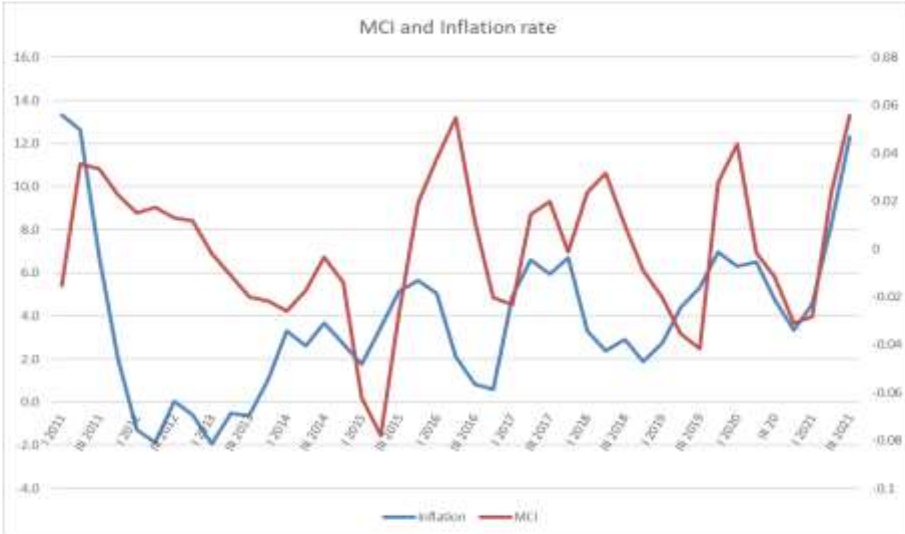

Chart 1: Monetary Condition Index for Georgia.
*Source: Authors' elaboration.

itive effect. The estimated monetary condition ratio is approximately 24:1(μ2/ μ1). So, we can conclude exchange rate channel is stronger than interest rate channel.

7. 7. CONCLUSION AND RECOMMENDATION

Authors the study focuses on the assessment of monetary policy in Georgia. Based on the aggregate demand function, the weights for interest rate and exchange rate were defined as 0.04 and 0.96 respectively. After the weights necessary to build the model have been determined, the next step is to calculate the monetary condition index to analyze the periods. For the calculation of the Monetary Conditions Index, the interest rate and the actual value of the exchange rate are reduced, considering the form given in Equation 1. To do this, we applied Hodrick-Prescort filter to the interest rate and exchange rate data we used. This method allows us to obtain the equilibrium level of interest rates and exchange rates. Thus, we can compare the equilibrium level and determine that the monetary conditions are very tight and very loose in that period, considering the certain base period. MCI values can be calculated using Equation 1 based on the weights we obtained earlier. The observed increases in MCI values indicate a tight monetary conditions, while the declines indicate a easy monetary conditions.

Chart 1 is based on MCI values in Georgia and shows the change in MCI over the years. And Chart 1 shows the inflation rate for the same quarters.

The increase in inflation, which began in 2013 and peaked in 2014 was caused by imported inflation. In the same period, the country's export growth also declined. In the context of tightening monetary policy pursued by the US Federal Reserve since October 2014 and a strong US dollar, this had important effect on the Georgian currency, and the lari lost its savings function. Lari depreciated by 44 percent against USD. This crisis was the most severe monetary and currency exchange crisis in Georgia.

The decline in inflation since late 2014 was mainly due to falling oil prices on world markets. Falling oil prices in world markets in 2014 from the expected level also had a negative impact on global markets. This also affects domestic markets of countries, including Georgia. The main reason for higher inflation since 2015 was the higher intermediate costs of firms as a result of the increasing debt service burden on foreign currency loans. Oil prices factor also contributed to the decline in inflation in 2016.

Due to supply-side factors, including the increase of excise taxes and rise in commodity and oil prices on international markets, lead to high inflation rate from 2017.

If we look at both graphs at the same time, we can observe an approximate a similarity in the changes. This is due to the fact that the Central Bank of Georgia has pursued a flexible and adequate monetary policy to regulate inflation. For instance, since the beginning of 2017, the Central Bank has adopted a contractionary monetary policy in order to prevent inflation caused by side factors. Moreover we can see that from 2020 to early 2021, the country has implemented a soft monetary policy. This can be explained by the need to reduce the effects of the pandemic and increase economic activity. After the first quarter of 2021, the National Bank will switch to a tight monetary policy. Restrictions related to the pandemic and high production costs resulting from the depreciation of the lari have triggered inflation. Tight monetary policy to prevent inflation has lasted until the end of the period under review. The graph shows that there are many parallels to such examples. Thus, it is possible to conclude that the change in the MCI indicates a trend in line with the level of inflation in the country.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflict of interest.

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