Journal of
Economics and Political Economy
www.kspjournals.org
Volume 5 March 2018 Issue 1

A monetary conditions index and its application on Tunisian economic forecasting

By Ali MNA [a] & Moheddine YOUNSI [b†]

Abstract. The purpose of this paper is to find out the extent of the influence of internal and external monetary conditions on Tunisian macroeconomic aggregates by constructing a synthetic index. We seek to contribute to the empirical literature in the following ways. First, we calculate the weights assigned to domestic interest rate and the exchange rate based on the estimated coefficients respectively for these two dimensions over the period 1965-2015. Second, by employing a VAR model approach, we confirm the long-run dynamic between the considered variables. The analysis of shocks indicates that monetary conditions have a particular importance through their effects on economic activity and inflation. The latter is characterized by its significant negative influence on economic growth and by its contribution in linking between internal and external interest rates. Third, we use a SVAR model approach for analyzing the short-run structural dynamics between the variables. Our findings reveal that the Tunisian economy is significantly influenced by external monetary conditions. This extensive influence is confirmed through the dynamics of structural monetary policy shocks and exchange rate. Overall, our study finds that the exchange rate plays an increasing role in transmitting the monetary policy effect to the inflation rate and thus the real economy.
Keywords. Monetary conditions index, SVAR approach, Structural monetary shocks.
JEL. E43, E51, E52.

1. Introduction

The Monetary Conditions Index (MCI) was firstly built by the central bank of Canada since the early 1990s (see Freedman, 1994), and then it has been extensively applied to varying degrees by many other central banks for conducting their monetary policy, including Finland, France, New Zealand (see Reserve Bank of New Zealand, 1996; Dennis, 1997), Iceland, Norway, Sweden, United Kingdom, Australia, Spain and other international organizations such as the International Monetary Fund (IMF), the Organization for Economic Co-operation and Development (OECD), and the European Monetary Institute (see Mayes & Virén, 2000; Goux, 2003).

The aim of the MCI is to synthesize the monetary indicators into a single policy index, by granting to each a weight proportional to its influence on a reference variable relevant to economic policy such as economic activity or inflation. Because monetary policy is mainly transmitted through both interest rate and exchange rate channels, the narrow form of MCI combines only the real short-term

[a] Department of Economics and Quantitative Methods, Higher Institute of Business Administration, University of Gafsa, Tunisia.
☎. +216 98 96 79 69
✉. ali.mna@gmail.com
[b†] Unit of Research in Development Economics, Faculty of Economics and Management, University of Sfax, Street of Airport, LP 1088, Sfax 3018, Tunisia.
☎. +216 97 80 48 98
✉. younsimoheddine@gmail.com

interest rate and the real effective exchange rate in a single policy indicator. However, in relation with all the relevant monetary policy transmission mechanisms, the MCI can be extended by introducing other financial indicators (long-term interest rates, stock prices, credit, etc.) in order to create financial and monetary conditions indices (FMCIs).

The MCI should be seen as an indicator of the degree of easing or tightening of monetary conditions as a whole, which in its construction makes it possible to measure the contribution of monetary conditions stance to changes in economic activity or inflation. Taken independently of any reference level (optimal level of MCI), its graphic interpretation in variation allows to deduce the direction in which the monetary and financial conditions affect the reference variable.

The key role of the MCI is usually to aggregate several variables mentioned above, to elaborate a synthetic policy index more relevant that each of the elements taken in isolation. In this context, it appears that the relevance of this indicator increases with its enrichment. In counterparts, more the field of the selected variables is wide ranging, less the indicator obtained is controllable by monetary authorities. For this reason, central banks of Canada and New-Zealand, at the origin of the MCI concept, have adopted a narrow approach to monetary conditions, which limited to a combination of the short interest rate and the exchange rate. In this framework, these banks have used their policy instruments, in practice the key interest rate, in order to influence the level of monetary conditions and bring it closer of the judged desirable level, for instance, the outlook for inflation or aggregate demand.

The empirical difficulties for this subject, mainly concern the determination of weights assigned to each of the components of the index and the choice of the reference values. However, the chosen option in the majority of studies is the case of a MCI backed by aggregate demand. Too often, the relative weight given to the exchange rate is approximated by the openness degree of the considered economy, without taking into account the horizon in which sits the central bank or other more structural features of the economy. For this reason, our objective in this paper is to find out the extent of the influence of variables representing the internal and external monetary conditions i.e. the domestic interest rate, the external interest rate and the exchange rate on the Tunisian macroeconomic aggregates such as economic activity and inflation. We thus focus on the construction of monetary conditions index (MCI) for Tunisian economic forecasting. For this purposes, a VAR and structural VAR models are used for dynamic analysis. Our contribution is based on three steps. First, we calculate the weights assigned to domestic interest rate and the exchange rate based on the estimated coefficients respectively for these two dimensions over the period 1965-2015. The estimation approach adopted is a VAR model using stationary variables. At this level, we begin by defining a close relationship to create the Tunisian's MCI. Second, a broader definition, including several macroeconomic variables, will be discussed, using cointegration procedure and vector error correction model (VECM). Third, we attempt, through a SVAR model, to examine the short-run structural dynamics between selected variables. This issue is attributed to responses of aggregate economic variables to structural shocks.

The remainder of this paper is organized as follows. Section 2 discusses the basic theoretical framework of MCIs construction and presents a literature review of some selected prior empirical studies on the MCI construction and its application on economic forecasting in some countries. Section 3 discusses the methodology of the MCI construction for Tunisia, using a VAR and VECM approaches. Section 4 interprets and discusses the empirical results of VAR and structural VAR. Section 5 holds the concluding remarks.

2. Theoretical framework and literature review

2.1. Theoretical framework

The basic theoretical framework of MCIs is the Keynesian theory extended to the Phillips curve. In an open economy, the general equilibrium is determined simultaneously on the money market, on the foreign exchange market and on the market for goods and services. The construction of MCIs is essentially based on the equilibrium conditions in the market for goods and services, i.e. on the IS component of the IS-LM model (Frochen, 1996). The underlying model can be written as follows:

$$Y_t = C_t + I_t + G_t + (X_t - M_t)$$

Where, C, I, G, X, and M represent private consumption, private investment, total public expenditure, exports and imports of goods and services, respectively. Therefore, the first part of the second member (C + I + G) corresponds to the internal absorption, while the second part (X - M) measures the balance of external trade in goods and services.

The previous relationship describes, therefore, the equilibrium in the market for goods and services (i.e. the IS curve) in open economy. The calculation of MCI is based on the identification of monetary policy transmission mechanisms (Duguay, 1994). This one acts on the global demand through the effects of the interest rate on consumption and investment and those of the exchange rate on competitiveness and the external balance. The effectiveness of monetary policy in an open economy depends upon the efficiency of the monetary authorities' control on the level of the interest rate. By modifying the behavior of economic agents, notably in terms of consumption, savings and investment, the interest rate allows to act on economic activity and inflation.

The calculation of MCI is essentially based on the highlighting of this mechanism. On the assumption that the effects of the interest rate on economic activity may be counteracted or reinforced by those of the exchange rate, hence the need for an indicator that takes into account the net effects. In mathematical terms, the mechanism can be written in the following form:

$$y_t = c + a_1 . i_r + a_2 e_r + u_t \quad ; a_1 < 0 \; et \; a_2 < 0 \tag{1}$$

Where y_t, i_r and e_r represent real GDP, real interest rate and real exchange rate, respectively; u_t represents the random term. This equation is interpreted as the global demand function based on interest rate and exchange rate.

However, taking into account of the dynamism of IS equilibrium can be expressed as following:

$$y_t - y_t^* = a_1(i_{rt} - i_{rt}^*) + a_2(e_{rt} - e_{rt}^*) + u_t \tag{2}$$

Where i^*, e^* represent the equilibrium rates, respectively, and ($y_t - y_t^*$) represents the production gap. Taking into account the difficulties associated with the measurements of equilibrium values (y^*, i^* and e^*), because they are unobservable variables, the founders of MCI in New Zealand have used potential GDP instead of y^* and variations in rates (i and e) instead of their deviations from equilibrium. This specification will be used later in our empirical study. The coefficients a_1 and a_2 are interpreted as the impacts on aggregate demand of variations in real interest rates and real effective exchange rates, respectively. Interest rates affect aggregate demand by modifying the set of domestic behavior: household consumption (substitution effect, impact on purchases of durable goods), residential investment (higher cost of credit, relative profitability of real estate investments) and productive investment through the increase in the cost of using capital. The effects of the real effective exchange rate are mainly transmitted by net exports.

2.2. Literature review

Over the past few decades, the MCI has become popular in several countries. This index helps to interpret the monetary policy stance and the linked effects on the real economy. In the literature, several economists have focused on the construction of MCI ratio derived from the characteristics of their countries by using different approaches of estimation.

However, by using quarterly Canadian data from 1968 to 1990, Duguay (1994) analyzed two structural models linking interest rate changes and exchange rate changes with inflation gap and aggregate demand changes. His study reveals that extended model can help to provide an important forecasting about monetary policy orientation in Canada. Dennis (1997) estimated the MCI for New-Zealand by using monthly data over the period 1986-1996 and based on three equations with three types of domestic output gap, which are functions of the gap in interest rate and the real exchange rate added to the foreign output gap. The results indicate that both real interest rate and real exchange rate influenced excess demand but that the act of real interest rate was extensively powerful on policy transmission channel. In the same context, Hataiseree (1998) build a MCI for Tailand based on inflation regressed to interest rate, exchange rate, import and agricultural price indices, and government fiscal indicator by using data from January 1990 to July 1998. The calculated MCI ratio was about 3.3/1, implying that if the exchange rate average has depreciated to 3.3%, the interest rate will be rise of 1%. In a similar vein, Kesriyeli & Kocaker (1999) used quarterly data for the period 1987-1999 to construct the MCI for Turkey by driving weights for interest rate and exchange rate from two price equations (wholesale price and consumer price). They reported that, despite the tightness of monetary policy (i.e. high real interest rate and local currency appreciation), output growth and inflation rate rest very high. Thus, currency appreciation causes input costs to diminish.

Using Euro-Zone's data over the period of 1985-2002, Goux (2003) estimated the MCI based on VECM and SVAR models by including industrial production index, inflation, ECB key interest rate, broad money supply (M3), exchange rate and American federal fund rate. The regression analysis shows the importance of monetary conditions in the Euro-Zone economies. The analysis of short-run and long-run dynamics is remarkable. These dynamics are ensured mainly by ECB key interest rate. In the short-run, the influence of monetary policy and exchange rate shocks is decisive in the evolution of industrial production. Tobias (2005) estimated the MCI for South Africa over the period 1994Q1-2003Q4 by regressing output gap on its fist lag, lagged values of real interest rate and real exchange rate changes. The results suggest that excluding of exchange rate developments in the monetary policy mechanism can lead to volatile monetary conditions. Similarly, by using quarterly data from 1998Q1 to 2005Q1 for Euro-Zone and USA, Montagné & Le Mestric (2005) applied NIGEM model where the FMCI is a function of real short rate, long-term interest rate, real effective exchange rate and stock market capitalization to GDP ratio. Their results reveal that the historical decline in real interest rates has benefited growth in both zones. However, the collapse in stock markets has negatively affected growth, more strongly in the US rather than in the Euro-area. At the same time, the depreciation of the dollar stimulated economic activity in the US while it penalized it in the Euro-area.

In another study, Peng & Leung (2005) used quarterly data covers the period of 1994Q1 to 2004Q2 to construct two forms of MCI (a narrow and a board form) for Mainland China by including real interest rate, real effective exchange rate and credit supply in an aggregate demand equation. They found that in easing monetary conditions (MCI measures decrease), the bank credit grow up after reducing real interest rate and appreciation of local currency. In this case, the economic growth has been accelerated. Hyder & Khan (2006) used monthly data from March 1991 to

April 2006, and four systems including monetary and aggregate demand measures based on VAR model and Johansen cointegration approach to construct the MCI ratio for Pakistan. They pointed out that the country has known eight tightening and six easing periods of monetary conditions during the studied period.

In case of Albania, Kodra (2011) and Arjeta (2013) constructed two different MCI measures by employing different approaches. The authors used the same regressors including real effective exchange rate, 3, 6 and 12 months treasurary bills rates, inflation and output gap. However, Kodra (2011) used an aggregate demand equation and monthly data from January 1998 to April 2008. He found a MCI ratio equal to 3.8, which implies that if the exchange rate has depreciated to 3.8%, the interest rate should be rise of 1%). His study provides evidence that the interest rates changes have not been a determinant factor in the monetary stance. In contrast, Arjeta (2013) used the inflation equation and quarterly data from 1999Q1 to 2011Q4. He reported that if the exchange rate rise by 1%, the central bank should neutralize this change with an increase in interest rate around 2.7%. His work provides evidence that the internal and external shocks affect Albanian economy.

Recently, Dembo (2012) constructed the MCI for WAEMU Members States by driving weights for interest rate and exchange rate from a reduced form equation of aggregate demand based on IS-LM model and Phillips curve, for the period 1970-2011. He showed a significant tightening of monetary conditions during the most of the study period, which has been marked by a weak growth. Moreover, the easing of conditions monetary policy has induced by the change in the parity of the WAEMU currency. In the case of Tunisia, El-khadhraoui & Ghattassi (2012) used quarterly data covers 2000-2011 period and an unrestricted VAR model to construct the MCI ratio, which included the real GDP, the real effective exchange rate, the short-term real interest rate and the stock market index. Their results highlighted the importance of the real exchange rate in the monetary policy orientations and its impact on economic activity. The authors suggest that during the post-revolution period, the influence of real interest rate seems more relevant on the economic environment, to the detriment of the real exchange rate. In the same context, Benazic (2012) built the MCI for Croatia during the period of 1998m1-2008m10 by applying an Engle-Granger cointegration time series method to logged (consumer price index, nominal effective exchange rate, industrial production index), and money market interest rate. His study provides evidence that MCI and inflation have opposite movements, suggesting a pro-cyclical monetary policy due to the exchange rate targeting regimes. In case of Nigeria, Abubaker & Yaaba (2013) applied quarterly data from 1989 to 2012 and an ARDL model on GDP, interest rate, exchange rate and credit to private sector in a broad MCI measure. The authors have classified three channels according to their efficiency; (a) interest rate, (b) exchange rate, (c) credit. Hence, they suggested that Central Bank of Nigeria should focus on deepening the financial market.

3. Methodology

3.1. Construction of a narrow MCI for Tunisia

At this stage, we attempt to construct the Tunisian's MCI in a narrow form by driving weights for real interest rate and real exchange rate from a reduced form equation of aggregate demand depicted in Eq.(2). For this purpose, we use three main variables; logged real GDP (LRGDP), real interest rate (RIR) and the real exchange rate (RER). The annual data are obtained from the Central Bank of Tunisia and covering the period from 1965 to 2015. Following the approach of El-Khadhraoui & Ghattassi (2012) and through the impulse response function analysis, we have detected the impact of RIR and RER changes on LRGDP.

Indeed, the augmented Dickey-Fuller (ADF) unit root test shows that LRGDP, RIR and RER are stationary in the first difference. Appendix 1 provides the results of this test. In fact, Eq. (2) described above can be estimated by a simple VAR, without recourse to the vector error correction model (VECM) specification. We have specified an unrestricted VAR model. The use of information criteria, to determine the optimal number of lags, provided a value equal to 1 (see Appendix 2). Thus, the impulse analysis, based on the estimation of the VAR (1), provides the cumulative responses of LRGDP changes to the shocks on RIR and RER changes at sufficiently stable horizons. We found thus the coefficients of ΔRIR and ΔRER are about (-0.02156) and (-0.04285), respectively (see Figure A1 in appendices). At the end of this result, we can estimate the MCI ratio by using these two weights.

3.2. Evolution of Tunisia's MCI

Using the results of the cumulative responses functions obtained above, and we report these responses on their total, we have found the values 33.47% and 66.53% for ΔRIR and ΔRER, respectively. Therefore, the narrow form equation of MCI can be written as follows:

$$MCI = 0.3347\Delta RIR + 0.6653\Delta RER \quad (3)$$

Figure 1 presents the evolution of monetary conditions, expressed in DMCI (difference between the MCI and its average level).

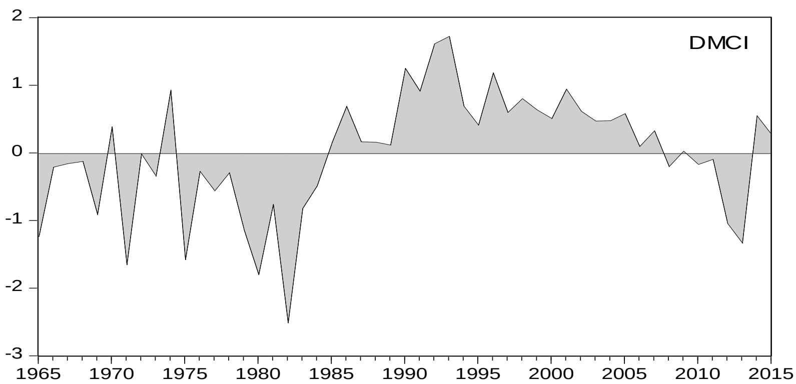

Figure 1. *Evolution of MCI gap during the period 1965-2015*
Source: Authors' estimation based on the CBT dataset

According to this evolution of DMCI curve, we conclude that monetary policy in Tunisia was more or less soft before the period 1985. This period has been described as 'accommodative monetary policy'. Thereafter until 2007, this policy has experienced a certain level of tightening or restrictive policy, which has attenuated its maximum in 1993. This description of monetary conditions is well argued by the period of application of the structural adjustment plan (SAP) with the various inherent regulations. In 1993, the Central Bank of Tunisia (CBT) has intervened in a direct way on the key interest rate to reduce it by 3 points. The next step is then to compare the evolution of DMCI with the economic growth (RGDP growth) and inflation (INF) (see Figure 2). We can notice that during the easing period (before 1985), the economic growth has experienced some volatility. After this period, this rate becomes more stable, with a lower average. We have also noticed, following the comparison of the evolution of DMCI with inflation rate (see Figure 3), that during the easing period this rate becomes volatile and clearly rising. However, in the second period inflation becomes more controlled.

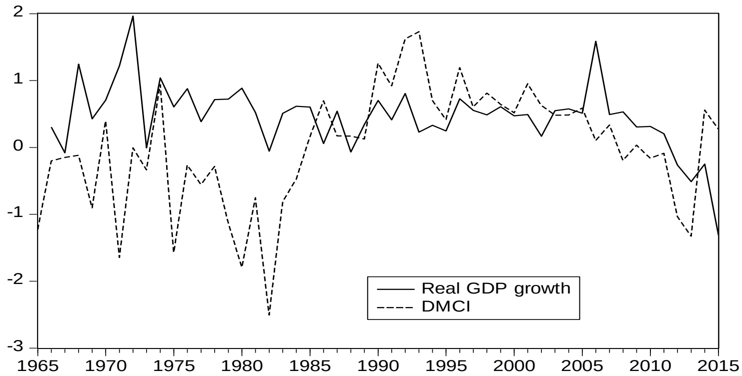

Figure 2. *Evolution of DMCI with real GDP growth*
Source: Authors' estimation based on the CBT dataset

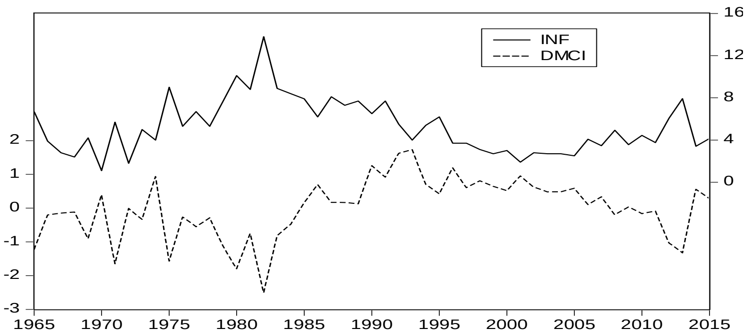

Figure 3. *Evolution of DMCI with inflation*
Source: Authors' estimation based on the CBT dataset

By way of conclusion, we can notice that for an MCI relatively low – sign of an easing monetary policy – economic growth and inflation have known remarkable volatility. For instance, inflation has reached its top level in 1982 (13.8 points) (see Figure 3). After 1985, there was a second period, where MCI has increased – sign of a tight monetary policy. At this sub-period, economic growth has declined and becoming more stable and inflation becoming increasingly controlled. After 2007, we observe a return off an easy stance, where economic growth began its decline and inflation becoming more and more volatile.

3.3. Modelling of a broad MCI

In the previous section, we have proposed an expression of a close relationship of the MCI's construction for Tunisia. However, despite its originality, this expression is well criticized by theoretical and empirical literature. It is considered as very simplified and cannot adequately summarize the economic stance. To remedy these anomalies, several authors proposed additional variables to the initial model. For this purpose, we attempt, in the rest of this paper, to estimate a broader MCI model for Tunisia. Our reference framework has been inspired by the Goux (2003) approach.

For our model, we have retained six explanatory variables: the real exchange rate (RER), that represents the equivalent of one US dollar to Tunisian dinar, deflated by the consumer price index (source: CBT) expressed in logarithm; the short-term nominal money market rate (MMR) (source: CBT); the real gross domestic product growth (RGDP) at constant prices (base year 2000) (source: NIS), expressed in logarithm; the real cash, represented by the quantity of money in circulation (M2) deflated by the general price index, expressed in logarithm (source: CBT), the inflation rate (INF), calculated as the growth rate of the consumer price index (base year 2000) (source: NIS); and an external factor designed by the U.S. Fed's real interest rate (FFED) (source: Federal Reserve Bank of Saint-Luis (FRBSL).

We first test the co-integration relationships between selected variables, and then we determine the structural monetary shocks, highlighting the significant role of monetary conditions on Tunisian economic activity and inflation. For this effect, we employ the VAR-ECM model given that ADF tests confirm that all series are stationary in the first difference (see Appendix 1).

4. Empirical results

4.1. A VAR model specification

From the above, the vector used in this VAR model is as follows: (LRGDP; LM2; MMR; RER; INF; FFED). Given the divergence of the results obtained by the information criteria (i.e. AIC, FPE and HQ indicate 5 lags, while SC indicates 1 lag) (see Appendix 3), we used the residual normality test for two VAR (1) and VAR (5) models. The chosen optimal number of lags is $p^* = 1$. This choice is confirmed by the Jarque-Bera normality test (see Appendix 4), which accepts the normality at the 5% level for VAR (1), but rejects it for VAR (5). Thus, we finally retain the VAR (1) model.

4.2. Cointegration analysis

Using the two cointegration tests proposed by Johansen & Jesilius (1998), the trace test and the maximum eigenvalue test, we can determine the number of cointegration relations. However, we will retain a 5% level in order to limit the number of relationships. Appendix 5 shows the presence of a one cointegration relation for the case of the trace test and two relations for the Lamda-max test. We observe a divergence of the results for the two tests at the 5% level. Indeed, for the trace test, only one relation is detected. On the other hand, for the Lamda-max test we find two relations. In contrast, if we have decided to take a 10% level of significance, the results of the two tests become similar (two cointegrating relationships). In addition, for the statistics of the two tests, the associated probabilities include enormous peaks on the rise, in the third line ($r = 2$). For the trace test, the probability ranged from 0.08 to 0.52, and for the Lamda-max test, it ranged from 0.04 to 0.90. We can interpret this peak in favor of accepting that the number of co-integrations is $r = 2$. The cointegrating relationships are then determined using the Johansen methodology (1995). The results (matrix β) are presented in Table 1.

Table 1. *The cointegrating relationships*

	LRGDP	LM2	RER	MMR	INF	FFED	Constante
CointEq1	1.000	-0.458	-0.029	0.006	0.000	0.000	-4.669
		(0.018)	(0.212)	(0.005)			(0.245)
		[-25.22]	[-0.13]	[1.306]			[-19.04]
CointEq2	0.000	0.000	20.88	1.000	-2.541	2.032	-53.044
			(7.489)		(0.272)	(0.246)	(9.727)
			[2.78]		[-9.32]	[8.25]	[-5.45]

Notes: Standard deviations are in parentheses, Student statistics are in brackets. However, their interpretation of significance is not done in the usual way. Indeed, there are the long-run relationships between non-stationary variables

In this stage, it is necessary to test the admissibility of the above cointegration space. The likelihood ratio of the null hypothesis and the alternative hypothesis is equal to 3,854. It is interpreted as a chi-square statistic with 2 degrees of freedom with a significance level of 0.145. Thus, we can accept our cointegration space (see Appendix 6). In order to measure the degree of stability, we determine the corresponding weights (α), which interpreted as the average speed of convergence towards long-term above cointegration relations. Table 2 presents the weights vector corresponding to the two cointegrating relations (U1, U2) for the different variables of VECM model. However, the presence of many negative signs is normal since it is an error correction. It appears that the corresponding signs to

ΔLRGDP for the first equation and ΔMMR for the second equation are negative, confirming thus the right specification of the VECM model.

Table 2. *Weights of return to long-term equilibrium*

Error correction	D(LRGDP)	D(LM2)	D(RER)	D(MMR)	D(INF)	D(FFED)
U1	-0.127935	0.342508	-0.072928	-5.045585	7.422758	-7.051935
	(0.07713)	(0.07298)	(0.08424)	(1.65174)	(2.59529)	(2.67840)
	[-1.65872]	[4.69325]	[-0.86573]	[-3.05470]	[2.86009]	[-2.63290]
U2	0.002581	0.006561	-0.003489	-0.115445	0.223346	-0.218552
	(0.00201)	(0.00190)	(0.00219)	(0.04304)	(0.06762)	(0.06979)
	[1.28428]	[3.45017]	[-1.58977]	[-2.68243]	[3.30283]	[-3.13167]

Notes: Standard deviations are in parentheses, Student statistics are in brackets

The first cointegration relation can be formulated in a standard way as follows:

$$LRGDP = 4.669 + 0.458LM2 + 0.029RER - 0.006MMR \quad (4)$$

This cointegration relation highlights the impact of monetary conditions on real economy. If we added to this the positive influence of real cash balances reflecting the role of liquidity and the credit. Indeed, an expansionary monetary policy can boost the economic system and promote investment when the allocation of production resources is efficient. We can also note the importance of external monetary conditions compared to internal conditions in their impacts on economic growth.

The second cointegration relation identified is the following:

$$MMR = 53.044 - 20.88RER + 2.541INF - 2.032FFED \quad (5)$$

This relationship can be interpreted as an uncovered interest rate parity relation, where the domestic interest rate can be anticipated based on the exchange rate, inflation and the external interest rate. We note that MMR has positively influenced by the domestic inflation and negatively by extending exchange with the outside world. These contradictory forces show the degree of independence of our economy to external economic phenomena. This result indicates, in particular, the vulnerability of the Tunisian financial system. Therefore, Eq. (4) confirmed the role of monetary conditions on economic growth. We will specify, in the following, this role through an analysis of the shocks influence in an impulse study.

4.3. Analysis of shocks influence

The impulse analysis allows us to know the reactions of economic activity and inflation to monetary conditions shocks. The VECM model found in the previous section will be used under condition of the existence of two cointegration relations already identified. However, the results of the variance decomposition of LRGDP presented in Table 3 show that the economic growth is characterized by an important self-explanatory power.

The inflation rate has a significant effect on income. Indeed, following a positive shock on inflation, real GDP experienced a remarkable decline which becomes more important in medium-, and long-term. The exchange rate also has a negative effect on the economic growth, but with less amplitude.

Table 3. *Variance decomposition of LRGDP*

Period	LRGDP	LM2	RER	MMR	INF	FFED
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	99.20894	0.195937	0.046963	0.504294	0.008932	0.034929
3	97.93749	0.291288	0.102268	0.299723	0.755470	0.613758
4	97.11372	0.534572	0.200062	0.224528	0.611595	1.315527

5	96.26943	0.848263	0.231840	0.284681	0.549304	1.816479
6	95.52684	1.330086	0.256456	0.405800	0.497252	1.983569
7	94.94443	1.771230	0.288960	0.495818	0.491499	2.008062
8	94.52291	2.128462	0.329831	0.547962	0.483914	1.986918
9	94.21027	2.396753	0.368409	0.574494	0.480992	1.969078
10	93.95599	2.621252	0.401960	0.590735	0.473377	1.956682

Figure 4 presents the impulse response functions of LRGDP following to shocks on the other variables (LM2, RER, MMR, INF, and FFED). We observe that the interest rate, despite its importance as a crucial instrument in monetary policy, has failed to stimulate the level of economic growth. This instrument is disconnected from the productive system in the Tunisian economy. The importance of the inflation shock on the economic growth encourages us to reflect on the variance decomposition of INF and know its responses.

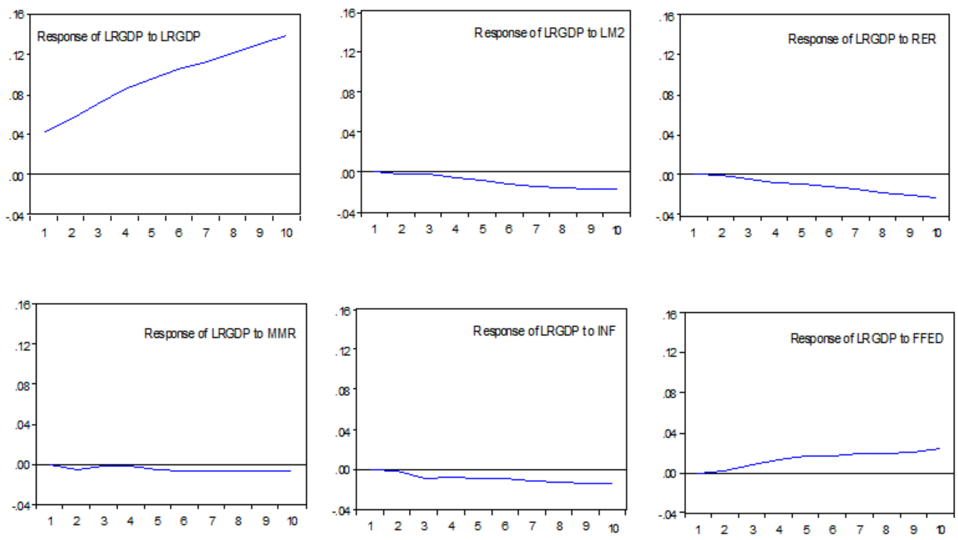

Figure 4. *Response functions of LRGDP*
Source: Authors' estimation based on the CBT dataset

The results of the variance decomposition of INF presented in Table 4 show that one quarter (25.16%) of the variability of this variable is explained in the long-term by the exchange rate and that one eighth (12.81%) is explained by the external interest rate.

Table 4. *Variance decomposition of INF*

Period	LRGDP	LM2	RER	MMR	INF	FFED
1	8.629918	1.534877	4.712191	0.728229	84.39478	0.000000
2	6.503276	4.048625	15.21957	3.140920	58.74829	12.33932
3	4.006216	2.567595	15.66587	1.972370	61.37464	14.41331
4	3.378562	2.070722	19.68637	1.708655	56.83706	16.31863
5	3.553556	2.466285	21.13397	1.677584	56.38667	14.78194
6	4.143401	2.403608	22.71125	1.518086	55.17899	14.04467
7	4.583277	2.255123	23.38165	1.340266	55.11324	13.32644
8	4.815910	2.055294	24.12952	1.198227	54.70275	13.09829
9	4.893907	1.901899	24.64655	1.079973	54.55623	12.92145
10	4.930475	1.788641	25.16160	0.988503	54.31438	12.81640

This decomposition is confirmed by the response functions to RER and FFED shocks on inflation (see Figure 5). Indeed, the responses of INF are positive and persistent. This shows that our economy is influenced by an imported inflation. We can conclude from this analysis of shocks the importance of inflation in the system of monetary and financial conditions. Inflation, by this fact, becoming the variable linking the financial conditions variables, especially external ones, with economic activity. The variables RER and FFED have an effect on economic activity through the inflation rate. This effect is then indirect. We observe that our economy is extremely dominated by external conditions. Indeed, the internal conditions, designated by the money supply and the interest rate, are insignificant in their contributions to the determination of the economic activity level and inflation compared to external conditions.

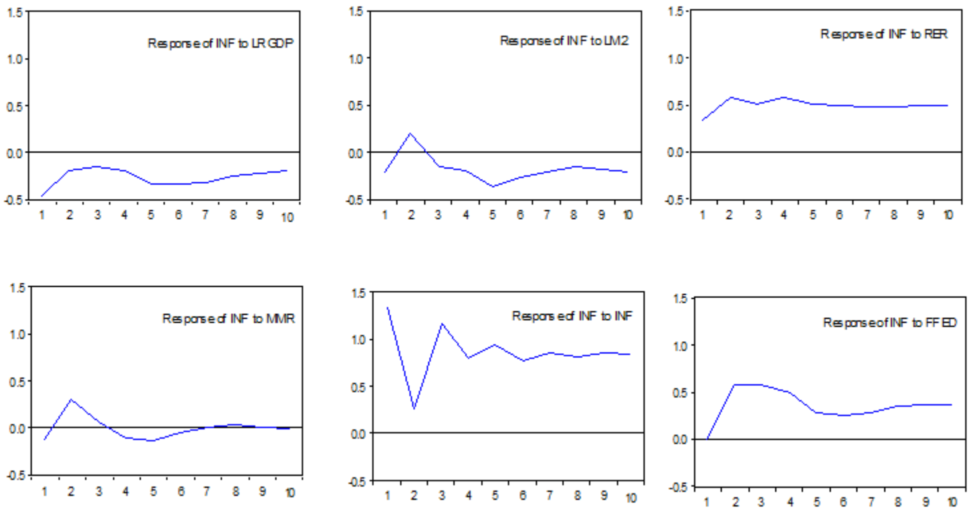

Figure 5. *Response functions of INF*
Source: Authors' estimation based on the CBT dataset

4.4. Estimation of SVAR model

The principle consists to impose constraints of identification, either long-term or instantaneous. In this study, we will only impose restrictions on the matrix of contemporary coefficients in the structural form. Given that our series of variables are non-stationary, the SVAR specification will be made on the variables in differences. By this purpose, our interpretation will be only for the short-run.

4.4.1. Identification of structural shocks

To identify shocks in the SVAR model, we use the order of variables according to the principle recommended by Peersman & Smets (2001) starting from the most to the least exogenous. In line with Bernanke & Mihov (1995), we introduce in head the variables representing non-monetary shocks, then those representing monetary shocks. Based on (i) Granger causality test on a VAR model using differenced variables (see Appendix 7) and founded on the (ii) theoretical framework and (iii) factual study, we imposed some selected constraints of identifications. The Granger causality test implies that there is: an effect of RER on FFED; an effect of LM2 and RER on LRGDP; an effect of FFED on INF; an effect of INF on MMR; an effect of LM2 on RER. Moreover, for theoretical considerations, we have imposed an inflationary influence of the monetary emission. In the context of short-run monetary illusion, we have introduced the effect of INF on real GDP growth. Though the stylized facts, we have note the dominance of external conditions on the Tunisian economy. For this purpose, we have imposed the effect of FFED on RER and INF. By this assumption, we can put in evidence the importance of the imported inflation. On the other side, we have ignored the causal effect of LRGDP, LM2, RER and MMR on FFED. Therefore, we have followed the order of variables in the SVAR as follows: FFED, LM2, INF, MMR, RER, and LRGDP.

However, the matrix writing which specifies the identification is based on the following equation:

$$Bu_t = A\ e_t \tag{6}$$

Where, B is a diagonal square matrix (6x6) of the coefficients (b_{ii}) associated with structural shocks orthogonal u_{it}, the matrix A of terms (a_{ij}), representing the constraints mentioned above, associated with the initial shocks of our system (residuals of the reduced VAR form).

$$\begin{pmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} \end{pmatrix} \begin{pmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \\ u_6 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 \\ 0 & 0 & a_{43} & 1 & 0 & 0 \\ a_{51} & a_{52} & 0 & 0 & 1 & 0 \\ 0 & a_{62} & a_{63} & 0 & a_{65} & 1 \end{pmatrix} \begin{pmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \\ e_5 \\ e_6 \end{pmatrix}$$

The codification of shock indices is as follows: (1) *FFED shock*; (2) *LM2 shock*; (3) *INF shock*; (4) *MMR shock*; (5) *RER shock*; (6) *LRGDP shock*. The likelihood ratio (LR) test confirms the acceptance of this form of identification. Indeed, the Chi-2 statistic associated with this test is 11.59 (p = 0.114 > 0.10) confirming the eligibility for our considered identification. In the light of these results, we can proceed to analyze the effects of structural shocks based on the works of Sims & Zha (1998), Kim & Roubini (2000), and Kim (2001).

4.4.2. The effects of structural shocks on economic activity

Figure 6 presents the impulse response functions of real economic activity (LRGDP) to structural shocks (FFED, LM2, INF, MMR, and RER). Compared to the impulse response functions estimated in unrestricted VAR, we find a slight modification of response functions. Indeed, we observe that only, LM2 and INF have significant effects on LRGDP. In addition, we have noticed that the monetary conditions related to exchanges with the outside world are determinants of the economic activity. In fact, a shock of RER affects negatively the level of economic activity (LRGDP) for at least two periods.

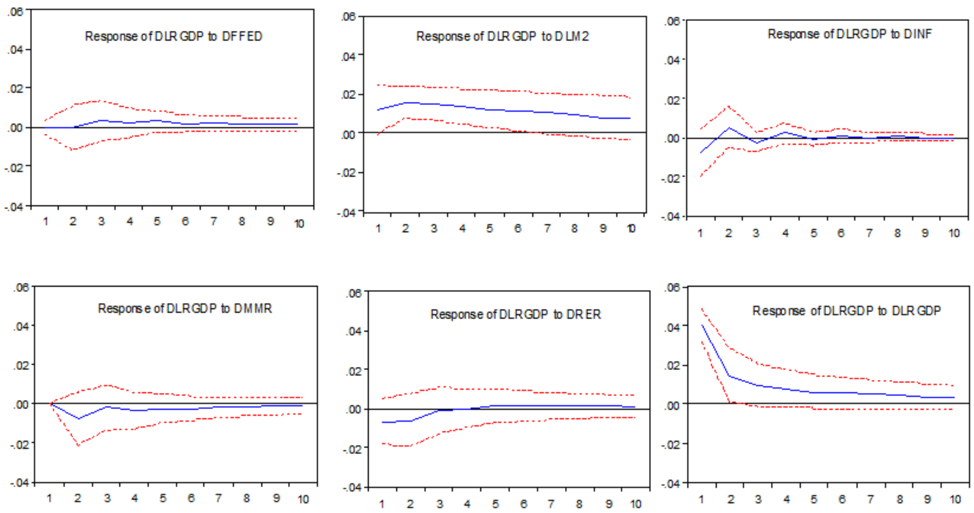

Figure 6. *Impulse response functions of DLRGDP to structural shocks*
Source: Authors' estimation based on the CBT dataset

For the decomposition variance of LRGDP (see Appendix 8a), we observe that LRGDP is characterized by a self-explanatory power for only one period (one year). The level of liquidity (LM2) plays an important role in the variability of economic activity for all predicted horizons. Moreover, the responses of LRGDP following to structural shocks appear low and insignificant. We observe a negative reaction of LRGDP to inflation and the exchange rate (RER). In contrast, the interest rates (MMR and FFED) have no effects on economic activity.

4.4.3. The effects of structural shocks on inflation

As already mentioned in the previous section, it seems that our economy is extremely influenced by an imported inflation. The result of SVAR model confirms this finding. Indeed, the FFED and RER shocks have significant effects on inflation rate in short-term and medium-term (see figure 7). Therefore, positive shocks on FFED or RER are likely to increase inflation in a direct way. In other words, the RER shock, representing a depreciation of the local currency, has detrimental effects on price stability and purchasing power. In addition, the analysis of the decomposition variance of INF (see Appendix 8b), shows, in first rank, the role of FFED variation in the variability of INF for all predicted horizons. In second rank, we find the contribution (6%) of MMR. The results highlight the action of monetary policy instruments on the price system and the demand for goods and services.

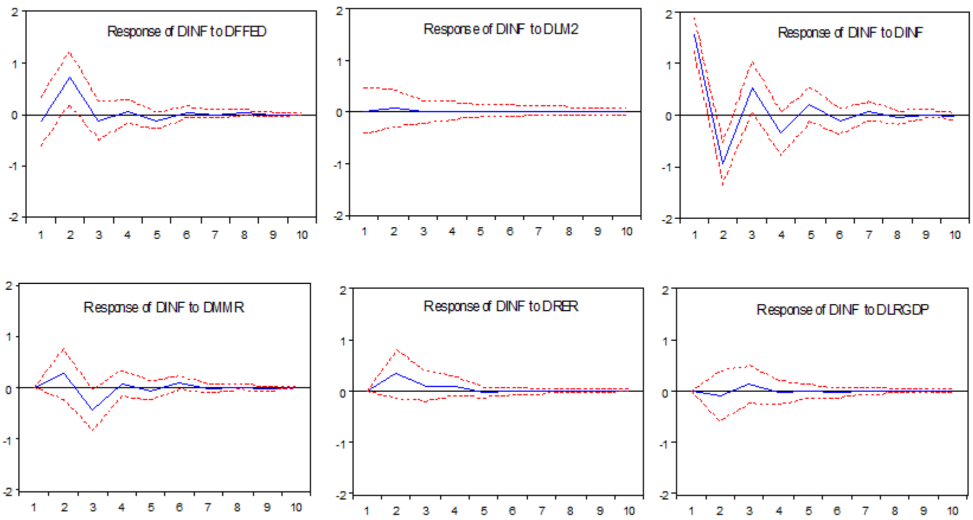

Figure 7. *Impulse response functions of DINF to structural shocks*
Source: Authors' estimation based on the CBT dataset

4.4.4. The effects of structural shocks on domestic interest rate

Despite its importance as a main instrument of monetary policy, the domestic interest rate leaves one potentially interesting question: why its contribution to the main macroeconomic aggregates is limited? Indeed, the inspection of the reaction functions of these macroeconomic aggregates confirmed its limited effect and the variance decomposition showed that its share does not exceed 6% in the best cases (see Appendix 8c).

Our concern is therefore to determine the sensitivity of this instrument to the other variables of the system in order to find out its major determinants. According to figure 8, which presents the impulse response functions of MMR to structural shocks (FFED, LM2, INF, RER, and LRGDP), we can conclude that MMR is mainly influenced by INF (12%). In second rank, we find the contribution of FFED (6%). It is observed that external financial conditions play a central role. However, the domestic aggregates (i.e. GDP and M2) have a close relationship.

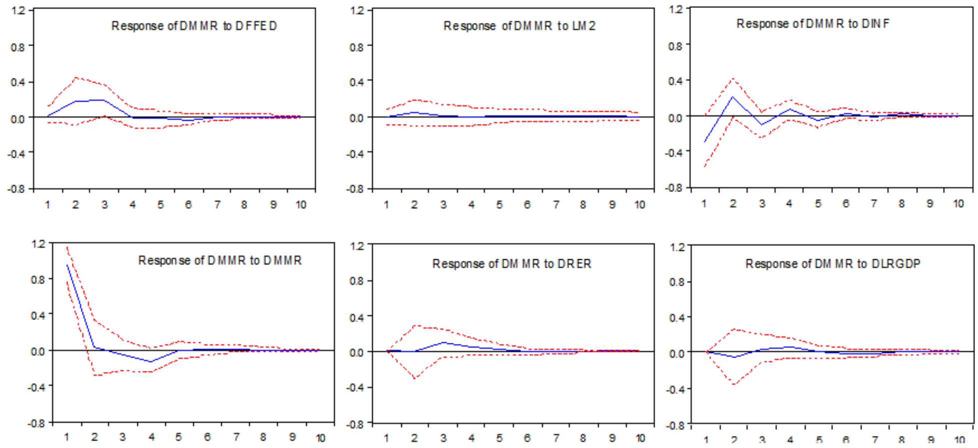

Figure 8. *Impulse response functions of DMMR to structural shocks*
Source: Authors' estimation based on the CBT dataset

5. Conclusions

In this paper we have focused on the construction of MCI for Tunisia and its application on the Tunisian economy. We have calculated the weights assigned to interest rate and the exchange rate based on the estimated coefficients respectively for these two indicators during the period 1965-2015. The found weights are 0.33 and 0.66, respectively for the real economy. The development of the MCI proposed in this work fits in the tools implementation framework for diagnosing the monetary conditions and monitoring monetary policy.

Our findings reveal that the Tunisia's monetary policy is more soft before the period 1985. This period is known as accommodative monetary policy. Thereafter until 2007, this policy becoming tight and more or less respect the norms of the monetary and financial liberalization strategy adopted within the SAP. Since 2008 – year of global financial crisis – we observed a return to an accommodative monetary policy, increasingly easy. Afterward, we have analyzed the effects of monetary policy shocks between the selected variables. For this purpose, we have applied VAR and SVAR models to find out the extent of the impact of exchange rates i.e. domestic interest rate, external interest rate and exchange rate on economic activity and inflation.

However, the specification of unrestricted VAR confirmed the presence of two long-run equilibrium relations. Therefore, the presence of a cointegration space is a first confirmation of the role of monetary conditions on economic activity. On this space, we have identified two equilibrium relationships. The first is assimilated to that of the IS equation in which the level of economic activity is explained by liquidity, interest rate and exchange rate. The second is identified as an interest rates parity relation, integrating the exchange rate and the external interest rate into the domestic interest rate equation. In addition, the analysis of shocks indicated that monetary conditions have a particular importance via their influence on the economic activity and inflation. The latter is characterized by its significant negative impact on economic activity and by its contribution in linking between internal and external interest rates.

Finally, we have examined through a SVAR model the short-run structural dynamics between the selected variables. In this model, we have identified the structural shocks based on VAR Granger causality tests, and theoretical and factual economic constraints. This model showed that our economy is highly influenced by internal and external monetary policy conditions. This influence is demonstrated through the dynamics of structural monetary policy shocks and exchange rates. Certainly, it appears that the monetary policy instruments and external financial conditions influence the price system and the demand for goods and services.

In summary, our main findings reveal that the exchange rates play an increasing role in transmitting the monetary policy effect to the inflation rate and thus the real economy. We recommend that to target inflation and guard against its harmful effects on economic activity, the monetary authorities should be adjusted their exchange rate policy and controlled the capital flows with the outside to avoid their detrimental implications on economic growth and thus the economic development.

Appendix

Appendix 1. *Augmented Dickey-Fuller (ADF) test*

Variable	ADF statistic	Prob.	Variable	ADF statistic	Prob.
RER	-1.6486	0.7582	d(TC)	-4.764**	0.0003
RIR	-2.0251	0.5754	d(TIR)	-13.875**	0.0000
MMR	-1.29120	0.6263	d(TMM)	-6.4779**	0.0000
LRGDP	-2.2566	0.5554	d(LPIBR)	-4.8347**	0.0016
INF	-1.5159	0.517	d(INF)	-12.9862**	0.0000
LM2	-2.2190	0.2024	d(LM2)	-4.1590**	0.0023
FFED	-2.7676	0.0707	d(FFED)	-5.1707**	0.0001

Notes: ** indicates significance at the 5% level

Appendix 2. *VAR lag order selection criteria*

Lag	LR	FPE	AIC	SC	HQ
0	NA	3.16e-05	-1.848482	-1.726832	-1.803368
1	35.44634*	1.96e-05*	-2.32554*	-1.83895*	-2.14509*
2	5.029093	2.60e-05	-2.052380	-1.200835	-1.736586
3	12.56987	2.75e-05	-2.012991	-0.796498	-1.561857
4	7.398898	3.36e-05	-1.842574	-0.261134	-1.256100

Notes: * indicates lag order selected by the criterion; FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion

Appendix 3. *VAR lag order selection criteria*

Endogenous variables: LRGDP LM2 RER MMR INF FFED
Exogenous variables: C

Lag	FPE	AIC	SC	HQ
0	0.009704	12.39202	12.63532	12.48225
1	7.21e-08	0.565362	2.268452*	1.196950
2	4.30e-08	-0.044431	3.118450	1.128518
3	2.82e-08	-0.719139	3.903534	0.995171
4	2.91e-08	-1.245611	4.836854	1.010061
5	1.86e-08*	-2.833230*	4.709026	-0.036198*

Notes: * indicates lag order selected by the criterion

Appendix 4. *Tests for normality of residuals*

VAR(1)				VAR(5)			
Component	Jarque-Bera	df	Prob.	Component	Jarque-Bera	df	Prob.
1	2.255459	2	0.3238	1	13.28558	2	0.0013
2	1.411599	2	0.4937	2	14.14402	2	0.0008
3	3.492019	2	0.1745	3	14.32524	2	0.0008
4	4.586089	2	0.1010	4	12.02684	2	0.0024
5	2.838599	2	0.2419	5	13.39269	2	0.0012
6	4.434060	2	0.1089	6	14.58244	2	0.0007
Joint	19.01782	12	0.0881	Joint	81.75681	12	0.0000

Appendix 5. *Determination of the number of cointegrating relations*

	Trace test			Lama-Max test		
H0 : r	Calculated value	Critical values (5%)	Prob.	Calculated value	Critical values (5%)	Prob.
0	131.4598*	103.8473	0.0002	57.43144*	40.95680	0.0003
1	74.02837	76.97277	0.0821	35.15501*	34.80587	0.0454
2	38.87336	54.07904	0.5276	13.43598	28.58808	0.9084
3	25.43739	35.19275	0.3742	10.89922	22.29962	0.7591
4	14.53817	20.26184	0.2540	8.536787	15.89210	0.4850
5	6.001378	9.164546	0.1906	6.001378	9.164546	0.1906

Appendix 6. *Admissibility test of the cointegration space*

Cointegration Restrictions: B(1,1)=1, B(1,5)=0, B(1,6)=0 (2,1)=0, B(2,2)=0, B(2,4)=1	
LR test for binding restrictions	
Chi-square	3,854883
Probability	0.14552

Appendix 7. *VAR Granger causality tests*

	Dependend variable e											
	DFFED		DLM2		DINF		DMMR		DRER		DLRGDP	
Excluded	Chi-2	Prob.	Chi-2	Prob.	Chi-2	Prob.	Chi-2	Prob.	Chi-2	Prob.	Chi-2	Prob.
DFFED			1.477	0.224	7.902	0.004	2.364	0.124	1.596	0.206	0.010	0.919
DLM2	4.893	0.027			0.237	0.626	0.367	0.544	3.147	0.076	7.262	0.007
DINF	0.522	0.469	0.529	0.466			2.825	0.092	0.709	0.399	1.254	0.262
DMMR	11.310	0.000	0.001	0.973	1.112	0.291			0.071	0.788	1.327	0.249
DRER	4.024	0.044	0.660	0.416	1.792	0.180	0.016	0.898			0.282	0.595
DLRGDP	3.079	0.079	3.387	0.065	0.143	0.705	0.118	0.730	1.224	0.268		

Appendix 8(a). *Variance decomposition of DLRGDP*

Period	DFFED	DLM2	DINF	DMMR	DRER	DLRGDP
1	0.004528	7.892332	3.294758	0.000000	2.377131	86.43125
2	0.023973	16.25356	3.553305	2.450121	3.181729	74.53731
3	0.409510	22.31732	3.356297	2.326603	2.849448	68.74082
4	0.512826	26.38461	3.182488	2.587380	2.598857	64.73384
5	0.708016	29.38615	3.002248	2.597185	2.482910	61.82350
6	0.755677	31.58656	2.869841	2.681078	2.408927	59.69791
7	0.813869	33.29684	2.763395	2.675673	2.368742	58.08148
8	0.842458	34.61062	2.683309	2.684741	2.335589	56.84328
9	0.876374	35.63921	2.619243	2.678041	2.313774	55.87336
10	0.899250	36.44201	2.569422	2.679936	2.296422	55.11296

Appendix 8(b). *Variance decomposition of DINF*

Period	DFFED	DLM2	DINF	DMMR	DRER	DLRGDP
1	0.734464	0.032973	99.23256	0.000000	0.000000	0.000000
2	12.63738	0.136942	82.74226	1.662407	2.610925	0.210086
3	11.51037	0.121026	79.75308	5.556897	2.525149	0.533479
4	11.22395	0.128468	79.93051	5.535324	2.654281	0.527471
5	11.44137	0.132792	79.74439	5.530419	2.630648	0.520381
6	11.40313	0.146824	79.63259	5.665497	2.616600	0.535359
7	11.38995	0.153300	79.64001	5.666112	2.614876	0.535751
8	11.39998	0.159313	79.62429	5.665497	2.615215	0.535712
9	11.39681	0.162758	79.61499	5.672307	2.614499	0.538640
10	11.39637	0.166202	79.61182	5.671768	2.614733	0.539104

Appendix 8(c). *Variance decomposition of DMMR*

Period	DFFED	DLM2	DINF	DMMR	DRER	DLRGDP
1	0.061318	0.002753	8.284617	91.65131	0.000000	0.000000
2	3.082036	0.197478	11.33042	85.11958	0.009014	0.261470
3	5.891262	0.210995	11.79991	80.90590	0.788856	0.403074
4	5.790319	0.208024	11.89899	80.51225	0.980858	0.609558
5	5.818362	0.216762	12.03228	80.31443	1.009259	0.608912
6	5.895708	0.229358	12.06367	80.18756	1.013513	0.610188
7	5.893117	0.243921	12.07158	80.16487	1.013966	0.612553
8	5.893776	0.253268	12.07700	80.14859	1.013839	0.613531
9	5.897975	0.260142	12.07722	80.13439	1.014672	0.615601
10	5.897348	0.265167	12.07673	80.12780	1.014961	0.617994

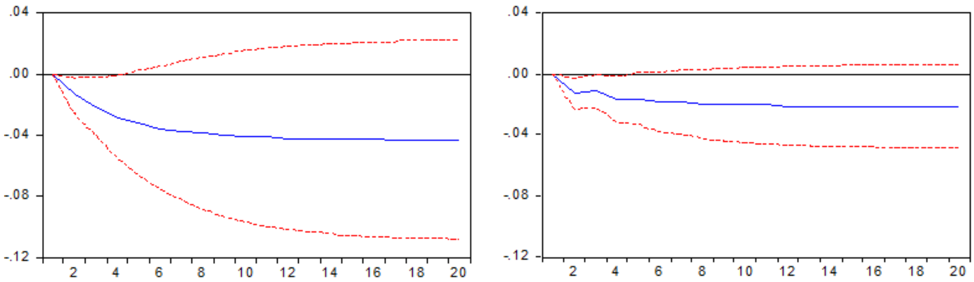

Figure A1. *Accumulated responses of DLRGDP*

References

Abubaker, M., & Yaaba, B.N. (2013). Post market reform analysis of monetary conditions index for Nigeria. *Journal of Economics and Sustainable Development*, 4(14), 2013.

Benazic, M. (2012). Monetary Conditions Index for Croatia. *Economic Research-Ekonomsk Istrazivanj*a, 25(1), 47-64. doi. 10.1080/1331677X.2012.11517556

Bernanke, B.S., & Mihov, I. (1995). Measuring monetary policy. *NBER Working Paper*, No.5145. doi. 10.3386/w5145

Dembo, T.M. (2012). Calcul de l'indice des conditions monétaires dans l'UEMOA. *Document d'Etude et de Recherche*, No.DER/12/01.

Dennis, R. (1997). A measure of monetary conditions. *Reserve Bank of New Zealand Working Paper*, No.G97/1. [Retrieved from].

Dickey, D., & Fuller, W. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49(4), 1057-1072. doi. 10.2307/1912517

Duguay, P. (1994). Empirical evidence on strength of the monetary transmission mechanism in Canada: an aggregate approach. *Journal of Monetary Economics*, 33(1), 39-61. doi. 10.1016/0304-3932(94)90013-2

El-Khadhraoui, S., & Ghattassi, I. (2012). Construction d'un Indicateur des Conditions Monétaires pour la Tunisie. *Central Bank of Tunisia Working Paper*, No.1-2012.

Freedman, C. (1994). The use of indicators and of the monetary conditions index in Canada. *In* T.J. Balino, & C. Cottareli, (Eds). *Frameworks for Monetary Stability: Policy Issues and Country Experiences*, International Monetary Fund, Washington, DC.

Frochen, P. (1996). Les indicateurs des conditions monétaires. *Bulletin de la Banque de France*, 30, 97-111.

Goux, J.F. (2003). Conditions monétaires et activité économique dans la Zone-Euro. *Working Paper du GATE*, No.2003-06. [Retrieved from].

Hataiseree, R. (1998). The roles of monetary conditions and the monetary conditions index in the conduct of monetary policy: The case of Thailand under the floating rate regime. *Bank of Thailand Quarterly Bulletin*. [Retrieved from].

Hyder, Z., & Khan, M.M. (2006). Monetary Conditions Index for Pakistan, *State Bank of Pakistan. Working Paper*, No.11/06.

Johansen, S. (1995). *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*. Oxford University Press, New York.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration with applications to the demand for money. *Oxford Bulletin of Economics and Statistics,* 52(2), 169-209. doi. 10.1111/j.1468-0084.1990.mp52002003.x

Kesriyeli, M., & Kocaker, I.I. (1999). Monetary Condition Index: A Monetary Policy Indicator for Turkey. *Central Bank of Republic of Turkey*, Discussion Paper, No.9908. [Retrieved from].

Kim, S., & Roubini, N. (2000). Exchange rate anomalies in the industrial countries: A solution with a structural VAR approach. *Journal of Monetary Economics*, 45(3), 561-586. doi. 10.1016/S0304-3932(00)00010-6

Kim, S. (2001). International transmission of the US monetary policy shocks: evidence from VAR's. *Journal of Monetary Economics*, 48(2), 339-372. doi. 10.1016/S0304-3932(01)00080-0

Kodra, O. (2011). Estimation of weights for the monetary conditions index in Albania. *Bank of Albania, Departmment Rerarch*, 7(30), 2011. [Retrieved from].

Mayes, D. G., & Virén, M. (2000). The exchange rate and monetary conditions in Euro Area. *Weltwirtschaftliches Archiv*, 136(2), 199-231. doi. 10.1007/BF02707686

Montagné, F., & Le Mestric, M. (2005). Les conditions monétaires et financières courantes et passées dans la zone euro et aux États-Unis. *Economie et Prévision*, 168(2), 157-166. doi. 10.3406/ecop.2005.7428

Montagné, F. (2005). Les indicateurs de la politique monétaire. *Economie et prévision*, 168(2), 149-155.

Peersman, G., & Smets, F. (2001). The monetary transmission mechanism in the Euro Area: More evidence from VAR analysis. *European Central Bank, Working Paper*, No.91. [Retrieved from].

Peeters, M. (1999). Measuring monetary conditions in Europe: Use and limitations of the monetary conditions index. *De Economist*, 147(2), 183-203. doi. 10.1023/A:1003638700879

Peng, W., & Leung, F. (2005). A monetary conditions index for Mainland China. *Hong Kong Monetary Authority Quarterly Bulletin*. [Retrieved from].

Reserve Bank of New Zealand. (1996). Summary indicators of monetary conditions. *Reserve Bank of New Zealand Bulletin*, 59(3), 223-228.

Sims, C., & Zha, T. (1998). Bayesian methods for dynamic multivariate models. *International Economic Review*, 39(4), 949-968. doi. 10.2307/2527347

Tobias, K. (2005). Estimating the monetary conditions index for South Africa. Paper presented at the Exchange Rate Econometrics conference, April 2005, Luxembourg. [Retrieved from].

Verdelhan, A. (1998). Construction d'un indicateur des conditions monétaires pour la zone euro. *Bulletin de la Banque de France*, 58, 1-8.

Vokshi, A. (2013). A monetary conditions index for Albania. *Annales Universitatis Apulensis Series Oeconomica*, 15(1), 205-213.