

## The evaluation of fiscal and monetary policy in Croatia over a business cycle\*

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### Abstract

*The aim of this paper is to evaluate the controversies of fiscal and monetary policies in defining business cycles in Croatia, i.e. to answer the question whether they can, and in what way, determine the cyclical movements. Using Hodrick-Prezcott filter for extracting cycles from selected macroeconomic variables for the period 1994-2013, this paper gives a reflection on the past relationship between the characteristics of Croatian fiscal and monetary policies by testing whether these two economic pillars are in fact coordinated over a business cycle. We found that both fiscal and monetary variables exhibit counter-cyclical behaviour with relatively weak correlation to the real GDP suggesting that they are coordinated during a business cycle but their reach is ambiguous. Finally, we conclude that fiscal and monetary policies in Croatia are constrained by internal and external factors, and thus they often cannot accomplish their counter-cyclical role.*

**Key words:** macroeconomic management, policy evaluation, fiscal policy, monetary policy, business cycles, Hodrick-Prezcott filter, Croatia

**JEL classification:** E30, E52, E61, E62

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\* Received: 10-02-2014; accepted: 06-06-2014

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## 1. Introduction

Inconsistency in macroeconomic policy and government failures in recognizing potential development moments lead to 'decision-making dilemma'; should economic policy be determined by a legislation rule or by a policymaker's discretion (Benazić and Tomić, 2013)? From time to time, economy can experience inflation and deflation stages that are persistent and long. These stages that last over one or more business cycles are often sufficiently long to be analyzed, allowing to some extent macroeconomic manoeuvrability. Many economists that dwell about '*market clearing*' grasp believe that fiscal and monetary policies can be coordinated to eliminate negative trends (gap) in output, unemployment and prices. The bigger the gap is, the stronger the impact of fiscal and monetary policies must be to have stabilizing effects on the economy. Optimal fiscal policy deals with the combination of taxes and debt return that maximizes welfare and is consistent with the government spending path (Manzano, Perez and Ruiz, 2005). Moreover, it is often questioned (even throughout theoretical debates between the Keynesian position, monetarist and rational expectation/real cycles revolution about the effectiveness of the active monetary policy) if monetary policy can directly affect performance of the real economy or can it be used only to eliminate or diminish shocks. Next relevant question is whether targeting price stability is really a legitimate way to ensure macroeconomic stability? There is a little doubt that cyclical property of fiscal and monetary policies is fascinating scientific field that proved to be the fundament for fierce debates in economic literature, as well as in professional circles.

Fiscal policy seeks to stabilize the economy by creating a negative feedback when income deviates from its potential level. Under pressure from fiscal changes, economy will be pushed to its potential level. Thus, if the demand is high and inflation threats loom, these changes will drag demand down. If the demand is weak and there also exists the problem of underemployed resources, changes in fiscal policy will push the demand up. The negative feedback loop is necessary but not sufficient condition for the stabilization process. If the economy operates with lags, which are fairly large compared to the fluctuations we tend to control, intervention can cause further destabilization, rather than mitigate the problems (Sharma and Tomić, 2012). Following the rise up of Keynesian theory, theoretical linkage between the monetary policy and business cycles has become an intriguing issue within macroeconomic policy. This relationship is somewhat arguable because there is still the question of size and the significance of monetary policy effects on business cycle dynamics. Contemporary orthodoxy holds that monetary authority has a central role in stabilizing the economy through its focus on price stability and in providing a stable and relatively trustworthy nominal ambience in which economic decisions are best made (Šimić, 2011). No doubt that transmission mechanism differs across countries. However, there is evidence in economic

literature that suggests money being one of the factors inducing business cycles, though not the only one.

Complexities of macroeconomic relations in Croatia reveal structural problems that dwell upon both fiscal and monetary policies. Besides ensuring sound public finance (which is the main objective), fiscal policy in Croatia needs to follow another objective i.e. tax harmonization within the European Union (plus limitation of Maastricht criteria). Croatia is a country with one of the highest shares of public revenue and expenditure in national product. The structure of revenues and expenditures seems to be a greater problem than their level. As Družić (2009) well points out, it is not in compliance with Croatian economic needs, let alone with European Union requirements. The macro indicators (deposit-investment ratio, national product growth, unemployment...) and micro-indicators (company business results, economic insolvency...) indicate that the tax capacity of the country is indeed overstrained, meaning that public consumption exceeds Croatian economic capacities. In addition to its volume, the structure of public consumption does not correspond to economic needs either because almost 50% of total public expenditure is asset and service expenditure which are often perceived as unproductive, concludes Družić (2009). Though we have witnessed important fiscal adjustments (introduction of value added tax, excise duties, tackling tax evasion, changes in pension (HZMO) and health (HZZO) insurance structures, etc.), high budget and external deficit that came out of the discrepancy between planned and budgeted fiscal targets points us to the mediocre quality of economic forecasting and lack of full political commitment to fiscal targets. Croatia has several fiscal rules, however it lacks an explicit – enforceable fiscal responsibility framework (World Bank, 2011). Due to a strong and prolonged economic crisis which was enhanced by late fiscal adjustments and credit rating downgrade, Croatia was pressured to make some fiscal cuts, however it seems that fiscal austerity brought only negative growth rates (though higher public revenues) and that will in the long-run probably result in serious fiscal problems undermining the welfare state. Let us review how monetary policy tackled the problem.

Monetary policy in Croatia is focused on one goal only and that is *exchange rate stability* (exchange rate anchor to euro) i.e. *price stability*. Although, high degree of the euroization of Croatian economy (78% of all saving and time deposits in 2012 were kept in foreign currency, such that the current crisis in Eurozone did not seriously erode faith in euro or dwindled faith in kuna) can explain why Croatian national bank (CNB) pursues this anchor policy, but the fact is that interest rate channel of monetary transmission does not function in the country (Benazić, 2012). The main characteristic feature of Croatian monetary system is that CNB does not use anchor policy to influence the balance of payment or GDP but only tries to preserve *eo ipso* a stability of the exchange rate as a precondition for a stable economic environment that is largely faced with foreign currency liabilities.

Limitations of monetary policy arise from both, external and internal vulnerability of Croatian economy. External vulnerability has burst out from unsustainable foreign debt, high balance of payment deficit, dependability on tourism and inflow of foreign currencies and also from the fact that the inflow of foreign capital was strongly correlated to the entry in the European Union. Internal vulnerability arises from large fiscal deficits and the structure of loans which are mostly denominated in foreign currency (Benazić and Tomić, 2013). Consequently, stable exchange rate regime of the CNB causes limitation in conducting monetary policy in Croatia since it is mostly directed towards neutralization of the external shocks and the stability of financial system. Is this not a primary objective of every monetary authority? The period of last global crisis certainly proved the audacity of CNB who helped the real economy not to lose its purpose by releasing and injecting relatively high banking reserves into banking system as a new liquidity boost.

The aim of this paper is to evaluate the controversies of fiscal and monetary policies in defining business cycles in Croatia, i.e. to answer the question can they and in what way determine the cyclical movements. Using Hodrick-Prescott filter (Hodrick and Prescott, 1997) for extracting cycles from selected macroeconomic variables for the period 1994-2013, this paper gives a reflection on the past relationship between the characteristics of Croatian fiscal and monetary policies by testing whether these two economic pillars are coordinated. Hence, due to a specific structure of the Croatian economy, our hypothesis is that fiscal and monetary policies are in fact coordinated over a business cycle. In conformity with the results, we will try to identify the variables that can be used as instruments and discuss their possible implications.

The rest of the paper is organized as follows. While Section 2 provides the theoretical background through literature review, in Section 3 we discuss the methodological concept of the research. Empirical analysis and results are introduced in Section 4, while Section 5 critically evaluates the effects of fiscal and monetary policies in Croatia. Finally, Section 6 provides the concluding remarks.

## **2. Literature review**

Business cycles at their peak can be very harmful for the whole economy. Atop, economic booms establish abruptly large profits for the entrepreneurial class and obstruct the way middle or 'working' class can earn constant incomes. These problems are often intensified by a strong increase in prices. At the bottom, business cycles produce negative growth rates, unemployment and poverty. Therefore, it is in interest of society to (try to) control cyclical behaviour of an economy. Although the concept of economic stability can be interpreted in many ways, it usually implies the stability of the whole economic system, and not of its parts. This brings us to the

next question: what is the objective of such policy: to ensure higher growth rates, to achieve full employment or to avoid price rampage. Moreover, stabilization policy has to be flexible too, because some market failures would not need to be corrected at all. Conventionally in the literature, most stabilization measures are attributed to monetary policy, whereas fiscal policy is commonly used as a counter-cyclical measure. However, both monetary and fiscal policies are of great importance for the stabilization process.

There is a large body of empirical work on the relationship between fiscal policy and business cycle. Consistent with the Keynesian and/or neoclassical perspective, empirical evidence of counter-cyclical fiscal policy can be found in Fiorito (1997), Agenor, McDermott and Prasad (1999), Fatas and Mihov (2001), Lane (2003), Kaminsky, Reinhart and Vegh (2004), Talvi and Vegh (2005), Alesina, Campante and Tabellini (2008), Lee and Sung (2007), etc. (extensive reflection on the literature can be found in Battaglini and Coate, 2008). Still, the counter-cyclical characteristic of fiscal policy is in fact a country (or a group of countries) or time specific. There are also papers that study pro-cyclical characteristic of fiscal policy: Gavin and Perotti (1997), Stein, Talvi and Grisanti (1998), Talvi and Vegh (2000), etc. (see Lee and Sung, 2007). Gavin and Perotti (1997) argue that decision-makers may not be able to use fiscal policies as stabilization tools due to stringent credit constraints that prevent them from borrowing during economic downturns. Additionally, these governments are also usually forced to run pro-cyclical policies since they are required to repay their debt. Talvi and Vegh (2000) reveal a pro-cyclical pattern in a wider sample of developing countries. There are few interesting papers that brought additional dimension to the analysis of cyclical behaviour within the fiscal policy research framework.

Using a comprehensive data-set of 22 members of the OECD and 72 non-OECD countries, and instrumental variable (IV) estimation, Lee and Sung (2007) showed that current expenditures, subsidies and transfers move counter-cyclically while taxes and capital expenditures move pro-cyclically. Namely, fiscal policy was found to respond asymmetrically over economic fluctuations (important implications for the issue of fiscal soundness) and that government works as a stabilizer (current expenditures and social security expenditures are key components in counter-cyclical response). Further, Caballero and Krishnamurthy (2004) suggested that the 'lack of financial depth' hinders the ability of governments to implement counter-cyclical fiscal policies. Their paper implies that governments are not able to adopt expansionary fiscal policies in bad times if they have limited access to (either domestic or external) funds and if expansionary fiscal policies worsen the quality of the country's assets. Calderon and Schmidt-Hebbel (2008) showed that countries are unable to conduct counter-cyclical fiscal policies if they: (1) lack wide access to domestic and foreign sources of financing, (2) exhibit lower levels of institutional quality, and (3) have multiple veto points in the political process —and, specially,

in the fiscal process (which is a feature of more democratic regimes). Their results are consistent with the statement that political distortions and market failures may explain the pro-cyclical bias of fiscal policies in many developing countries. To conclude: implementation of fiscal policy has many practical problems that are often burdensome and prone to criticisms thereby suggesting that it alone can not solve all the problems in the economy, hence monetary policy must go hand in hand.

Many economists emphasize the importance of empirical evidence between monetary and real variables as it provides information about the way in which private agents react to business cycles (shocks) and the way how monetary policy is managed in order to respond to these shocks. The real business cycle theory challenging Keynesian views suggest that economic fluctuations do not arise as the result of a monetary shock but from an external shock such as innovation. There are several ways to analyze the conceptual relation between monetary policy and business cycles. Most often we find studies that associate the volatility of monetary variables with the output volatility in a way they want to determine the nature of that relation (pro-cyclical or counter-cyclical) having in mind the possible time lags. Recent theories and empirical evidence provide more explicit scope of business cycles asymmetry which is important because if the cyclical asymmetries can be explained by the differences in monetary policy, then we could describe particular monetary phenomena within the observed asymmetry (Kakes, 1998). Interesting theoretical and empirical papers on the subject of measuring relation (at least in some aspects) between monetary policy and business cycles are: Kakes (1998), De Arcangelis and Di Giorgio (1999), Karame and Olmedo (2002), Korenok and Radchenko (2004), Rabanal (2004) Sorensen and Whitta-Jacobsen (2005), Korap (2006) etc. (extensive reflection on the literature can be found in Benazić and Tomić, 2013).

We found heterogeneous research patterns associated with business cycles analysis in Croatia. Ahec-Šonje (2000) and again Bačić and Vizek (2006, 2008) calculated composite leading indicator of the Croatian economy (CROLEI) whose purpose was to forecast classical business and growth cycles. On the other hand, Cerovac (2005) developed new composite indicators which have the purpose to identify and predict cyclical expansions and contractions. Šonje and Vrbanc (2000) examined the similarities in Central European economic area by analyzing the relationship between business cycles in Germany, Hungary, Czech Republic and Croatia. Vučković (2010) examined political business cycle theory by providing the overview of theoretical background and empirical analysis of opportunistic political cycles in Croatia. Recent research conducted by Jovančević and Arčabić (2011) provided interesting results: Croatian economy exhibits lower volatility and persistence of nominal and real macroeconomic variables during the business cycles compared to the EU countries. By analyzing relationship between monetary policy

and business cycles, Benazić and Tomić (2013) have taken two stands from which complexities in policy-making arise. First complexity defines the basic limitation of CNB in conducting at least a partial pro-growth monetary policy (this limitation is even more amplified by the Maastricht criteria which CNB has to follow). In such manner CNB consciously hands over its governing ability to predetermined rule of exchange rate stability. Second complexity is of conceptual nature and related to the former. Disproportion in lags/leads behaviour of the Croatian monetary variables (money supply, exchange rates, gross domestic product deflator, consumer prices) suggests that possible fine-tuning efforts could turn into unintended destabilizing forces because of uncertainty about contemporaneous economic activity as the data provides mixed signal such that there is no room for implementation of appropriate instruments for responding to emerging or expected economic conditions (Sprinkel, 1986). Further, Rukelj (2009) concluded that fiscal and monetary policies behave as substitutes both having dominant effect on economic activity only in the short-run, whereas in the medium and long-run economic activity is dominated by its own dynamics. This conclusion could have significant implications for our study.

### 3. Methodology

In order to evaluate cyclical components of fiscal and monetary policies we have followed the works of Stock and Watson (1998), Agresti and Mojon (2001), and Napoletano, Roventini and Sapio (2005). Though their work was based on Baxter-King filter, we used Hodrick-Prescott (HP) filter that has come to be recognised as standard method for removing long run movements from the time series in the business cycle literature<sup>3</sup>.

The problem of the optimal method to decompose a data series into two components (long term trend and stationary cycle) is still much debated. In the context of the business cycle analysis, this problem is much more important if the entire analysis that follows it is based on the results of such filtering method. Taking into consideration fairly large literature that is criticizing HP filter, Ravn and Uhlig (2002) emphasised that this filtering method withstood the test of time and the intensity of discussion and criticism remarkably well, so it appear it will most likely remain the standard method for detrending in theoretically oriented researches for a long time to come. The HP filter focuses at removing a smooth trend  $\tau_t$  from some given data  $y_t$  by solving next equation:

$$\min_t \sum_{t=1} ((y_t - \tau_t)^2 + \lambda((\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1}))^2) \quad (1)$$

<sup>3</sup> For an insightful analysis on different methods of filtering and their quantitative and qualitative effects within business cycle interpretations see Burnside (1998) and Canova (1999).

so the residual  $y_t - \tau_t$  is then commonly referred to as the business cycle component. This is actually a linear filter that requires previous specification of a parameter known as lambda ( $\lambda$ ). Giving the form of time series data (annually, quarterly or monthly) this parameter tunes the smoothness of the trend i.e. penalizes the acceleration in the trend component relative to the cycle component. Having both, intuitive and economic background, HP filter has been applied in a number of relevant studies (Kydland and Prescott (1977), Hansen (1985), Backus, Kehoe and Kydland (1992), Blackburn and Ravn (1992) etc.) but what is more important it has been an unavoidable filtering method used in empirical researches similar to ours, for example (De Arcangelis and Di Giorgio (1999), Šonje and Vrbanc (2000), Korap (2006), Jovančević and Arčabić (2011), etc.: see in Benazić and Tomić (2013)).

According to Stock and Watson (1998) and Napoletano, Roventini and Sapio (2005), co-movements between variables are revealed through the cross-correlation of the cyclical component of each series with the cyclical component of real gross domestic product as a benchmark variable, which is thought to represent the business cycle. This is the correlation between  $x_t$  and  $y_{t+k}$ , where  $x_t$  is the filtered series and  $y_{t+k}$  is the  $k$ -quarter lead of the filtered logarithm of real gross domestic product. A large positive correlation at  $k = 0$  (i.e. around lag zero) indicates procyclical behaviour of the series; a large negative correlation at  $k = 0$  indicates counter-cyclical behaviour; and no correlation indicates acyclical behaviour of the series. A maximum correlation at, for example,  $k = -1$  indicates that the cyclical component of the variable tends to lag the aggregate business cycle by one quarter. In other words, if the absolute maximum (or minimum) is achieved at some real gross domestic product lead, then the variable is denoted as *leading*, whereas it is called *lagging* in the opposite case<sup>4</sup>. Finally, *coincident* variables are those displaying the bulk of their cross-correlation with real gross domestic product at lag zero. Furthermore, calculated standard deviations are comparable across series only when the series have the same units. For the series that appear in logarithms, the units correspond to percentage deviations from trend growth paths. Further facts on the predictive ability of macroeconomic variables are obtained through bivariate (pairwise) Granger causality tests (Granger, 1969) between the real gross domestic product and other variables.

Therefore, in order to analyze the volatility we have calculated standard deviations (relative values) and cross-correlation (to estimate the degree to which two series are correlated) and autocorrelation (for finding repeating patterns) coefficients, introduced time lags/leads to evaluate time analogy between the variables and in addition, we have obtained bivariate (pairwise) Granger causalities to eliminate

<sup>4</sup> The concept of lags/leads is usually used to describe phase relations between the variables in time domain. Specifically it is a notion of a lag in time domain as a 'pure delay' in relationship.



any possible doubts on the subject. Since correlation does not necessarily imply causation in any meaningful sense, we introduced Granger (1969) which questions whether variable  $x$  causes variable  $y$ , as well as how much of the current  $y$  can be explained by past values of  $y$  and then to see if adding the lagged values of  $x$  can improve conclusions. Hence,  $y$  is said to be Granger-caused by  $x$  if  $x$  can help in predicting  $y$  or if coefficients on the lagged  $x$  are statistically significant. Again we have to accentuate that the statement 'Granger-cause' does not imply that one variable is the effect of the result of the other, because Granger causality measures precedence and information content, but does not by itself indicate causality in the more common use. We use bivariate (pairwise) regression of this form to test Granger causality between the observed variables:

$$y_t = a_0 + a_1 y_{t-1} + \dots + a_l y_{t-l} + b_1 x_{t-1} + \dots + b_l x_{t-l} + e_t \quad (2)$$

$$x_t = a_0 + a_1 x_{t-1} + \dots + a_l x_{t-l} + b_1 y_{t-1} + \dots + b_l y_{t-l} + u_t \quad (3)$$

The null hypothesis is that  $x$  does not Granger-cause  $y$  in the equation (2) and that  $y$  does not Granger-cause  $x$  in the equation (3). The F-statistics and supporting p-values are used for evaluation of joint hypothesis.

#### 4. Data and empirical analysis

Quarterly data presenting macroeconomic variables<sup>5</sup> for Croatia were collected from International Financial Statistics of IMF, Croatian National Bank statistics and Zagreb Stock Exchange for the period of 1994Q2 – 2013Q1. Data were seasonally adjusted using the Census X12 seasonal adjustment procedure and then linearised using the logarithmic transformation. In order to extract the business cycle component that presents the stationary cycle of the variable we used smoothing parameter  $\lambda$  of 1,600 which is the standard value for quarterly frequencies<sup>6</sup>.

The scope of this research is divided into two parts; one analysing the relation between real gross domestic product (*GDP\_real*) and real fiscal variables, and the other analysing the relation between real GDP and monetary variables. Such distinction can help in explaining past relationship between the characteristics

<sup>5</sup> Consistent statistical base for most of Croatian macroeconomic variables dates from 1997. Since the period prior to 1997 was characterized with inconsistency in availability and quality of data sources, we used estimates of quarterly gross domestic product and its compounds for the period 1994:1 – 1996:4 calculated by Mikulić and Lovrinčević (2000).

<sup>6</sup> Namely, Hodrick and Prescott favoured the choice of  $\lambda = 1,600$  based on the argument that a 5% deviation from trend per quarter is relatively moderate as is an 8% change in the trend component. They show that lambda can be interpreted as the variance of the business cycle component divided by the variance of the acceleration in the trend component if the cycle component and the second difference of trend component are mean zero (i.e. we have normally distributed variables).

of Croatian fiscal/monetary policy and business cycles and reveal us possible (effective) way for macroeconomic decision-makers to manage cyclical behaviour of the Croatian economy. Included fiscal variables<sup>7</sup> are: real general government consumption expenditure ( $G_{real}$ ), real (central government) budget revenue ( $REV_{real}$ ), real (central government) budget expenditure ( $EXPN_{real}$ ), real budget revenue to real GDP ratio ( $REV_{real}/GDP_{real}$ ), real budget deficit ( $DEF_{real}$ ) defined as real budget revenue over real budget expenditure where an increase (decrease) implies a budget surplus (deficit), then real government debt to real GDP ratio ( $GOV\_DEBT_{real}/GDP_{real}$ ), the Zagreb Stock Exchange debt index ( $CROBIS$ ) and the interest rate on 365-day treasury bills ( $T-BILLS(365)$ ). Included monetary variables<sup>8</sup> are: real money supply ( $MI_{real}$ ) deflated with the consumer price index, real total bank credits ( $CRED_{real}$ ), average money market interest rate ( $MMR-A$ ), overnight money market interest rate ( $MMR-O$ ), average long-term interest rate on kuna credits indexed in foreign currency ( $LTR$ ), yield curve spread ( $YIELD$ ), nominal exchange rate of kuna to euro ( $HRK/EUR$ ) where an increase (decrease) implies depreciation (appreciation) and real effective exchange rate ( $REER$ ) also deflated with the consumer price index where the increase implies real effective appreciation.

<sup>7</sup> All fiscal variables are deflated with consumer price index with the base year 2005=100. Central government data (collected from IFS) are defined according to GFS 2001 methodology. Countries are strongly encouraged to report their annual data using the GFS 2001 framework that is compatible with the ICS transmission system. However, if this is not possible, data using the GFS 1986 framework will be accepted and the IMF will convert them to the GFS 2001 framework prior to their dissemination. Since there are no quarterly fiscal data for Croatia at central government level for the observed period, we use IFS converted data.

<sup>8</sup> All money market variables are also deflated with the consumer price index. Real money supply and real effective exchange rate are given as index with the base year 2005=100. Due to the data unavailability, time series for the ratio of real central government debt in real GDP, CROBIS, T-BILLS (365) and yield curve start from 2003Q1. Since there are no consistent data on interest rate of government bonds, we will use average long-term interest rate on kuna credits indexed in foreign currency (LTR) to display long-term interest rate. Yield curve spread is calculated as the difference between the long and short-term interest rate, i.e. the long-term interest rate on kuna credits indexed to foreign currency and the interest rate on 365-day treasury bills. Contrary to the nominal exchange rate of kuna to euro, an increase in real effective exchange rate is indicating real effective appreciations because we used IFS statistics.

Table 1: Unit root tests

Variables	ADF test		PP test	
	Constant	Constant and trend	Constant	Constant and trend
	t-stat.		Adj. t-stat.	
GDP_real	-3.995043	-3.967988	-3.658124	-3.637061
REV_real / GDP_real	-3.821500	-3.795601	-3.841100	-3.813299
DEF_real	-5.604877	-5.558108	-5.686231	-5.636415
G_real	-4.468806	-4.436374	-3.515243	-3.486587
REV_real	-3.643277	-3.618368	-3.671983	-3.646162
EXPN_real	-3.524030	-3.497346	-5.268777	-5.228750
GOV_DEBT_real / GDP_real	-2.158595	-2.116303	-1.963611	-1.950362
CROBIS	-2.602924	-2.497774	-2.167993	-2.091974
T-BILLS (365)	-3.218810	-3.167976	-2.525749	-2.543913
MI_real	-3.395194	-3.364998	-3.433619	-3.422806
CRED_real	-3.705016	-3.664055	-2.904147	-2.867826
MMR-A	-4.962806	-4.941049	-4.311171	-4.284963
MMR-O	-5.778924	-5.795448	-4.180921	-4.098241
LTR	-5.948360	-5.975331	-7.372208	-7.337454
YIELD	-3.886449	-3.871638	-3.178416	-3.131425
HRK/EUR	-4.641788	-4.638569	-4.833329	-4.801661
REER	-3.807314	-3.786892	-3.481653	-3.463358

Note: Short-term and long-term interest rates, the interest rate on 365-day T-BILLS (365) and yield curve are not linearised. Due to the unavailability, data for the ratio of real central government debt in real GDP, CROBIS, T-Bills and yield curve start from 2003:1. For the implementation of ADF test the Akaike Information Criterion (AIC) is used. ADF test critical values (MacKinnon, 1996): constant: 1% level (-3.49), 5% level (-2.89), 10% level (-2.58); constant and trend: 1% level (-4.04), 5% level (-3.45), 10% level (-3.15). PP test critical values (MacKinnon, 1996): constant: 1% level (-3.49), 5% level (-2.89), 10% level (-2.58); constant and trend: 1% level (-4.04), 5% level (-3.45), 10% level (-3.15).

Source: Authors' calculation

After detrending selected variables, we applied unit root tests which results are presented within *Table 1*; since the cyclical component is assumed to be stationary i.e. it has to fluctuate around its mean. For this purpose we have used Augmented Dickey-Fuller test (1979) and Phillips-Perron test (1988). Generally, all tests confirmed the absence of unit root in the observed variables. Graphical displays also suggest that they are stationary in levels. Stationarity of a variable is an important property; otherwise a spurious cycle (if the data are difference stationary) might lead to artificial conclusions.

*Table 2* presents extracted cyclical components of both, fiscal and monetary variables, whereat we simply completed cross-correlations with lags/leads between the real GDP and selected variables. Namely, the sample standard deviation of a time series is the measure of series' variability and the correlation with real GDP is the measure of series' covariability. In addition to current correlation coefficients ( $t-0$ ), lag/lead analysis was also introduced in order to determine if some variables lag, lead or coincide with the fluctuations in real GDP.

In order to understand the presented tables it is first necessary to understand correlation as a measure of the linear relationship between two variables, the cross-correlation function (*Table 2*) as just the correlation of one time series versus lag/led version of the other i.e. real GDP, and the auto-correlation (*Table 3* in the Appendix) as the cross-correlation of a function and itself. Thus these tables display the time structure and the strength of the linear relationship, both internally (autocorrelation) and from one to another (cross-correlation). From the results we can see that there exists a great similarity between the cross-correlation of fiscal and monetary variables that might suggest their time analogy. Results on the bivariate Granger causality tests (*Table 4*) can be also found in the Appendix.

If we take standard deviations as a measure of volatility, by analyzing *Table 2* we can notice that almost all *fiscal variables* are highly volatile in comparison to real GDP. The most volatile variables are real budget revenue to real GDP ratio, real government debt to real GDP ratio, real central government budget revenue, real budget deficit and real central government expenditure. Furthermore, detailed analysis of cross-correlation coefficients suggest that most of the fiscal variables are weakly correlated to the real GDP.

Yet we cannot argue against few facts. Real budget revenue to real GDP exhibits counter-cyclical behaviour and is a leading variable, real budget deficit displays leading and pro-cyclical pattern, whereas real government consumption coefficients suggest that we have counter-cyclical and lagging variable. Both real budget revenues and real budget expenditures display similar (leading) characteristics in comparison to real GDP, however the signs of cross-correlation coefficients strongly differ over the time, so it is difficult to create a conclusion about their pro-cyclical or counter-cyclical behaviour, revealing some heterogeneity between the cyclical behaviours. Non-the-less, there are few indications from which we can consider real budget revenue as a pro-cyclical and real budget expenditure as a counter-cyclical variable. Real government debt to real GDP ratio exhibits a counter-cyclical behaviour and is a lagging variable, CROBIS displays pro-cyclical and leading relationship to real GDP, and finally interest rate on 365-day treasury bills demonstrates leading and counter-cyclical pattern. Generally, we can conclude that most of the fiscal variables in Croatia display counter-cyclical behaviour with relatively weak correlation to the real GDP.

Table 2: Business fluctuations of the Croatian economy

Variables	Std. Dev. (in %)	Cross-correlation to GDP (Corr (x <sub>t</sub> , y <sub>t+k</sub> ))											
		-4	-3	-2	-1	0	+1	+2	+3	+4			
GDP_real	2.74391												
Fiscal variables													
REV_real / GDP_real	8.0022	0.2661**	0.1854	0.0691	-0.0882	-0.2658*	-0.2582**	-0.2726**	-0.3046***	-0.2908**			
DEF_real	6.23550	0.1035	-0.0631	-0.0570	-0.0193	0.1884	0.2495**	0.1394	-0.0495	-0.1321			
G_real	3.70408	0.0617	-0.0044	-0.0523	-0.1248	-0.1159	-0.0631	-0.0368	-0.0032	-0.0468			
REV_real	7.63728	0.2581**	0.2352**	0.2103*	0.1773	0.0710	-0.0036	-0.1319	-0.2694**	-0.3246***			
EXPN_real	5.86143	0.2043*	0.2606**	0.2370**	0.1594	-0.0649	-0.1994*	-0.2156*	-0.2381**	-0.2530**			
GOV_DEBT_real / GDP_real	7.91239	-0.7658***	-0.7791***	-0.7597***	-0.6845***	-0.5462***	-0.3038*	-0.0391	0.2106	0.3882**			
CROBIS	3.60567	-0.6471***	-0.5589***	-0.3153**	-0.0617	0.1082	0.2197	0.3173**	0.4335***	0.5455***			
T-BILLS (365)	1.16970	0.5972	0.4683	0.2350	-0.0175	-0.2292	-0.3646**	-0.4610**	-0.5782***	-0.6233***			
Monetary variables													
M1_real	8.17822	0.1695	0.3017***	0.4011***	0.4380***	0.3351***	0.2575**	0.1422	0.0292	-0.1089			
CRED_real	5.9773	0.3616***	0.3005***	0.1963*	0.0895	-0.0269	-0.1924*	-0.3480***	-0.4825***	-0.3931***			
MMR-A	2.84368	0.3091***	0.2235*	0.0177	-0.1079	-0.1818	-0.1554	-0.1666	-0.1914*	-0.1078			
MMR-O	3.39262	0.2845**	0.1885	-0.0141	-0.1394	-0.2118*	-0.1666	-0.1393	-0.1317	-0.0533			
LTR	1.1414	0.0364	0.0978	0.1529	0.1407	0.0147	-0.1929*	-0.1525	-0.1314	-0.1702			
YIELD	0.98495	-0.5010***	-0.4648***	-0.3060*	-0.1247	0.0993	0.1722	0.2394	0.2944*	0.3249**			
HRK/EUR	1.67299	-0.1861	-0.1849	-0.3060***	-0.3195***	-0.2479*	-0.0864	0.0756	0.1200	0.1690			
REER	1.62220	0.4903***	0.5218***	0.4941***	0.3302	0.0811	-0.2484**	-0.4313***	-0.5276***	-0.5183***			

Note: \*\*\*, \*\*, \* denotes 1%, 5% and 10% significance levels respectively.

Source: Authors' calculation

The bivariate Granger causality tests shown in *Table 4* suggest that real GDP Granger cause real budget revenues and CROBIS, whereas between real GDP and real government debt to real GDP ratio as well as real GDP and interest rate on 365-day treasury bills, the causality runs in both directions.

Foregoing results lead us to conclude that Croatian recession was accompanied by an increase in fiscal burden i.e. deterioration of fiscal indicators. This does not come to us as a surprise because the fiscal policy of a small and open economy such as Croatia is destined to be limited in its reach. Namely, during the recession due to a deceleration in economic activity, a fall in budget revenues enforces fiscal consolidation (in respect to Maastricht criteria, Fiscal Stability Treaty and related Excessive Deficit Procedure-EDP); this can bring along a suspension in EU Funds utilization which implies additional curtailment of necessarily needed financial impulse and incapacity to increase real money supply. Therefore, we can say that Croatian government has its work cut out because it cannot act expansively by using its fiscal policy actively during recession.

Turning the attention to monetary domain, by analyzing *Table 2*, we can notice that all *monetary variables* are less volatile (except real money supply) in comparison to the fiscal variables with real money supply being the most volatile one, and nominal exchange rate of kuna to euro and real effective exchange rate being the least volatile ones. Such conclusions are not strange for Croatia, having in mind great internal and external imbalances as well as the fact that exchange rate stability is the key factor in maintaining the price stability; the fundamental aspiration of the CNB. Next, we can see that the long-term interest rate is less volatile than short-term interest rate. Furthermore, monetary variables are strongly correlated to the real GDP in comparison to fiscal variables, yet we can notice relatively weak cross-correlation coefficients between the monetary variables and the real GDP, again real money supply being the most correlated variable.

Real money supply is shown to be a pro-cyclical and lagging variable. The signs of cross-correlation coefficients regarding real credits strongly differ over the time, so it is difficult to create a conclusion about their pro-cyclical or counter-cyclical behaviour. Interest rates display lagging and counter-cyclical pattern. Yield curve spread exhibits a counter-cyclical behaviour and is a lagging variable. Nominal exchange rate of kuna to euro display lagging and counter-cyclical pattern. On the other side, real effective exchange rate exhibits pro-cyclical behaviour. This is because different statistical source lead us to different interpretations; an increase in nominal exchange rate of kuna to euro (source: CNB Statistics) implies depreciation, whereas an increase in real effective exchange rate (source: IFS Statistics) implies real appreciation. Following such domain-defined feature, we can conclude that both of the exchange rate indicators are in fact counter-cyclical variables. Overall, most of the monetary variables display similar statistical properties i.e. counter-cyclical behaviour and relatively weak correlation to the real GDP.

While, the Granger causality tests do provide additional evidence on the links between the real GDP and monetary variables; real GDP Granger cause real money supply, yield curve spread and nominal exchange rate of kuna to euro, we have determined the mutual causality between the real GDP and real effective exchange rate.

In general, by governing money supply we could influence business cycles in Croatia (but one must not forget high volatility related to this variable, which is a major limitation if we consider possible depreciation effect). Let's recall a mentioned limitation – increase in money supply would lead to a depreciation of kuna to euro. Due to great external imbalances, import dependency and indebtedness of Croatian economy<sup>9</sup> such action would increase debt repayments of different business sectors, import prices of raw materials (having *pass-through effect* on prices of domestic products) and prices of final goods and services. This is in compliance with CNB statement that depreciation would cause more damage than it would benefit Croatian economy (Hrvatska narodna banka, 2006). Considering the main objective of CNB, we may conclude that reliance on exchange rate as a factor inducing positive movements in business cycles is a highly unrealistic assumption within present state of Croatian economy.

Notice that CNB has also a limited influence in respect to interest rates which we can clearly see from low correlations coefficients between short-run interest rates and real GDP, as well as from its emphatic volatility. A logical conclusion since interest rate transmission channel actually does not work in Croatia meaning that monetary authority does not influence or administrate money market interest rates as for example in developed financial systems of the EU or United States). Moreover, an increase in money supply would lower money market interest rates, but it would also lead to a depreciation pressure on the bilateral exchange rate to euro (Benazić and Tomić, 2013). But we must bear in mind that most credits in Croatia are indexed in foreign currency and that over 90% of Croatian banks are owned by foreign subjects. This fact implies reevaluation of the possibility of influencing business cycle in Croatia. Providing that CNB tends to do so, it would have to apply specific monetary instrument, the so-called 'moral persuasion', through which it would compel banks to change interest rates in order to alter the course of the cycle. However, there is one major limitation to this logic also; basically, changes in interest rates can come as a result of recession in domestic market or in neighbouring countries.

<sup>9</sup> After gaining independence, Croatia developed in a highly open economy that liberalized fast in conformity to *Washington consensus*. Maybe this happened too quickly, because a young and uncompetitive economy such as Croatia was not ready for rivalry that the international markets and Neoliberalism brought. The result was strong growth of import and not so strong growth of export. It implied great external imbalances and import dependency. High export/import to GDP ratio and high trade deficit bear out the necessity of studying how import and export prices, exchange rate changes etc. shape Croatian trade and growth perspectives.

Furthermore, historical data suggest that expansion of Croatian economy was always followed by the exchange rate appreciation, and *vice versa* during recessions. Thus, the past depreciation of exchange rate of kuna was *de facto* aftermath and not CNB monetary instrument, as some would conclude. Reason for that could be found in the fact that capital inflow produced appreciation pressure on exchange rate of kuna, which also resulted in public expenditure biased growth of the Croatian economy. Reduced inflow of capital (especially during the crisis) manifested itself as an increase in demand for foreign currency (euro), creating depreciation pressures on exchange rate of kuna, meaning that CNB had to decrease money supply and act counter-cyclically. In such a manner, exiting a crisis becomes even harder (Benazić and Tomić, 2013).

If we know that exchange rate in Croatia holds the role of economic stabilizer rather than only a position of an active monetary instrument we can evaluate its movements. First, appreciation contributed to a lower inflation. Certainly, inflation would be much higher in the expansive years if the exchange rate of kuna had not caused appreciation effect. Second, we can notice a low exchange rate of kuna volatility probably because the exchange rate stability was the most important objective of CNB. By pursuing exchange rate of kuna stability during different phases of business cycle, CNB preserved macroeconomic stability, purchasing power of Croatian kuna, confidence in financial sector and positive expectations. Hence, balance sheet effect is very important. Namely, because of high levels of euroization exchange rate devaluation has recessionary impact on the economy; similarity with Fischer's 'Debt-Deflation Phenomenon' (Fisher, 1933).

Finally, we have observed the persistence of the variables (*Table 3*). Persistence indicates the length in which one variable stays within a phase of a business cycle. Both monetary and fiscal variables are persistent in a phase of a cycle for at least two periods, suggesting that variables fluctuate persistently and stabilize within specific economic periods. Most of the variables are persistent in three or even four periods, whereas real GDP, real general central government budget expenditures, CROBIS and interest rate on 365-day treasury bills showed no such characteristic which means that their cycle lasts a bit shorter.

## 5. Results and discussion

How can we then pull Croatian economy out of a recession? It is foremost that a solution is sought through attracting new foreign capital (FDI) that would increase money supply without an exchange rate effect. That would have an immense effect on the fiscal policy due to increased economic activity and consequently a rise in budget revenues. The EU accession in itself should boost the effect, mainly through EU funding programmes. However, we should also consider the future situation



when the EU funds would dry away either because of excessive deficit or due to a fall in country's rating (something that Croatia is already experiencing) – which would discourage foreign investors and diminish inflow of the foreign currencies creating additional depreciation pressure on the exchange rate, scaling down the money supply and pushing the Croatian economy deeper in recession. Thus, undisciplined fiscal policy and irrational budget expenditures could only worsen the already troubled situation. Furthermore, we must not forget the role of IMF with its positive and negative effects. The most significant positive effect is related to the inflow of new capital and consequential interest rate reductions, while the negative effects reflect in the loss of economic sovereignty in the decision-making and the fact that sometimes IMF measures may also be proved wrong (something that history has proved over-and-over again).

Another solution could be found in more active if not aggressive role of monetary policy. Monetary policy should encourage economic awakening by manipulating all available instruments. CNB has utilized some of the measures by lowering minimally required amount of foreign currency claims and banks' reserve requirements, by special lending programmes, syndicated loans with Croatian Bank for Reconstruction and Development (prior to the Funding for Lending, Risk Sharing Credits), etc. These measures did alleviate negative effects in the economy, but unfortunately did not stimulate real economic progress. In continuation, Croatian fiscal policy during recession also needed to be more expansion oriented. Particularly during economic downturns, foreign loans could increase real money supply and enhance economic activity whilst maintaining the exchange rate stability. Currently, this is not an option for Croatia due to an already excessive indebtedness, possible deterioration in international 'credit' ratings and a threat of interest rates increase. Therefore, when monetary policy is constrained by high level of currency substitution (euroization), fiscal policy should be the main counter-cyclical policy tool. However, that requires fiscal discipline in good times, of which, in Croatia, there was none. The relevance of so-called international rating for fiscal policy is of great concern for every country; fiscal reform, deficit and debt reduction, restoration of economic growth and structural reforms such as state privatizations, reforms of the business climate, labour law amendments, planned pension reforms etc., would definitely have a positive effect on international ratings. Thus, immediate fiscal consolidation is necessary, in order to prevent further worsening of fiscal position. We can conclude that if Croatian fiscal policy had been more responsible in good times, deficit/debt would have been lower and fiscal policy could have been used to help restore growth after the crisis. Finally, some other factors such as revival of the business climate, improved judicial system, diminished corruption and etc. could also improve effectiveness and coordination of fiscal and monetary policies in Croatia over different phases in a business cycle.

## 6. Conclusions

Our hypothesis was pointed towards testing whether fiscal and monetary policies in Croatia are coordinated over a business cycle in order to answer the question can they and in what way determine the cyclical movements. Results suggest that both fiscal and monetary variables exhibit counter-cyclical behaviour with relatively weak correlation to the real GDP which brings us to the conclusion that two economic policies are in fact coordinated during a business cycle; however, their practical reach is somewhat ambiguous. Namely, due to limitations that arise from different internal (exchange rate stability, fiscal austerity) and external factors (Maastricht criteria, Fiscal Stability Treaty), macroeconomic management in Croatia is confined in applicability of distinct economic measures within different stages of a business cycle. In such manner, fiscal and monetary authorities had consciously hand over its governing ability to predetermined rule of exchange rate stability and externally defined standards. Disproportion in lags/leads behaviour of the Croatian macroeconomic variables (for example real budget revenues and expenditures, money supply, exchange rates) suggest that possible fine-tuning efforts could turn into unintended destabilizing forces because with uncertainty about contemporaneous economic activity when data provide mixed signal there is no precision whatsoever for implementation of appropriate instrument for responding to economic shocks. Consequently, we conclude that fiscal and monetary policies in Croatia are constrained, therefore they often cannot accomplish their counter-cyclical role. Our paper is a supplement to the strand of literature in Croatia that tries to evaluate controversies over fiscal and monetary policies in a manner that it answers the question of compatibility i.e. coordination of these two economic pillars as well as it offers deep and constructive analytical commentary. There are two major shortcoming of this paper that a reader can detect. First is relatively short time series and second is the generalizability of some conclusions. Both can impose scantiness in economic reasoning; however, we find this argument as an incentive for further research that might include more complex methods of analysis and international comparison, especially with the EU countries. Not being evasive towards limitations, we believe that our conclusions could bear important implications for the Croatian macroeconomic management, especially for financial prospect and development perspective. In the times of economic downfall, due to a specific structure of the Croatian economy (high indebtedness, euroization, import dependency etc.) and the above mentioned policy constraints, fiscal and monetary authorities cannot resort to expansive economic measures. In other words, it means that macroeconomic management in Croatia needs to create such economic framework which will assure fiscal discipline, restructuring of the economy in every manner necessary, curtailment of a public and foreign debt and restoration of the faith in domestic currency (considering that Croatia is still not a part of EMU). Such tendency will surely enable adequate functioning of fiscal and monetary policies in Croatia.

## References

- Agenor, P., McDermott, C. J., Prasad, E. S. (1999) "Macroeconomic Fluctuations in Developing Countries: Some Stylized Facts", *IMF Working Paper*, No 99/35, pp. 1-45.
- Agresti, A. M., Mojon, B. (2001) "Some Stylized Facts on the Euro Area Business Cycle", *ECB Working Paper*, No 95, pp. 1-43.
- Ahec-Šonje, A. (2000) "Ekonomska prognostika u Hrvatskoj: CROLEI indeks", *Ekonomski pregled*, Vol. 51, No 5-6, pp. 579-605.
- Alesina, A., Campante, F. R., Tabellini, G. (2008) "Why is fiscal policy often procyclical?", *Journal of the European Economic Association*, Vol. 6, No 5, pp. 1006-1036.
- Backus, D. K., Kehoe, P. J., Kydland, F.E. (1992) "International Real Business Cycles", *The Journal of Political Economy*, Vol. 100, No 4, pp. 745-775.
- Bačić, K., Vizek, M. (2006) "CROLEI u novome ruhu: treba li nam novi prognostički indeks?", *Financijska teorija i praksa*, Vol. 30, No 4, pp. 309-344.
- Bačić, K., Vizek, M. (2008) "Forecasting business and growth cycles in Croatia", *Ekonomski pregled*, Vol. 59, No 11, pp. 646-668.
- Battaglini, M., Coate, S. (2008) "Fiscal policy over the real business cycle: A positive theory", *NBER Working Paper Series*, No 14047, pp. 1-57.
- Benazić, M. (2012) "Monetary conditions index for Croatia", *Economic Research – Ekonomski Istraživanja*, Vol. 25, Special Issue No 1, pp. 47-64.
- Benazić, M., Tomić, D. (2013) "Monetary policy and business cycles in Croatia" In: Gonan Božac, M. and Ribnikar, I. ed. *The Future of Economics: Between Rules and Discretion*, Pula: Juraj Dobrila University of Pula.
- Blackburn, K., Ravn, M. O. (1992) "Growth, Human Capital Spillovers and International Policy Coordination", *Scandinavian Journal of Economics*, Vol. 95, No 4, pp. 495-515.
- Caballero, R., Krishnamurthy, A. (2004) "Fiscal Policy and Financial Depth", *NBER Working Paper Series*, No 10532, pp. 1-20.
- Calderon, C., Schmidt-Hebbel, K. (2008) "Business cycle and fiscal policies: The role of institutions and financial markets", *Central Bank of Chile Working Paper*, No 481, pp. 1-68.
- Burnside, C. (1998) "Detrending and business cycle facts: A comment", *Journal of Monetary Economics*, Vol. 41, pp. 513-532.
- Canova, F. (1999) "Does Detrending Matter for the Determination of the Reference Cycle and the Selection of Turning Points?", *The Economic Journal*, Vol. 109, pp. 126-50.
- Cerovac, S. (2005) "Novi kompozitni indikatori za hrvatsko gospodarstvo: prilog razvoju domaćeg sustava cikličkih indikatora", *HNB Istraživanja*, No I-16, pp. 1-35.

- De Arcangelis, G., Di Giorgio, G. (1999) "Monetary policy shocks and transmission in Italy: A VAR analysis", *Economics Working Papers*, No 446, pp. 1-47.
- Dickey, D.A., Fuller, W.A. (1979) "Estimators for autoregressive time series with a unit root", *Journal of the American Statistical Association*, No 74, pp. 427-431.
- Družić, G. (2009) *Croatian Economic Development and the EU: Potentials and Perspectives*, Zagreb: Školska knjiga.
- Fatas, A., Mihov, I. (2001) "Government size and automatic stabilizers: international and intranational evidence", *Journal of International Economics*, Vol. 55, No 1, pp. 3-28.
- Fiorito, R. (1997) "Stylized Facts of Government Finance in the G-7", *IMF Working Papers*, No 97/142, pp. 1-54.
- Fisher, I. (1933) "The Debt-Deflation Theory of Great Depressions", *Econometrica*, No 1933, pp. 337-357.
- Gavin, M., Perotti, R. (1997) "Fiscal policy in Latin America", In: Bernanke, B.S., Rotemberg, J. ed. *NBER Macroeconomics Annual 1997, Vol. 12*, Massachusetts: MIT Press.
- Granger, C. W. J. (1969) "Investigating causal relations by econometric models and cross spectral methods", *Econometrica*, Vol. 37, No 3, pp. 424-438.
- Hansen, G. D. (1985) "Indivisible labor and the business cycle", *Journal of Monetary Economics*, Vol. 16, No 3, pp. 309-327.
- Hodrick, R. J., Prescott, E. C. (1997) "Postwar U.S. Business Cycles: An Empirical Investigation", *Journal of Money, Credit and Banking*, Vol. 29, No 1, pp. 1-16.
- Hrvatska narodna banka (2006) *Analiza inozemne zaduženosti Republike Hrvatske*. Zagreb: HNB (Ostale publikacije).
- Jovančević, R., Arčabić, V. (2011) "Usporedba karakteristika poslovnih ciklusa u Europskoj Uniji i Republici Hrvatskoj", In: Obadić, A., Šimurina, J., Tica, J. ed. *Kriza: Preobrazba ili propast?*, Zagreb: Ekonomski fakultet Zagreb.
- Kakes, J. (1998) "Monetary transmission and business cycle asymmetry" Presented at: *Gronin-gen, the Netherlands, December 1997 and at EEA98, Berlin, Germany, September 1998*, pp. 1-28. Available from: <<http://som.eldoc.ub.rug.nl/FILES/reports/1995-1999/themeC/1998/98C36/98c36.pdf>> [Accessed November 14, 2013].
- Kaminsky, G.L., Reinhart, C.M., Vegh, C.A. (2004) "When It Rains, It Pours: Procyclical Capital Flows and Macroeconomic Policies", *NBER Macroeconomics Annual 2004*, Vol. 19, pp. 11-82.
- Karame, F., Olmedo, A. (2002) "The Asymmetric Effects of Monetary Policy Shocks: A Nonlinear Structural VAR Approach", Presented at: *The XIX International Conference on Monetary Economics and Banking*, Lyon, France, June 2002.
- Korap, L. (2006) "An essay upon the business cycle facts: the Turkish case", *MPRA Paper*, No 21717, pp. 1-28.

- Korenok, O., Radchenko, R. (2004) "Monetary Policy Effect on the Business Cycle Fluctuations: Output vs. Index Measure of the Cycle", *EconWPA*, No 0409015, pp. 1-45.
- Kydland, F. E., Prescott, E.C. (1977) "Rules Rather than Discretion: The Inconsistency of Optimal Plans", *The Journal of Political Economy*, Vol. 85, No 3, pp. 473-492.
- Lane, R.P. (2003) "Business Cycles and Macroeconomic Policy in Emerging Market Economies", *Trinity Economics Papers*, No 20032, pp. 1-24.
- Lee, Y., Sung, T. (2007) "Fiscal Policy, Business Cycles and Economic Stabilisation: Evidence from Industrialised and Developing Countries", *Fiscal Studies*, Vol. 28, No 4, pp. 437-462.
- MacKinnon, J. G. (1996) "Numerical Distribution Functions for Unit Root and Cointegration Tests", *Journal of Applied Econometrics*, Vol. 11, pp. 601-618.
- Manzano, B., Perez, R., Ruiz, J. (2005) "Identifying optimal contingent fiscal policies in a business cycle model", *Spanish Economic Review*, Vol. 7, pp. 245-266.
- Mikulić, D., Lovrinčević, Ž. (2000) "Procjena tromjesečnog BDP Republike Hrvatske za razdoblje od prvog tromjesečja godine 1994. do četvrtog tromjesečja godine 1996.; rashodovni pristup", *Ekonomski pregled*, Vol. 51, No 9-10, pp. 1006-1032.
- Napoletano, M., Roventini, A., Sapio, S. (2005) "Are Business Cycles All Alike? A Bandpass Filter Analysis of Italian and US Cycles", *LEM Working Paper Series*, No 2004/25, pp. 1-36. Available from: <<http://www.lem.sssup.it/WPLem/files/2004-25.pdf>> [Accessed November 14, 2013].
- Phillips, P. C. B., Perron, P. (1988) "Testing for a Unit Root in Time Series Regression", *Biometrika*, Vol. 75, No 2, pp. 335-346.
- Rabanal, P. (2004) "Monetary Policy Rules and the U.S. Business Cycle: Evidence and Implications", *IMF Working Papers*, No 04/164, pp. 1-26.
- Ravn, M. O., Uhlig, H. (2002) "On Adjusting the Hodrick-Prescott Filter for the Frequency of Observation", *The Review of Economics and Statistics*, Vol. 84, No 2, pp. 371-376.
- Rukelj, D. (2009) "Modelling Fiscal and Monetary Policy Interactions in Croatia Using Structural Vector Error Correction Model", *Privredna kretanja i ekonomska politika*, Vol. 19, No 121, pp. 27-58.
- Sharma, S., Tomić, D. (2012) *Ekonomska politika i makroekonomski management*, Zagreb: Mikrorad.
- Sorensen, P., Whitta-Jacobsen, H. (2005) *Introducing Advanced Macroeconomics: Growth and Business Cycles*, McGraw-Hill.
- Sprinkel, B. W. (1986) "Monetary Policy and Business Cycle", *Cato Journal*, Vol. 6, No 2, pp. 365-367.
- Stein, E., Talvi, E., Grisanti, A. (1998) "Institutional Arrangements and Fiscal Performance: The Latin American Experience", *NBER Working Paper Series*, No 6358, pp. 1-49.

- Stock, J. H., Watson, M. W. (1998) "Business Cycle Fluctuations in U.S. Macroeconomic Time Series", *NBER Working Paper Series*, No 6528, pp. 1-83.
- Šimić, V. (2011) "Monetary policy frameworks and the role of central bank in the economies of Central and Eastern Europe" In: *Proceedings of 5<sup>th</sup> International Scientific Conference "Entrepreneurship and Macroeconomic Management: Reflections on the World in Turmoil"*, 24-26 March, Pula, Juraj Dobrila University of Pula, Department of Economics and Tourism "Dr. Mijo Mirković", pp.1044-1067.
- Šonje, V., Vrbanc, I. (2000) "Mjerenje sličnosti gospodarskih kretanja u Srednjoj Europi: povezanost poslovnih ciklusa Njemačke, Mađarske, Češke i Hrvatske", *HNB Istraživanja*, No I-5, pp.1-18.
- Talvi, E., Vegh, C.A. (2000) "Tax base variability and procyclical fiscal policy", *NBER Working Paper Series*, No 7499, pp. 1-36.
- Vučković, V. (2010) "Političko-poslovni ciklusi: postoje li u Hrvatskoj?", *Privredna kretanja i ekonomska politika*, Vol. 20, No 125, pp. 61-88.
- World Bank (2011) *Fiscal Responsibility Framework in Croatia: Lessons from the Past, Rules for the Future*. The World Bank: (*Croatia Policy Notes – The World Bank Document*) Available from: <<http://documents.worldbank.org/curated/en/2011/07/16406447/fiscal-responsibility-framework-croatia-lessons-past-rules-future>> [Accessed November 14, 2013].

## Appendix

Table 3: Autocorrelations (ACF) – (persistence analysis)

Variables	t+1	t+2	t+3	t+4
GDP_real	0.7341***	0.4219***	0.1393	-0.0496
REV_real / GDP_real	0.6748***	0.4465***	0.2681**	0.1304
DEF_real	0.3414***	0.0364	-0.2254**	-0.3198***
G_real	0.7165***	0.4599***	0.1391	-0.0956
REV_real	0.6988***	0.4818***	0.2598**	0.1056
EXPN_real	0.4568***	0.3789***	0.1226	0.0282
GOV_DEBT_real / GDP_real	0.8679***	0.6833***	0.5134***	0.3475**
CROBIS	0.7604***	0.3623**	0.0555	-0.1059
T-BILLS (365)	0.7996***	0.4858***	0.1983	-0.0530
M1_real	0.8269***	0.6812***	0.4715***	0.2828**
CRED_real	0.8352***	0.6032***	0.3908***	0.1639
MMR-A	0.6403***	0.3069***	-0.0299	-0.2478**
MMR-O	0.6668***	0.3161***	-0.0758	-0.3364***
LTR	0.1656	0.0979	-0.2117*	-0.2661**
YIELD	0.7071***	0.3513**	0.0140	-0.2803*
HRK/EUR	0.6353***	0.3744***	0.2180*	0.0497
REER	0.7494***	0.4682***	0.2204*	0.0174

Note: \*\*\*, \*\*, \* denotes 1%, 5% and 10% significance levels respectively.

Source: Authors' calculation

Table 4: Bivariate (pairwise) Granger causality tests

Variables	Cause real GDP		Real GDP caused	
	F-stat.	Prob.	F-stat.	Prob.
REV_real / GDP real	0.80120	0.5532	1.90074	0.1076
DEF_real	0.98536	0.4343	1.15437	0.3422
G_real	0.79416	0.5581	0.65002	0.6626
REV_real	0.94547	0.4585	2.25697	0.0601
EXPN_real	0.77825	0.5693	1.21331	0.3140
GOV_DEBT_real / GDP_real	3.39218	0.0178	3.01044	0.0292
CROBIS	2.08599	0.1009	5.03617	0.0025
T-BILLS (365)	6.14661	0.0008	5.24357	0.0020
M1_real	1.56877	0.1827	3.26376	0.0113
CRED_real	5.41089	0.0004	0.44333	0.8164
MMR-A	0.69104	0.6322	1.12849	0.3552
MMR-O	0.60995	0.6926	1.00228	0.4243
LTR	2.26860	0.0589	0.46750	0.7989
YIELD	1.37502	0.2672	2.56546	0.0526
HRK/EUR	1.26189	0.2922	2.85734	0.0222
REER	2.28486	0.0574	6.14525	0.0001

Note: Bivariate (pairwise) models with each variable and the real GDP, and five lags.

Source: Authors' calculation



## Ocjena fiskalne i monetarne politike u Republici Hrvatskoj tijekom poslovnog ciklusa

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### Sažetak

U radu se teži vrednovanju učinaka fiskalne i monetarne politike u Hrvatskoj tijekom poslovnog ciklusa. Korištenjem Hodrick-Prescott filtra za izdvajanje cikličkog kretanja iz makroekonomskih varijabli za razdoblje 1994.–2013., ovaj rad povijesno povezuje odnose fiskalne/monetarne politike u Hrvatskoj testiranjem hipoteze jesu li ova dva ekonomska stupa zapravo koordinirana tijekom poslovnog ciklusa. Utvrdili smo kako i fiskalne i monetarne varijable pokazuju protu-cikličko kretanje i relativno slabu povezanost s realnim BDP-om, što nam sugerira da su dvije ekonomske politike zaista koordinirane, međutim njihov doseg je ograničen. U konačnici, zaključak je da su fiskalna i monetarna politika u Hrvatskoj ograničene internim i eksternim faktorima i stoga često ne mogu ispunjavati svoju protu-cikličku ulogu.

**Ključne riječi:** makroekonomski management, ocjena ekonomske politike, fiskalna politika, monetarna politika, poslovni ciklusi, Hodrick-Prescott filter, Hrvatska

**JEL klasifikacija:** E30, E52, E61, E62

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