Macroeconomic dynamics in China, Laos and Vietnam: a VAR analysis

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Abstract

The surprising resilience of current communist states towards democratic opening and a mainstream neoliberal economic 'way-of-life' in the past did not hamper their economic performances and development perspectives as much as we would expect. In the countries that are one-party states, in which the institutions of the ruling party and the state have become intertwined, ostensibly arguing for political and economic equality, still maintaining a firm control over the economic resources, we could expect economic relationships that are au contraire modern economic trends. However, China for example, a supposedly communist economy, with its breath-taking socio-economic progress, elusively ignores mainstream economic vocation, progressively advancing towards establishing itself as a sacrosanct economic force. In that manner, the goal of this paper is to (1) evaluate the dynamics of relevant macroeconomic variables in three current communist states (China, Laos and Vietnam) in order to (2) expose possible deviations to modern capitalist trends as well as to (3) provide relevant information that can serve as a guideline for macro policies. For that purpose, we analyzed the relationship between the GDP, price, money and the exchange rate by using VAR modeling. Results revealed coherent macroeconomic dynamics with a causality that is in accordance to a common capitalist economic framework.

Keywords: macroeconomic shocks, macroeconomic dynamics, current communist states, central planned economic systems, VAR analysis

Introduction

During the 20th century, communist countries could be found all over the world, from Latin America, over to Eastern Europe and from Africa to far Asia. Now, in 2020, we can note down only five so-called communist states; these are

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China (PRC), Cuba, Laos, Vietnam and North Korea (DPRK); whereas the last one is considered to be a communist country, it does not label itself to be one, for it removed every possible reference to communism from its constitution. Putting aside reasonable political grounds and legitimate arguments, we can unambiguously detect four communist states. Those four countries tell us different development stories, as Laos can be classified as the least developed countries, whereas China, Laos and Vietnam are considered to be developing countries. On the other hand, China's rising prominence in the world economy suggests that its government has put considerable effort towards economic efficiency, which made the country a mayor player on a global scale through the increased trade and openness. Today, China is considered as one of the most fast-growing economies, but despite being the world's second largest economy with enormous political, economic and social influence, it is still labelled as developing country with relatively low per capita income. None-the-less it would not be wrong to (at least by its economic leverage) consider China as a developed country, too. Economic indicators reveal different levels of economic progress between these countries; however, their surprising resilience towards a more democratic opening and a mainstream neoliberal economic 'way-of-life' in the past did not hamper their economic performances and development perspectives as much as we would expect. In the countries that are (in their functioning) one-party states, in which the institutions of the ruling party and the state have become intertwined, ostensibly arguing for political and economic equality, while still maintaining a firm control over the economic resources, we could expect economic relationships that are au contraire modern economic trends. On the other hand, in many Central and East European countries, the political globalization was enhanced by the process of EU adhesion; however, many of these economies which have embraced capitalism and global economic framework have soon faced the problem of increased economic volatility and social inequality (Diaconu and Bayar, 2020). Yet, as we already mentioned, China with its breath-taking socio-economic progress, elusively ignores the mainstream economic vocation, progressively advancing towards establishing itself as a sacrosanct economic force, Cuba and Vietnam with their distinct macroeconomic management postulates are gaining ground, and even Laos has made an impressive progress in human development and poverty reduction. Competition, necessity for timely reforms and the global recession drove those countries towards a more dynamic growth and improvement in living standards. The real question is: are these countries so differently functioning in comparison to a prevailing neoliberal free-market economic concept or not? Hence, do the same economic laws apply for all or not?

Since this study is not focused on analyzing the leading macroeconomic trends and policies in these communist states, but has an intention of revealing the intrinsic dynamics of those specific political and economic systems, we will not go into the description and interpretation of economic data; yet we will provide an extensive literature review on macroeconomic points that are of relevance for our research.

The main goal of this study is, therefore, to investigate the dynamics of gross domestic product (GDP), price, money and the exchange rate in three declared communist countries, namely China, Laos and Vietnam. We excluded Cuba, as data for that country are not available on a consistent time scale. Our approach would provide a deeper view of the factors in determination of mutual relationship between those relevant economic variables with empirical evidence. This study has several motivations to inspect: (1) the first motivation is related to identifying whether there exists a short- or long-run relationship between the variables; (2) second, this study uses vector autoregressive (VAR) modelling which can provide relevant information on the dynamics of the relationship and serve as a guideline for macro policy, and (3) finally, this study tries to reveal similarities between the selected countries as well as to expose possible deviations to mainstream trends in capitalists economies. These variables are selected for they are generally accepted as one of the key macroeconomic variables, in accordance with economic theory and empirical evidence. Results revealed rather coherent macroeconomic dynamics with causality that is compatible to a standard economic framework.

The rest of the paper is organized as follows: following the elaborate Introduction, Section 1 contains a review of relevant empirical literature by each country considering the data of interest. Methodology and results are provided in Section 2, while some concluding remarks are given in final section.

1. A review of related literature

In many international economic discussions, GDP as an indicator of the real economy and prices, money and the exchange rate as monetary variables, are often put at the centre due to their important roles in economic stability. According to standard economic theory, money and prices, hence the exchange rate affects country's economic competitiveness; as the movements in those variables is an important indicator of the economic processes (especially in aggregate demand and consumption) in the economy and for that, a clear understanding of those determinants is very important for investors, corporations, policy makers, as well as for researchers. On the other hand, an increase in aggregate demand, i.e. in the GDP, raises the level of economic activity, thereby increasing corporate earnings and prices. Related inflation can influence savings and investment, input costs and interest payment, demand pressures and general uncertainty. The mutual relationship between those variables, de facto defines the cyclical dynamics of every economy. What do empirics say about the movements and trends in those variables across different communist countries?

For China, Fan *et al.* (2011) investigated the responsiveness of monetary policies in terms of the money supply and interest rates to economic conditions and the effectiveness of these policies in achieving the goals of stimulating economic growth and controlling inflation, by using VAR models for the period from 1992 to

2009. The results suggested that the monetary policy variables respond to economic growth and the inflation rate, but the magnitudes of the responses are much weaker than those observed in market economies. Money supply responds actively to both the inflation rate and the real output, whereas official interest rates responds passively to the inflation rate and does not respond to the real output. Chow and Shen (2005) introduced a VEC model to explain inflation from 1954 to 2002. A VAR explaining the logs of price level, output and money supply yielded impulse responses that support the Friedman proposition that output reacts to money shocks first, but the effect is short-lived and prices react later but the effect lasts longer. Su (2012) provided evidence on the relationship between Renminbi exchange rate and macroeconomic variables in China by applying the non-parametric rank tests and the threshold error-correction model to detect possible nonlinear causal relationships. The results implicated that the exchange rate and macroeconomic variables have a nonlinear relationship with each other so that in the long-run they found evidence that supports the hypothesis of an asymmetrical error-correction process in China. A very (methodologically) similar study to ours is provided by He (2017) who tried to analyses the relationship between the money supply (M2) and the macroeconomic variables (the real GDP, the inflation rate and the interest rate) for China through the VAR modelling for the period from 2000 to 2016. Results indicated that an increase in the real GDP can result in an increase in the money supply and that an increase in the inflation rate can lead to an increase in the money supply, thus an increase in the interest rate can cause a decrease in the money supply. They finally concluded that through adjusting the change of real GDP, inflation rate and interest rate, a better control of the money supply can be performed for the policy-makers.

Though Cuba will not be part of our empirical research, we cannot bypass its empirical evidence. Hernández-Catá (2009) showed that the combination of exchange rate, price and foreign exchange controls practiced in Cuba lowers output and employment, reduces domestic saving and investment, and hinders the efficacy of macroeconomic policies. In particular, under rationing conditions, an expansionary monetary policy can lose its ability to influence income and prices, therefore, can serve only to boost the monetary overhang and increase the severity of exchange control, whereas an expansionary fiscal policy can retain some of its ability to increase output, but is likely to generate a larger increase in prices. Vidal (2010) analyzed the transmission mechanisms of the global crisis on variables that pertain to Cuban monetary policy by using SVAR model. The author stated that the impact that the global crisis had on the Cuban economy, the monetary policy was able to keep inflation under control, although it could not prevent exchange rate imbalances, adverse effects on the convertible peso and a banking crisis without benefit of a lender of last resort, whereas the most controversial decision in monetary terms was to follow a fixed exchange rate policy. In another paper, Vidal (2017) evaluated the leading macroeconomic trends and policies in Cuba from 1985 to 2013 as five macroeconomic indexes were estimated using dynamic factor models. The

correlations between the estimated indexes and the GDP growth rate suggested that the fiscal policy was procyclical while monetary policy was countercyclical. Econometric simulations confirmed the economy's high vulnerability to an eventual collapse of relations with Venezuela, also suggesting that pending monetary reforms could create negative pressure on goods production and on households' living conditions, which could not be mitigated by an expansionary fiscal policy.

Next, for Laos, Srithilat and Sun (2017) examined the impact of the monetary policy on the economic development for the period from 1989 to 2016 by using the cointegration approach and VEC model. The results showed that the money supply, interest rate and the inflation rate have a negative impact on the real GDP per capita in the long-run and that only the real exchange rate has a positive influence. The VEC model results indicated the existence of short-run causality between money supply, real exchange rate and real GDP per capita. Shahbaz *et al.* (2018) analyzed whether currency devaluation is expansionary for Laos by combining cointegration, the VEC method and the Granger causality analysis to examine long-run and causal relationships among specific macroeconomic variables. The results confirmed the presence of cointegration among the variables and support expansionary effects of currency devaluation on economic growth with government spending increasing, economic growth and money supply decreasing the growth. Their evidence, in fact, supported the devaluation-led growth hypothesis. Kyophilavong *et al.* (2015) investigated whether or not nominal devaluation leads to real devaluation in Laos by using the ARDL bounds testing and the Granger causality test in a VECM framework. Their results suggested that the nominal devaluation Granger causes the real devaluation, both in the short- and long-run, implying that nominal devaluation leads to real devaluation. Kyophilavong (2009) evaluated the impact of the macroeconomic policy, especially growth and stability policies on the economy of Laos. A simple macroeconomic model was developed for this simulation, whose results showed that the stability policy has a more positive impact on the economy than the growth policy. The author concluded that in order to maintain a high growth, it would be important to implement the stability policy by controlling prices through a tight money supply and a stable exchange rate.

And finally, for Vietnam, Trung and Vinh (2011) examined the impact of oil prices on Vietnam's economic activity by using VAR modelling and cointegration techniques for the period from 1995 to 2009. They found evidence of a long-run relationship between oil prices, inflation, exchange rate and economic activity, suggesting that both oil prices and the real effective exchange rate have significant impact on the economic activity with a modest positive impact of inflation on the economic activity. General conclusions indicated that and the increase in oil prices, depreciation and even moderate inflation could be helpful rather than harmful for Vietnamese economy. Hoang (2014) examined the nexus among budget deficit, money supply and inflation for the period from 1995 to 2012 by using a SVAR model with five endogenous variables, inflation, money growth, budget deficit

growth, real GDP growth and interest rate. Author found that money growth has positive effects on inflation, while budget deficit growth has no impact on money growth and therefore on inflation and that the interest rate was not an effective instrument for fighting inflation for it was significantly and positively influenced by inflation. Hung and Pfau (2008) analysed the monetary transmission mechanism in Vietnam, using the VAR modelling and focusing on the reduced-form relationships between money, real output, price level, real interest rate, real exchange rate and credit. They found consistent evidence that the monetary policy can affect real output and, surprisingly, that the connection between money and inflation is less clear. Within the transmission mechanism, the credit and exchange rate channels have shown to be more important than the interest rate channel. Hai and Trang (2015) analysed monetary transmission mechanisms i.e. various monetary transmission channels in Vietnam using the VAR model and quarterly data in the period from 1995 to 2010. They focused on how the economy dynamically responds on money demand, interest rate, exchange rate, and asset price shocks. Obtained results show that money demand and interest rates affect variations in output whereby monetary tightening leads to a decrease in output. Nguyen and Vo (2016) investigated the transmission mechanism in Vietnam, i.e. the existence of interest rate channel, exchange rate channel and asset price channel using the VAR model and monthly data from January 2003 to December 2012. They found evidence only of the cost channel. Vinh and Fujita (2007) evaluated the impact of the real depreciation on Vietnamese economic performance by using the VAR approach, mainly suggesting that although the main sources of variance in output and price levels were attributive or own shocks, innovation in the real exchange rate accounted for a higher proportion in the variation of output than that of the price level. On the other hand, real effective exchange rate changes showed no significant effect on output in the long run.

As we provided enough empirical evidence to support the main hypothesis that communist states indeed share the same economic framework, hence the economic dynamics with other market economies, in the next part we will try to provide a similar conclusion based on an econometric analysis.

2. Methodology, empirical analysis and the results

The aim of this study is to find similarities in macroeconomic dynamics between current communist (Marxist-Leninist) states. Therefore, the following communistic states with the Marxist-Leninist ideology are included in the analysis: the People's Republic of China, the Lao People's Democratic Republic and the State of Vietnam. In order to analyze the macroeconomic dynamics in the named states, a

vector autoregression (VAR) model[1] is estimated[2]. Usually, VAR methodology is based on Granger causality tests, variance decomposition and impulse response functions. However, before defining the VAR model, it is necessary to examine the properties of time series, i.e. the degree of integration since models with nonstationary series can lead to wrong conclusions (Österholm, 2005). For these purposes, Augmented Dickey-Fuller ADF test (Dickey and Fuller, 1979), Phillips and Perron PP test (Phillips and Perron, 1988) and KPSS test (Kwiatkowski *et al.*, 1992) are considered. The cointegration between the variables is tested using the methodology proposed by Johansen (1991, 1995) in order to be sure that the VAR models in levels are suitable for the analysis of macroeconomic dynamics. Based on the assumption of cointegration, the following unrestricted VAR model with variables in levels is estimated (Lütkepohl, 2007):

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + Cx_t + \varepsilon_t \qquad (1)$$

where y_t is a vector of endogenous variables, x_t is a vector of exogenous variables, $A_1, \dots, A_p$ are matrices of lag coefficients, C is a matrix of exogenous variable coefficients and ε_t is a white noise innovation process. For each county, the analysis includes data on Gross domestic product[3] (GDP), Gross domestic product deflator[4] (as a proxy for prices) (DEF), broad money (MONEY) and exchange rate[5] (EXCH). Data are taken from the World Bank database[6]. All variables are on annual basis and are expressed as indices in their logarithmic form.

2.1. Macroeconomic dynamics in the People's Republic of China (PRC)

Data for the People's Republic of China (PRC) covers the period from 1977 to 2016 and Figure 1 shows their movement.

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[1] Similarly to Okur, Akkuş and Durmaz (2019).

[2] The Eviews 11 (IHS Global Inc., 2020) econometric software is used for the multiple time series analysis.
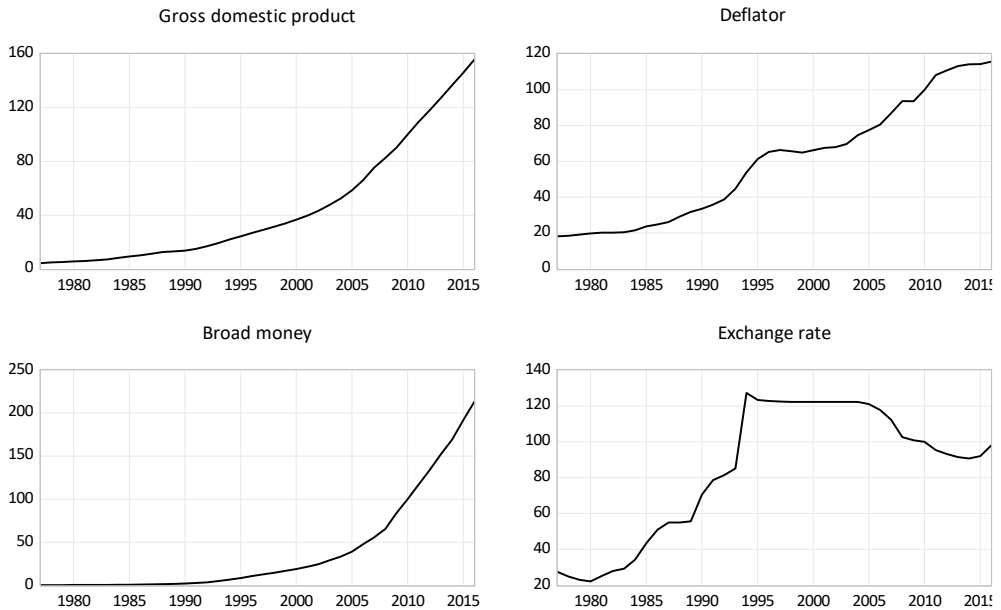
[3] In constant local currency unit.

[4] In current local currency unit.

[5] In local currency unit per US dollar, period average.

[6] The World Bank (2017), *World Bank Open Data*, https://data.worldbank.org/.

Figure 1. Gross domestic product, gross domestic product deflator, broad money and exchange rate (indices, 2010=100)

Gross domestic product

Deflator

Broad money

Exchange rate

Source: The World Bank (2017) and authors' calculations

It is visible that in the observed period almost all variables (except the exchange rate from 1994 onwards) achieve upward trends. Results of the unit root tests are shown in Table 1.

Table 1. Unit root tests

Variable and test	Level		First difference	
	Constant	**Constant and trend**	**Constant**	**Constant and trend**
ADF test			Prob.	
LGDP	0.8930	0.0037	0.0027	0.0131
LDEF	0.6196	0.6199	0.0767	0.1930
LMONEY	0.0551	0.9966	0.0017	0.0001
LEXCH	0.2142	0.9879	0.0014	0.0015
PP test			Prob.	
LGDP	0.8283	0.8016	0.0306	0.1546

LDEF	0.7819	0.8838	0.0542	0.1490
LMONEY	0.1138	0.9929	0.0009	0.0001
LEXCH	0.4333	0.9822	0.0015	0.0017
KPSS test	**LM-stat.**			
LGDP	0.776594	0.047004	0.137202	0.102949
LDEF	0.750241	0.137160	0.157898	0.104148
LMONEY	0.771704	0.193016	0.446281	0.094262
LEXCH	0.562571	0.194294	0.395198	0.129029

Notes: "L" indicates logarithm of the variable. For the implementation of ADF and PP test, the Schwarz information criterion has been implemented. KPSS test asymptotic critical values: constant: 1% level (0.739), 5% level (0.463), 10% level (0.347); constant and trend: 1% level (0.216), 5% level (0.146), 10% level (0.119).
Source: authors' representation

Obtained results suggests that all the series are integrated of order I (1), i.e. that they are stationary in the first differences. Results of cointegration tests indicate that the long-run relationship between the variables exist[7]. Based on this assumption the unrestricted VAR model with variables in levels is estimated, whereby the vector of endogenous variables includes GDP, deflator, broad money and exchange rate while the vector of exogenous variables includes constant, trend and several dummy variables. The number of lags in the VAR model is determined using standard information criteria. All criteria indicate that the optimal number of lags in the model is one. VAR model diagnostic tests presented in Table 2 include test for autocorrelation, normality and heteroscedasticity. They suggest that the model is adequately estimated with acceptable characteristics.

Table 2. VAR diagnostic tests

Autocorrelation LM (lag=1)	LRE stat.=27.05804, df=16, Prob.=0.0408, Rao F-stat.=1.878843, df=(16, 55.6), Prob.=0.0429
Normality (Joint)	Skewness: Chi-sq=2.679292, df=4, Prob.=0.6128
	Kurtosis: Chi-sq=5.389337, df=4, Prob.=0.2496
	Jarque-Bera: J-B=8.068629, df=8, Prob.=0.4268
Heteroskedasticity (Joint)	Chi-sq=172.8773, df=180, Prob.=0.6350

Source: authors' representation

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[7] The results are not shown in order to preserve space.

In order to examine the causality between variables VAR Granger causality/block exogeneity Wald tests are applied. Test results are shown in Table 3.

Table 3. VAR Granger causality/block exogeneity tests

Excluded	Chi-sq	df	Prob.
Dependent variable: LGDP			
LDEF	8.437035	1	0.0037
LMONEY	0.200330	1	0.6545
LEXCH	7.928291	1	0.0049
All	23.15861	3	0.0000
Dependent variable: LDEF			
LGDP	9.514314	1	0.0020
LMONEY	0.462754	1	0.4963
LEXCH	5.728930	1	0.0167
All	18.36696	3	0.0004
Dependent variable: LMONEY			
LGDP	27.54072	1	0.0000
LDEF	5.589274	1	0.0181
LEXCH	42.72463	1	0.0000
All	62.86345	3	0.0000
Dependent variable: LEXCH			
LGDP	3.187120	1	0.0742
LDEF	10.23001	1	0.0014
LMONEY	7.831293	1	0.0051
All	18.36696	3	0.0004

Note: "L" indicates logarithm of the variable.
Source: authors' representation

The results indicate that GDP causes prices, broad money and exchange rate. Furthermore, prices cause GDP, broad money and exchange rate while broad money causes only the exchange rate. At the end, exchange rate causes GDP, prices and broad money. The dynamic interdependence among variables in the model is analyzed through the variance decomposition presented in the Table 4.

Table 4. VAR variance decomposition

Variance decomposition of LGDP				
Horizon (years)	LGDP	LDEF	LMONEY	LEXCH
2	95	3	1	1
4	72	20	4	4
6	50	36	8	6
8	36	47	10	6

10	31	51	12	6

Variance decomposition of LDEF

Horizon (years)	LGDP	LDEF	LMONEY	LEXCH
2	19	80	0	1
4	32	58	4	6
6	33	42	12	12
8	26	39	20	15
10	19	41	24	16

Variance decomposition of LMONEY

Horizon (years)	LGDP	LDEF	LMONEY	LEXCH
2	26	3	65	7
4	28	3	51	19
6	19	11	47	22
8	13	20	45	22
10	10	25	44	21

Variance decomposition of LEXCH

| Horizon (years)	LGDP	LDEF	LMONEY	LEXCH
2	1	3	47	48
4	4	7	51	37
6	8	7	51	33
8	12	7	51	30
10	16	6	50	29

Note: "L" indicates logarithm of the variable.
Source: authors' representation

Variance decomposition results indicate that prices and broad money had the greatest impact on the variability of GDP while GDP and broad money had the greatest impact on the variability of prices. Furthermore, prices and the exchange rate had the greatest impact on the variability of broad money whereby GDP and broad money had the greatest impact on the variability of the exchange rate. In order to analyze if the influence of variables generates an order change, the variance decomposition is performed in reverse order of variables in the model. The results are quite similar[8].

To trace if each endogenous variable responds over time to shock in that variable and other endogenous variables, the impulse response functions are analyzed. Figure 2 shows the impulse responses of the GDP, deflator, broad money and exchange rate.

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[8] The results are not shown in order to preserve space.

Figure 2. VAR impulse responses to Cholesky one S.D. (d.f. adjusted) innovations ± 2 S.E. confidence interval
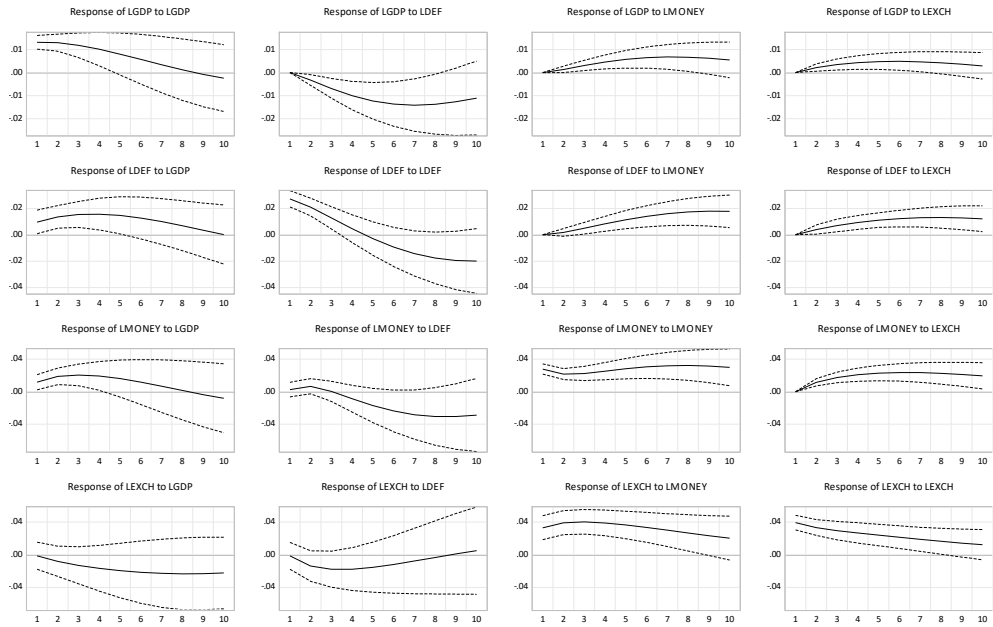
Note: "L" indicates logarithm of the variable.
Source: authors' representation

An increase in GDP increase prices, broad money and causes exchange rate appreciation. An increase in prices decreases GDP, broad money and causes exchange rate appreciation. An increase in broad money increases GDP, prices and causes exchange rate depreciation. Finally, exchange rate depreciation increases GDP, prices and broad money.

2.2. Macroeconomic dynamics in the Lao People's Democratic Republic

Data for the Lao People's Democratic Republic covers the period from 1989 to 2016 and Figure 3 shows their movement.

Figure 3. Gross domestic product, gross domestic product deflator, broad money and exchange rate (indices, 2010=100)
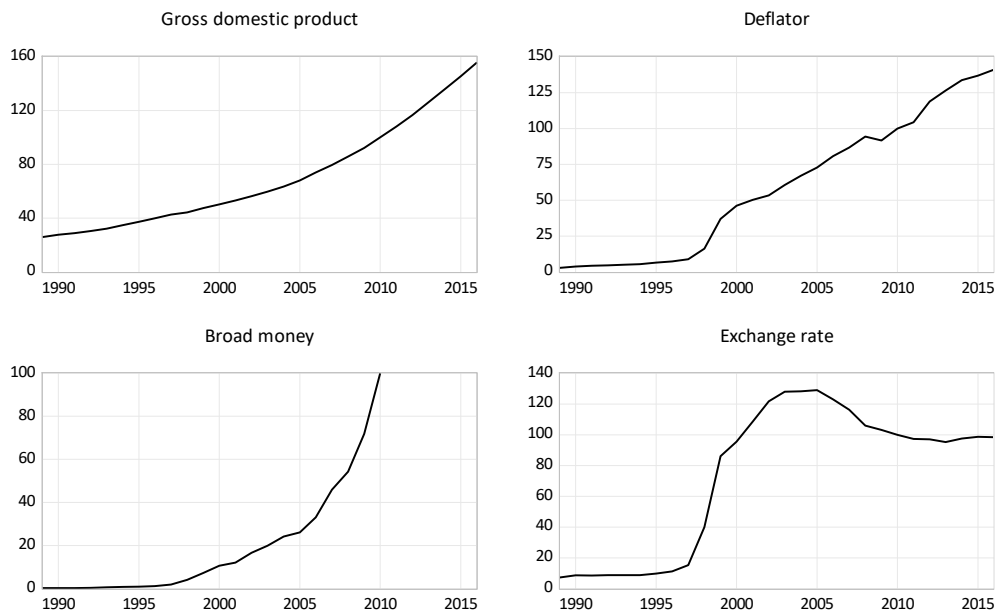
Source: authors' representation based on World Bank Data (2017).

It is noticeable that in the observed period almost all variables (except the exchange rate from 2005 onwards) achieve upward trends. Results of the unit root tests are shown in Table 5.

Table 5. Unit root tests

Variable and test	Level		First difference	
	Constant	**Constant and trend**	**Constant**	**Constant and trend**
ADF test	Prob.			
LGDP	1.0000	0.9531	0.0375	0.0128
LDEF	0.6387	0.8221	0.0937	0.0721
LMONEY	0.6619	0.4250	0.0255	0.0552
LEXCH	0.4538	0.7013	0.2101	0.1352
PP test	Prob.			
LGDP	1.0000	0.9407	0.0375	0.0106
LDEF	0.4142	0.9379	0.0780	0.1906
LMONEY	0.8519	0.8403	0.0894	0.2468
LEXCH	0.5001	0.9376	0.1822	0.3971

KPSS test	LM-stat.			
LGDP	0.673703	0.172027	0.473576	0.074200
LDEF	0.623152	0.153559	0.289340	0.077127
LMONEY	0.649965	0.131039	0.133628	0.103881
LEXCH	0.512071	0.150119	0.229051	0.095025

Notes: "L" indicates logarithm of the variable. For the implementation of ADF and PP test, the Schwarz information criterion has been implemented. KPSS test asymptotic critical values: constant: 1% level (0.739), 5% level (0.463), 10% level (0.347); constant and trend: 1% level (0.216), 5% level (0.146), 10% level (0.119).
Source: authors' representation

Although the ADF and PP tests suggest that the exchange rate is integrated of order I(2), KPSS test rejects such a possibility. Therefore, it will be accepted that all the series are integrated of order I(1), i.e. that they are stationary in first differences.

Results of cointegration tests indicate that the long-run relationship between the variables exist[9]. Based on this assumption the unrestricted VAR model with variables in levels is estimated whereby the vector of endogenous variables includes GDP, deflator, broad money and exchange rate while the vector of exogenous variables includes only a constant. The number of lags in the VAR model is determined using standard information criteria. All criteria indicate that the optimal number of lags in the model is one. VAR model diagnostic tests presented in Table 6 include test for autocorrelation, normality and heteroscedasticity. They suggest that the model is adequately estimated with acceptable characteristics.

Table 6. VAR diagnostic tests

Autocorrelation LM (lag=1)	LRE stat.=18.53908, df=16, Prob.=0.2933, Rao F-stat.=1.222028, df=(16, 28.1), Prob.=0.3113
Normality (Joint)	Skewness: Chi-sq=3.563466, df=4, Prob.=0.4683 Kurtosis: Chi-sq=8.052457, df=4, Prob.=0.0897 Jarque-Bera: J-B=11.61592, df=8, Prob.=0.1692
Heteroskedasticity (Joint)	Chi-sq=90.84713, df=80, Prob.=0.1911

Source: authors' representation

In order to examine the causality between variables VAR Granger causality/block exogeneity Wald tests are applied. Test results are shown in Table 7.

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[9] The results are not shown in order to preserve space.

Table 7. VAR Granger causality/block exogeneity tests

Dependent variable: LGDP			
Excluded	**Chi-sq**	**df**	**Prob.**
LDEF	0.013237	1	0.9084
LMONEY	0.567086	1	0.4514
LEXCH	0.438704	1	0.5077
All	2.728516	3	0.4354
Dependent variable: LDEF			
LGDP	2.712225	1	0.0996
LMONEY	6.263451	1	0.0123
LEXCH	20.85252	1	0.0000
All	47.45506	3	0.0000
Dependent variable: LMONEY			
LGDP	0.640674	1	0.4235
LDEF	1.821288	1	0.1772
LEXCH	0.762910	1	0.3824
All	3.301409	3	0.3474
Dependent variable: LEXCH			
LGDP	0.131092	1	0.7173
LDEF	12.81572	1	0.0003
LMONEY	5.109391	1	0.0238
All	18.88073	3	0.0003

Note: "L" indicates logarithm of the variable.
Source: authors' representation

Although on the border of statistical significance, the results indicate that GDP causes only prices. Prices cause only the exchange rate while broad money causes prices and exchange rate. Finally, the exchange rate causes only prices.

The dynamic interdependence among variables in the model is analyzed through the variance decomposition presented in the Table 8.

Table 8. VAR variance decomposition

Variance decomposition of LGDP				
Horizon (years)	**LGDP**	**LDEF**	**LMONEY**	**LEXCH**
2	99	0	0	1
4	96	0	0	4
6	93	0	1	6
8	91	1	2	6
10	89	1	3	6

Variance decomposition of LDEF				
Horizon (years)	LGDP	LDEF	LMONEY	LEXCH
2	36	33	17	14
4	36	17	36	11
6	32	16	43	9
8	30	16	46	9
10	29	16	46	9
Variance decomposition of LMONEY				
Horizon (years)	LGDP	LDEF	LMONEY	LEXCH
2	20	25	54	1
4	17	21	62	1
6	14	20	64	1
8	17	19	62	3
10	22	17	57	4
Variance decomposition of LEXCH				
Horizon (years)	LGDP	LDEF	LMONEY	LEXCH
2	47	18	18	18
4	43	12	33	13
6	39	11	39	10
8	37	12	41	10
10	37	12	42	10

Note: "L" indicates logarithm of the variable.
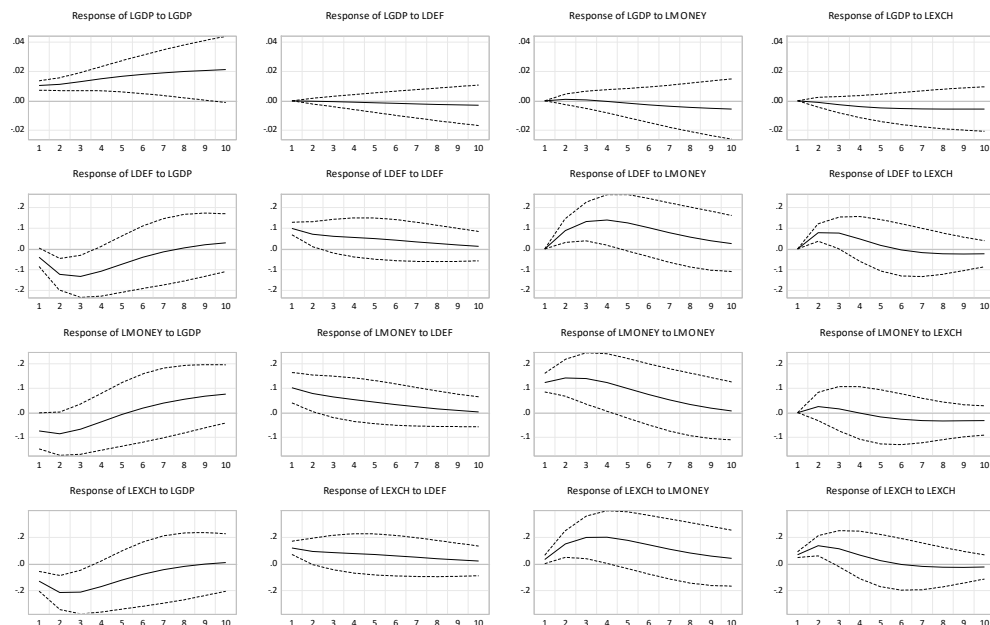*Source*: authors' representation

Variance decomposition results indicate that none of the other variables had impact on the variability of GDP while GDP and broad money had the greatest impact on the variability of prices. Furthermore, GDP and prices had the greatest impact on the variability of broad money whereby GDP and broad money had the greatest impact on the variability of the exchange rate. In order to analyze influence of variables order change, variance decomposition is performed with reverse order of variables in the model. The results are slightly different meaning that there is a possibility that the variables order affects the results[10].

As before, in order to trace each endogenous variable response over time to shock in that variable and other endogenous variables, the impulse response functions are analyzed. Figure 4 shows the impulse responses of the GDP, deflator, broad money and exchange rate.

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[10] The results are not shown in order to preserve space.

Figure 4. VAR impulse responses to Cholesky one S.D. (d.f. adjusted) innovations ± 2 S.E. confidence interval


Note: "L" indicates logarithm of the variable.
Source: authors' representation

An increase in GDP decreases prices, initially decreases broad money and causes exchange rate appreciation. An increase in prices has almost no impact on GDP, increases broad money and causes an exchange rate depreciation. An increase in broad money has almost no impact on GDP, it increases prices and causes exchange rate depreciation. Finally, the exchange rate depreciation slightly decreases GDP, increases prices and has almost no impact on broad money.

2.3. Macroeconomic dynamics in the state of Vietnam

Data for the State of Vietnam covers the period from 1992 to 2015 and Figure 5 shows their movement.

Figure 5. Gross domestic product, Gross domestic product deflator, broad money and exchange rate (indices, 2010=100)
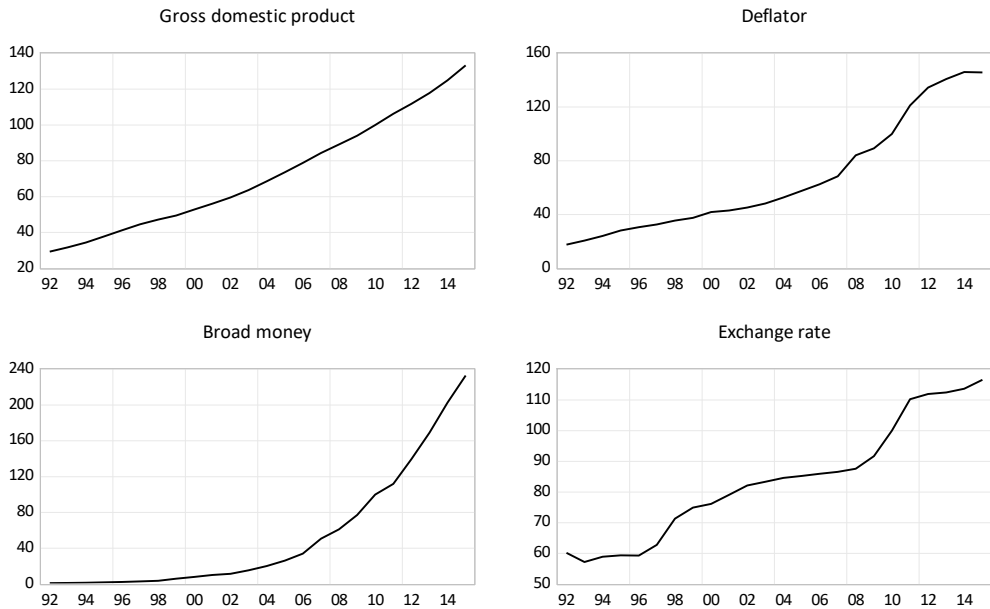
Source: authors' representation based on the World Bank data (2017).

It is noticeable that in the observed period almost all variables achieve upward trends. Results of the unit root tests are shown in Table 9.

Table 9. Unit root tests

Variable and test	Level		First difference	
	Constant	**Constant and trend**	**Constant**	**Constant and trend**
ADF test			Prob.	
LGDP	0.6403	0.0389	0.3146	0.1489
LDEF	0.5341	0.4706	0.0519	0.1540
LMONEY	0.7642	0.9390	0.0035	0.0093
LEXCH	0.7048	0.1436	0.0140	0.0695
PP test			Prob.	
LGDP	0.0582	0.4173	0.2910	0.3893
LDEF	0.6218	0.5015	0.0659	0.1638
LMONEY	0.7642	0.9150	0.0035	0.0092
LEXCH	0.9544	0.3188	0.0138	0.0676

KPSS test		LM-stat.		
LGDP	0.712746	0.154728	0.425481	0.077830
LDEF	0.705734	0.094740	0.153752	0.110280
LMONEY	0.704917	0.134912	0.205483	0.133598
LEXCH	0.679597	0.064650	0.109327	0.096021

Notes: "L" indicates logarithm of the variable. For the implementation of ADF and PP test, the Schwarz information criterion has been implemented. KPSS test asymptotic critical values: constant: 1% level (0.739), 5% level (0.463), 10% level (0.347); constant and trend: 1% level (0.216), 5% level (0.146), 10% level (0.119).
Source: authors' representation

Although the PP tests suggest that GDP and prices are integrated of order I(2), KPSS test rejects such a possibility. Therefore, it will be accepted that all the series are integrated of order I(1), i.e. that they are stationary in the first differences.

Results of cointegration tests indicate that the long-run relationship between the variables exists[11]. Based on this assumption the unrestricted VAR model with variables in levels is estimated whereby the vector of endogenous variables includes GDP, deflator, broad money and exchange rate while the vector of exogenous variables includes a constant, trend and one dummy variable. The number of lags in the VAR model is determined using standard information criteria. All criteria indicate that the optimal number of lags in the model is one. The VAR model diagnostic tests presented in Table 10 include the test for autocorrelation, normality and heteroscedasticity. They suggest that the model is adequately estimated with acceptable characteristics.

Table 10. VAR diagnostic tests

Autocorrelation LM (lag=1)	LRE stat.=27.29697, df=16, Prob.=0.0383, Rao F-stat.=2.065757, df=(16, 28.1), Prob.=0.0448
Normality (Joint)	Skewness: Chi-sq=2.275155, df=4, Prob.=0.6853 Kurtosis: Chi-sq=0.503451, df=4, Prob.=0.9732 Jarque-Bera: J-B=2.778606, df=8, Prob.=0.9475
Heteroskedasticity (Joint)	Chi-sq=129.8963, df=110, Prob.=0.0947

Source: authors' representation

In order to examine the causality between variables, the VAR Granger causality/block exogeneity Wald tests are applied. Test results are shown in Table 11.

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[11] The results are not shown in order to preserve space.

Table 11. VAR Granger causality/block exogeneity tests

Dependent variable: LGDP			
Excluded	**Chi-sq**	**Df**	**Prob.**
LDEF	1.684008	1	0.1944
LMONEY	0.333889	1	0.5634
LEXCH	4.555935	1	0.0328
All	6.099227	3	0.1069
Dependent variable: LDEF			
LGDP	1.724723	1	0.1891
LMONEY	2.742297	1	0.0977
LEXCH	1.883507	1	0.1699
All	4.840576	3	0.1839
Dependent variable: LMONEY			
LGDP	9.287920	1	0.0023
LDEF	1.409225	1	0.2352
LEXCH	1.220356	1	0.2693
All	10.16611	3	0.0172
Dependent variable: LEXCH			
LGDP	6.207947	1	0.0127
LDEF	1.081883	1	0.2983
LMONEY	0.440611	1	0.5068
All	9.039359	3	0.0288

Note: "L" indicates logarithm of the variable.
Source: authors' representation

The results indicate that GDP causes broad money and exchange rate. Prices does not cause any of the variables while broad money causes only prices, although on the border of statistical significance. Finally, the exchange rate causes only GDP.

The dynamic interdependence among variables in the model is analyzed through the variance decomposition presented in the Table 12.

Table 12. VAR variance decomposition

Variance decomposition of LGDP				
Horizon (years)	**LGDP**	**LDEF**	**LMONEY**	**LEXCH**
2	96	1	0	3
4	82	6	2	10

6	71	13	4	12
8	65	17	6	12
10	63	17	8	12

Variance decomposition of LDEF			
Horizon (years)	**LGDP**	**LDEF**	**LMONEY**	**LEXCH**
2	1	92	5	1
4	1	76	20	2
6	1	67	30	2
8	2	63	33	2
10	4	62	32	2

Variance decomposition of LMONEY			
Horizon (years)	**LGDP**	**LDEF**	**LMONEY**	**LEXCH**
2	2	2	95	1
4	14	11	73	3
6	23	20	55	2
8	24	23	50	2
10	23	25	50	2

Variance decomposition of LEXCH			
Horizon (years)	**LGDP**	**LDEF**	**LMONEY**	**LEXCH**
2	16	3	4	77
4	14	5	6	75
6	14	9	6	71
8	14	10	7	69
10	14	10	8	68

Note: "L" indicates logarithm of the variable.
Source: authors' representation

Variance decomposition results indicate that the prices and exchange rate had impact on the variability of GDP while broad money had the greatest impact on the variability of prices. Furthermore, GDP and prices had the greatest impact on the variability of broad money whereby GDP and prices had the greatest impact on the variability of the exchange rate. In order to analyze influence of variables order change, variance decomposition is performed with reverse order of variables in the model. The results are very similar[12].

Again, in order to trace each endogenous variable response over time to shock in that variable and other endogenous variables, the impulse response functions are analyzed. Figure 6 shows the impulse responses of the GDP, deflator, broad money and exchange rate.

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[12] The results are not shown in order to preserve space.

Figure 6. VAR impulse responses to Cholesky one S.D. (d.f. adjusted) innovations ± 2 S.E. confidence interval
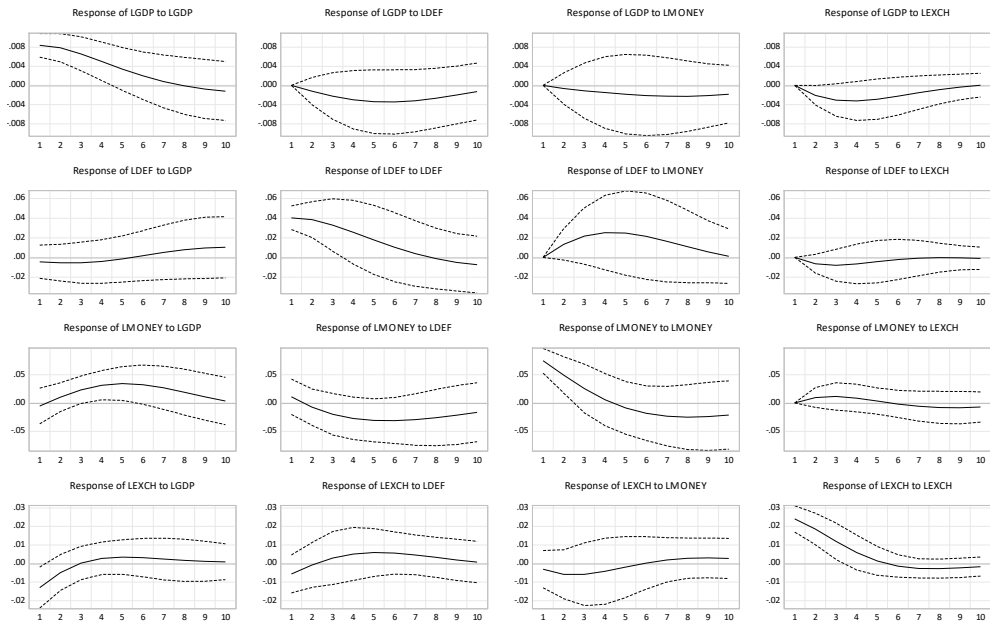
Note: "L" indicates logarithm of the variable.
Source: authors' representation

An increase in GDP increases prices, broad money and causes exchange rate appreciation. An increase in prices decreases GDP, broad money and causes exchange rate depreciation. An increase in broad money decreases GDP, increases prices and causes exchange rate appreciation. Finally, exchange rate depreciation decreases GDP, slightly decreases prices and has almost no impact on broad money.

By comparing all the results obtained from the Granger causality tests, it is noticeable that in the case of the PRC, the number of casual relations between the variables is higher in regard to other countries, giving the PRC's economic policy makers better opportunities in managing the macroeconomic policy. In addition, the highest number of casual relations in all countries is observed when prices and exchange rate are dependent variables. By comparing the results from the variance decomposition for all countries, it is noticeable that GDP and broad money had the highest impact on the variability of other variables. By comparing the results from the impulse responses analysis for all countries, it is noticeable that an increase in GDP generally increases prices, broad money and causes exchange rate appreciation. An increase in prices generally decreases GDP, broad money and causes exchange rate depreciation. An increase in broad money generally increases prices and causes

exchange rate depreciation. Finally, exchange rate depreciation generally decreases GDP, increases prices and broad money.

Beyond conclusion

Although our standard VAR models are limited in their interpretations, hence could be improved by developing a structural VAR method, they help to summarize the statistical properties of the data and shed light on our main question as is there a similarity in the dynamics of relevant macroeconomic variables between communist and capitalist countries. This paper should not be viewed as a contribution to testing a macroeconomic theory, but only as an evidence of standard economic relationship that operates in distinct economic systems.

For the purpose of the analysis, the VAR models are estimated for current communist countries, i.e. China, Laos and Vietnam. All models include four typical macroeconomic variables respectively GDP, prices, money supply and exchange rate. Granger causality tests suggests that China has a higher number of casual relationships then other countries meaning that China's economic policy makers have better opportunities in managing the macroeconomic policy. Results from the variance decomposition indicate that GDP and broad money had the highest impact on the variability of other variables. The impulse responses analysis for all countries show that an increase in GDP generally increases prices, broad money and causes exchange rate appreciation while an increase in prices generally decreases GDP, broad money and causes exchange rate depreciation. In addition, an increase in broad money generally increases prices and causes exchange rate depreciation whereby exchange rate depreciation generally decreases GDP, increases prices and broad money. The results generally indicate that money related variables have an important role in the efficiency of the transmission channels in selected countries.

Changes in monetary policy could, therefore, affect prices and economic movements through a multitude of complex and often intertwined tracts. Since we cannot unambiguously interpret lags in the transmission of monetary impulses to the economy, it means that it is not an easy task to suggest how the controlling of short-term shock will influence the variables (especially price levels) in the long-run. In order to avoid considerable difficulty in managing the possible destabilizing effects of shocks, policy makers need to continuously assess how the current economic conditions affect the medium-run outlook, for example price stability and exchange rate variability. For example, the evolution of policy rates set by Central and East European countries central banks in targeting inflation under floating exchange rates (Slovakia, Czech Republic, Hungary, Poland and Romania) reflected the overall course of domestic economic and financial turnovers in these countries. In general, the choice of exchange rate regime has not been the deciding factor for economic performance of these countries. As results suggest a similarity in macroeconomic dynamics with causality that is compatible to a common economic framework we

believe that policy makers in communist states should also watch for the impact of fluctuation in exchange rates, money and prices in their economies the same way as in other mainstream economies. Obtained results are quite similar to those obtained from other authors dealing with the same topic in the same countries.

There are two shortcomings of this paper that we can detect. First is the limited background for economic policy comparison and the second is the generalizability that might arise from the focus on selected countries, rather than on a wider sample. 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. Since this work is not strictly oriented toward the interpretation of possible policy implications and suggestions, rather than on the revealing important macroeconomic causalities, the structural VAR could be a great step towards the elaboration of economic policy tools within future research perspective.

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