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The effectiveness of fiscal and monetary policy during the financial crisis

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ABSTRACT

The objective of this paper is to assess the effectiveness of monetary and fiscal policy on economic growth during the financial crisis in developing and emerging countries. Applying the dataset provided by Leaven and Valencia (2008 and 2010), I examine 83 financial crisis episodes in 66 developing and emerging countries. Employing the method utilized by Gupta at al., (2007), Baldacci at al., (2009), Hutchison (2010) and Li and Tang (2010), I performed the monetary and fiscal variables in order to control various determinants of output cost during the financial crisis. Applying different techniques OLS with robust standard errors and GMM estimator, I find out that monetary and fiscal policy contractions are associated with an increase of the output cost during the financial crisis. In addition, fiscal policy expansion is accompanied with smaller output cost over the financial crisis, whereas monetary expansion has no showed a clear effect. The macroeconomic policy mix with a discretionary fiscal expansion and a neutral monetary policy are likely to mitigate output cost during the financial crisis in developing and emerging countries.

Keywords: Output Loss, Financial Crisis, Fiscal Policy, Monetary Policy

JEL Classification: E52, E62, G15

Introduction

The financial crisis usually has been associated with output loss or cost. The recent financial crisis in 2008 has again posed a question among the researchers as for the effectiveness of monetary and fiscal policy over the period of financial crisis. Regarding the question for appropriate monetary and fiscal measures, there is not yet consensus among the researchers whether or not monetary or fiscal policies are more effective tool to deal with financial crisis. To address this question, I examine 83 financial crisis episodes in 66 developing and emerging countries. Following the methods used by Gupta at al. (2007), Baldacci (2009), Hutchison (2010) and Li and Tang (2010), I assess the effectiveness of monetary and fiscal policy and including controls macroeconomic variables in order to control various determinants of output cost during the financial crisis. For robustness check and endogeneity test I employ GMM estimator.

There are several studies that investigate the effectiveness of monetary and fiscal policy on output growth during the financial crisis. In the literature, most of the studies ague that fiscal policy is more effective than monetary policy during the financial crisis and therefore fiscal expansion can reduce output loss or output cost (IMF report, 2008a and 2008b). Regarding monetary policy the report shows that countercyclical monetary policy can support shortening of economic recession, however its efficiency is limited during the crisis. Baldacci at al., (2009) investigate the effect of fiscal policy on real output during the financial crisis and they find out that government consumption can shorten duration of the financial crisis and such measure is more effective than policy supporting public investment or tax cuts. The study by Hutchison at al. (2010) examines the effect of monetary and fiscal policy during the sudden-stop balance of payments crisis in emerging and developing countries. They find out that fiscal expansion is associated with smaller output cost following a sudden stop but monetary expansion has no discernable effect. Therefore, they suggest that macroeconomic policy mix has to be coordinated by discretionary fiscal expansion with a neutral monetary policy during the financial crisis. On the other hand, Li J., and Tang L., (2010) analyze the effectiveness of monetary and fiscal policy response twin crisis for 72 episodes during 1977-2010 in 57 emerging and developing countries. They find out that monetary expansion (contraction) can decrease (increase) output cost, whereas fiscal expansion (contraction) has no effect on banking crisis, but monetary policy has no discernable effect on currency crisis. Moreover, fiscal policy expansion (contraction) has no effect either banking or currencies crisis. They conclude that policy mix has to be coordinated by discretionary monetary expansion with a neutral fiscal policy during the financial crisis, since fiscal expansion or contraction has no effect on output cost. The study by Goldfain and Gupta (2003)

analyses a financial crisis in 80 countries for the period 1980-1998, and they find out that monetary and fiscal policy are ineffective if the economies have both currency and banking crisis.

To summarize, the financial crisis (both banking and currency crisis) is on of the most controversial issue in the literature regarding optimal macroeconomic policy mix, i.e. optimal coordination between monetary and fiscal policy over the financial crisis. I attempted to fill this gap in the literature by the investigation of the effectiveness of monetary and fiscal policy during the financial crisis in the developing and emerging countries and what kind of macroeconomics measure should be used in the developing and emerging countries during the economic crisis in order to alleviate economic recession.

The paper is organized as a follows: Section II Definition of banking and currency crisis; Section III Research methodology and data; Section IV Research result and Section V Conclusions.

Definition of banking and currency crisis

There is little empirical evidence that examine coexistence of the banking and currency crises; however they do not analyze banking and currency crises at the same time. For example, the study by Kaminsky and Reihnart (1999) was the first work that provides evidence regarding both banking and currency crises. In their research they show that many global financial crises have taken placed due to currency devaluation which in turn leads to a collapse of the banking system (during 1980's and 1990's). They define crises as episodes that the banking crises are following by a currency crisis within two years. Contrary, Kaminsky and Reihnart I define both banking and currency crises at the same time, if the banking crisis occur in year t is combine with currency crises over the period (t-3, t+3).Therefore, I avoids the assumption that banking crises is preceded by currencies devaluation or otherwise. The data in my empirical research are used by the database calculated by Laeven and Valencia (2008 and 2010). They identify 144 systematic banking crisis and 207 banking crisis. They define banking crisis as "a corporate and financial sectors experience a large number of defaults and financial institutions and corporations face great difficulties repaying contracts on time. The currencies crisis is defined as "a nominal depreciations of currency of at least 30% percent that is also a 10 percent increase in the rate of depreciation compared to the year before." The research contains a sample of 83 episodes in 66 countries over the period from 1980 to 2010. I denote the starting of a both crises in period t, as a banking crisis, associated with currencies crisis over the period [t-3, t, t+3]. The details of the countries episodes and data sources are reported in Appendix A and B.

Frequency of banking and financial crises

In Table 1, I display frequency of both crises such as banking crisis, currency crisis and coexistence of both crises. As seen from the Table 1, in period of 1970, banking and currency episodes are zero, whereas from 1980, the frequency of both crisis are considerably increased from zero on average per year to 2.3 on average per year in 1980's and then in 5.5 per year from 1990 to 2000. An increase of both crises, (banking crisis and currencies crisis), perhaps could be as result of financial liberalization (Kaminsky and Reinhart, 1999). In addition, both crises are larger than single crisis, which indicate that banking crisis can lead to a currency crisis or will occur after the currency crisis. Thus, the policy makers have to take into account both crises should not consider them separately.

Table 1: Frequency of banking and currency crises

	1970-2010		1970-1979		1980-1989		1990-2000		2000-2008	
	total	aver.	total	aver.	total	aver.	total	aver.	total	aver.
banking crises	144	3.7	4	0.4	38	3.8	74	7.4	28	3.1
join crises episodes	83	2.1	0	0	23	2.3	55	5.5	5	0.5
currency crises	207	5.3	25	2.5	72	7.2	92	9.2	18	2

Note: both crises episodes are beginning data of a banking crisis with currency crises over (t-3, t+3). Aver. is average per year.
Source: Author's calculation.

Output loss during the banking and currency crisis

There is several ways to measure output-cost associated with financial crisis. Following Laeven and Valencia (2008 and 2010) I construct the data for output cost by comparing in real terms the pre-crisis average GDP growth rate trend for given countries t-3 to t-1, t is starting crisis and post-crisis GDP growth rate t+1 to t+3, until GDP growth rate return back to its trend. The difference between real GDP growth rate trend (pre-crisis) and actual real GDP growth is output-loss or cost for each given countries. If the difference is higher it means the cost of financial crises is lower.

Table 2 shows the output loss during financial crises episodes from 1990 to 2000. As seen from table 2 the join banking and currency crises is much more then banking crises. In 1990 the join crises is more than double that of banking crises.

Table 2. Output loss during the banking and currency crises

	1970	1980	1990	2000
banking crises	-15%	-32%	18%	-36%
both crises episodes	0	-38%	-39%	-47%

Source: Author's calculation.

Research methodology and data

Research Methodology

My research methodology is similar to that adopted by Gupta at al. (2007), Baldacci (2009), Hutchison (2010) and Li and Tang (2010), in their analysis of the effect of monetary and fiscal policy on economic growth over the period of financial crisis. I run cross-sectional regression with robust standard errors. However, I differ from them as I employ GMM estimator for robustness check and endogeneity test of my result. Moreover, I include important control variables in the regression in order to measure marginal effect of macroeconomics variables and avoiding omitted-variables bias. The choice of the controls variables are identified from previous literature as a significant determinant of the output loss over the financial crisis.

The specification of the empirical model is as follows:

$$y_i = B_0 + \sum B_k X_i + B_1 D_i^{mon} + \Delta_i^{fis} + u_i, \quad u_i = N(0, \delta_i^2), \quad i = 1,2,.....,I \qquad (1)$$

where y is an $I \times 1$ vector of output loss associated with financial crisis i , X is a $I \times 1$ vector of control variables, D^{mon} are binary indicators for monetary expansion and contraction, Δ^{fis} is the changes of cyclical fiscal-adjusted fiscal policy stance and u_i is error terms which is assumed to be normally distributed with mean zero and variance δ^2. The regressions are performed using Ordinary Least Squares with robust standard errors. Regarding the constructions of monetary and fiscal indicators are explained in detail in the next section.

I use domestic and international the control macroeconomic variables in multiple regression in order to take into the account omitted-variables bias. The list of control variables are based on the previous literature, particularly, Li and Tang (2010) and Clavo et al., (2004). The list is important since I'm interested to control for factors (unless monetary and fiscal variables) which may affect output growth during the financial crisis. The lists of variables that I use in my empirical research are trade openness, inflation rate and degree of openness of the capital account.

Moreover, I employ GMM estimator in order to deal with endogeneity problem and to check robustness of my empirical model. Following Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998), I solve the problem of lagged dependant variable as an explanatory variable which may correlate with county fixed effect in error terms, by putting it in the first difference. By transforming the variables in the first difference the country fixed effect will be removed. The lagged differenced in the regressors are utilized as instruments in the GMM estimation. Since the explanatory variable may correlate with error term, I solve this problem by using explanatory variable as instruments. The efficiency of GMM estimator depends on validity of its instruments. For this purpose I use Hansen J- test in order to prove or reject null hypothesis for the overall significance of the validity of instruments. Then I use AR (1) and AR (2) test in order to test the hypothesis whether or not the error term are not serially correlated, i.e. no autocorrelation between the residuals.

Estimating fiscal policy

I'm interested to measure discretionary fiscal policy response to output cost. Since the balance budget can goes with the same direction with GDP growth movement, I have to decompose budget balance into their structural and cyclical component in order to assess discretionary fiscal measure during financial crisis. I employ standard method used by Blanchard, (1990), (Li and Tang (2010) and Hutchison at al., (2010), in order to extract both trend and cyclical measures from budget balance. The discretionary fiscal policy I calculate from the residual of each country based on the following equation. This is standard measure for fiscal stance which allows us to find discretionary fiscal measure. The model for estimating fiscal indicator is as follows:

$$BB_t = \alpha_0 + A_1 y_t + A_2 y_{t-1} + \alpha_1 t + \eta_t \qquad (2)$$

where BB_t is budget balance in percent of GDP of each countries ***i***, y_t is real GDP growth rate for given countries, ***t*** is the time trend and η_t is the error term in the regression. Then I estimate the discretionary measure of fiscal policy such as:

$$\Delta^{f} = \lambda_{t+1} - \lambda_{t} \qquad (3)$$

where λ_t is the calculated error term from equation (2). By this estimation I eliminate simultaneity bias of fiscal stance with output movement in our empirical result.

Estimating monetary policy

There are several way to measure monetary policy, I follow Li and Tang (2010) and Hutchison at al., (2010), Baig and Goldfajn (2001), Goldfajn and Gupta (2003) and they consider changes in discount rate and international reserves. I assess changes in the monetary policy stance applying discount rate since interest rate is not available measure for developing and emerging countries (see more Hutchison at al. 2010). Moreover, I use discount rate as it is under the control of monetary authority in developing and emerging countries. The monetary policy changes are calculated as country/years in which the change in the monthly discount rate exceeds two country-specific standard deviation above the country specific mean. The calculation is based from previous literature that examines the impact of monetary policy during the financial crises. Thus I construct dummy variable with 1 monetary tightening and 0 otherwise for not tightening. In the same manner, I construct monetary expansion, as country/years in which change in the monthly discount rate is smaller by at least two country-specific standard deviations from the country specific mean. Thus I construct dummy variable with 1 for year one or more monetary expansion and 0 otherwise (1 losing and 0 not losing).

In order to check the efficiency of monetary policy I employ a second measure of monetary/exchange rate policy - international reserve changes. Accumulating international reserves is associated with an expansion of the monetary base which is the instrument of monetary loosing. De-accumulating international reserve is associated with a contraction of the monetary base which is the instruments of monetary tightening. The reserve accumulation is calculated as country/years in which the change in the monthly reserves exceeds two country-specific standard deviation above the country specific mean changes. Thus I construct dummy variable with 1 reserve accumulation and 0 otherwise for monetary expansion. In the same manner, I construct monetary contraction, in which reserve de-

accumulating is calculated as country/years in which the change in the monthly reserves exceeds two country-specific standard deviation below the country specific mean changes. Thus I construct dummy variable with 1 reserve de-accumulation and 0 otherwise for monetary contraction. I use binary measure in order to avoid the endogeneity issue as monetary reaction might correlate with dependant variable. For endogenety test I use also the second econometrics technique i.e., GMM estimator.

Summary statistics

In the table 3 I provide basic summary statistics of variables that I employ in cross sectional regression and GMM estimator. I apply to econometrics technique and include output loss (OL) and variety fiscal and monetary indicators such as: fiscal expansion/ tightening (fiscale/fiscalt) and monetary expansion/tightening (discd/reservi and disci/reservd) in order to provide more robust result.

Table 3. Data description for fiscal and monetary policy and control variables

Variable	Obs.	Mean	SD	Min	Max
OL	83	-8.014961	72.92507	-297.101	197.684
Δ^f	83	0.483215	4.749234	-15.683	22.342
$fiscal^e$	83	0.340426	0.478975	0	1
$fiscal^t$	83	0.106383	0.311661	0	1
$disc^i$	83	0.468085	0.504375	0	1
$reserv^i$	83	0.063835	0.247092	0	1
$disc^d$	83	0.319149	0.471186	0	1
$reserv^d$	83	0.297342	0.359876	0	1
trop	83	62.89607	36.73843	6.32	185.665
inflation	83	404.3609	1044.335	-12.907	5018.108
kaopen	83	-0.347291	1.320673	-1.81162	2.531836

Source: Author's calculation

Moreover, I introduce the control variables in order to provide more control factors unless monetary/fiscal/exchange rate policy that may affect output cost or loss, during the financial crisis. For this purpose, I include three control variables trade openness (trop), inflation rate and openness of the capital account (kaopen). The data sources for all variables are provided in appendix A and B.

Research results

In the table 4 I report the result obtains from equation 1, with policy indicators and control variables. In my empirical research I include variety fiscal and monetary indicators such as: fiscal expansion/ tightening (fiscale/fiscalt) and monetary expansion/tightening (discd/reservi and disci/resrvd), in order to assess the effectiveness of monetary and fiscal policy during the financial crises. The control variables are included in the table 4, in order to provide more detail examination of the marginal effect of monetary and fiscal variables in showing variation of output loss, during the financial crisis. I include three control variables trade openness (trop), inflation and capital account open (kaopen). A positive value of the coefficient of explanatory variables mean a decrease of output cost or cost of crises and negative value of the coefficient of explanatory variables mean an increase of the output cost or cost of crisis.

As seen from table 4, I find out that tightening of fiscal and monetary variables will shapely increase cost of crisis and coefficients are statically significant (column (4.1) and (4.2) (see appendix C). Furthermore, the evidence shows that the impact of monetary expansion on output cost is not statically significant (both discount rate and international reserve), while fiscal expansion shows positive impact on output cost and coefficient is statistically significant. A one percentage increase in the fiscal expenditure will decrease output cost or cost of the crisis by 1.11 percentages. The 78 percentage the variation output cost is explained by explanatory variables.

In the Column (4.2), I exclude the policy variables that are statistically insignificant. As seen from (4.2), the number of observation is reduce due to the missing of variables for some countries, and the coefficient of determination is slightly increase by 0.5. Almost I find the same result, the fiscal and monetary contraction has significant negative impact on output cost associated with crises and the coefficients are significant. Fiscal expansion has positive impact on output cost during the crisis and the coefficient is statistically significant. A one percentage increase fiscal expenditure reduces output cost by 0.98 percentages and the coefficient is significant. Therefore, I find out that fiscal policy is more effective tools than monetary policy during the financial crisis in the developing and emerging countries.

In order to examine robustness check and to deal with endogeneity problem I employ GMM estimator. The table 5 reports the estimation result by this methodology. The dynamic panel model is well modeled, as the coefficients lagged output loss is statistically significant (see appendix C). Moreover, the Hansen J-test with associated p-value, which examines the validity of the instrumental variables, is accepted as healthy instruments. Therefore, the results from GMM estimator

have proved the hypothesis that instrumental variables are not correlated with the set of residuals. As result, Hansen p-value test can not reject the null hypothesis. In addition, AR (1) and AR (2) test with associated p-value is accepted in second order which confirm that there is no autocorrelation in second order in the errors term. Applying different techniques OLS with robust standard errors and GMM estimators I obtain almost the same result. The results show that fiscal and monetary contractions are associated with larger output loss and the coefficients are statistically significant. Moreover, the results show that fiscal expansion is associated with smaller output loss whereas monetary expansion has no clear effect and coefficients are not statistically significant. Therefore, the result suggests that macroeconomic policy mix with a discretionary fiscal expansion and a neutral monetary policy are likely to reduce output cost during the financial crisis in developing and emerging countries. My result is consistent with the result of Hutchison et al., (2010), where they find that fiscal policy is more effective than monetary policy. However, my result is different than the result of Li and Lihua (2010) where they find that monetary policy is more effective than fiscal policy.

Conclusions

The article analyses the macroeconomic effect of monetary and fiscal policy on output cost or loss during the financial crisis in developing and emerging countries. The banking crises and currency crises are often following with deep depression in these countries; however there is no professional consensus among the researcher in term of optimal macroeconomic mix during the financial crises in these countries. To address this question, I examine 83 episodes in 66 developing and emerging countries, applying cross sectional regression with robust standard errors and GMM estimator in order to explain for various factor of output loss during the financial crises. Applying different techniques OLS with robust standard errors and GMM estimators the results show that monetary and fiscal contractions during the financial crises are associated with larger output loss. I find out that fiscal expansion is associated with smaller output loss during these episodes, whereas monetary expansion has no showed clear effect and coefficients are not statistically significant. Moreover, the result suggests that in developing and emerging countries fiscal policy is more effective tool for handling with financial crises then monetary policy. Therefore, the macroeconomic policy mix with a discretionary fiscal expansion and a neutral monetary policy are likely to reduce output cost during the financial crisis in these countries.

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Appendix A: Banking and currency crises episodes

Albania	1994	1995	Lebanon	1990	
Algeria	1990		Malta	1995	2000
Angola	2000		Malaysia	1994	1997
Argentina	1980	2001	Macedonia	1993	
Armenia	1994		Mexico	1981	1994
Azerbaijan, Rep.	1994		Moldova	1995	
Bolivia	1982		Morocco	1980	
Belarus	1994		Mozambique	1987	
Brazil	1994	2002	Nicaragua	1990	
Bulgaria	1996		Oman	1999	
Cameroon	1988	1994	Nigeria	1991	
Cen.African Rep.	1994		Paraguay	1995	
Chad	1992		Peru	1983	
Chile	1982	1998	Philippines	1983	1997
Costa Rica	1996	2000	Russia	1998	
Colombia	1998		Pakistan	1998	
Dominican Repub.	2002		Panama	2000	
Ecuador	1983	1999	Peru	1993	1998
Egypt	1980	1990	Philippines	1997	
Estonia	1992		Poland	1994	2001
El Salvador	1999		Sierra Leone	1989	
Fiji	1999		Tanzania	1987	
Gabon	1989		Thailand	1997	
Georgia	1991		Tonga	1989	
Ghana	1982	2000	Tunisia	2000	
Haiti	1999	2002	Togo	1993	
Honduras	2000		Turkey	2000	
Hungary	1996		Ukraine	1998	
Indonesia	1997		Uruguay	1981	2002
India	1995		Vanuatu	1991	
Jordan	1989		Venezuela	1994	
Kenya	1992		Yemen	1995	
Korea	1997		Zambia	1995	

Source: Laeven and Valencia, 2008 and 2010. Systematic banking crises: a new database, IMF, working paper.

Appendix B. Source of data

Variables	**Data Sources**
Real GDP growth rate	WDI
Discount rate/International reserves	IMF, IFS
Annual budget balance (% of GDP)	IMF, GFS
Trade openness	WDI
Inflation	WDI
Capital account openness	Chin and Ito, 2006

Appendix C. OLS Estimation result with policy indicators and control variables

Variable	(4.1)		(4.2)	
Intercept	-12.45932**	(-0.61)	-5.34561***	(-0.63)
fiscal^{e}	1.11031**	(3.56)	0.98432*	(3.92)
fiscal^{t}	-1.95647***	(-3.69)	-2.34128**	(4.79)
disc^{i}	2.38971	(0.37)		
reserv^{i}	-1.16384	(-0.13)		
disc^{d}	9.81321	(0.63)		
reserv^{d}	-1.2878**	(-3.72)	-2.3297***	(-4.12)
iflation	0.02939**	(2.98)	0.03768*	(3.53)
kaopen	3.74134***	(0.84)	4.19934**	(0.79)
Trop	-0.09635	(-0.32)	-0.09267	(-0.67)
R-quared	0.7812		0.8313	
F-test	7.8		8.3	
Obs.	82		63	

Note: The table reports output loss (OL) following financial crises, dependant variables OL to one percent policy variables with control

variables (associated t-statistics in parenthesis), *,**,***, show the significance at 10, 5 and 1 percent respectively.

APPENDIX D: GMM Estimation result with policy indicators and control variables

Variable	(5.1)		(5.2)	
OL (-1)	2.9432*	(2.57)	3.1932**	(2.63)
$fiscal^e$	0.7101***	(2.96)	0.5765**	(2.92)
$fiscal^t$	-0.9132**	(-2.99)	-0.5428***	(-3.19)
$disc^i$	3.7154	(0.62)		
$reserv^i$	-4.16384	(-0.52)		
$disc^d$	6.34128	(0.87)		
$reserv^d$	-1.7721***	(-2.82)	-1.9297**	(-3.71)
iflation	0.2875**	(3.51)	0.3498*	(2.76)
kaopen	3.74134	(0.84)	4.19934	(0.79)
Trop	-0.976543	(-0.78)	-1.6785	(-0.65)
R-quared	0.62		0.69	
F-test	7.8		8.3	
Obs.	82		63	
AR(1) p-value		(0.000)		(0.000)
AR(2) p-value		(0.445)		(0.567)
Hansen p-value of J-test		(0.32)		(0.11)

Note: Output loss is dependant variables. The results are first step GMM estimator. Two lag are utilized as a instruments an GMM method. All GMM regression is used robust standard error. Associated t statistics in parenthesis, *, **, ***, denote significance at the 10%, 5% and 1% respectively. Hansen J test shows the p-value for Null hypothesis of the validity of instruments. The AR (1) and AR (2) are p-values for first and second order of auto correlated of error term. That is no autocorrelation between the residuals.