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A NOTE ON INFLATION DYNAMICS, PRICE VOLATILITY, AND FISCAL ACTIVISM

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Using a panel of 54 countries between 1980 and 2013, we find empirical support for the view that changes in the fiscal policy stance (year-on-year change in the cyclically adjusted primary balance) have a significant positive correlation with inflation volatility. An increase in the volatility of discretionary fiscal policies by one standard deviation raises inflation volatility by about 6%. Moreover, results using alternative inflation volatility proxies confirm that an expansionary fiscal stance increases price volatility. Another relevant outcome is that in a context of economic expansions (recessions) the harmful impact of fiscal activism on price volatility is soft (heightened), while the negative impact of fiscal activism on price stability is higher when fiscal policy is expansionary. Finally, fiscal activism fuels inflation volatility much more pronouncedly in emerging market economies vis-à-vis advanced economies.

Keywords: Consensus Forecasts, Fiscal Policy, GARCH, Inflation, Volatility

1. INTRODUCTION

Inflation volatility has been an important topic in the literature looking at the relationship between inflation and economic growth. On the one hand, several studies have concluded that high inflation (and associated high inflation volatility) is generally harmful to growth. On the other hand, only few studies have focused on disentangling the individual channels through which such effect occurs. High variability of inflation over time makes expectations over the future price level more uncertain. In a world with nominal contracts this induces risk premia for long-term arrangements, raises costs for hedging against inflation risks, and leads to unanticipated redistribution of wealth. Thus, inflation volatility can impede growth even if inflation on average remains restrained [Friedman (1977)].

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Judson and Orphanides (1999) found evidence that inflation volatility has led to lower economic growth in a large panel of countries.[1] Also, Froyen and Waud (1987) found that high inflation induces high inflation volatility and uncertainty in the USA, Germany, Canada, and the UK. For the latter two they also reported a negative impact of inflation uncertainty on economic growth. Similarly, Al-Marhubi (1998) found negative growth effects of conditional and unconditional inflation volatility for a panel of 78 countries. Blanchard and Simon (2001) found a strong positive link between inflation volatility and output volatility for large advanced countries.

In this note, we empirically analyze the impact of the volatility of discretionary fiscal policies on the volatility of inflation, while taking other possible explanatory factors into account. This approach follows Fatas and Mihov (2003), who reported that discretionary fiscal policies have significantly contributed to output volatility in a wide range of countries, and Furceri and Jalles (2018), who showed that increased fiscal stabilization reduces output fluctuations. Moreover, our purpose is not exactly the study of the potential effect of inflation volatility on fiscal developments but rather how fiscal policies can impinge on inflation volatility, stemming notably from the need of the government in reducing the real value of the outstanding stock of government debt. The relation between volatilities also builds on the fact that the levels of discretionary fiscal policies and of the price level are also linked. For instance, Afonso and Jalles (2017) showed that improvements in the fiscal stance lead to persistent falls in sovereign yields, and lower sovereign yields are reflected in downward price movements.

We use a sample of 54 advanced and emerging countries between 1980 and 2013. By means of panel data techniques, this study finds empirical support for the view that changes in the fiscal policy stance (defined as the year-on-year change in the cyclically adjusted primary balance, in percentage of GDP) show a significant positive correlation with inflation volatility. Fiscal activism adversely affects price stability, and an increase in the volatility of activist fiscal policies by one standard deviation raises inflation volatility by about 6%. Results using alternative inflation volatility proxies confirm that an expansionary fiscal stance increases price volatility. In a context of economic expansions (recessions), the harmful impact of fiscal activism on price volatility is soft (heightened), while the negative impact of fiscal activism on price stability is higher when fiscal policy is expansionary. Finally, fiscal activism fuels inflation volatility much more pronouncedly in emerging market economies vis-à-vis advanced economies.

The remainder of the note is organized as follows. Section 2 provides a survey of the related literature. Section 3 presents the empirical methodology. Section 4 reports and discusses our main results. The last section concludes.

2. LITERATURE REVIEW

There are several potential channels through which fiscal policies can affect inflation. The first one is the effect of prices' evolution on aggregate demand. The

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second—the spillover from public wages into private sector as well as taxes affecting marginal costs and private consumption. Notably, Afonso and Gomes (2014), looking at an OECD panel, reported that the growth of public sector wages and of public sector employment positively affects the growth of private sector wages. Thirdly, fiscal policy can affect inflation through public expectations regarding the ability of future governments to redeem the outstanding public debt.

On the one hand, the impacts of fiscal policies on inflation have been extensively addressed in the literature, notably going back to Sargent and Wallace's (1981) unpleasant monetarist arithmetic. In that context, although the monetary authority presently keeps inflation low, if the fiscal authority sets the budget independently, then the monetary authority will be forced to create money and tolerate more inflation in the future.

On the other hand, a less orthodox view of how fiscal developments might impinge on the price level can be traced to the Fiscal Theory of the Price Level (FTPL), initially made popular by Leeper (1991), Sims (1994), and Woodford (1994). Leeper–Sims–Woodford argue that it will be then up to the government budget constraint to play a key role in the determination of the price level. Therefore, in this so-called "strong form" of the FTPL, fiscal policy may have a relevant role, at least as important as monetary policy, in determining the price level.

In fact, there is also a renewed interest in countercyclical fiscal policy, as a possible policy measure to deal with the eventual limitations of monetary policy in a situation of very low interest rates and subdued growth. For instance, Tulip (2014) argued that countercyclical fiscal policy can help in stabilizing the economy, in the absence of targeting higher inflation levels. On the other hand, fiscal policies can be somewhat destabilizing if they are procyclical [Furceri and Jalles (2018)], adding to inflation volatility. Magkonis and Tsopanakis (2016) studied the empirical fiscal–financial stress interconnectedness and found that it has increased since the global financial crisis calling for more integrated fiscal–financial macroprudential stability policies.

Regarding empirical studies on the link between budget balances and inflation, for instance, Catão and Terrones (2003), using a panel analysis for 107 countries over the period 1960–2001, reported a positive link between budget deficits and inflation only in the case of developing countries with high levels of inflation. Fischer et al. (2002), looking at 133 countries between 1960 and 1996, also reported such a link between fiscal imbalances and inflation for high inflation cases. More specifically, on volatility, Rother (2004) reported that for OECD countries between 1967 and 2001, fiscal policy volatility has increased inflation volatility, using notably GARCH models.

Bassetto and Butters (2010), for an OECD panel between 1970 and 2008, did not find evidence that budget deficits have preceded higher inflation. On the other hand, Tiwari et al. (2015) used quarterly data for the period 1990–2013 for several OECD countries and reported frequency domain causality from inflation to budget deficits and a long-run relationship for Belgium and France.

In a VAR set up for five OECD countries, Perotti (2002) showed that the effect of government spending on the price level is positive, although mostly small and seldom statistically significant. In addition, Afonso and Sousa (2012), using a Bayesian structural VAR approach for the USA, the UK, Germany, and Italy, found that government spending shocks do not have an effect on the price level.

In addition, in the context of a DSGE model setup, De Graeve and von Heideken (2013), for the period 1966:Q1–2011:Q2, conjectured that concerns about fiscal inflation increase anticipated long-run inflation, notably as far as future projections of government debt are concerned.

Another related issue worth mentioning is the role of currency regimes and monetary policy independence, notably in the context of the open economy macroliterature. For instance, Aizenman et al. (2010), looking at a panel of emerging market economies between 1972 and 2006, mentioned that greater exchange rate stability and a higher degree of financial openness are associated with lower inflation, while the inflation volatility coefficient shows up as statistically significant for output volatility. Bleaney and Fielding (2002) presented results suggesting lower inflation expectations when a country pegs its exchange rate to another currency. Ghosh et al. (1997) found evidence of less volatile inflation dynamics under pegged exchange rate regimes. Moreover, if monetary authorities follow inflation targeting, such regime is more prone to reduce output volatility. Complementarily, in our note we focus on the relevance of fiscal developments for inflation volatility.

3. EMPIRICAL METHODOLOGY AND DATA ISSUES

This note assesses the empirical link between a measure of inflation volatility and a measure of fiscal policy volatility for a panel of 54 advanced and emerging countries between 1980 and 2013, controlling for a set of possible additional explanatory factors.[2] Generally, in regression terms, this is equivalent to:

$$\sigma_t^{\pi} = \alpha_0 + \alpha_1 \sigma_t^{F} + X_t' \alpha_3 + \varepsilon_t \qquad (1)$$

where σ_t^{π}, σ_t^{F} denote inflation volatility and volatility of discretionary fiscal policies, respectively. X_t is a vector of control variables.

Our baseline proxy for inflation volatility consists of an unconditional proxy of inflation volatility based on a 5-year rolling standard deviation of the CPI inflation rate. This unconditional inflation volatility measure captures the extent of short-term fluctuations in inflation. The idea underlying this approach is that changes in discretionary fiscal policies either directly or indirectly induce reactions in inflation, making it more volatile in the short run.

To measure the volatility of discretionary fiscal policies, our analysis is based on changes in the fiscal policy stance.[3] The fiscal policy stance is defined as the year-on-year change in the cyclically adjusted primary balance (CAPB) (in percentage of GDP).[4] Removing from the overall budget balances the effects of

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changes in interest payments and—in the business cycle—reflects the net budgetary impact of activist fiscal policy measures, essentially the component of discretion arguably attributed to the fiscal authorities. Our first measure of fiscal stance is captured by the absolute change in CAPB between two consecutive years. Our second measure, similarly to inflation, is based on a 5-year rolling standard deviation of the CAPB.

Finally, our set of controls includes, most notably, the following variables. First, we control for the level of inflation (given by the %CPI change) since it has been observed empirically that inflation volatility is highly correlated with its level. Second, we include output gap (computed using the HP filter), reflecting the impact of aggregate demand. Third, we add total government expenditures (in percentage of GDP), since large governments tend to reduce the volatility of output and inflation in response to demand shocks through the operation of automatic fiscal stabilizers [Martinez-Mongay (2001) and Furceri and Jalles (2018)]. Fourth, given that the effect of monetary policies offsetting inflationary fiscal policies will induce price volatility, we control for the 5-year rolling standard deviation of broad money (M2) expressed in percentage of GDP. Fifth, we add the nominal effective exchange rate since, in an open economy, the CPI inflation rate will in part be determined by price movements of foreign goods due to the direct inclusion of such goods in the consumption basket or through their use as intermediate inputs. On the one hand, inflation volatility is expected to increase with the volatility of nominal exchange rate, foreign price volatility, and the openness of the economy. On the other hand, with sticky domestic wages and prices, adjustments to shocks to the economy will occur to some extent through the exchange rate. In this situation, movements in the nominal exchange rate would substitute for changes in prices, implying a negative relationship between variations in the two variables. Thus, the overall effect is a priori not obvious. Finally, to account for the spillover from foreign prices into domestic prices, the share of imports in GDP is also included.

The following regression equation is estimated:

$$\sigma_{it}^{\pi} = \alpha_0 + \lambda_i + \delta_t + \sum_{j=1}^{2} \beta_j \sigma_{it-j}^{\pi} + \sum_{j=0}^{1} \theta_j \pi_{it-j} + \alpha_3 \sigma_{it}^{F} + \alpha_4 gap_{it-1} + \alpha_5 G_{it} + \alpha_6 \sigma_{it-1}^{M} + \alpha_7 \sigma_{it-1}^{ER} + \alpha_8 M_{it-1} + \varepsilon_{it} \quad (2)$$

where λ_i, δ_t are country and time effects, respectively, σ_{it}^{π} is a measure of inflation volatility, $\pi_{it}$is the CPI inflation rate, σ_{it}^{F} is a measure of fiscal stance, gap_{it} is the output gap, G_{it} is the government expenditure (percentage of GDP), σ_{it}^{M} is money volatility, σ_{it}^{ER} is the nominal exchange rate volatility, M_{it} is the share of imports in GDP.[5] Finally, ε_{it} stands for an i.i.d. error term satisfying the usual assumptions of zero mean and constant variance. Equation (2) will be estimated via OLS with heteroskedastic robust standard errors.

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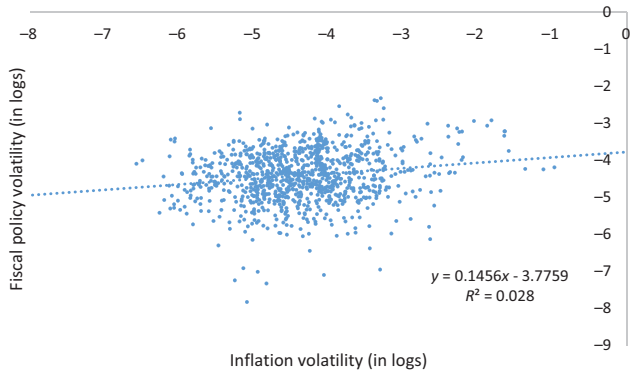

FIGURE 1. Fiscal policy volatility versus inflation volatility (all countries, years).

4. EMPIRICAL RESULTS

4.1. Stylized Facts

Figure 1 presents a scatterplot of the two key variables in this study, using annual data. Inflation volatility, measured by the (log of) 5-year rolling standard deviation of inflation rates, is presented along the *x*-axis, while fiscal policy volatility, measured by the (log of) absolute changes in the cyclically adjusted primary balance, is presented along the *y*-axis. Even though the scatter does not show a strong relationship, there appears to be some positive link between these two variables when other explanatory factors are not accounted for.

4.2. Baseline

We now move on into estimating equation (2). Table 1 shows the results when two lags of the dependent variable and one lag of inflation rate are included in the set of regressors. We present OLS results with both country and time effects (results with no effects or with country fixed effects only yield qualitatively similar findings). Looking at the estimated coefficients, all of them have the expected signs when significant. Looking at specification 1 (when fiscal discretion is measured as the absolute value of the annual changes in CAPB), an increase in the level of inflation, a widening of the output gap (overheating), a higher share of imports in GDP bringing in the influence of external prices, and higher nominal exchange rate volatility, all raise price volatility. Larger governments do seem to moderate fluctuations in prices, but corresponding estimates are not statistically different from zero in this table. Also, volatility in monetary policy, while yielding positive coefficient estimates, is not statistically significant at usual levels. More importantly, our measure of fiscal stance comes out with positive and statistically significant coefficients, meaning that heightened fiscal activism adversely affects price stability.

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TABLE 1. Price volatility and fiscal discretion

Specification	(9)	(9)
Fiscal discretion	Absolute value of fiscal stance	5-year rolling standard deviation of fiscal stance
Regressors		
dep.var. (−1)	0.700*** (0.032)	0.711*** (0.028)
dep.var. (−2)	−0.117*** (0.023)	−0.079*** (0.019)
inflation	0.129*** (0.010)	0.153*** (0.009)
inflation (−1)	−0.108*** (0.010)	−0.137*** (0.009)
fiscal stance	0.039*** (0.013)	0.099*** (0.029)
output gap	0.056*** (0.015)	0.059*** (0.016)
gov.expenditures	−0.015*** (0.007)	−0.017* (0.009)
sd.money	0.005 (0.005)	0.000 (0.007)
sd NEER (−1)	0.017*** (0.002)	0.012*** (0.002)
imports_gdp (−1)	−0.005 (0.005)	−0.004 (0.005)
Observations	723	805
R-squared	0.877	0.892

Notes: OLS regression including time and country fixed effects omitted for reasons of parsimony. Robust standard errors in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Constant term was estimated by omitted for reasons of parsimony.

The size of the impact of volatility of activist fiscal policies on inflation variability can be important. The estimated coefficient for fiscal stance is around 0.03–0.06. With a cross-country average of standard deviations of discretionary fiscal policies of 1.94 percentage points of GDP, this suggests that an increase in the volatility of activist fiscal policies by one standard deviation raises inflation volatility by about 6%. To this direct impact, the indirect impact of the volatility of discretionary fiscal policies through their impact on output gap variability needs to be added. Based on a comprehensive survey of the literature, Hemming et al. (2002) reported a likely size of the short-run fiscal multiplier between one-half and one. Combining the average of these values (3/4) with the coefficient on output gap variability yields a potential additional impact between 1.5% and 3.5%, resulting in a total impact between 6.5% and 9.5% for the average across the sample. Feedback effects through the interaction of fiscal discretion with the other explanatory variables would increase the impact further. In specification 2, we replace our measure of fiscal discretion by the 5-year rolling standard deviation of CAPB. Results are generally in line with those reported earlier, with a few exceptions: government size (proxied by public expenditures) now yields a negative and statistically significant coefficient, confirming the theoretical role of automatic stabilizers in attenuating general fluctuations.

For the remainder of the analysis we use the absolute value of annual changes in CAPB as our preferred measure for the fiscal stance.

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4.3. Robustness

It is important to subject our equation (3) to alternative estimators that help correcting and overcoming some of the traditionally encountered econometric pitfalls. First, a positive correlation between inflation volatility and fiscal stance can also be the result of reverse causality, that is, higher inflation volatility causing more activist fiscal policies. In addition, the results can be driven by a third, omitted variable that affects inflation volatility and the volatility of discretionary fiscal policies simultaneously. If we correctly specify the form of the variance (i.e., if we account for serial correlation and possible cross-sectional heteroskedasticity and then use estimated cross-section residual variances as weights), then there exists a more efficient estimator (Feasible Generalized Least Squares—FGLS) than OLS.

Endogeneity between right- and left-hand side variables can be an additional concern. In an attempt to overcome this issue, we resort to Arellano and Bond's (1991) difference GMM estimator (DIF-GMM). However, as there are a number of limitations in DIF-GMM estimation[6], under the assumptions set by Arellano and Bover (1995), the system-GMM estimator (SYS-GMM) can be used to alleviate the weak instrument problem.

We also run main regression equation with Driscoll and Kraay's (1998) robust standard errors.[7]

Another important aspect to take into consideration is how much outliers drive our results. We use two alternative methods to exclude potentially adverse outliers. First, we employ the Least Absolute Deviations (LAD) estimation method, which is a robust method in the presence of outliers and asymmetric error terms [Bassett and Koenker (1978)]. Second, we use the M (which stands for "maximum likelihood type") estimation that was introduced by Huber (1973).

Table 2 shows the results. We observe consistent results across the different estimators, from column (1) to (5). Specifically, higher inflation or nominal exchange rate fluctuations enhance price volatility. The same is true if fiscal policy becomes more active (in discretionary terms). The positive impact of the output gap is only statistically significant in the FGLS regression. As far as the two outlier robust approaches are concerned, looking at Table 2, we can see a positive and significant impact of fiscal activism on inflation volatility. Note that the other regressors keep the previous signs and similar magnitudes.

Next, we allow for alternative measures of inflation volatility to play a role as the dependent variable. A second measure we consider relies on setting up an appropriate inflation forecast model to capture the impact of discretionary fiscal policies on the uncertainty of expected inflation. The underlying assumption is that changes in discretionary fiscal policies make inflation forecasting more difficult, translating into larger forecast errors. In a panel setting there is a trade-off between forecast accuracy and structural homogeneity to countries when generating a proxy for inflation expectations. An AR(1) model with GARCH(1,1) structure for residual variances is estimated at annual frequency, with the forecast error variance representing conditional inflation uncertainty. Our conditional

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TABLE 2. Price volatility and fiscal discretion (measured as the absolute value of fiscal stance), alternative estimators

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Estimator	GLS	Driscoll Kraay	Difference GMM	System GMM	LAD	M
Regressors						
dep.var. (−1)	0.749*** (0.031)	0.705*** (0.099)	0.611*** (0.238)	0.535*** (0.158)	0.715*** (0.028)	0.937*** (0.066)
dep.var. (−2)	−0.155*** (0.026)	−0.134** (0.050)	−0.512*** (0.157)	−0.114* (0.069)	−0.089*** (0.022)	−0.154** (0.065)
inflation	0.122*** (0.007)	0.121*** (0.026)	0.117*** (0.023)	0.119*** (0.035)	0.142*** (0.009)	0.114*** (0.024)
inflation (−1)	−0.076*** (0.007)	−0.090*** (0.025)	0.029 (0.054)	−0.056 (0.038)	−0.114*** (0.008)	−0.092*** (0.024)
fiscal stance	0.017*** (0.007)	0.033*** (0.009)	0.135*** (0.050)	0.038** (0.018)	0.030*** (0.011)	0.022** (0.010)
output gap	0.016*** (0.006)	0.023 (0.017)	0.037 (0.029)	0.028 (0.020)	0.046*** (0.012)	0.030*** (0.009)
gov.expenditures	−0.002 (0.004)	−0.004 (0.006)	0.022 (0.027)	−0.019 (0.014)	−0.003* (0.002)	−0.002* (0.001)
sd.money	0.005 (0.003)	0.002 (0.002)	−0.028 (0.048)	0.001 (0.013)	−0.003 (0.004)	−0.001 (0.002)
sd NEER (−1)	0.007** (0.003)	0.019*** (0.006)	0.036* (0.020)	0.034*** (0.009)	0.011*** (0.002)	0.008*** (0.002)
imports_gdp (−1)	0.002 (0.002)	−0.001 (0.003)	0.004 (0.013)	0.003 (0.007)	0.002** (0.001)	0.001 (0.001)
Observations	848	848	794	848	714	723
AR(1)			0.020	0.002		
AR(2)			0.146	0.747		
Hansen (*p*-value)			0.863	0.751		

Notes: Estimation using alternative estimators as identified in the second row. LAD denotes the least absolute deviation; M denotes the Huber's (1973) estimator. Robust standard errors in parentheses. AR(1) and AR(2) denote the *p*-values for the first- and second-order serial correlation in the residuals. The Hansen *p*-value tests the null hypothesis of correct model specification and valid overidentifying restrictions, that is, validity of the instruments. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Constant term was estimated by omitted for reasons of parsimony.

inflation variances account for this possible interaction through the inclusion of the level of fiscal stance in the level equation for inflation. The time series model for inflation forecast takes the following form:

$$\begin{aligned} \pi_t &= \delta + \beta_1 \pi_{t-1} + \beta_2 F_t + \xi_t \\ \sigma_t^2 &= \psi + \theta_1 \lambda_{t-1}^2 +_1 \sigma_{t-1}^2 \end{aligned} \tag{3}$$

where π_t is the year-on-year inflation rate and F_t is the fiscal stance. Conditional inflation volatility is given by the one-step-ahead standard deviation σ_t for each forecast of the inflation rate.

The remainder of our measures of inflation volatility are based on inflation forecasts produced by Consensus Economics. We use the mean of the private analysts' monthly consensus forecasts of the inflation rate for the current and next year for the period from September 1989 to December 2012.

The third, fourth, fifth, and sixth proxies of inflation volatility correspond to the 12-month averages and standard deviations for current year and year-ahead forecasts. It is important to use higher-frequency data to better capture the interactions between fiscal policies and monetary policies [see Melitz (1997) and Muscatelli et al. (2002)].[8]

Table 3 shows that changes in the fiscal stance robustly increase price volatility. This means that fluctuations in both actual inflation data and also in inflation expectations, reflecting different horizons of uncertainty, are equally affected by changes in discretionary fiscal policy actions.

Table 4 splits our sample by income group into advanced and emerging countries. In general, fiscal activism in emerging market economies fuels inflation volatility much more pronouncedly compared with advanced countries. High inflation has also a more damaging effect in price fluctuations in emerging markets than in advanced countries. Hence, the fact that this effect is present (in a statistically significant way) for the emerging markets subsample implies that fiscal activism somehow pushed up prices. Interestingly, several papers dealing with possible price explanations via the fiscal theory of the price level, and the interactions between monetary policy and fiscal policy, essentially only find such links between the fiscal stance and prices in emerging economies [Loyo (1999)].

Then we went on to explore whether fiscal activism was different during good and bad times of the economic business cycle. To this end, we interacted our measure of fiscal volatility with positive and negative output gap. We observed that during economic expansions (recessions) the detrimental effect of fiscal activism on price volatility is soft (heightened).

Finally, we assessed if our measure of fiscal stance (defined as the absolute value of annual changes in CAPB) had differentiated effects if those changes meant an improvement or a deterioration of the fiscal stance. We explored this by splitting our proxy for fiscal volatility into the absolute value of positive changes and the absolute value of negative changes. Results (not shown but available upon request) showed that the negative impact of fiscal activism on price stability was higher when fiscal policy was expansionary.

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TABLE 3. Price volatility and fiscal discretion (measured as the absolute value of fiscal stance), alternative dependent variables

Specification	(1)	(2)	(3)	(4)	(5)
Dependent variable	GARCH-implied volatility	Average of monthly inflation forecast errors (current year)	Standard deviation of monthly inflation forecast errors (current year)	Average of monthly inflation forecast errors (year ahead)	Standard deviation of monthly inflation forecast errors (year ahead)
Regressors					
dep.var. (−1)	0.730*** (0.027)	0.128*** (0.038)	0.216*** (0.021)	0.130*** (0.044)	0.030** (0.013)
dep.var. (−2)	−0.294*** (0.027)	0.100*** (0.029)	−0.007 (0.020)	−0.027 (0.039)	0.046*** (0.012)
inflation	−0.022*** (0.003)	41.059*** (2.044)	20.014*** (1.375)	−1.456 (4.038)	12.507*** (0.828)
inflation (−1)	0.053*** (0.003)	−17.813*** (2.298)	−8.679*** (1.342)	10.869*** (3.392)	−4.500*** (0.825)
fiscal stance	0.012*** (0.004)	0.106*** (0.037)	0.019 (0.019)	0.099** (0.046)	0.030*** (0.011)
output gap	0.013*** (0.004)	0.234*** (0.046)	0.121*** (0.027)	0.185*** (0.064)	0.064*** (0.015)
gov.expenditures	−0.001 (0.003)	0.016 (0.021)	0.011 (0.011)	−0.003 (0.028)	0.001 (0.006)
sd NEER (−1)	−0.000 (0.001)	0.037*** (0.005)	0.015*** (0.003)	0.080*** (0.007)	0.007*** (0.002)
imports_gdp (-1)	0.002 (0.001)	−0.017 (0.011)	−0.015** (0.006)	−0.003 (0.016)	−0.008** (0.004)
Observations	912	597	596	597	596
R-squared	0.755	0.602	0.734	0.547	0.694

Notes: OLS regression with different proxies for the dependent variable as identified in the second row. Time and country effects included but omitted. Robust standard errors in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Constant term was estimated by omitted for reasons of parsimony.

TABLE 4. Price volatility and fiscal discretion (measured as the absolute value of fiscal stance), alternative dependent variables, by income group

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent variable	Baseline		GARCH-implied volatility		Average of monthly inflation Forecast Errors (current year)		Standard deviation of monthly inflation forecast errors (current year)		Average of monthly inflation Forecast Errors (year ahead)		Standard deviation of monthly inflation forecast errors (year ahead)	
Income group	AE	EM	AE	EM	AE	EM	AE	EM	AE	EM	AE	EM
Regressors												
dep.var. (−1)	0.926***	0.486***	0.647***	0.702***	0.076	−0.006	0.014	0.220***	0.106*	0.176*	−0.030	0.023
	(0.036)	(0.067)	(0.043)	(0.044)	(0.052)	(0.058)	(0.053)	(0.039)	(0.054)	(0.089)	(0.052)	(0.023)
dep.var. (−2)	−0.215***	−0.148***	−0.114***	−0.264***	−0.023	0.046	0.047	−0.037	−0.043	−0.065	0.035	0.031
	(0.030)	(0.038)	(0.036)	(0.044)	(0.047)	(0.050)	(0.044)	(0.036)	(0.054)	(0.073)	(0.043)	(0.023)
inflation	0.100***	0.132***	0.001	−0.019***	−0.356	37.854***	1.053	22.276***	10.601***	−3.390	0.005	14.827***
	(0.010)	(0.016)	(0.001)	(0.006)	(1.334)	(3.623)	(0.917)	(2.708)	(3.531)	(8.568)	(0.655)	(1.601)
inflation (−1)	−0.062***	−0.042**	0.002***	0.073***	3.022**		2.115**	−4.410	−0.707	20.112***	2.782***	−2.674
	(0.010)	(0.021)	(0.001)	(0.006)	(1.214)		(0.844)	(2.720)	(3.300)	(6.778)	(0.606)	(1.723)
fiscal stance	0.010	0.067**	0.001**	0.038***	−0.008	0.264**	−0.002	0.002	0.028	0.094	−0.001	0.037
	(0.007)	(0.027)	(0.001)	(0.013)	(0.010)	(0.109)	(0.007)	(0.052)	(0.025)	(0.121)	(0.005)	(0.028)
output gap	0.029***	0.040**	0.000	0.009	−0.007	0.424***	−0.009	0.241***	0.036	0.281***	−0.014*	0.128***
	(0.008)	(0.020)	(0.001)	(0.009)	(0.014)	(0.115)	(0.011)	(0.060)	(0.041)	(0.138)	(0.008)	(0.032)
gov.expenditures	−0.000	−0.047*	0.001***	−0.014	0.003	0.036	0.002	−0.068	0.018	−0.097	−0.000	−0.052*
	(0.001)	(0.027)	(0.000)	(0.011)	(0.005)	(0.092)	(0.004)	(0.052)	(0.013)	(0.123)	(0.003)	(0.028)
sd NEER (−1)	0.004*	0.040***	0.000	0.001	0.000	0.035***	0.001	0.014***	−0.028*	0.084***	−0.001	0.007**
	(0.002)	(0.006)	(0.000)	(0.002)	(0.006)	(0.010)	(0.004)	(0.005)	(0.016)	(0.013)	(0.003)	(0.003)
imports_gdp (−1)	0.001***	−0.003	0.000	0.004	−0.004	−0.023	−0.006***	−0.062***	0.008	−0.057	−0.003**	−0.030***
	(0.000)	(0.010)	(0.000)	(0.004)	(0.003)	(0.034)	(0.002)	(0.021)	(0.008)	(0.050)	(0.001)	(0.011)
Observations	609	239	625	287	404	193	404	192	404	193	404	192
R-squared	0.814	0.850	0.752	0.796	0.220	0.613	0.479	0.799	0.457	0.619	0.496	0.773

Notes: OLS regression with different proxies for the dependent variable as identified in the second row. Time and country effects included but omitted. Subsampling analysis as identified in the third row: AE, advanced economy; EM, emerging market. Robust standard errors in parentheses. *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Constant term was estimated by omitted for reasons of parsimony.

5. CONCLUSION

The links between fiscal policy and inflation are important in terms of inflationary pressures from fiscal expansions and also regarding the potential instability effects of government activities on price volatility.

In this note, we used a panel sample of 54 advanced and emerging economies between 1980 and 2013, and we found empirical support for the view that changes in the fiscal policy stance show a significant positive correlation with inflation volatility. Even after accounting for possible endogeneity we still found similar results. Our findings are robust to alternative measures of inflation volatility [e.g., GARCH (1,1) implied volatility; the average and standard deviation of 12-month forecast errors using Consensus Economics forecasts]. That is, expansionary fiscal stance augments price volatility. Taking into account the two subsamples of advanced and emerging economies, fiscal activism fuels inflation volatility much more pronouncedly in the case of emerging market economies vis-à-vis advanced economies. Another relevant result relates to the fact that, in the context of economic expansions (recessions), the harmful impact of fiscal activism on price volatility is soft (heightened). In the same vein, the negative impact of fiscal activism on price stability is higher when fiscal policy is expansionary. This has a useful policy implication since it hints at the idea that discretionary fiscal policy can produce less price volatility in boom times. In contrast, in the context of a currency crisis, discretionary fiscal policy can exacerbate price volatility.

All in all, the fact that fiscal developments can impinge on inflation volatility is relevant from a policy perspective as it calls for further cooperation between fiscal and monetary authorities. Regarding future work, one might consider possible regime shifts notably due to the fact that some countries may decide to peg their currencies or to enter a monetary union.

SUPPLEMENTARY MATERIAL

To view supplementary material for this article, please visit https://doi.org/10.1017/S1365100518000688.

NOTES

1. Inflation can also impact societal welfare, but such incursion would go beyond the scope of this paper. For a recent discussion in OECD countries, see Boel and Camera (2011).

2. The list of countries is: the USA, the UK, Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland, Canada, Japan, Finland, Greece, Iceland, Ireland, Portugal, Spain, Turkey, Australia, New Zealand, South Africa, Argentina, Brazil, Chile, Colombia, Mexico, Peru, Israel, Jordan , Egypt, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand, Morocco, Bulgaria, Russia, China, Ukraine, Czech Republic, Slovak Republic, Hungary, Lithuania, Slovenia, Poland, Romania. The set of 54 countries was dictated by data availability, namely the variable cyclically adjusted balance provided by the IMF WEO database and used in this note as the main input for generating our measure of discretionary fiscal policy.

3. For a recent discussion on the cyclicality of automatic and discretionary fiscal policy, see Bernoth et al. (2015).

4. Using the CAPB as a percentage of potential GDP does not qualitatively change our main results.

5. Summary statistics of all variables are presented in Table A2 in the Appendix. Note that for variables entering in levels, in order to dismiss concerns about model misspecification or spurious results, we checked using the Im-Pesaran-Shin panel unit root that such variables are $I(0)$. We thank an anonymous referee for this point.

6. For instance, the lagged levels of the series may be weak instruments for first differences, especially when they are highly persistent, or the variance of the individual effects is high relative to the variance of the transient shocks.

7. This non-parametric technique assumes the error structure to be heteroskedastic, autocorrelated up to some lag and possibly correlated between the groups.

8. The correlations between our eight measures of inflation volatility are presented in Table A1 in the Appendix. All our measures are positively correlated at the 1% statistical significance level.

REFERENCES

Afonso, A. and J. Jalles (2017) The price relevance of fiscal developments. *International Economic Journal* 31(1), 36–50.

Afonso, A. and P. Gomes (2014) Interactions between private and public sector wages. *Journal of Macroeconomics* 39, 97–112.

Afonso, A. and R. Sousa (2012) The macroeconomic effects of fiscal policy. *Applied Economics* 44(34), 4439–4454.

Aizenman, J., M. Chinn and H. Ito (2010) The emerging global financial architecture: Tracing and evaluating new patterns of the trilemma configuration. *Journal of international Money and Finance* 29(4), 615–641.

Al-Marhubi, F. (1998) Cross-country evidence on the link between inflation volatility and growth. *Applied Economics* 30, 1317–1326.

Arellano, M. and O. Bover (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics* 68, 29–51.

Arellano, M. and S. Bond (1991) Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies* 58, 277–297.

Bassett, G. and R. Koenker (1978) Asymptotic theory of least absolute error regression. *Journal of the American Statistical Association* 73(363), 618–622.

Bassetto, M. and R. Butters (2010) What is the relationship between large deficits andinflation in industrialized countries? *Economic Perspectives* 3Q/2010, 83–100, Federal Reserve Bank of Chicago.

Bernoth, K., A. Hallet and J. Lewis (2015) The cyclicality of automatic and discretionary fiscal policy: What can real-time data tell us? *Macroeconomic Dynamics* 19(1), 221–243.

Blanchard, O. and J. Simon (2001) The long and large decline in U.S. output volatility. *Brookings Papers on Economic Activity* 1, 135–164.

Bleaney, M. and D. Fielding (2002) Exchange rate regimes, inflation and output volatility in developing countries. *Journal of Development Economics* 68(1), 233–245.

Boel, P. and G. Camera (2011) The welfare cost of inflation in OECD countries. *Macroeconomic Dynamics* 15(S2), 217–251.

Catão, L. and M. Terrones (2003) Fiscal deficits and inflation. IMF, Washington, DC.

De Graeve, F. and V. von Heideken (2013) Identifying fiscal inflation. Sveriges Riksbank Working Paper Series, No. 273.

Driscoll, J. and A. Kraay (1998) Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics* 80(4), 549–560.

Fatas, A. and I. Mihov (2003) The case for restricting fiscal policy discretion. *Quarterly Journal of Economics* 4, 1419–1447.

Fischer, S., R. Sahay and C. Végh (2002) Modern hyper- and high inflations. *Journal of Economic Literature* 40(3), 837–880.
Friedman, M. (1977) Nobel lecture: Inflation and unemployment. *Journal of Political Economy* 85, 451–472.
Froyen, R. and R. Waud (1987) An examination of aggregate price uncertainty in four countries and some implications for real output. *International Economic Review* 28(2), 353–372.
Furceri, D. and J. T. Jalles (2018) Determinants and effects of fiscal stabilization: New evidence from time-varying estimates. *Ensayos sobre Politica Economica* 36(85).
Ghosh, A., A.-M. Gulde, J. Ostry and H. Wolf (1997) Does the nominal exchange rate regime matter? NBER WP 5874.
Hemming, R., M. Kell and S. Mahfouz (2002) The effectiveness of fiscal policy in stimulating economic activity– A review of the literature. IMF Working Paper 02/208.
Huber, P. (1973) Robust regression: Asymptotics, conjectures and Monte Carlo. *Annals of Statistics* 1, 799–821.
Judson, R. and A. Orphanides (1999) Inflation, volatility and growth. *International Finance* 2(1), 117–138.
Leeper, E. (1991) Equilibria under 'active' and 'passive' monetary and fiscal policies. *Journal of Monetary Economics* 27(1), 129–147.
Loyo, E. (1999) *Tight Money Paradox on the Loose: A Fiscalist Hyperinflation*. Boston, USA: Kennedy School of Government, Harvard University.
Magkonis, G. and A. Tsopanakis (2016) The financial and fiscal stress interconnectedness: The case of G5 economies. *International Review of Financial Analysis* 46, 62–69.
Martinez-Mongay, C. (2001) *Some (un-)Pleasant Econometrics about the Relationship Between Fiscal Policy and Macroeconomic Stability. Stability-Enhancing Reforms of Governments*. Brussels: mimeo, European Commission.
Melitz, J. (1997) Some cross-country evidence about debt, deficits and the behaviour of monetary and fiscal authorities. CEPR Discussion Paper 1653.
Muscatelli, V., P. Tirelli and C. Trecroci (2002) Monetary and fiscal policy interactions over the cycle: Some empirical evidence. CESifo Working Paper 817.
Perotti, R. (2002) Estimating the effects of fiscal policy in OECD countries. ECB WP 168.
Rother, P. (2004) Fiscal policy and inflation volatility. ECB WP 317.
Sargent, T. and N. Wallace (1981) Some unpleasant monetarist arithmetic. *Federal Reserve Bank of Minneapolis Quarterly Review* 5(3), 1–17, Fall.
Sims, C. (1994) A simple model for the study on the determination of the price level and the interaction of monetary and fiscal policy. *Economic Theory* 4(3), 381–399.
Tiwari, A. K., S. Bolat and Ö. Koçbulut (2015) Revisit the budget deficits and inflation: Evidence from time and frequency domain analyses. *Theoretical Economics Letters* 5, 357–369.
Tulip, P. (2014). Fiscal policy and the inflation target. *International Journal of Central Banking* June, 10(2), 63–96.
Woodford, M. (1994) Monetary policy and price level determinacy in a cash-in-advance economy. *Economic Theory* 4(3), 345–380.