Does Central Bank Independence Affect Stock Market Volatility?

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Abstract: This paper addresses the issue of impacts of central banks' conservativeness/independence on stock market volatility. Using a simple theoretical macroeconomic model, we analytically find a positive link between stock prices volatility and central bank conservativeness. By applying panel data analysis on a set of 29 countries from 1998 to 2005, sufficient evidence for this positive relationship is provided using two different measures of stock market volatility.

Key words: Central bank transparency, stock market volatility, panel data
JEL classification numbers: E52, E58, G1

1. Introduction

The conduct of monetary policy has moved during the last two decades to a new paradigm, which gives accent to central banks' independence and transparency. In effect, a very important strand of the literature, starting with the seminal papers by Kydland and Prescott (1977), Barro and Gordon (1983), and Rogoff (1985), by assuming that individuals form rational expectations and modeling the behavior of

government, they showed that a discretionary monetary policy creates an inflation bias. However, the so-called time inconsistency problem of monetary policy can be solved when considering central banks which are politically, economically and personally independent because inflation expectations are better anchored and therefore surprise inflation generated by politicians is prevented. Moreover, more transparent monetary policies gained importance based on accountability and economic arguments. Since the pioneer work of Cukierman and Meltzer (1986), a large body of the literature on the economic desirability of central bank transparency has been developed.[1] There is common wisdom that more information is crucial for the private sector and financial operators helping them to improve expectations and therefore their decisions (Blinder, 1998; Eijffinger *et al*., 2000; Van der Cruijsen and Demertzis, 2007; Crowe and Meade, 2008; Papadamou, 2013, Papadamou *et al*. 2014a among others).

Recent studies on central bank independence mainly investigate the effects of central bank independence on macroeconomic performance[2] (Cukierman, 2008; de Haan *et al*., 2008; Carlstrom & Fuerst, 2009; Alpanda & Honig, 2009; Alesina & Stella, 2010; Klomp & de Haan, 2010a; Klomp and de Haan, 2010b; Arnone & Romelli, 2013; Dincer & Eichengreen, 2014).

However, little attention has been paid to the link between central bank independence and financial stability. Garcia Herrero & Del Rio (2003) and Čihák (2007) suggest that there is a positive relationship between central bank independence and financial stability. In their analysis, they consider that financial instability is proxied by the occurrence of banking crises. More recently, Klomp & De Haan (2009) have resulted to the same conclusion by using factor analysis on a number of financial instability indicators. Kuttner & Posen (2010), focusing on the impact of central bank governor appointments on exchange rates and bond yields, have shown that less independence may result in higher markets' reaction. Moser & Dreher (2010) find that high governor turnover affects stock market returns, if the perceived inflation aversion of the new central bank governor differs from that of the of the predecessor's. Förch &

[1] See for a survey on central bank transparency, Geraats (2002) and Eijffinger and van der Cruisjen, (2010).

[2] For an overview of previous literature on central bank's independence macroeconomic desirability, see Arnone *et al.*, 2009.

Sunde (2012) investigate the effect of central bank independence on stock market returns, finding evidence of a positive effect which is however based on the economic independence rather than the political independence. Berger & Kißmer (2013), contrary to previous studies, find a negative link between central bank independence and financial stability. According to their view, a preemptive interest rate hike gives rise to a lower inflation rate in the boom period, leading to an undesirable undershooting of the inflation target for independent central bankers. In this context, Borio & Lowe (2002) underlines that a credible low inflation policy reduces the vigilance of investors and financial institutions to the occurrence of future economic downturns, leading to further borrowing and lending, respectively, positively affecting asset prices.

Unambiguously, in our days, central banks by their speeches, reports and actions have a more upgraded role in the formation of investors' expectations in the stock markets. This study tries to identify the effect of central bank independence on the stock market volatility measures. The level of central bank independence may also have an influential effect on stock market volatility, as central bank's level of transparency proposed by Papadamou *et al*. (2014b). More precisely, this study contributes to the existing literature in two ways: a) by developing a theoretical model which shows the link between stock market volatility and central bank conservativeness and b) by providing, in an international context, empirical evidence for the effect of independence/conservativeness on stock market volatility. Our findings imply that a high level of conservativeness can increase stock market volatility. An interesting policy implication is that a high degree of central bank conservativeness can contribute to financial instability.

The remainder of the paper is structured as follows: The next section describes the theoretical model developed. Section 3 presents the empirical analysis, and finally, we conclude in the last section.

2. The analytical setting

We develop a stylised model similar to that of Smets (1997) in order to investigate the relationship between central bank conservativeness[3] and stock prices. In this context, the economy is characterised by the following equations:

$$\pi_t = \pi_t^{\,e} + \gamma y_t - \varepsilon_t^{\pi}, \quad \gamma > 0, \tag{1}$$

$$y_t = -\theta\, r_t + \delta\, q_t + \varepsilon_t^{d}, \qquad \theta, \delta > 0. \tag{2}$$

$$q_t = \rho E_t q_{t+1} + (1-\rho) E_t d_{t+1} - r_t + \varepsilon_t^{q} \tag{3}$$

where all variables are in logarithms, except the interest rates, and constants have been normalised to zero.

Our inflation augmented Phillips is described by equation (1), where π denotes the inflation rate, y the output, and ε_π a supply stock.

According to equation (2), the aggregate demand of the economy is negatively related to the real interest rate and positively to stock prices where the real interest rate, $r = i - \pi^e$ is the difference between the nominal interest rate, i, and the expected inflation rate, π^e. A wealth effect (denoted by q) is incorporated in the aggregate demand in order to capture the role of asset prices in the transmission mechanism of monetary policy (see, e.g., Cecchetti *et al*., 2000). It can also be interpreted as the Tobin's *q*, which positively influences consumption and investment. Finally, ε_d indicates a demand shock.

Equation (3) denotes real stock prices which can be decomposed into the expected capital gain ($E_t q_{t+1}$), the expected dividend gain ($E_t d_{t+1}$), the effect of the real interest rate, and a time-varying risk premium (ε_t^q). We assume that $d_{t+1} = y_t$, meaning that the expected real dividend is proportional to output. Moreover, without loss of

[3] The relationship between independence and conservatism has been investigated both theoretically and empirically by Eijffinger & Hoeberichts (1998; 2008). They found a negative relationship between these two concepts. In our study, we do not relate independence in terms of a specific parameter. In other words, we consider that central bank independence and conservatism are positively linked.

generality, we also consider that the expected value of future stock prices can be expressed by $E_t q_{t+1} = \beta q_t$.[4]

The Rogoff-type central bank minimises the following loss function:

$$L = \frac{1}{2} E\left[\pi^2 + b(y-k)^2\right], \tag{4}$$

where E is the expectation operator, and b is the weight associated with the output objective k relative to the inflation objective (which is supposed to be zero).[5] As it is common in the related literature, the weight attached to the inflation objective is normalised to unity (see Muscatelli, 1998; Demertzis & Hughes Hallet, 2007 among others).

We complete the description of our model with the timing of events as follows: (i) the public forms its inflationary expectations π^e; (ii) shocks ε_d, ε_t^q, and ε_π occur; (iii) the central bank sets its monetary policy; and finally (iv) firms decide their level of production, y, and price level, p.

In our study, we consider that the more important the value of b, the less conservative the central bank is. Assuming that the central bank correctly anticipates what the public thinks, the minimization of the central bank's problem leads to the following optimality condition:

$$\pi = -\frac{b}{\gamma}(y-k) \tag{5}$$

Substituting then equations (1) and (2) into equation (5) and rearranging the terms, we get the following expression for the real interest rate:

$$r = \frac{1}{\theta}\frac{\gamma}{b+\gamma^2}\pi^e + \frac{\delta}{\theta}q + \frac{1}{\theta}\varepsilon_d - \frac{1}{\theta}\frac{\gamma}{b+\gamma^2}\varepsilon_\pi - \frac{1}{\theta}\frac{b}{b+\gamma^2}k \tag{6}$$

[4] It is initially assumed that the future value of stock prices can be expressed as $q_{t+1} = \beta q_t + \mu_t$.

[5] The parameter k reflects the central bank's desire to offset labour market distortions.

However, it must be noticed that the term of expected inflation (π^e) is not yet developed. Substituting then equations (2) and (6) into equation (1), and using the optimality condition (5) yields

$$\pi^e = \frac{b}{\gamma} k \tag{7}$$

$$\pi = \frac{b}{\gamma} k - \frac{b}{b+\gamma^2} \varepsilon_\pi \tag{8}$$

$$y = \frac{\gamma}{b+\gamma^2} \varepsilon_\pi \tag{9}$$

Using then equations (6), (7), (8) and (9) into equation (3), and solving for the stock prices, we get

$$q = \frac{\gamma}{b+\gamma^2} \left[\frac{(1-\rho)\theta\alpha + 1}{(1-\rho\beta)\theta + \delta} \right] \varepsilon^\pi + \frac{1}{(1-\rho\beta)\theta + \delta} \left(\theta\varepsilon^q - \varepsilon^d \right) \tag{10}$$

Looking at the impact of central bank conservativeness on the variability of stock prices, we take the variance of equation (10) and we find the following expression:

$$\mathrm{Var}q = \left(\frac{\gamma}{b+\gamma^2} \right)^2 \left[\frac{(1-\rho)\theta + 1}{(1-\rho\beta)\theta + \delta} \right]^2 \sigma^2_{\varepsilon_\pi} + \left(\frac{1}{(1-\rho\beta)\theta + \delta} \right)^2 \left(\theta^2 \sigma^2_{\varepsilon_q} + \sigma^2_{\varepsilon_d} \right) \tag{11}$$

The volatility of stock prices is related to the volatility of exogenous shocks. Since central bank conservativeness is negatively related to the weight attached to the output objective b ,it is straightforward that there is a clear-cut positive link between stock market volatility and central bank conservativeness, leading thus to the following proposition.

Proposition: *The volatility of stock prices is negatively related to central bank conservativeness or independence.*

Proof: Differentiating the volatility of stock prices, $Var(q)$, with respect to the inverse of conservativeness, b, we obtain

$$\frac{\partial \mathrm{Var}q}{\partial b} = -2\frac{1}{\left(b+\gamma^2\right)}\left(\frac{\gamma}{b+\gamma^2}\right)^2\left[\frac{(1-\rho)\theta+1}{(1-\rho\beta)\theta+\delta}\right]^2\sigma^2_{\varepsilon_\pi} < 0 \qquad (12)$$

Since central bank weights more (a higher value of b) the output objective, there is a negative impact on the volatility of stock prices. In other words, more conservative and independent central banks are more likely to harm financial stability. A notable example is the case of the ECB which has a more conservative profile compared to the FED.

3. Empirical analysis

3.1 Data and Methodology

Our sample covers 29 countries for the period from 1998 to 2005 on an annual basis, where significant changes on the level of central bank characteristics such as independence and transparency have been occurred. In the literature several methods to construct central bank independence index are proposed (Bade & Parkin, 1982; Cukierman *et al*., 1992, Fry *et al*. 2000, Polillo & Guillén, 2005; Arnone *et al*. 2009, Arnone & Romelli, 2013). Recently, Dincer & Eichengreen (2014) create an index of independence for a large number of countries and an extended period of time. In our study, we consider this latter index of central bank independence.

As far as transparency index is considered we used the one developed by Eijffinger & Geraats, (2006) and Dincer & Eichengreen, (2007). More specifically, they construct an index of transparency by taking account of the actual information disclosed by central banks taking a value from zero (lower level of transparency) to fifteen (higher level of transparency). Dincer & Eichengreen (2007) extended the transparency index, initially proposed by Eijffinger & Geraats, (2006), for a large range of central banks (124) over the period (1998–2005).

Stock market general indices are drawn from the database Ecowin Reuters, and the money market rates are taken from the IFS database of the International Monetary Fund. Every year, the standard deviation of the money market rates is calculated as a proxy for historical volatility measure, by using quarterly data.

Following the study of Papadamou *et al*. (2014b) and in order to check for the robustness of our results two different measures of stock market volatility are constructed. The first one refers to conditional volatility based on the estimation of a GARCH model on stock market returns on a daily frequency.[6] Based on the coefficients estimated in these models, we construct the daily conditional standard deviation (conditional volatility), and then we aggregate up the daily volatilities to annual frequency.[7]The second one called historical volatility is on an annual basis by using quarterly data of stock prices.

In order to investigate empirically the theoretical relationship developed in the previous section between central bank's level of independence and stock market volatility panel data analysis is applied on a set of data for 29 countries. Panel data methodology presents a number of significant advantages compared to times series analysis. Among others, Wooldridge (2002) argues that panel data methodology controls for individual heterogeneity, diminishes problems associated with multicollinearity and estimation bias. Therefore, our general form of the model estimated is the following:

$$y_{j,t} = a_0 + a_1 Tr_{j,t} + a_2 CBI_{j,t} + \sum_{k=1}^{\lambda} \beta_k x_{j,t}^k + e_{j,t} \tag{13}$$

where stock market volatility (y) can be measured either by the standard deviation of quarterly stock prices $\sigma(q)_{j,t}$, by the GARCH-based stock return volatility previously used by Papadamou *et al*. (2014b). The central bank independence index $CBI_{j,t}$ and the transparency index $Tr_{j,t}$ are the regressors proposed in order to capture central bank characteristics. Based on the analytical model of section two, we expect a positive effect of CBI on stock market volatility. While $x_{j,t}$ is the group of k control variables based on previous relevant literature (Mun, 2007; Umutlu *et al.*, 2010; Esqueda *et al.*, 2012). More specifically, in order to take into account any possible size effects the stock market capitalization deflated by GDP (referred to here after as 'Size') is constructed.The interest rate volatility measured as the standard deviation of

[6] GARCH estimates are not presented for economy of space reasons but are available from the authors upon request.

[7] To aggregate volatilities from daily to lower frequencies, say annually, we take the average over that year and scale by $\sqrt{365}$, allowing for the possibility of missing days due to, for instance, holidays.

quarterly interest rates, $\sigma(i)_{j,t}$, is used to capture the reaction to demand and inflation shocks. The country's foreign equity inflows and outflows plus foreign direct investment inflows and outflows divided by GDP (referred to hereafter as 'GEQY') can offer an index of financial integration. The ratio of the total value of shares traded over the average market capitalization on (TO, turnover ratio) can capture any possible liquidity effects on stock market volatility.

Finally as general macroeconomic factors, we include the real GDP growth and the effective exchange rate volatility measured by the standard deviation of the effective exchange rate (EER) monthly series over a year. [8] The EER data are provided by the Bank of International Settlements (BIS).

Table 1 provides the descriptive statistics for the variables of interest of our sample. The conditional volatility is presenting higher mean and standard deviation comparing to historical one. As far as central bank characteristics are considered the transparency variable presents higher dispersion compared to the independence variable. They both cover a significant part of the scale of the measurement. Interest rate volatility is higher compared to exchange rate volatility implying more active management of demand shocks in the economies studied. The variables concerning the stock market like turnover ratio, and market capitalization present high mean values but also significant variation across the mean, while GDP growth is more stable and with low mean.

<Insert Table 1 here>

Referring to our empirical model the $e_{j,t}$ are the error terms for j=1,2, …,M cross-sectional units, observed for t=1,2,…,T dated periods. The parameter a_0 represents the overall constant in the model. At this point we have to mention that any cross-panel correlations, i.e., $Cov(e_{j,t}, e_{s,t}) \neq 0$, may result to inefficient estimates (see Beck and Katz, 1995).Therefore, the hypothesis of cross-sectional independence is tested by implementing to tests for panel-data models with small T and large N. The first one is the semi-parametric test proposed by Frees (1995), while the second one is the

[8] Turnover ratio and size are collected by the World Bank, while GEQY is available on the updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007).

parametric one proposed by Pesaran (2004). As far as heteroskedasticity problems are considered we employed the modified Wald test for group-wise heteroskedasticity (Wooldridge, 2002). The results of the above tests, employed to assess the existence of such biases, are presented in the lower part of table 3 where estimation results are presented.

Given that in the case of heteroskedastic and contemporaneously correlated across panels disturbances, the combination of OLS with panel-corrected standard errors (PCSEs) leads to an accurate estimation compared to the feasible GLS method (Beck and Katz, 1995), we proceed to the OLS estimations with PCSEs. Moreover, in order to correct for any correlation within panels, Prais-Winsten regression is estimated with PCSEs.

3.2 Empirical Results

By proceeding to our empirical investigation two different versions of our model are estimated. In the first one we investigate the effect of central bank's characteristics alone on stock market volatility measures. While in the second one, referred as extended model, all the control variables described in the previous section are included. The two models are estimated for both historical and conditional stock market volatility measures. The estimation results is obtained by using OLS and the Prais-Winstein method with PCSEs, due to the evidence provided for contemporaneous correlations of errors (see the results of tests suggested by Frees, 1995, and Pesaran, 2004) and for group-wise heteroskedasticity (see Wald test in the bottom of table 3).

<Insert Table 2 here>

The first version of our model confirms our theoretical argument for the positive effect of central bank independence on stock market volatility. While as in study of Papadamou *et al*. (2014b), the higher level of central bank transparency can have beneficial effect on stock market volatility. These two effects, responsible for almost 20% percent of stock market variability, are not affected in the extended models for all measures of stock market volatility. In absolute terms the effect of central bank independence on stock market volatility is higher compared to the effect of higher

transparency. This result can have significant implication for monetary authorities when paying particular attention on dimensions of central bank characteristics.

Concerning the effects of other control variables on stock market volatility measures we can summarize the following: The positive effect of interest rate volatility is present only in case of conditional volatility measure. This positive relation is expected due to the fact that interest rate discounts expected dividends in a fundamental stock pricing model. Higher stock market size leads to significant reduction of conditional stock market volatility. Less developed stock market with thin trading is expected to be more volatile. In line with previous studies (Umutlu *et al*., 2010; Esqueda *et al*, 2012, Papadamou *et al*., 2014b), the financial integration measure, GEQY, is negatively correlated with stock market volatility. Worth mentioning, the beneficial effect of GDP growth on stock market volatility measures. Another important finding for central bankers is the positive correlation between exchange rate variability and stock market variability. Therefore, lower uncertainty about exchange rate policy may contribute to a more stable stock market also. Generally speaking the inclusion of control variables increases significantly the explanatory power of our models.

By comparing the size of the coefficients of independence index and central bank transparency in absolute terms, can be characterised as similar between the two models of historical and conditional volatilities. Overall, it can be argued that the positive theoretical relationship between level of independence and stock market volatility is empirically confirmed even if we control for variables previously used in the literature such as central bank transparency, interest rate volatility, exchange rate volatility, real GDP growth, stock market's size and turnover ratio.

4. Concluding remarks

This paper examined the relationship between stock market volatility and central bank independence. Our analytical setting implies a positive relationship between central bank independence and stock market volatility. By using panel data for 29 countries our empirical analysis confirms our analytical proposition.

Our study has significant policy implications for monetary authorities that establish their profile for implementing a successful monetary policy strategy. Given that higher level of independence may harm stock market volatility and higher level of

transparency may reduce it, a mixed strategy by central banks can fulfill the goals initially set by central banks concerning stock market stability.

Moreover, central bank interventions and policies for reducing exchange rate uncertainty can lead to a more stable stock market with consequently significant benefits for the investment in the local economy.

In conclusion central bank's characteristics like the level of independence and the level of transparency may enhance the traditional goal of financial stability, which was highlighted by the recent financial crisis. Therefore, moving toward monetary policy transparency with lower levels of central bank independence is recommended as stock market volatility can be reduced considerably.

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REFERENCES

Alesina, A., Stella, A., 2011. The politics of monetary policy. In B. M. Friedman and M. Woodford (Eds.), *Handbook of Monetary Economics*, Volume 3 of *Handbook of Monetary Economics*, Chapter 18, pp. 1001–1054. Elsevier.

Alpanda, S., Honig, A., 2009. The impact of central bank independence on political monetary cycles in advanced and developing nations. *Journal of Money, Credit and Banking 41*(7), 1365–1389.

Arnone, M., Romelli, D. 2013. Dynamic central bank independence indices and inflation rate: A new empirical exploration. *Journal of Financial Stability 9*(3), 385–398.

Arnone, M., Laurens, B.J., Segalotto, J.-F. Sommer, M., 2009. Central bank autonomy: Lessons from global trends. *IMF Staff Papers 56*(2), 263–296.

Bade, R., Parkin M., 1982. Central bank law and monetary policy. Technical report, Department of Economics University of Western Ontario.

Barro, R., & Gordon, D., 1983. A positive theory of monetary policy in a natural rate model. *Journal of Political Economy* 91, 589-610.

Beck, N., Katz, J.N., 1995. What to do (and not to do) with time-series cross-section data. *American Political Science Review* 89, 634–647.

Berger, W., Kißmer, F., 2013. Central Bank Independence and Financial Stability: A Tale of Perfect Harmony?, *European Journal of Political Economy*, 31: 109-118.

Blinder, A. S., 1998. Central Banking in Theory and Practice.MIT Press, Cambridge, MA.

Borio, C. and Lowe, P., 2002. Asset Prices, Financial and Monetary Stability: Exploring the Nexus, BIS Working Paper No. 114, Bank for International Settlements, Basle.

Carlstrom, C. T. and Fuerst, T. S., 2009. Central bank independence and inflation: A note. *Economic Inquiry 47*(1), 182–186.

Cecchetti, S., Genberg, H., Lipsky, J., Wadhwani, S., 2000. Asset prices and central bank policy.Center for Economic Research, London.

Čihák, M., 2007. Central bank independence and financial stability, IMF, mimeo.

Crowe, C., Meade, E.E., 2008. Central bank independence and transparency: Evolution and effectiveness. *European Journal of Political Economy* 24,763-777.

Cukierman, A., 2008. Central bank independence and monetary policymaking institutions – past, present and future. *European Journal of Political Economy 24*(4), 722–736.

Cukierman, A., Meltzer, A., 1986. The theory of ambiguity, credibility, and inflation under discretion and asymmetric information. *Econometrica* 54, 1099-1128.

Cukierman, A., Webb, S. B., Neyapti, B., 1992. Measuring the independence of central banks and its effect on policy outcomes. *The World Bank Economic Review* 6(3), 353–398.

de Haan, J., Masciandaro, D., Quintyn, M., 2008. Does central bank independence still matter? *European Journal of Political Economy 24*(4), 717–721.

Demertzis, M., Hughes-Hallet, A., 2007. Central Bank Transparency in Theory and Practice. *Journal of Macroeconomics* 29 (4), 760-789.

Dincer, N., Eichengreen, B., 2007. Central bank transparency: where, why, and with what effects? NBER Working Paper Nr. 13003.

Dincer, N. N., Eichengreen, B., 2014. Central bank transparency and independence: updates and new measures. *International Journal of Central Banking*, *10*(1), 189-253.

Eijffinger, S. C. W., & Hoeberichts, M., 1998. The tradeoff between central bank independence and conservativeness. *Oxford Economic Papers*, 50(3), 397-411.

Eijffinger S.C.W., & Hoeberichts M., 2008. The tradeoff between central bank independence and conservativeness in a New Keynesian framework. *European Journal of Political Economy* 24, 742-747.

Eijffinger, S., Geraats, P.M., 2006. How transparent are central banks? *European Journal of Political Economy* 22, 1–21.

Eijffinger, S. C. W., van der Cruijsen, C., 2010. 'The Economic Impact of Central Bank Transparency: a Survey', in P. Siklos, M. Bohl and M. Wohar (eds.),Challenges in Central Banking, Cambridge, Cambridge University Press, pp. 261–319.

Eijffinger, S.C.W., Hoeberichts, M., Schaling, E., 2000. Why money talks and wealth whispers: Monetary uncertainty and mystique. *Journal of Money, Credit and Banking*, 218-235.

Esqueda, O.A., Assefa, T.A., Mollick, A.V., 2012. Financial globalizationand stock market risk. *Journal of International Financial Markets,Institutions and Money* 22, 87-102.

Förch, T., and Sunde, U., 2012. Central bank independence and stock market returns in emerging economies. *Economics Letters* 115 (1)): 77-80.

Frees, E. W., 1995. Assessing cross-sectional correlations in panel data. *Journal of Econometrics* 69: 393-414.

Fry, M., Julius, D., Mahadeva, L., Roger, S., Sterne G., 2000. Key issues in the choice of monetary policy framework. In. Mahadeva L. and Sterne G. (Eds), Monetary policy frameworks in a global context, Routledge; 1-17.

Garcia Herrero, A., Del Rio, P., 2003. Financial Stability and the Design of Monetary Policy, Working paper 17, American University Paris.

Geraats, P. M., 2002. Central Bank Transparency. *Economic Journal*, 112(483), 532-565.

Klomp, J., de Haan, J., 2010a. Central bank independence and inflation revisited. *Public Choice 144*(3-4), 445–457.

Klomp, J. de Haan, J., 2010b. Inflation and central bank independence: a meta-regression analysis. *Journal of Economic Surveys 24*(4), 593–621.

Klomp, J., de Haan, J., 2009. Central bank independence and financial instability. *Journal of Financial Stability* 5(4), 321-338.

Kuttner, K.N., Posen, A.S., 2010. Do markets care who chairs the central bank? *Journal of Money, Credit and Banking* 42 (2), 347–371.

Kydland, F. E., & Prescott, E. C., 1977. Rules rather than discretion: The inconsistency of optimal plans. *Journal of Political Economy*, 85, 473-492.

Lane, P.R., Milesi-Ferretti, G.M., 2007. The external wealth of nations mark II: Revised and extended estimates of foreign assetsand liabilities, 1970–2004. *Journal of International Economics* 73 (2), 223–250.

Moser, C., Dreher, A., 2010. Do markets care about central bank governor changes? evidence from emerging markets. *Journal of Money, Credit and Banking* 42 (5), 1589–1612.

Mun, K.-C., 2007. Volatility and correlation in international stock markets and the role of exchange rate fluctuations. *Journal of International Financial Markets, Institutions and Money* 17, 25-41.

Muscatelli, A., 1998. Optimal inflation contracts and inflation targets with uncertain central bank preferences: Accountability through independence?. *The Economic Journal*, *108*(447), 529-542.

Papadamou, S., 2013. Market anticipation of monetary policy actions and interest rate transmission to US Treasury market rates. *Economic Modelling*,33, 545-551.

Papadamou, S., Sidiropoulos, M., Spyromitros, E. 2014a. Central bank transparency and the interest rate channel: Evidence from emerging economies. *Economic Modelling*,doi:10.1016/j.econmod.2014.10.016.

Papadamou, S., Sidiropoulos, M., Spyromitros, E., 2014b. Does Central Bank Transparency Affect Stock Market Volatility, *Journal of International Financial Markets, Institutions & Money*, 31, 362-377.

Pesaran, M. H., 2004. General diagnostic tests for cross section dependence in panels.University of Cambridge, Faculty of Economics, Cambridge Working Papers in Economics No. 0435.

Polillo, S., & Guillén, M., 2005. Globalization Pressures and the State: The Global Spread of Central Bank Independence. *American Journal of Sociology* 110(6), 1764-1802.

Rogoff, K., 1985. The optimal degree of commitment to a monetary target. Quarterly *Journal of Economics* 100(4), 1169–1190.

Smets, F., 1997. Financial asset prices and monetary policy: theory and evidence, BIS Working Paper 47.

Umutlu, M., Akdeniz, L., Altay-Salih, A., 2010. The degree of financialliberalization and aggregated stock-return volatility in emerging markets. *Journal of Banking & Finance* 34, 509-521.

Van der Cruijsen,C., Demertzis, M., 2007. The impact of central bank transparency on inflation expectations. *European Journal of Political Economy* 23 (1), 51-66.

Wooldridge, J. M., 2002. Econometric Analysis of Cross Section and Panel Data. Cambridge, MA: The MIT Press.

Tables

Table 1 Descriptive Statistics of the variables of interest

Variable	Obs	Mean	Std. Dev.	Min	Max
Historical Volatility	232	0.128	0.084	0.017	0.554
Conditional volatility	232	0.275	0.138	0.091	1.090
Transparency Index	232	6.325	3.312	1.000	13.500
Independence Index	232	0.415	0.237	0.100	0.810
TO	232	0.730	0.642	0.009	3.766
GEQY	232	0.000	0.160	-0.832	0.597
Interest Rate Volatility	232	0.186	0.237	0.000	1.923
Size	232	0.707	0.535	0.024	2.564
EER Volatility	232	0.051	0.138	0.004	1.741
Real GDP Growth	232	0.036	0.035	-0.131	0.113

Table 2 Estimation results for historical and conditional volatilities models

Dependent Variable		Hstorical Stock Market Volatility				Conditional stock Market Volatility			
Independent Variables	Exp. Sign	OLS with PCSEs		Prais-Winsten with PCSEs		OLS with PCSEs		Prais-Winsten with PCSEs	
		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Constant	+	0.1835	0.1488	0.1874	0.1520	0.3772	0.2915	0.3975	0.3410
		(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Transparency Index	-	-0.0103	-0.0083	-0.0109	-0.0086	-0.0189	-0.0130	-0.0214	-0.0144
		(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Independence Index	+	0.0498	0.0502	0.0521	0.0536	0.0799	0.0514	0.0831	0.0407
		(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Interest Rate Volatility	+		0.0040		0.0039		0.0474		0.0326
			(0.32)		(0.35)		(0.00)***		(0.00)***
Real GDP Growth	-		-0.4767		-0.5332		-0.4323		-0.5154
			(0.00)***		(0.00)***		(0.00)***		(0.00)***
TO	+		0.0332		0.0331		0.0747		0.0691
			(0.00)***		(0.00)***		(0.00)***		(0.00)***
GEQY	-		-0.0621		-0.0609		-0.1127		-0.1043
			(0.00)***		(0.00)***		(0.00)***		(0.00)***
Size	- /+		0.0003		0.0018		-0.0264		-0.0469
			(0.86)		(0.34)		(0.00)***		(0.00)***
EER Volatility	+		0.2005		0.1786		0.4626		0.3043
			(0.00)***		(0.00)***		(0.00)***		(0.00)***
R^2		16.5%	42.2%	18.9%	40.3%	19.4%	61.3%	41.2%	66.9%
F Test									
Wald Test		449.25***	2557.42***	388.81***	2103.34***	665.52***	11447.53***	468.45***	5313.87***
ρ [AR(1) coeff.]				0.2234	0.1189			0.5079	0.4733
N =(ixT)		232	232	232	232	232	232	232	232
Specification tests									
Test of cross-sectional independence by Frees		0.085	0.454			2.391***	1.476***		
Test of cross-sectional independence by Pesaran		9.775***	8.448***			6.385***	3.554***		
Modified Wald test for group wise heteroskedasticity		1576.01***	1833.02***			4661.98***	1108.69***		