# The Behaviour of Banking Stocks During the Financial Crisis and Recessions. Evidence from Changes-in-Changes Panel Data Estimations


Dimitrios Asteriou
Oxford Brookes University
Department of Accounting, Finance and Economics

Keith Pilbeam
City, University of London
Department of Economics

Antonios Sarantidis
Hellenic Open University,
School of Social Sciences



**Abstract**

This paper examines the impact of the financial crisis and economic recessions on bank shares compared to the overall stock market index for 18 OECD countries from 1993 to 2015. The empirical methodology utilizes the changes-in-changes approach. We compare and contrast the returns of the banking stock price index (treatment group) in each country with their general stock price index (control group), which experiences smaller changes. Our results suggest that bank returns on average perform significantly worse than that of the general stock price index during recessions. In addition we also find significantly greater volatility in bank share returns.



**Keywords:** Changes-in-Changes; Panel Data; Crises; Recessions

**JEL Codes:** C58, E32, E44, G01, G21

## 1. Introduction

Recessions come in many shapes and sizes varying both in causes and degree of severity, they can be caused by economic shocks, a crisis in the financial sector, currency shocks or external factors such as oil price shocks and earthquakes. Crises quickly impact upon financial markets that respond quickly to an unexpected shock (Spyrou, 2011). An interesting issue is whether bank stocks perform better or worse during periods of economic and financial crises than shares of other companies in the economy.

The paper examines the impact of the financial crises and economic recessions on the performance of banking sector share price return which is particularly sensitive to various shocks from around the world (Savor, 2012). Following Calomiris *et al.* (2012), banking stock returns are utilized to capture the overall performance of the banking sector in a given country during and following a crisis or economic recession. Our econometric modelling utilizes the Changes-in-Changes (CIC) approach, which is a reformulation of the well known Differences-in-Differences (DID) approach. The DID approach is a popular tool and has been widely used and applied in economics to estimate the effect of a shock (Beck, 2003; Abadie and Gardeazabal, 2003; Abadie, 2005; Dell' Ariccia *et al.*, 2008; Levintal, 2013; Draca *et al.*, 2011). However, the DID approach has limitations (see Bertrand, Duflo and Mullainathan, 2004). Athey and Imbens (2006) suggest that the CIC approach as a generalized version of the DID approach helps to resolve some of these problems. The method can be applied using either panel data or repeated cross sections and it allows time and treatment effects to differ systematically across individuals.

In contrast to the DID approach, the CIC has not been widely used (Duygan-Bump *et al.*, 2012). To date neither the DID or CIC methods have been applied to the analysis of stock markets. Our analysis estimates the effect of several recessions which occurred during the

period 1993-2015, first separately in each country of our sample[1], and then as groups of countries depending on their economic and geographical characteristics[2]. In the empirical part of this paper, we compare and contrast the performance of the banking stock price index (*treatment group*) in each country with their general stock price index (*control group*), which generally experienced a smaller change, due to the fact that the general indices also contain "blue chip" stocks[3]. For the estimation and analysis we apply the CIC approach expecting a negative coefficient for the treatment group[4]. To the best of our knowledge, this is the first time that CIC model approach has been applied to analyse stock market returns and estimate and explain the effects of financial crises and recessions.

The rest of the paper is organized as follows: section 2 presents the data set, section 3 discusses the methodology, section 4 presents the empirical results and section 5 concludes.

## 2. The Data

Data on stock price indices was obtained from the Thomson Reuters DataStream database and are collected for 18 OECD countries. We restrict our sample to two stock indices, the general stock price index and the banking sector stock price index available for each country.[5] Our sample consists of quarterly data for 1993 through 2015, returns are computed as logarithmic differences.

[1] This is a simple panel model in the sense that for every country we have $Y_{jt}$, with *j=(banking index, general index)* for the period *t=1993q1-2015q4*.
[2] This is a three-way panel since now we have $Y_{ijt}$, with *i=(country 1, country 2, ... country 18)* and the rest defined as before.
[3] The New York Stock Exchange mentions that a blue chip is a stock that has a very good national reputation, is in excellent financial conditions and, moreover, it performs well in tranquil as well as in recession periods.
[4] We use in our analysis the general stock price index as a control group, although we clearly acknowledge that it is certainly affected by the crisis or by the recession periods as well. We do that because we believe that the general index is less affected during recessions then the banking index. Also we wanted to use an index as a benchmark, which would be similar to the banking index indicating the stock market of each country. Furthermore, we believe that there is no other alternative measure that can be used across different economies. Our control group unavoidably contains some banking sector firms as well. However, this is very small – see Table A1 in Appendix – and we believe that it does not affect our overall results significantly.
[5] For the names of the specific stock market and banking indices used in our study see Table A2 in Appendix.

In addition to banking indices and stock market returns we also include a set of macro control variables, such as: the unemployment rate, the interest rate, the GDP growth rate and the inflation rate.

For our empirical study we determine the periods in which the financial crises and recession periods have occurred in two different ways:

(1) A dummy variable called $D_{crisis}$ which captures the recent financial crises. To identify the date of start of this dummy, we obtain information from the NBER (as in Brunnermeier *et al*., 2012) and from Wagener, Krusse and Basse (2017). This dummy takes the value of 1 for periods of crisis (2007Q4 – 2013Q1) and 0 otherwise.[6]

(2) A Dummy variable called $D_{GDP}$ and identify as recession periods the dates in which the countries show negative GDP growth for two quarters in a row. This dummy takes the value of 1 when a country is in a recession, 0 otherwise.

Apart from checking the recession/crises effect on individual countries, we also construct five different country groups. We defined the groups according to the geography and economic standing of each country. The five groups are as follows:

(i) The "ALL" group contains all the 18 countries of our sample in order to catch the overall effect of the crises/recessions on the banking index.

(ii) The "PERIPH" group contains the weakest economies of Europe and specifically the countries that were most affected by the Eurozone crisis.

[6] It is worth noticing that for this dummy we used various versions of crises period definitions. First we have tried the subprime crises definition (dummy takes the value of 1 for 2007q1 – 2009q1); second the financial crisis definition (2007q4 – 2013q1) and third a final definition which assumes that the crisis is ongoing (as it is indeed the case for Greece, Portugal, Spain, Ireland and Italy, or what we call peripheral EU countries). In this third case the dummy has followed the second definition for all other countries apart from the peripheral were the dummy took the value of 1 for2007q4 till the end of the data set. The results of those alternative definitions were not significantly different from those reported in the paper. Tables and results of the various dummy versions are not reported here for economy of space but are available from authors upon request. Additionally, apart from testing various definitions of the crisis dummy as described above, we have also used other crises/recessions definitions such as the definition provided by the Federal Reserve Bank of St Louis and the data/definition provided by Reihnart and Roggoff (2011) . The results of those two alternative definitions just proved the robustness of our findings reported in this version of the paper. The usual disclaimer applies for those results as well.

(iii) The "EU" group contains the EU countries inclusive of the PERIPH.

(iv) The "EU-PERIPH" is the EU countries without the PERIPH.

(v) The "Non-EU" contains all the countries of our sample that are not an EU member. In this group we examine whether the banking sector was more or less affected in contrast to the other groups.

Table 1 presents all the data and their sources used in the empirical analysis, while Table 2 presents the groups and the countries included.

[Insert Tables 1 and 2 approximately here]

**3. Methodology**

In our methodology we use two groups, the treatment and the control group. The treatment group is the group that was subjected the intervention and the control group is the one that was not subject to the intervention. The treatment and control groups should behave similarly assuming that they do not receive the intervention. Moreover, the method assumes that the difference between the treatment and the control group before the intervention is constant over time but this does not mean that both of them have the same mean outcome (Angrist and Pischke, 2008). In our case, since we want to explore whether bank shares are more sensitive during crises compared to the general stock index, the treatment group consists of the banking sector index and the control group consists of the general index for each country in our sample. Furthermore, the intervention in our case is either the recent financial crises (captured by the $D_{crisis}$ dummy defined above) or the recessionary periods (captured by the $D_{GDP}$ dummy defined above).

Our methodology employs the CIC approach to estimate the effect of negative economic shocks/crises on banking stock price indices. CIC is a non-parametric extension of

the commonly used DID approach, which is the standard choice of method for this kind of problems. The use of CIC instead of the DID approach has to do with he fact that the DID has limitations. Bertrand, Duflo and Mullainathan (2004) argue that the estimation has a possible serial correlation problem and mention three important factors that lead them to this conclusion. First, they argue that the method requires long time series; second, the dependent variables are positively serial correlated and third, since the variable of the treatment group changes itself very little over time, the standard errors are inconsistent. In order to address these problems of inconsistency they propose (a) the technique of aggregating the data into pre- and post-treatment, (b) the technique of allowing for unrestricted covariance structure, (c) the technique of using simple parametric corrections and (d) the block bootstrapping technique.

Furthermore, according to Athey and Imbens (2006) the DID approach relies heavily on linearity and additivity and requires multiple groups and periods. Heterogeneity might be present in the effect of treatment and it is not known precisely what the effect for the group that was not treated would be. Heckman at al. (1997) argue that heterogeneity in the treatment effect is very important and the DID approach does not allow for that. To address these deficiencies, Athey and Imbens (2006) proposed and developed the CIC approach. This model is applied by using either panel data or repeated cross sections and it allows time and treatment effects to differ systematically across individuals. In contrast to the DID approach, the CIC approach is able to address the question of what the effect of a treatment would be if it were applied on the control group. Huynh et al. (2011) mention, as a further advantage of this method, that only two time periods and two groups are needed for identification purposes.

In terms of obtaining robust standard errors for our estimates, we apply the bootstrapping technique, because the number of groups we are using in our data is large. We employ this technique in order to address any possible deficiencies that exist in our model. The bootstrapping technique is a non-parametric technique (Efron, and Tibshirani, 1994;

McKinnon, 2002). This method keeps all observations together if they belong to the same group, in order to maintain the autocorrelation structure and is a reliable solution if the number of groups is large.

In our setting, time series observations are observed in a treatment (banking sector) and control (general index) group, before and after the treatment (crises/recessions). Each time series t is observed once in time period $T_i \in \{0,1\}$, where period 0 is absence of crises/recessions and period 1 is during crises/recessions. Each time series also belongs to a group $G_i \in \{0,1\}$, where group 0 is the general index returns (or the control group) and group 1 is the banking sector returns (or the treatment group).

More specifically, based on the above definitions and following Athey and Imbens (2006) we hypothesize that in the absence of the intervention the outcome satisfies the relationship:

$$Y^{pre} = h(U_i, T_i) \tag{1}$$

where $U_i$ is an underlying unobserved effect and $T_i$ is the time period in which crises/recessions occur. We also hypothesize that $\mathbb{U}_1 \subseteq \mathbb{U}_0$, $U_i \perp T_i|G$ and $h(U_i, T_i)$ where $h: \mathbb{U} * \{0,1\} \to \mathbb{R}$, is strictly increasing in $u$ for $t \in \{0,1\}$. $U$ is continuous or discrete and the distribution function equals:

$$F_{Y^{pre},11}(y) = F_{Y,10}\left(F_{Y,00}^{-1}\left(F_{Y,01}(y)\right)\right) \tag{2}$$

and

$$\begin{aligned} F_{Y^{pre},gt}(y) &= Pr(h(u,t) \le y \mid G = g, T = t) \\ &= Pr(U \le h^{-1}(y;t) \mid G = g, T = t) \\ &= Pr(u \le h^{-1}(y;t) \mid G = g) \\ &= Pr\left(u_g \le h^{-1}(y;t)\right) = F_{u,g}\left(h^{-1}(y;t)\right). \end{aligned} \tag{3}$$

If we let $(g,t) = (0,0)$ and substitute $y = h(u,0)$,

$$F_{Y,00}\big(h(u,0)\big) = F_{U,0}\big(h^{-1}(h(u,0);0)\big) = F_{U,0}(u). \tag{4}$$

First, applying to each side $F_{Y,00}^{-1}$ for all $u \in \mathbb{U}_0$, we obtain:

$$h(u,0) = F_{Y,00}^{-1}\Big(F_{U,0}(u)\Big) \tag{5}$$

Second, applying $(g,t) = (0,1)$ using that $h^{-1}(y;1) \in \mathbb{U}_0$ for all $y \in \mathbb{Y}_{01}$ and the transformation $F_{U,0}^{-1}(\cdot)$ to both sides,

$$F_{U,0}^{-1}\Big(F_{Y,01}(y)\Big) = h^{-1}(y;1), for\ all\ y \in \mathbb{Y}_{01} \tag{6}$$

Combining the two equations for all $y \in \mathbb{Y}_{01}$,

$$h(h^{-1}(y;1),0) = F_{Y,00}^{-1}\Big(F_{Y,01}(y)\Big). \tag{13}$$

Third, applying $(g,t) = (1,0)$ and substituting $y = h(u,0)$ we obtain:

$$F_{Y,10}\big(h(u,0)\big) = F_{U,1}(u). \tag{7}$$

Athey and Imbens (2006) then combine the two equations with $(g,t) = (1,1)$ for all $y = \mathbb{Y}_{01}$ and obtain:

$$F_{Y^{pre},11}(y) = F_{U,1}\big(h^{-1}(y;1)\big) = F_{Y,10}\big(h(h^{-1}(y;1),0)\big) = F_{Y,10}\left(F_{Y,00}^{-1}\left(F_{Y,01}(y)\right)\right) \tag{8}$$

Under the above hypotheses, the identification result can be interpreted by the transformation,

$$k^{CIC}(y) = F_{Y,01}^{-1}\Big(F_{Y,00}(y)\Big). \tag{9}$$

The second-period outcome for a group with an unobserved component $u$, $h(u,0) = y$ is given from the above transformation, then $Y_{11}^{pre} = k^{CIC}(Y_{10})$. The average treatment effect from the CIC approach can be written as,

$$\tau^{CIC} \equiv \mathbb{E}\big[Y_{11}^{post} - Y_{11}^{pre}\big] = \mathbb{E}\big[Y_{11}^{post}\big] - \mathbb{E}[k^{CIC}(Y_{10})] =$$

$$= \mathbb{E}\big[Y_{11}^{post}\big] - \mathbb{E}[F_{Y,01}^{-1}\Big(F_{Y,00}(Y_{10})\Big)] \tag{10}$$

where $Y_{gt}$ is a random variable with distribution $D = (Y|G = g,t)$. Given random samples from each subgroup, a generally consistent estimator of $\tau^{CIC}$ is

$$\tau^{CIC} = N_{11}^{-1} \sum_{i-1}^{N_{11}} Y_{11,i} - N_{10}^{-1} \sum_{i-1}^{N_{10}} F_{01}^{-1}(F_{00}(Y_{10,i})), \quad (11)$$

where $F_{00}$ and $F_{01}$ are the control groups in the initial and latter time periods, $Y_{11,i}$ is a random draw on the observed outcome for the $g = 1, t = 1$ group and similarly for the $Y_{10,i}$.

According to CIC explanations the model takes the following form:

$$\tau_{st}^{CIC} = \mathbb{E}\left[Y_{st}^{banks} - Y_{st}^{general}\right] = \Delta^{CIC} + \boldsymbol{\gamma' Z} \quad (12)$$

where $\tau$ is the average treatment effect in sector s and time *t*, $\Delta$ represents the CIC coefficient (treatment), and $\boldsymbol{Z}$ represents a vector of additional macroeconomic indicators.

## 4. Empirical Results

Table 3 reports the Average Treatment Effects (ATE) from the CIC estimation and gives an overview of all the countries in the sample. The ATE is negative in 16 out of 18 countries and in all our groups of the $D_{crisis}$ estimation. The only two countries with positive sign were Finland and France, but in both cases the estimator is not-significant. More importantly, significant negative estimates are obtained for the following countries, in terms of magnitude: Ireland (-17.62%), Greece (-17.12%), Netherlands (-13.13%), Denmark (-7.96%), Belgium (-7.00%), Portugal (-5.75%), UK (-4.84%), the US (-4.48%), and lastly Germany (-3.66%). The highest negative effect is found in countries that had the worst crises (Greece and Ireland) but it is moderate for Portugal and not-significant for Italy and Spain. Also, there is negative effect in stronger economies, suggesting that the sub-prime financial crises affected bank shares more than the general stock index.

For the $D_{GDP}$ dummy definition estimation, the highest negative statistically significant estimates were for Greece (-19.27%) followed by the Netherlands (-17.70%), Denmark (-16.61%), Ireland (-15.05%), US (-13.27%), the UK (-10.99%) and Belgium (-3.47%).[7]

[7] Note that there are no reported results for Australia. This is because Australia had no consecutive quarters with negative GDP growth and therefore the dummy would have been a vector of zero. Therefore, since there are no recessions in Australia's recent economic history the country is excluded from this analysis.

Interestingly we did not find significant effects for Italy, Portugal and Spain, while there is a positive significant effect for the case of Finland, which suggests that Finish banks performed better during recessions than the general index. The results for different countries differ in their severity but this can be explained by the very different quality of assets in their portfolios, access to capital markets and risk management skills.

[Insert Tables 3 and 4 approximately here]

Table 4, presents results of the same estimation method but for the different panel groups. From these results, with regards to the $D_{crisis}$ dummy, it is interesting to see that the effect is negative in all cases (as predicted) and it is statistically significant in four out of the five group cases. The only group that seems to be unaffected is the "Non-EU" countries – suggesting clearly that the financial crises affected mostly European banks – and the largest negative effect is for the "PERIPH" countries as expected since this is where the banking crises was most severe. This provides a strong empirical support for the proposition that the banking sector of these countries was most adversely affected by the global and Eurozone recessions and financial crises. When we re-estimate all panel groups for the $D_{GDP}$ dummy, the effect is similar as in the $D_{crisis}$ estimation. Again, the PERIPH countries are those who were mostly affected by the recessions and the non-EU countries' banks were not affected by recessions at all.

[Insert Tables 5 and 6 approximately here]

For a robustness check, Tables 5 and 6 presents estimations of the same models (country by country in Table 5 and then in panel groups in Table 6) adding to the estimated equation some additional macroeconomic control variables. This robustness check shows that the results are very similar with in many cases the macro-variables also playing a significant role in determining stock market returns. From this analysis, Greece, Ireland, Portugal and the Netherlands are those who are most adversely affected, followed by Belgium for the financial

crisis. Also, as before Greece and Ireland together with the US and the UK banks are most significantly negatively affected by recessions, while Finish banks showing relative gains during recessions, that is, while bank stocks fell in Finland they fell by less than the stock index. All the other countries show insignificant estimates, suggesting that after controlling for macroeconomic effects the impact of the financial crisis and recessions on bank returns compared to the general stock index is similar. We note that the significance and signs for our macroeconomic control variables generally show unemployment has a positive impact with inflation having a negative impact and economic growth a generally positive impact.

Next, we perform the same analysis this time for volatilities. First we estimate daily frequency (29,158 observations) GARCH(1,1) models for each of our returns using an AR(1) model in the mean equation in order to obtain the volatility series for each case (18 banking index volatilities and 18 general index volatilities; one for each country). The GARCH(1,1) specification used is as follows:

$$R_t = a + \beta R_{t-1} + u_t$$

$$u_t|\Omega_t \sim iid\ N(0, h_t)$$

$$h_t = \gamma_0 + \gamma_1 h_{t-1} + \gamma_2 u_{t-1}^2 \quad (13)$$

After estimating our 36 GARCH(1,1) models – see analytical results in Appendix Tables A3 and A4 – we then obtain daily volatility series for each case. These series are then first converted to monthly frequency and then from monthly to quarterly frequency using the EViews frequency conversion tool by averaging the data. Quarterly frequency graphs of all volatility series obtained from this method are presented in the Appendix (Figures A1 and A2).

After this procedure, we then estimate the ATE for those volatilities to detect if the financial crisis and recessions have any impact on the volatilities of the stock markets and specifically whether they have a larger impact on bank stocks volatilities compared to the general stock market index volatilities. The results are presented in Tables 7 (for each country)

and 8 (for panel groups). The results suggest that there is a very strong positive effect (i.e. an increase in the uncertainty/volatility) from both the financial crisis and recession definitions for most countries in the sample. There are very high and significant effects for Ireland, Belgium, Netherlands, Denmark, Greece and Portugal, and moderately significant effects for the US, Italy, Austria, Germany, Spain, the UK, Canada and Finland. Interestingly there is a reduction on bank returns volatility compared to the volatility of the market index for both Japan and Sweden. The results are consistent with both definitions with the only exception that Japan's positive effect is not-significant when we examine recessions instead of the financial crisis. The three-way panel group results, show strong positive effects everywhere, with the largest being for the PERIPH countries followed by the EU countries.

[Insert Tables 7 and 8 approximately here]

Finally, similarly as before, in order to do an additional robustness check we re-estimate all models adding macroeconomic indicators in the estimation model for robustness check. These robustness check results are reported in Tables 9 (for each country) and 10 (for the different panel groups). The results obtained are very similar with the above analysis suggesting that the effects are quite strong and persistent. We note that the significance and signs for our macroeconomic control variables do vary in both significance and even in sign, with unemployment and inflation sometime coming in positive and sometimes negative while the GDP growth variable is almost always negative.

[Insert Tables 9 and 10 approximately here]

To conclude, the *CIC* approach shows negative and significant estimation results for many country and group cases suggesting that there is a strong negative effect of the crises and recession periods on bank returns compared to the general market index. In the case for the volatility measurements we can see that the financial crisis and recessions have a positive effect on bank volatilities compared to the effect to the general stock index volatility.

## 5. Conclusions

The paper contributes to the current literature by using the CIC approach to analyse the behaviour of bank shares in relation to the overall performance overall of stock indices in terms of both returns and volatility. The results are consistent with the hypothesis that banks stock returns underperformed the general stockmarket index during the financial crisis and during recession periods. In addition, the results for the GARCH model volatilities suggest that banks returns volatilities are positively related with the financial crisis and recessions and are more volatile than companies making up the general stock index

Our results have significant policy implication. Since banks share price valuations are more heavily negatively affected in times of recessions than ordinary shares this suggests that capital adequacy ratios may need to be much higher than otherwise to ensure banks can survive during recessions without the need for state intervention. As such, our results are supportive of the Basel III requirements for significantly higher capital requirements compared to the Basel II framework.

In addition, our results have implications for fund managers, if a recession is anticipated then it would seem to be appropriate to lower the weights accorded to bank stocks in their portfolios. This will have the advantage also lowering the volatility of stock portfolios during periods of both financial crisis and recessions. The results also extend to fund managers in terms of international portfolio diversification.

The CIC econometric approach that is used in our estimation performs well and provides meaningful and significant results. The same econometric approach can be used to

estimate the effect that crises and recessions have on other financial sectors such as the insurance sector and of course applied to non-financial sectors such as the technology, real estate, utilities and transport in future research.

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## TABLES

**Table 1**

Availability and sources of the variables.

| Variable description | Source | Sample |
|---|---|---|
| General stock price index | Thomson Reuters Datastream | 1993q1-2015q4 |
| Banking sector stock price index | Thomson Reuters Datastream | 1993q1-2015q4 |
| Unemployment (%) | OECD | 1993q1-2015q4 |
| Inflation (%) | IFS, Thomson Reuters Datastream | 1993q1-2015q4 |
| GDP growth (%) | OECD, IFS | 1993q1-2015q4 |
| Interest 3 month Treasury bills (%) | IFS | 1993q1- 2015q4 |

**Table 2**

Groups and included countries

| Group Name | Countries |
|---|---|
| All | Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Portugal, Spain, Sweden, UK, US |
| PERIPH | Portugal, Italy, Ireland, Greece, Spain |
| EU | Austrial, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, UK |
| EU (without PERIPH) | Austria, Belgium, Denmark, France, Germany, Netherlands, Sweden, UK |
| Non-EU | Australia, Canada, Japan, US |

**Table 3**
*CIC* (Average Treatment Effect) estimates for the two crises Definitions for each country

| | $D_{crisis}$ | | $D_{GDP}$ | |
|---|---|---|---|---|
| **Country/Groups** | **Coef.** | **z** | **Coef.** | **z** |
| **Australia** | -2.48 | -1.59 | **No recession** | **No recession** |
| **Austria** | -0.19 | -0.09 | -1.93 | -1.20 |
| **Belgium** | **-7.00**** | -2.64 | **-3.47+** | -1.67 |
| **Canada** | -1.03 | -0.68 | -0.15 | -0.05 |
| **Denmark** | **-7.96**** | -3.28 | **-16.61**** | -3.69 |
| **Finland** | 0.87 | 0.52 | **5.84*** | 2.06 |
| **France** | 0.28 | 0.14 | -3.10 | -0.84 |
| **Germany** | **-3.66+** | -1.78 | 0.17 | 0.07 |
| **Greece** | **-17.12**** | -7.01 | **-19.27**** | -5.48 |
| **Ireland** | **-17.62**** | -5.81 | **-15.05**** | -3.84 |
| **Italy** | -2.51 | -1.38 | 1.31 | 0.51 |
| **Japan** | -0.93 | -0.59 | -0.07 | -0.04 |
| **Netherlands** | **-13.13**** | -5.79 | **-17.70**** | -4.99 |
| **Portugal** | **-5.75**** | -2.66 | -4.38 | -1.59 |
| **Spain** | -1.27 | -0.71 | 1.15 | 0.70 |
| **Sweden** | -1.06 | -0.65 | -1.07 | -0.39 |
| **UK** | **-4.84**** | -2.69 | **-10.99**** | -3.51 |
| **US** | **-4.36*** | -2.14 | **-13.27**** | -3.17 |

**Notes:** Bold figures indicate statistical significant coefficients, ** denotes statistical significance at the 1% level ($p<0.01$), * denotes statistical significance at the 5% level ($p<0.05$), + denotes statistical significance at the 10% level ($p<0.1$). In all the estimations the standard errors are block-bootstrapped . The results are given in percentage points.

**Table 4**

*CIC* (Average Treatment Effect) estimates for the two crises Definitions for panel groups

| | | | | |
|---|---|---|---|---|
| **ALL** | **-4.46**** | -3.96 | **-3.44**** | -2.59 |
| **PERIPH** | **-8.31**** | -5.12 | **-5.73**** | -3.13 |
| **EU** | **-5.98**** | -4.71 | **-4.23**** | -2.88 |
| **EU (without PERIPH)** | **-4.65**** | -3.42 | **-2.98**** | -1.80 |
| **Non-EU** | -0.15 | -0.13 | -0.18 | -0.11 |

**Notes:** Bold figures indicate statistical significant coefficients, ****** denotes statistical significance at the 1% level ($p<0.01$), ***** denotes statistical significance at the 5% level ($p<0.05$), + denotes statistical significance at the 10% level ($p<0.1$). In all the estimations the standard errors are block-bootstrapped . The results are given in percentage points.

**Table 5**
*CIC* (ATE) estimates for the crises definition with additional control variables for each country

| | | $D_{crisis}$ | | $D_{GDP}$ | |
|---|---|---|---|---|---|
| **Country** | **Variables** | Coef. | z | Coef. | z |
| **Australia** | **CIC (ATE)** | 0.80 | 0.33 | No recession | No recession |
| | **Unemployment** | 0.02 | 0.03 | No recession | No recession |
| | **Inflation** | -0.26 | -0.56 | No recession | No recession |
| | **GDP growth** | **-1.16**** | -3.57 | No recession | No recession |
| | **Interest rate** | -0.81 | -1.34 | No recession | No recession |
| **Austria** | **CIC (ATE)** | 0.19 | 0.05 | -3.17 | -0.84 |
| | **Unemployment** | **4.97*** | 2.43 | **6.04**** | 2.93 |
| | **Inflation** | -0.01 | -0.01 | -1.24 | -0.98 |
| | **GDP growth** | 0.08 | 0.78 | **0.43*** | 2.19 |
| | **Interest rate** | -1.54 | -1.34 | 0.67 | 0.75 |
| **Belgium** | **CIC (ATE)** | **-8.03**+ | -1.77 | -6.41 | -1.44 |
| | **Unemployment** | 1.84 | 1.10 | 2.56 | 1.56 |
| | **Inflation** | -2.37 | -1.59 | **-3.20*** | -2.25 |
| | **GDP growth** | 0.01 | 0.06 | 0.27 | 1.13 |
| | **Interest rate** | -0.46 | -0.48 | 0.58 | 0.78 |
| **Canada** | **CIC (ATE)** | -1.31 | -0.44 | -0.89 | -0.26 |
| | **Unemployment** | **2.58**** | 2.86 | **1.64**+ | 1.95 |
| | **Inflation** | -0.47 | -0.47 | -0.55 | -0.54 |
| | **GDP growth** | 0.25 | 0.84 | 0.49 | 1.30 |
| | **Interest rate** | **-2.21*** | -2.44 | -0.52 | -0.79 |
| **Denmark** | **CIC (ATE)** | -9.04 | -2.12 | **-14.72**** | -3.37 |
| | **Unemployment** | **2.12*** | 2.41 | 0.70 | 0.91 |
| | **Inflation** | **-0.97*** | -0.44 | **-3.35**+ | -1.81 |
| | **GDP growth** | -0.27 | -0.57 | **-1.29*** | -2.27 |
| | **Interest rate** | -1.44 | -1.62 | 0.10 | 0.14 |
| **Finland** | **CIC (ATE)** | 2.40 | 0.83 | **10.39**** | 3.27 |
| | **Unemployment** | **2.10**** | 2.45 | 1.35 | 1.61 |
| | **Inflation** | -0.65 | -0.46 | -1.97 | -1.59 |
| | **GDP growth** | 0.56 | 1.11 | **2.30**** | 3.54 |
| | **Interest rate** | **-3.12*** | -1.97 | -1.48 | -1.03 |
| **France** | **CIC (ATE)** | 1.49 | 0.32 | **-11.25**** | -2.72 |
| | **Unemployment** | **3.62**** | 2.64 | **4.00*** | 2.53 |
| | **Inflation** | -2.40 | -1.15 | -2.74 | -1.08 |
| | **GDP growth** | 0.55 | 0.60 | **2.11**+ | 1.82 |

| | | | | | |
|---|---|---|---|---|---|
| | **Interest rate** | **-2.39*** | -2.02 | -1.23 | -1.24 |
| **Germany** | **CIC (ATE)** | 1.47 | 0.46 | 1.47 | 0.45 |
| | **Unemployment** | **2.16*** | 2.39 | **2.16*** | 2.39 |
| | **Inflation** | **-2.64+** | -1.69 | **-2.64+** | -1.69 |
| | **GDP growth** | 2.13 | 1.54 | 2.13 | 1.54 |
| | **Interest rate** | -0.42 | -0.45 | -0.42 | -0.45 |
| **Greece** | **CIC (ATE)** | **-18.49**** | -4.84 | **-15.01**** | -3.26 |
| | **Unemployment** | -0.83 | -1.00 | -0.19 | -0.23 |
| | **Inflation** | -1.70 | -1.58 | **-1.94+** | -1.74 |
| | **GDP growth** | 0.17 | 0.29 | **1.41*** | 2.01 |
| | **Interest rate** | 1.07 | 1.50 | 0.67 | 0.92 |
| **Ireland** | **CIC (ATE)** | **-16.61**** | -4.06 | **-9.02*** | -2.31 |
| | **Unemployment** | **2.15*** | 2.43 | 1.04 | 1.22 |
| | **Inflation** | -0.77 | -0.71 | **-2.11+** | -1.89 |
| | **GDP growth** | **0.74+** | 1.90 | **0.71+** | 1.92 |
| | **Interest rate** | **-4.54*** | -2.57 | **-3.55*** | -2.00 |
| **Italy** | **CIC (ATE)** | -2.08 | -0.70 | 1.11 | 0.32 |
| | **Unemployment** | **1.62*** | 2.18 | **1.49*** | 1.98 |
| | **Inflation** | **-4.98**** | -2.98 | **-5.55**** | -3.43 |
| | **GDP growth** | 0.89 | 1.36 | **2.44**** | 3.35 |
| | **Interest rate** | 0.39 | 0.49 | 0.21 | 0.26 |
| **Japan** | **CIC (ATE)** | -0.76 | -0.17 | 0.08 | 0.02 |
| | **Unemployment** | -0.32 | -0.12 | -0.15 | -0.06 |
| | **Inflation** | **-3.44*** | -2.12 | **-3.39*** | -2.09 |
| | **GDP growth** | **1.07*** | 2.17 | 1.13 | 1.63 |
| | **Interest rate** | 2.34 | 1.06 | 2.59 | 1.27 |
| **Netherlands** | **CIC (ATE)** | **-13.41**** | -4.09 | -21.73 | -5.47 |
| | **Unemployment** | **3.34**** | 2.93 | **3.50**** | 2.98 |
| | **Inflation** | **-4.01*** | -2.25 | **-4.47**** | -2.48 |
| | **GDP growth** | **1.40*** | 2.12 | **2.17*** | 2.78 |
| | **Interest rate** | -2.01 | -1.42 | **-0.81**** | -0.61 |
| **Portugal** | **CIC (ATE)** | **-10.92**** | -3.21 | -4.24 | -1.16 |
| | **Unemployment** | **1.82**** | 2.73 | 0.56 | 0.82 |
| | **Inflation** | **-3.02**** | -2.85 | **-2.40+** | -1.85 |
| | **GDP growth** | 0.10 | 0.25 | 0.40 | 0.80 |
| | **Interest rate** | 0.04 | 0.07 | 0.20 | 0.24 |
| **Spain** | **CIC (ATE)** | 5.24 | 1.59 | 1.53 | 0.55 |
| | **Unemployment** | 0.62 | 1.58 | -0.19 | -0.56 |
| | **Inflation** | -1.37 | -1.09 | -2.05 | -1.57 |
| | **GDP growth** | 0.02 | 0.18 | 0.10 | 0.60 |
| | **Interest rate** | -0.90 | -0.84 | 1.25 | 1.31 |
| **Sweden** | **CIC (ATE)** | -1.19 | -0.40 | -3.01 | -0.97 |

| | | | | | |
|---|---|---|---|---|---|
| | **Unemployment** | **4.47**** | 5.27 | **3.50**** | 4.34 |
| | **Inflation** | **1.93**+ | 1.86 | 0.51 | 0.54 |
| | **GDP growth** | 0.12 | 0.28 | 0.35 | 0.61 |
| | **Interest rate** | **-2.80**** | -3.08 | -1.08 | -1.51 |
| **UK** | **CIC( ATE)** | -3.16 | -1.19 | **-6.17**+ | -1.88 |
| | **Unemployment** | **0.03**** | -2.99 | **0.03**** | -2.82 |
| | **Inflation** | -0.52 | -0.46 | -1.38 | -1.35 |
| | **GDP growth** | **0.90**+ | 1.72 | 1.35 | 1.54 |
| | **Interest rate** | **-1.44*** | -2.22 | -0.80 | -1.47 |
| **US** | **CIC( ATE)** | -5.70 | -1.35 | **-13.34**** | -2.91 |
| | **Unemployment** | **2.46**** | 2.74 | **1.29**+ | 1.76 |
| | **Inflation** | **-2.14**** | -1.99 | **-3.54**** | -3.37 |
| | **GDP growth** | **1.38*** | 2.27 | 0.88 | 1.14 |
| | **Interest rate** | 0.34 | 0.38 | **1.29**+ | 1.66 |

**Notes:** Bold figures indicate statistical significant coefficients, ** denotes statistical significance at the 1% level ($p<0.01$), * denotes statistical significance at the 5% level ($p<0.05$), + denotes statistical significance at the 10% level ($p<0.1$). In all the estimations the standard errors are block-bootstrapped . The results are given in percentage points

**Table 6**

*CIC* (ATE) estimates for the crises definition with additional control variables for panel groups

| | | | | | |
|---|---|---|---|---|---|
| **ALL** | **CIC( ATE)** | **-4.32**** | -3.20 | **-4.09**** | -2.87 |
| | **Unemployment** | **0.01**+ | -1.84 | **0.00**+ | -1.69 |
| | **Inflation** | **-1.01**** | -4.90 | **-1.34**** | -6.51 |
| | **GDP growth** | **0.17*** | 3.32 | **0.22**** | 3.36 |
| | **Interest rate** | 0.03 | 0.22 | **0.35**** | 3.09 |
| **PERIPH** | **CIC (ATE)** | **-8.18**** | -4.27 | **-5.68*** | -2.49 |
| | **Unemployment** | **0.42**** | 3.09 | **0.41**** | 2.77 |
| | **Inflation** | **-1.09**** | -2.90 | **-0.65**+ | -1.66 |
| | **GDP growth** | 0.14 | 1.38 | **0.26**** | 2.17 |
| | **Interest rate** | -0.09 | -0.40 | -0.17 | -0.73 |
| **EU** | **CIC (ATE)** | **-5.80**** | -3.92 | **-5.04**** | -3.10 |
| | **Unemployment** | **0.01*** | -1.80 | 0.00 | -1.61 |
| | **Inflation** | **-1.00**** | -3.99 | **-1.27**** | -4.96 |
| | **GDP growth** | **0.12*** | 2.11 | **0.20**** | 2.73 |
| | **Interest rate** | -0.07 | -0.52 | **0.26**+ | 1.92 |
| **EU (without PERIPH)** | **CIC (ATE)** | **-4.60*** | -2.47 | **-3.52**+ | -1.80 |
| | **Unemployment** | **0.02*** | -1.98 | **0.01**+ | -1.77 |
| | **Inflation** | **-1.89**** | -4.25 | **-2.48**** | -5.67 |
| | **GDP growth** | 0.10 | 1.32 | 0.11 | 1.21 |
| | **Interest rate** | -0.41 | -1.47 | 0.52 | 2.25 |
| **Non-EU** | **CIC (ATE)** | -0.44 | -0.30 | -0.60 | -0.36 |
| | **Unemployment** | **0.71**** | 3.89 | **0.62**** | 3.39 |
| | **Inflation** | **-1.06**** | -2.71 | **-1.38**** | -3.77 |
| | **GDP growth** | **0.55**** | 3.26 | **0.60**** | 2.81 |
| | **Interest rate** | -0.17 | -0.51 | 0.14 | 0.48 |

**Notes:** Bold figures indicate statistical significant coefficients, ** denotes statistical significance at the 1% level ($p<0.01$), * denotes statistical significance at the 5% level ($p<0.05$), + denotes statistical significance at the 10% level ($p<0.1$). In all the estimations the standard errors are block-bootstrapped . The results are given in percentage points

**Table 7**
CIC (ATE) estimates on volatilities of stock market returns for each country

| | $D_{crisis}$ | | $D_{GDP}$ | |
|---|---|---|---|---|
| **Country/Groups** | **Coef.** | **Z** | **Coef.** | **z** |
| **Australia** | **21.27**** | 7.09 | **No recession** | **No recession** |
| **Austria** | **149.95**** | 21.29 | **150.13**** | 23.66 |
| **Belgium** | **1612.58**** | 71.40 | **596.04**** | 32.74 |
| **Canada** | **23.40**** | 4.61 | **77.87**** | 10.25 |
| **Denmark** | **858.78**** | 38.92 | **2977.58**** | 82.81 |
| **Finland** | **11.86**** | 7.25 | **67.55**** | 8.29 |
| **France** | **243.83**** | 23.68 | **104.02**** | 5.65 |
| **Germany** | **72.77**** | 13.62 | **59.89**** | 9.46 |
| **Greece** | **429.72**** | 69.99 | **16.46*** | 2.36 |
| **Ireland** | **4568.67**** | 112.03 | **3628.68**** | 74.05 |
| **Italy** | **258.18**** | 23.31 | **306.58**** | 25.25 |
| **Japan** | **-55.13**** | -29.05 | -1.42** | -0.57 |
| **Netherlands** | **1071.77**** | 37.62 | **3564.23**** | 74.01 |
| **Portugal** | **442.58**** | 51.70 | **493.92**** | 49.63 |
| **Spain** | **68.13**** | 14.21 | **19.43**** | 4.50 |
| **Sweden** | **-10.48**** | -5.68 | **-38.55**** | -14.78 |
| **UK** | **50.95**** | 7.62 | **57.07**** | 6.95 |
| **US** | **252.52**** | 27.89 | **343.01**** | 21.38 |

**Notes:** Bold figures indicate statistical significant coefficients, ** denotes statistical significance at the 1% level ($p<0.01$), * denotes statistical significance at the 5% level ($p<0.05$), + denotes statistical significance at the 10% level ($p<0.1$). In all the estimations the standard errors are block-bootstrapped . The results are given in percentage points

**Table 8**
CIC (ATE) estimates on volatilities of stock market returns for panel groups

| | | | | |
|---|---|---|---|---|
| **ALL** | **583.59**** | 52.46 | **674.01**** | 46.10 |
| **PERIPH** | **1101.49**** | 55.43 | **872.26**** | 37.08 |
| **EU** | **743.82**** | 58.40 | **737.94**** | 46.39 |
| **EU (without PERIPH)** | **511.39**** | 45.65 | **625.36**** | 40.80 |
| **Non-EU** | **46.08**** | 9.83 | **92.73**** | 14.85 |

**Notes:** Bold figures indicate statistical significant coefficients, ** denotes statistical significance at the 1% level ($p<0.01$), * denotes statistical significance at the 5% level ($p<0.05$), + denotes statistical significance at the 10% level ($p<0.1$). In all the estimations the standard errors are block-bootstrapped . The results are given in percentage points

**Table 9**
CIC (ATE) estimates on volatilities of stock market returns with additional control macroeconomic variables for each country

| | | $D_{crisis}$ | | $D_{GDP}$ | |
|---|---|---|---|---|---|
| **Country** | **Variables** | Coef. | z | Coef. | z |
| **Australia** | **CIC( ATE)** | **21.37**** | 4.73 | No recession | No recession |
| | **Unemployment** | 0.99 | 0.23 | No recession | No recession |
| | **Inflation** | 1.12 | 0.32 | No recession | No recession |
| | **GDP growth** | 1.21 | 0.50 | No recession | No recession |
| | **Interest rate** | 0.06 | 0.01 | No recession | No recession |
| **Austria** | **CIC( ATE)** | **166.25**** | 15.31 | **149.38**** | 11.79 |
| | **Unemployment** | -8.37 | -0.43 | 21.94 | -1.10 |
| | **Inflation** | **-59.33**** | -4.69 | **-35.94**** | -2.67 |
| | **GDP growth** | -0.04 | -0.04 | -0.61 | -0.31 |
| | **Interest rate** | -11.01 | -1.00 | **-50.92**** | -5.29 |
| **Belgium** | **CIC( ATE)** | **1804.74**** | 50.74 | **770.18**** | 17.01 |
| | **Unemployment** | -94.30 | -1.45 | **-187.93*** | -2.42 |
| | **Inflation** | **-385.44**** | -6.68 | **-272.69**** | -4.06 |
| | **GDP growth** | **-13.68**** | -2.76 | -16.88 | -1.55 |
| | **Interest rate** | -24.76 | -0.67 | **-166.82**** | -4.78 |
| **Canada** | **CIC( ATE)** | **37.09**** | 5.53 | **164.14**** | 22.41 |
| | **Unemployment** | -1.20 | -0.30 | 2.22 | 0.81 |
| | **Inflation** | -5.47 | -1.24 | -4.91 | -1.48 |
| | **GDP growth** | **-4.44**** | -3.40 | 0.67 | 0.54 |
| | **Interest rate** | 3.95 | 0.99 | -0.22 | -0.10 |
| **Denmark** | **CIC( ATE)** | **800.19**** | 23.04 | **3630.74**** | 105.28 |
| | **Unemployment** | **-117.49**** | -2.65 | 10.04 | 0.33 |
| | **Inflation** | **-186.05+** | -1.69 | 30.76 | 0.43 |
| | **GDP growth** | **-129.21**** | -5.52 | **-43.20+** | -1.94 |
| | **Interest rate** | **100.56*** | 2.25 | -21.29 | -0.80 |
| **Finland** | **CIC( ATE)** | **-31.81**** | -3.34 | -13.16 | -1.27 |
| | **Unemployment** | 8.69 | 0.91 | 1.85 | 0.18 |
| | **Inflation** | **54.72**** | 3.42 | 23.31 | 1.54 |
| | **GDP growth** | **-22.14**** | -3.93 | **-14.61+** | -1.84 |
| | **Interest rate** | -16.02 | -0.91 | 12.80 | 0.73 |
| **France** | **CIC( ATE)** | **341.88**** | 15.96 | **1098.84**** | 58.11 |
| | **Unemployment** | 28.09 | 0.79 | -25.84 | -0.65 |
| | **Inflation** | **-146.99**** | -2.72 | **-271.69**** | -4.27 |
| | **GDP growth** | -36.79 | -1.55 | **-89.29**** | -3.06 |
| | **Interest rate** | **-67.82*** | -2.21 | **-41.67+** | -1.67 |
| **Germany** | **CIC( ATE)** | **134.22**** | 13.99 | **33.62**** | 5.07 |
| | **Unemployment** | 1.62 | 0.20 | 0.54 | 0.10 |
| | **Inflation** | -6.86 | -0.70 | -10.06 | -1.12 |

| | | | | | |
|---|---|---|---|---|---|
| | **GDP growth** | **-16.37+** | -1.84 | 13.89 | 1.38 |
| | **Interest rate** | **-15.93*** | -2.11 | **-16.73**** | -3.01 |
| **Greece** | **CIC( ATE)** | **501.01**** | 56.59 | **751.72**** | 63.10 |
| | **Unemployment** | 2.78 | 0.59 | -13.44 | -1.64 |
| | **Inflation** | -9.08 | -1.47 | -6.58 | -0.64 |
| | **GDP growth** | -2.94 | -0.90 | **-22.62**** | -3.84 |
| | **Interest rate** | -2.39 | -0.59 | 5.82 | 0.89 |
| **Ireland** | **CIC( ATE)** | **4520.69**** | 90.02 | **5499.32**** | 118.39 |
| | **Unemployment** | **-269.82**** | -2.73 | **-185.76+** | -1.91 |
| | **Inflatio** | **-689.96**** | -5.69 | **-610.17**** | -4.85 |
| | **GDP growth** | -24.57 | -0.57 | **-71.68+** | -1.71 |
| | **Interest rate** | **409.05*** | 2.08 | **349.97*** | 1.74 |
| **Italy** | **CIC( ATE)** | **273.99**** | 21.33 | **80.12**** | 6.16 |
| | **Unemployment** | **79.65**** | 4.17 | **86.49**** | 4.51 |
| | **Inflation** | 0.32 | 0.01 | -4.79 | -0.12 |
| | **GDP growth** | **-55.93**** | -3.29 | **-74.49**** | -4.02 |
| | **Interest rate** | -33.35 | -1.62 | -26.84 | -1.30 |
| **Japan** | **CIC( ATE)** | **-47.41**** | -6.68 | 6.66 | 0.87 |
| | **Unemployment** | 7.08 | 1.02 | 5.75 | 0.80 |
| | **Inflation** | 6.96 | 1.65 | 6.58 | 1.49 |
| | **GDP growth** | 0.09 | 0.07 | -0.76 | -0.40 |
| | **Interest rate** | -0.15 | -0.03 | -2.07 | -0.37 |
| **Netherlands** | **CIC( ATE)** | **1118.18**** | 31.74 | **3606.20**** | 76.46 |
| | **Unemployment** | **-315.06**** | -3.98 | **-270.05**** | -3.66 |
| | **Inflation** | -130.96 | -1.06 | -117.09 | -1.04 |
| | **GDP growth** | **-242.93**** | -5.29 | **-156.32**** | -3.21 |
| | **Interest rate** | **309.00**** | 3.14 | **275.52**** | 3.26 |
| **Portugal** | **CIC( ATE)** | **549.86**** | 52.93 | **610.66**** | 64.89 |
| | **Unemployment** | -1.29 | -0.14 | 8.46 | 0.95 |
| | **Inflation** | -15.68 | -1.04 | -1.38 | -0.08 |
| | **GDP growth** | -3.78 | -0.68 | 2.28 | 0.35 |
| | **Interest rate** | 8.43 | 0.93 | -6.25 | -0.57 |
| **Spain** | **CIC( ATE)** | **97.72**** | 13.71 | **63.07**** | 8.95 |
| | **Unemployment** | **15.46**** | 4.14 | **8.36**** | 2.56 |
| | **Inflation** | **-32.09**** | -2.69 | **-35.82**** | -2.90 |
| | **GDP growth** | **1.94+** | 1.84 | -0.17 | -0.11 |
| | **Interest rate** | **-39.03**** | -3.84 | **-20.78*** | -2.31 |
| **Sweden** | **CIC( ATE)** | **-38.60**** | -6.77 | **-68.05**** | -11.01 |
| | **Unemployment** | 11.46 | 1.43 | 1.23 | 0.16 |
| | **Inflation** | **46.09**** | 4.72 | **30.96**** | 3.47 |
| | **GDP growth** | **-11.73**** | -2.82 | **-12.60*** | -2.33 |
| | **Interest rate** | -7.70 | -0.90 | 9.96 | 1.49 |

| | | | | | |
|---|---|---|---|---|---|
| **UK** | **CIC( ATE)** | **87.73**** | 11.21 | **33.39**** | 3.11 |
| | **Unemployment** | **1.76**** | 2.82 | **1.66**** | 2.70 |
| | **Inflation** | **-49.22**** | -3.66 | **-49.04**** | -3.86 |
| | **GDP growth** | **-39.77**** | -6.52 | **-33.52**** | -3.29 |
| | **Interest rate** | -5.88 | -0.77 | -5.47 | -0.88 |
| **US** | **CIC( ATE)** | **263.42**** | 18.75 | **714.37**** | 40.02 |
| | **Unemployment** | -4.92 | -0.47 | 11.54 | 1.45 |
| | **Inflation** | **-37.14**** | -2.98 | -17.76 | -1.56 |
| | **GDP growth** | **-37.33**** | -37.33 | **-30.93**** | -3.70 |
| | **Interest rate** | 16.35 | 1.56 | 2.94 | 0.35 |

**Notes:** Bold figures indicate statistical significant coefficients, ** denotes statistical significance at the 1% level ($p<0.01$), * denotes statistical significance at the 5% level ($p<0.05$), + denotes statistical significance at the 10% level ($p<0.1$). In all the estimations the standard errors are block-bootstrapped . The results are given in percentage points

**Table 10**
CIC (ATE) estimates on volatilities of stock market returns with additional control macroeconomic variables for panel groups

| | | | | | |
|---|---|---|---|---|---|
| **ALL** | **CIC (ATE)** | **589.64**** | 35.02 | **746.24**** | 45.40 |
| | **Unemployment** | **-0.38**** | -4.29 | **-0.33**** | 3.70 |
| | **Inflation** | **-99.27**** | -8.38 | **-83.28**** | -7.08 |
| | **GDP growth** | **-8.33**** | -2.77 | -2.95 | -0.81 |
| | **Interest rate** | **31.97**** | 4.62 | **15.79*** | 2.34 |
| **PERIPH** | **CIC (ATE)** | **1202.85**** | 52.91 | **1212.89**** | 43.60 |
| | **Unemployment** | **-19.32+** | -1.79 | **-21.39+** | -1.90 |
| | **Inflation** | **-234.69**** | -7.89 | **-243.67**** | -8.20 |
| | **GDP growth** | -2.29 | -0.29 | -1.29 | -0.14 |
| | **Interest rate** | **81.86**** | 4.75 | **82.73**** | 4.75 |
| **EU** | **CIC (ATE)** | **779.06**** | 40.95 | **896.83**** | 44.01 |
| | **Unemployment** | **-0.59**** | -4.00 | **-0.58**** | -3.82 |
| | **Inflation** | **-138.39**** | -8.90 | **-125.39**** | -8.04 |
| | **GDP growth** | **-6.56+** | -1.82 | 0.09 | 0.02 |
| | **Interest rate** | **33.59**** | 3.81 | **14.76+** | 1.69 |
| **EU (without PERIPH)** | **CIC (ATE)** | **524.15**** | 30.55 | **693.60**** | 37.75 |
| | **Unemployment** | **-0.57**** | -2.82 | **-0.58**** | -2.94 |
| | **Inflation** | **-78.61**** | -4.05 | **-56.79**** | -3.02 |
| | **GDP growth** | **-12.81**** | -4.06 | -2.57 | -0.65 |
| | **Interest rate** | **-26.22*** | -2.09 | **-53.92**** | -5.25 |
| **Non-EU** | **CIC (ATE)** | **41.79**** | 7.41 | **88.67**** | 14.62 |
| | **Unemployment** | **22.35**** | 10.78 | **21.38**** | 10.48 |
| | **Inflation** | **12.31**** | 2.77 | **9.49*** | 2.30 |
| | **GDP growth** | **-12.43**** | -6.57 | **-12.54**** | -5.29 |
| | **Interest rate** | **-19.83**** | -5.44 | **-16.98**** | -5.11 |

**Notes:** Bold figures indicate statistical significant coefficients, ** denotes statistical significance at the 1% level ($p<0.01$), * denotes statistical significance at the 5% level ($p<0.05$), + denotes statistical significance at the 10% level ($p<0.1$). In all the estimations the standard errors are block-bootstrapped . The results are given in percentage points

**APPENDIX**

**Table A1:**
Number and percentage of banking stocks that are included in the General Index for each country

| | UK | AUS | BEL | DEN | FIN | FRA | GER | GRE | IRL |
|---|---|---|---|---|---|---|---|---|---|
| No of stocks | 646 | 20 | 20 | 20 | 24 | 40 | 30 | 60 | 49 |
| No of Banking stocks | 9 | 2 | 1 | 3 | 1 | 3 | 2 | 5 | 2 |
| % | 1.39% | 10% | 5.0% | 15.0% | 4.17% | 7.5% | 6.67% | 8.33% | 4.08% |
| | | | | | | | | | |
| | ITA | SWE | NET | POR | SPA | CAN | AUS | US | JAP |
| No of stocks | 200 | 30 | 25 | 20 | 35 | 249 | 500 | 500 | 225 |
| No of Banking stocks | 15 | 4 | 2 | 3 | 7 | 8 | 6 | 15 | 11 |
| % | 7.50% | 13% | 8.0% | 15.0% | 20.0% | 3.21% | 1.20% | 3.0% | 4.89% |

**Table A2:**
The Stock Market and Banking Indices used in the Study

| | Country | General Index | Banking Index |
|---|---|---|---|
| 1 | Australia | ASX Price Index | S&P Australia 200 Banks Index |
| 2 | Austria | ATX Austrian Price Index | FTSE Austria Banks Index |
| 3 | Belgium | BEL20 Price Index | FTSE Belgium Banks Index |
| 4 | Canada | S&P/TSX Price Index | TSX Banks Index |
| 5 | Denmark | OMX Copenhagen Price Index | FTSE Denmark Banks Index |
| 6 | Finland | OMX Helsinki Price Index | FTSE Finland Banks Index |
| 7 | France | CAC 40 Price Index | FTSE France Banks Index |
| 8 | Germany | DAX 30 Price Index | DAX Banks (XETRA) Index |
| 9 | Greece | ATHEX Price Index | FTSE Banks Index |
| 10 | Ireland | ISEQ Price Index | FTSE Ireland Banks Index |
| 11 | Italy | FTSE MIB Price Index | FTSE Italy Nanks Index |
| 12 | Japan | NIKKEI 225 Price Index | TOPIX Banks Index |
| 13 | Netherlands | AEX Price Index | FTSE Netherlands Banks Index |
| 14 | Portugal | PSI 20 Price Index | FTSE Portugal Banks Index |
| 15 | Spain | IBEX 35 Price Index | FTSE Spain Banks Index |
| 16 | Sweden | OMX STOCKHOLM 30 Price Index | FTSE Sweden Banks Index |
| 17 | UK | FTSE ALL SHARE Price Index | FTSE UK Banks Price Index |
| 18 | US | DOW JONES Price Index | S&P500 Banks Index |

**Table A3**

GARCH (1,1) estimates for the daily Bank Returns for each country

| Parameter | Austria | Belgium | Denmark | Finland | France | Germany | Greece | Ireland | Italy |
|---|---|---|---|---|---|---|---|---|---|
| Mean equation | | | | | | | | | |
| constant | 0.811 | **3.911+** | **4.615**** | 2.600 | 1.716 | 1.505 | 0.768 | **3.935**** | **2.735**** |
| | (0.416) | (2.270) | (3.943) | (1.155) | (0.799) | (0.663) | (0.357) | (2.608) | (2.827) |
| Returns(-1) | 0.179 | -0.070 | **-0.366**** | 0.020 | 0.012 | 0.017 | **0.229*** | -0.248 | 0.011 |
| | (1.047) | (-0.416) | (-4.243) | (0.156) | (0.075) | (0.104) | (2.126) | (-1.485) | (0.096) |
| Variance equation | | | | | | | | | |
| constant | 36.674 | 16.306 | **47.232*** | 70.500 | **82.039+** | 0.388 | **9.705*** | 6.475 | 7.941 |
| | (1.561) | (1.514) | (2.487) | (0.904) | (1.956) | (0.124) | (2.108) | (0.399) | (0.458) |
| ARCH(1) | **0.201+** | **0.570**** | **1.504**** | 0.012 | **0.544** | **0.094**** | **0.102**** | **1.081*** | **1.020**** |
| | (1.826) | (3.315) | (3.872) | (1.169) | (2.568) | (3.717) | (4.531) | (2.116) | (2.656) |
| GARCH(1) | **0.685*** | **0.592**** | **-0.013+** | **0.641**** | **0.40**** | **1.104**** | **1.120**** | **0.337**** | **0.396**** |
| | (7.076) | (10.347) | (-1.903) | (2.638) | (2.646) | (40.613) | (39.77) | (2.663) | (2.504) |
| Diagnostics | | | | | | | | | |
| R-squared | 0.040 | 0.074 | 0.239 | 0.002 | 0.007 | 0.009 | 0.054 | 0.196 | 0.037 |
| Adj R-squared | 0.028 | 0.088 | 0.255 | 0.011 | 0.020 | 0.022 | 0.042 | 0.212 | 0.051 |
| Observations | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 |

| Parameter | Neth/ands | Portugal | Spain | Sweden | UK | Australia | Canada | Japan | US |
|---|---|---|---|---|---|---|---|---|---|
| Mean equation | | | | | | | | | |
| constant | 1.102 | 0.494 | 0.854 | 2.201 | 1.694 | **2.288*** | **2.605*** | -1.704 | 1.345 |
| | (0.688) | (0.245) | (0.420) | (1.097) | (1.398) | (2.348) | (2.105) | (-0.939) | (0.911) |
| Returns(-1) | 0.153 | 0.102 | 0.027 | 0.071 | **0.240+** | 0.128 | 0.019 | 0.097 | 0.054 |
| | (1.036) | (0.735) | (0.153) | (0.555) | (1.924) | (0.884) | (0.121) | (0.803) | (0.323) |
| Variance equation | | | | | | | | | |
| constant | 61.978 | 37.780 | 46.920 | 71.846 | **45.863+** | 24.596 | 28.860 | 21.391 | 25.360 |
| | (1.538) | (1.066) | (1.294) | (1.147) | (1.997) | (0.658) | (1.220) | (0.526) | (1.475) |
| ARCH(1) | **0.708**** | **0.452**** | **0.246**** | 0.007 | 0.454 | 0.164 | **0.288+** | **0.022**** | **0.353+** |
| | (2.908) | (2.431) | (2.109) | (0.13) | (1.511) | (0.679) | (1.931) | (2.274) | (1.744) |
| GARCH(1) | **0.270**** | **0.510+** | **0.582+** | **0.591**** | **0.258**** | **0.451**** | **0.412**** | **0.874**** | **0.520**** |
| | (2.672) | (1.770) | (1.993) | (2.624) | (2.014) | (2.560) | (2.185) | (3.735) | (2.075) |
| Diagnostics | | | | | | | | | |
| R-squared | 0.030 | 0.017 | 0.004 | 0.036 | 0.060 | 0.024 | 0.001 | 0.005 | 0.002 |
| Adj R-squared | 0.017 | 0.005 | 0.017 | 0.024 | 0.048 | 0.012 | 0.012 | 0.008 | 0.015 |
| Observations | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 |

**Notes**: ** denotes statistical significance at the 1% level ($p<0.01$), * denotes statistical significance at the 5% level ($p<0.05$), + denotes statistical significance at the 10% level ($p<0.1$)

## Table A4

GARCH (1,1) estimates for the daily General Index Returns for each country

| Parameter | Austria | Belgium | Denmark | Finland | France | Germany | Greece | Ireland | Italy |
|---|---|---|---|---|---|---|---|---|---|
| Mean equation | | | | | | | | | |
| constant | **2.935*** | 2.012 | **2.343+** | 2.021 | 1.225 | 2.424 | 0.912 | **2.801+** | 0.942 |
| | (2.015) | (1.644) | (1.814) | (1.069) | (1.039) | (1.291) | (0.503) | (1.956) | (0.578) |
| Returns(-1) | **0.197*** | -0.004 | **0.308+** | 0.060 | 0.188 | 0.013 | **0.241*** | 0.060 | 0.163 |
| | (2.032) | (-0.027) | (1.830) | (0.433) | (1.321) | (0.090) | (2.007) | (0.380) | (1.134) |
| Variance equation | | | | | | | | | |
| constant | 3.244 | **38.871+** | **35.481*** | 14.727 | 34.545 | 37.238 | **10.121*** | 22.717 | 39.495 |
| | (0.990) | (1.743) | (2.123) | (0.641) | (1.354) | (0.630) | (2.134) | (1.227) | (0.769) |
| ARCH(1) | **-0.108**** | **0.445+** | **0.684**** | 0.261 | **0.303+** | 0.114 | **-0.122**** | **0.444*** | 0.147 |
| | (-3.365) | (1.950) | (2.682) | (1.315) | (1.667) | (1.003) | (-4.210) | (2.263) | (0.836) |
| GARCH(1) | **1.090**** | **0.253*** | **0.142*** | **0.722**** | **0.455**** | **0.672**** | **1.100**** | **0.458*** | 0.579 |
| | (28.692) | (1.864) | (1.825) | (4.653) | (2.501) | (2.638) | (32.46) | (1.998) | (1.235) |
| Diagnostics | | | | | | | | | |
| R-squared | 0.024 | 0.012 | 0.026 | 0.004 | 0.023 | 0.002 | 0.046 | 0.006 | 0.013 |
| Adj R-squared | 0.012 | 0.025 | 0.013 | 0.017 | 0.037 | 0.015 | 0.034 | 0.019 | 0.001 |
| Observations | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 |

| Parameter | Neth/ands | Portugal | Spain | Sweden | UK | Australia | Canada | Japan | US |
|---|---|---|---|---|---|---|---|---|---|
| Mean equation | | | | | | | | | |
| constant | 1.863 | 0.571 | 2.222 | 2.020 | **2.064*** | **1.594*** | **1.833*** | -0.154 | **2.178*** |
| | (1.296) | (0.388) | (1.502) | (1.395) | (2.291) | (2.059) | (2.144) | (-0.113) | (2.209) |
| Returns(-1) | 0.083 | 0.141 | 0.178 | 0.216 | 0.162 | 0.163 | 0.143 | 0.130 | 0.064 |
| | (0.520) | (1.159) | (1.051) | (1.479) | (1.101) | (0.850) | (1.642) | (1.286) | (0.409) |
| Variance equation | | | | | | | | | |
| constant | 16.611 | 57.045 | 17.859 | 19.371 | 9.250 | 12.600 | 3.666* | 36.129 | 7.691 |
| | (1.268) | (0.374) | (1.296) | (1.124) | (1.427) | (1.232) | (2.289) | (1.088) | (1.473) |
| ARCH(1) | **0.577+** | 0.088 | **0.316+** | **0.230**** | **0.564**** | **0.446**** | **-0.130**** | -0.162 | **0.295*** |
| | (1.688) | (0.462) | (1.722) | (2.298) | (3.093) | (2.770) | (-3.762) | (-1.305) | (2.238) |
| GARCH(1) | **0.470*** | **0.529**** | **0.607**** | **0.654**** | **0.439**** | 0.323 | **1.092**** | **0.854**** | **0.640**** |
| | (2.496) | (2.469) | (3.222) | (3.026) | (3.192) | (1.050) | (36.772) | (3.746) | (4.417) |
| Diagnostics | | | | | | | | | |
| R-squared | 0.012 | 0.011 | 0.065 | 0.011 | 0.034 | 0.049 | 0.010 | 0.011 | 0.002 |
| Adj R-squared | 0.025 | 0.001 | 0.079 | 0.024 | 0.047 | 0.036 | 0.001 | 0.001 | 0.010 |
| Observations | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 | 29,158 |

**Notes**: ** denotes statistical significance at the 1% level ($p<0.01$), * denotes statistical significance at the 5% level ($p<0.05$), + denotes statistical significance at the 10% level ($p<0.1$)

**Figure A1:**
GARCH Volatility Series for the Banking Sector Stock Returns for each country

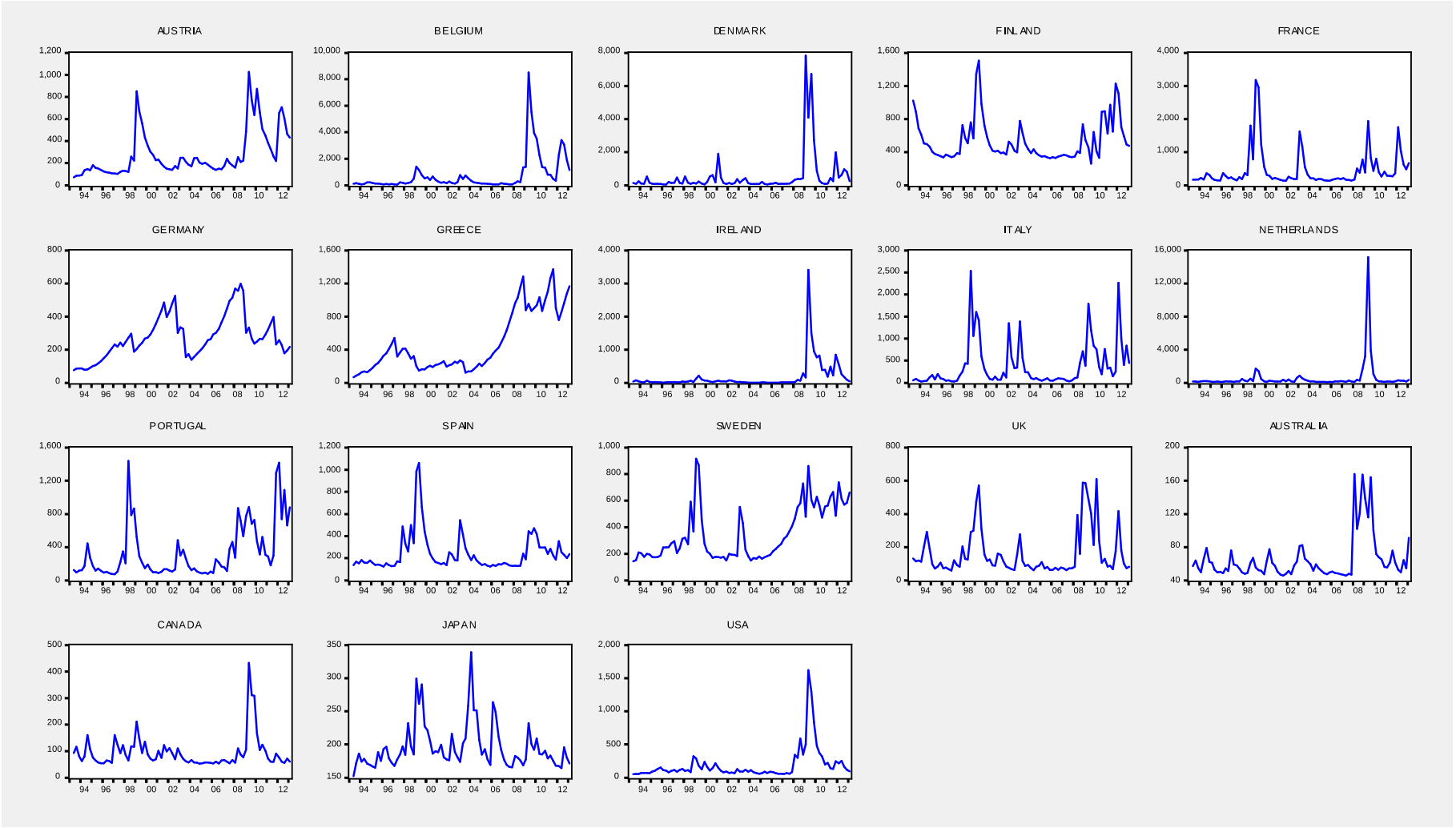

**Figure A2:**

GARCH Volatility Series for the General Index Stock Returns for each country