National GDP Growth and Changes of Stock Market Indices

Evidence from France, Germany, Great Britain and Japan

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Abstract

Using data from Germany, Japan, Great Britain and France we provide an analysis of the effect of national GDP Growth on changes of national stock market indices. Controling for various covariates we find that for Great Britain and France GDP growth has statistically significant effects on the FTSE100 and the CAC40.

Contents

Introduction

In this paper, we investigate on an odd relation: GDP growth and national equity prices; that is national stock indices. The intuitive assumption that one has automatically is fairly straight forward: The better the economy performs, the higher expectations of market participants, investments and trust in the future. In turn, we should - naturally - obtain an increase the level of national stock market indices. However, the more interesting question is beyond this intuitive assumption: Focusing on four OECD countries (Germany, France, Great Britain and Japan) we investigate on the question whether there are different levels of statistical significance for the effect of GDP growth on equity prices. Note that we do not compare the size of the effects (i.e. coefficients) since we investigate on different dependent variables. Rather, we compare the statistical significance across the four countries of interest. For equity prices, we take the four major national stock market indices of the countries as our dependent variable: The CAC40 (France), DAX (Germany), FTSE100 (Great Britain) and the NIKKEI (Japan). We control for a row of other, lagged explanatory determinants - not only from within the national economy (e.g. unemployment rate) but also external, more global factors (e.g. oil prices). We elaborate on the specific covariates below. For our analysis we focus on the time period between the second quarter of 1999 (where ECB interest rates became relevant) and fourth quarter of 2015. The rest of this paper is structured as follows:

Literature Review

We would like to provide a two-step literature review. In the first part we summarize general findings of the field regarding national indices: What are determinants that ought to be influential on the level of National Indices? In the second, more narrow step, we focus on the relationsship between GDP growth and national indices: Did previous studies find a relationship after all? Were causal assumptions confirmed?

National Indices

Dimson et al. provide a solid and helpful introduction to the subject[1] with a focus on world's stock markets and the question of returns (Dimson, Marsh, and Staunton 2009). The field provides a tremendous amount of research on the question what influences stock markets in general and national indices in specific. Work includes research on herding effects in advanced (Chiang and Zheng 2010), Chinese (Tan et al. 2008) or Japanese stock markets (Chang and Dong 2006).

Other scholars aim to predict the direction of indices via neural networks - as an attempt to go beyond traditional (non-)linear models. Examples of this stream of research include the work of Guresen et al. (Guresen, Kayakutlu, and Daim 2011) or a study of the Istanbul stock exchange index (Kara, Boyacioglu, and Baykan 2011). Other authors investigate the effect of the media (Tetlock 2007) or even the weather on stock markets (Symeonidis, Daskalakis, and Markellos 2010, Kang et al. (2010), Yoon and Kang (2009), Goetzmann and Zhu (2005), Cao and Wei (2005)).

Contagion and spill-over effects are also of interest for the field. Boyer et al. provide empirical evidence that stock market crises are spread globally through asset holdings of international investors. The more open (i.e. accessible) the stock markets, the higher the co-movements, they find (Boyer, Kumagai, and Yuan 2006). Kenourgios et al. conclude very similar. (Kenourgios, Samitas, and Paltalidis 2011). Furthermore, the field moved on to insights from behavioral economics. Bollen et al. provide an interesting piece of work and find correlations between what they call the *twitter mood* and the Dow Jones Industrial Average over time (Bollen, Mao, and Zeng 2011). The work of Zhang et al. (Zhang, Fuehres, and Gloor 2011) and Si et al. (Si et al. 2013) follow a similar approach and find identical results.

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[1] The work of Dimson et al. was regularly updated. The 2009 edition is the most recent version available

GDP Development and National Indices

The field provides various studies focusing on the relationship between GDP growth (or macroeconomic determinants of GDP growth) and stock markets in general. For example, Claessens et al. "study how local stock market development and internationalization listing, trading, and capital raising in international exchanges are related to economic fundamentals" (Claessens, Klingebiel, and Schmukler 2006). Duca states that there is a clear co-movement between stock market prices and GDP in developed economies. Assuming causal effects he finds that "the level of economic activity in a country can potentially depend on the stock market amongst other variables" (Duca 2007). On the other hand, Ritter finds that cross-country correlation of real stock returns and per capita GDP growth over 1900-2002 is negative. This is mainly traced back to the fact that increases in capital and labor inputs (i.e. two main determinants of GDP growth) in new corporations (i.e. representing innovation) do not necessarily imply higher dividends (Ritter 2005).

For 42 emerging markets Yartey examines the effect of institutional and macroeconomic determinants on stock market developments (Yartey 2008). Similar studies focus on these determinants for a wide range of countries. These include OECD countries like Belgium (Van Nieuwerburgh, Buelens, and Cuyvers 2006), France (Sraer and Thesmar 2007), Germany (Antonios 2010) or New Zealand from 1990 to 2003 (Diebold and Yilmaz 2008). And developing markets such as Malaysia (Rahman, Sidek, and Tafri 2009) or BRICS-countries like India (Singh 2010, Agrawalla and Tuteja (2007)) and South Africa (Hsing 2011) in general.

Research Question and Hypothesis

Does national GDP growth lead to growing national stock market indices?

- H_0: There are statistically significant effects of national GDP growth on the growth rates of national stock market indices.

- H_1: There are no statistically significant effects of national GDP growth on the growth rates of national stock market indices.

Data and Variables of Interest

In the following we introduce our variables of interest and briefly summarize how they fit our purpose. All variables were collected (or aggregated from our side) on a quarterly basis.

Variables	Number	Origin of Data	Time Range
Dependent Variables	4	Yahoo Finance	Quarter 2 1999 - Q4 2015
Covariates	6	ECB, OECD	Q2 1999 - Q4 2015

Dependent Variables

We use data from Yahoo Finance to derive four dependent variables. We are interested in equity prices in the form of national stock market indices. These indices measure the combined stock values of companies or equities in a country which are top performing according to given benchmarks. We measure the dependent variables as the change to the the average closing value of a given index. In other words, we are not interested in the *level* but rather in the *variation* of the indices.

Dependent Variables	Official Title	Scope
DAX (Germany)	Deutscher Aktienindex	30 major Companies

Dependent Variables	Official Title	Scope
CAC40 (France)	Cotation AssistÃ© en Continu 40	40 highest Market Caps
FTSE100 (Gr. Britain)	Fin. Times Stock Exchange 100 Index	100 Companies
NIKKEI (Japan)	NIKKEI 225	225 Equities

Covariates

In the following we control for various control variables. In our final model, we use a lag of one quarter and another lag of two quarters for all covariates.

Starting with country-specific covariates (i.e. variables that are unique to France, Germany, Great Britain and France), we use OECD data to derive the three following covariates. Among them is our key independent variables: GDP growth.

Country-specific Covariates	Measured
GDP growth	% change to previous rate
Private consumption	in % of GDP
Consumer price index (CPI)	in % to previous rate

From the ECB database we use the deposit facility (i.e. interest rate for banks[2] making overnight deposits with the Eurosystem). Quite noticeable is the fact that, since June 2014, the rate here is negative. That is, quite counter-intuitive from a banks are penalized when making deposits.

Again using OECD data, we take the quarterly GDP growth rate of the USA as a proxy for the general development of the world economy. The economy of the USA has a profound impact on other national business cycles, and national recessions in the US have sever repercussions across the globe. This was demonstrated again after 2007 when the US subprime mortgage crisis turned into a global recession. Moreover, the West Texas Intermediate (WTI) price changes are taken as an indicator of global economic health and a crucial determinant of economic growth.

Covariates	Measured
ECB deposit facility	% change to previous rate
GDP growth USA	% change to previous rate
WTI	% change to previous rate in U.S. $

At the early stage of research for this paper other covariates were taken into account: the ECB's interest rate on the main refinancing operations (MRO), the unemployment rate for the four countries of interest and the brent crude oil price. A first variance inflation factor (vif) test after prelimenary regressions suggested to ignore the mentioned variables.

Descriptive Statistics

Figure 1 presents a first overview of the four dependent variables from the second quarter in 1999 to the last quarter in 2015. Striking is the non-linearity of the graphs and the fact that the NIKKEI - quite contrary to the other indices - rather declined/stagnated. The DAX, CAC40 and the FTSE100 share a general upward trend.

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[2]We rakishly use the term "banks" for this paper. While "Financial Institutions" would be more appropriate to apply, we dare to continue with "banks" for reasons of simplicity.
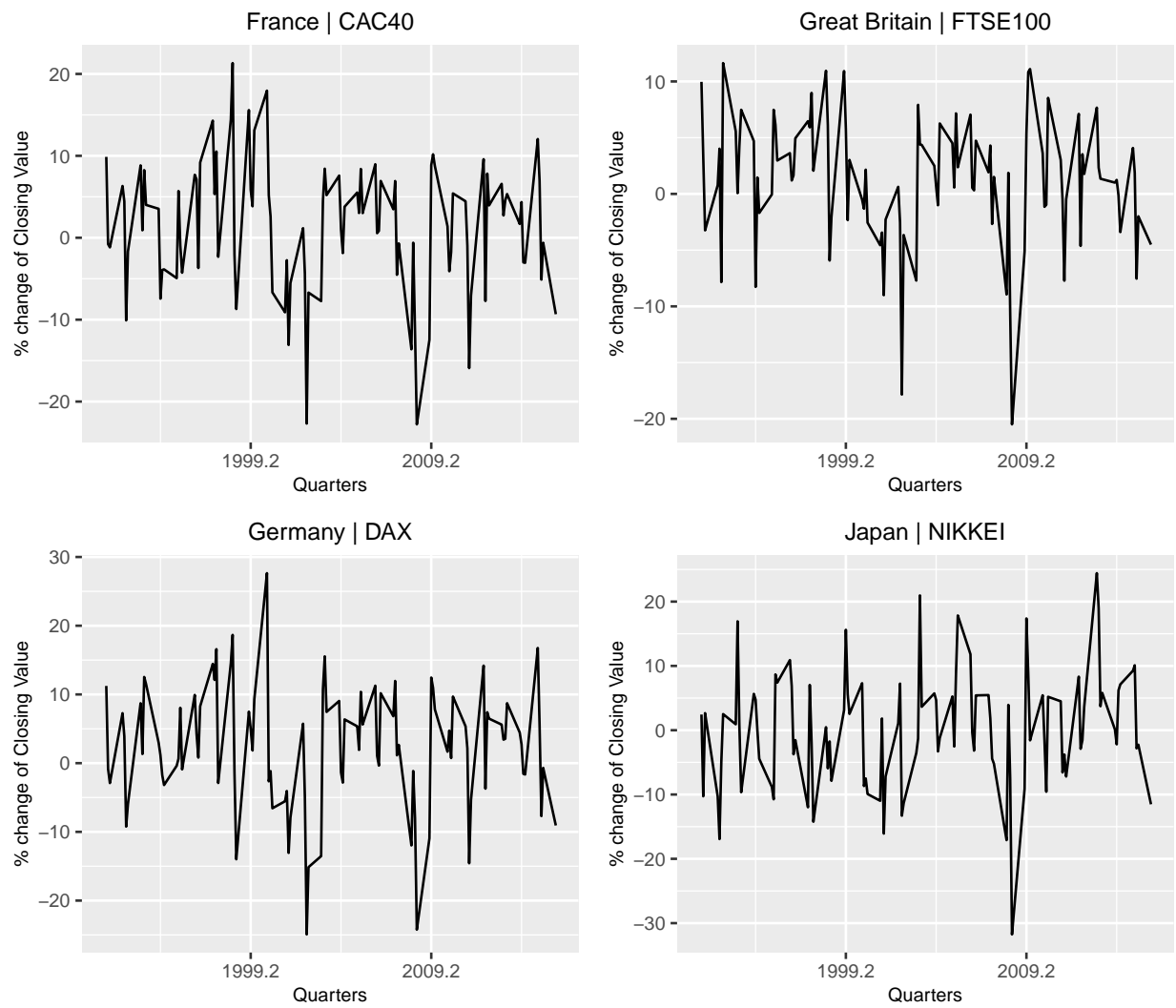
Figure 1: Dependent Variables (Change of National Stock Indices) over time

Another interesting overview is given with **Figure 2** which summarizes the developments of our key independent variables over the same time (i.e. Q2 1999 until Q4 2015). Our country-specific, key independent variables measure GDP growth (i.e. change to previous quarter) for the country in question. Note that below we also plot the graph for the USA: An external factor we assume to be influential on all four national stock indices. Compared to the dependent variables, the key independent variables show a relatively more congruent development. Remarkable is the major, well visible downturn during and in the aftermath of financial crisis in all five graphs.
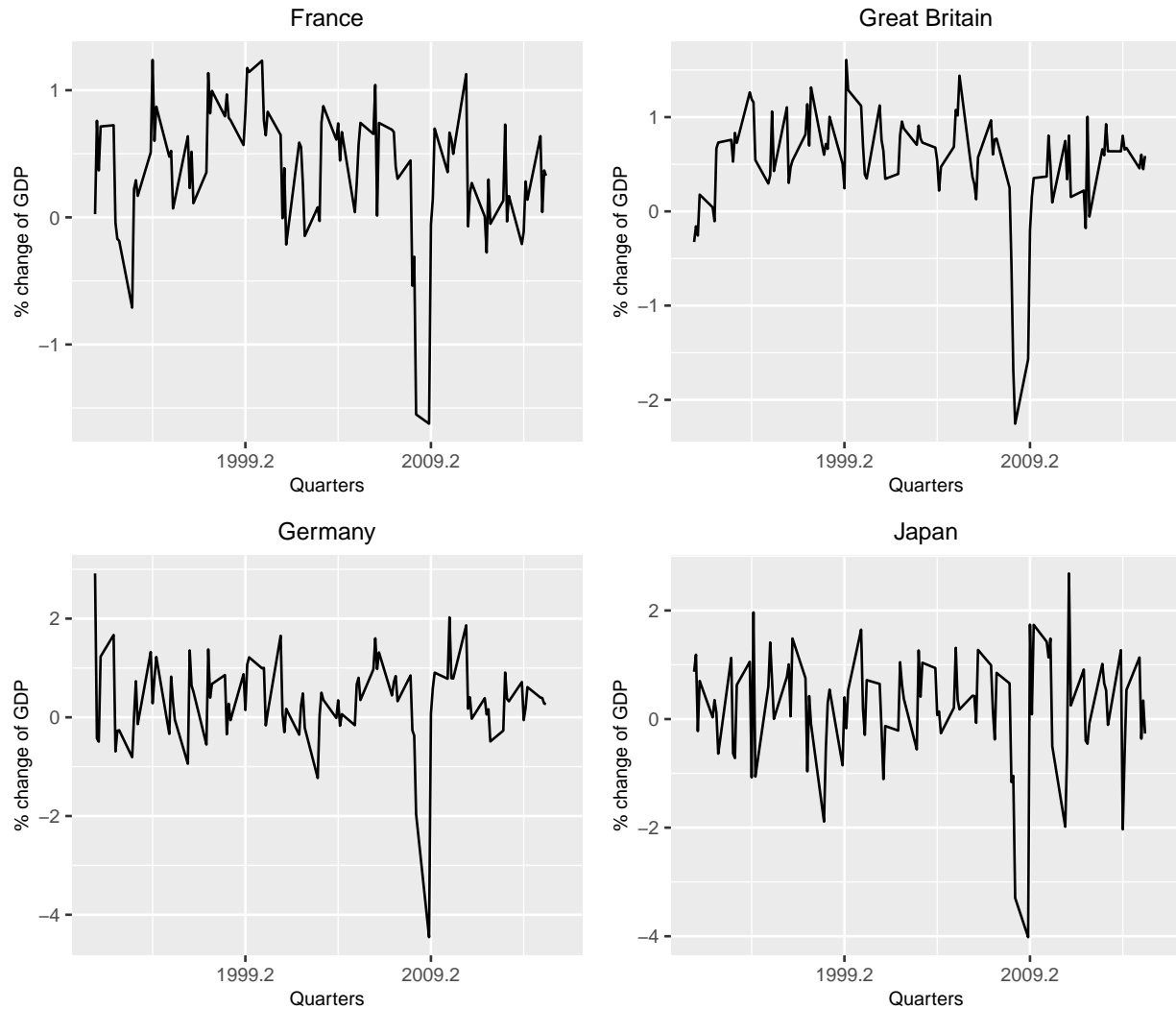
Figure 2: Key Independent Variables (Quarterly GDP growth to previous quarter)

Figure 3 summarizes the main characteristics for the depent and key indepent variables.

The according Medians for the each dependent variable are as follows:

L.DEU.prvconsm NA L.WTI.dollar.change NA L.Brent.dollar.change NA L.ECB.MRO.change NA

In the next step, **Figure 4** summarizes the frequency distributions of the dependent variables. For now, we assume the variables to be normally distributed. In following research to this assignment we will consider log-transformation for the variables.

** Question: Maybe subset data so that we only use Close. change for Q21999-2015?!**

Table 5: Descriptive statistics

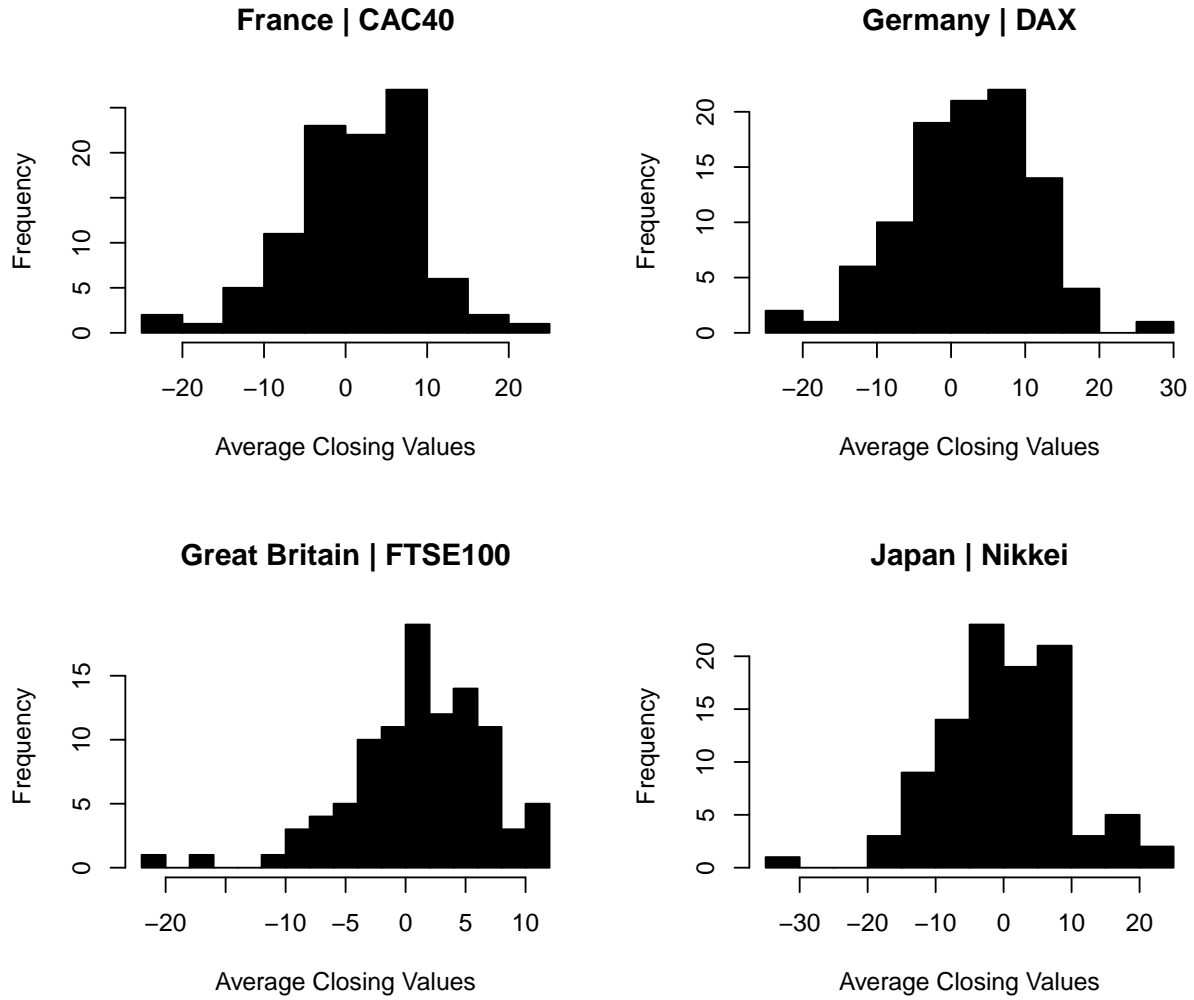| Statistic	N	Mean	St. Dev.	Min	Max
CAC.Close.change	100	1.3	8.0	−22.8	21.3
DAX.Close.change	100	2.3	8.9	−24.9	27.6
FTSE.Close.change	100	1.1	5.7	−20.5	11.6
NIK.Close.change	100	0.03	9.1	−31.8	24.4
L.FRA.GDP	100	0.4	0.5	−1.6	1.2
L.DEU.GDP	100	0.3	0.9	−4.5	2.9
L.GBR.GDP	100	0.5	0.6	−2.3	1.6
L.JPN.GDP	100	0.2	1.0	−4.0	2.7

Figure 3: Distribution of Dependent Variables: Average Closing Values

Finally, we obtain the joint distributions between our dependent and key independent variables in **Figure 5**. Remarkable are the trends for a high GDP growth (i.e. over 2%) in the case of Germany and Japan. Here, the intuitive relation between higher GDP growth and a higher level of the index is violated.

QUESTION: Do we start with GDP also from Q2 1999 ?!
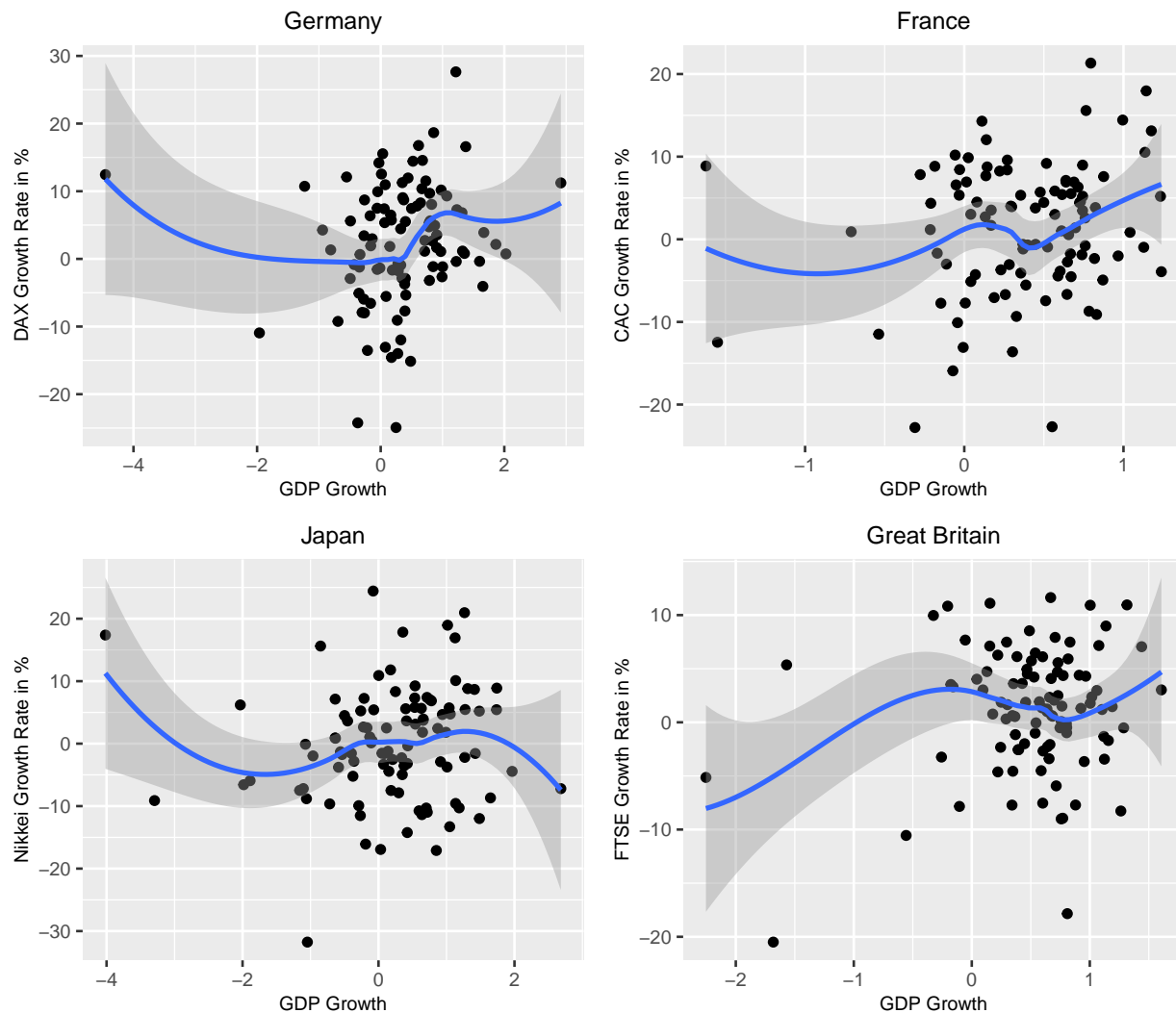
Figure 4: Joint Distributions of DVs and Key IVs

Analysis

For the analysis section we provide our comprehensive model below. However, before going into the most promising model that we found during our research, we would like to offer a very basic model as a starting point of the analysis. We only regress the development of the four national stock indices on the GDP growth of the related country.

Looking at the model we see that the effect of GDP growth of the previous quarter on national stock indices growth of the current quarter is only statistically significant for France. It is mildly statistically significant (at the 10 percent level) for Germany and Japan. Significance levels for Great Britain do not allow to tell whether the effect is different from zero. This effect becomes insignificant for all countries when lagged

Table 6: Basic Model

	Dependent variable:			
	CAC40	DAX	FTSE100	Nikkei
	(1)	(2)	(3)	(4)
France GDP growth	3.271**			
	(1.610)			
Germany GDP growth		1.496		
		(1.038)		
Great Britain GDP growth			1.709*	
			(0.993)	
Japan GDP growth				0.679
				(0.899)
Constant	0.060	1.788*	0.252	−0.117
	(0.994)	(0.957)	(0.769)	(0.933)
Observations	100	100	100	100
R^2	0.040	0.021	0.029	0.006
Adjusted R^2	0.031	0.011	0.019	−0.004
Residual Std. Error (df = 98)	7.891	8.893	5.693	9.141
F Statistic (df = 1; 98)	4.127**	2.079	2.960*	0.571

Note:	*p<0.1; **p<0.05; ***p<0.01

by two time periods. The effect is always positive which suggests that a healthy growing economy correlates with a growing stock market. That the effect of GDP growth becomes insignificant (standard errors increase relative to the coefficient) when lagged by two periods suggests that the channel of influence between the real and the financial economy is rather immediate.

The effect of inflation measured as change of the consumer price index lagged by one period suggests a statistical significant negative effect for France and Japan. Results suggests that increasing inflation decreases performances of the respective stock market indices in these countries. This negative effect is mildly statistically significant for Germany. Significant levels decrease for all countries when looking at the effect lagged by two periods. The effect however stays mildly statistically significant for France which also showed the highest significance for the effect lagged by one quarter. These results assume that the inflation does have a negative effect on stock market indices. It is not clear how the channel of influence works since theory would suggest that at a higher inflation rate consumers rather invest than safe.

Coefficients for both variables and both lags quarterly GDP and change of inflation (i.e. consumer price index) for Great Britain are statistically insignificant. First, this result can be interpreted as the real sector not being a significant determinant of the financial performance of the stock of the companies included in the FTSE100. One explanation would be that in the Anglo-Saxon economic model, the financial system is a capital market based system as oppose to a system which relies more on financial intermediaries on the continent. Thus, it is much more flexible and volatile independently of the real sector. Second, the statistically insignificant negative coefficient of changes in consumer prices does indicate that people do not decrease savings and increase investments. This can be explained by the different set up of the financial sector in Great Britain as compared to the other countries. Such a financial sector might follow different underlying dynamics. Since banks are not so important people have a different propensity to save. Put differently, people invest their money into stocks anyway regardless of the inflation rate. It should be noted, however, that in Germany and Japan this effect is only significant at the 10 percent level and thus, general conclusions are difficult to draw from these results.

Looking at the quarterly change of the European Central Bank's deposit facility the variable yield statistically significant results for France, Germany, and Great Britain when lagged by two periods. For Japan the coefficient is statistically significant at the 10 percent level. In simple terms, the negative effect

Table 7: Final model

|	_Dependent variable:_			
	CAC40	DAX	FTSE100	NIKKEI
	(1)	(2)	(3)	(4)
France GDP growth	8.020**			
	(3.169)			
France GDP growth (two q. lag)	2.417			
	(3.468)			
France inflation	−9.222***			
	(2.823)			
France inflation (two q. lag)	−5.454*			
	(2.945)			
France pr. consumption	−3.528			
	(2.856)			
France pr. consumption (two q. lag)	1.320			
	(2.972)			
Germany GDP growth		3.717*		
		(2.011)		
Germany GDP growth (two q. lag)		0.447		
		(1.815)		
Germany inflation		−9.295*		
		(4.771)		
Germany inflation (two q. lag)		−1.893		
		(4.869)		
Germany pr. consumption		−2.408		
		(2.412)		
Germany pr. consumption (two q. lag)		−0.632		
		(2.441)		
Great Britain GDP growth			1.823	
			(1.754)	
Great Britain GDP growth (two quarter lag)			2.609	
			(2.013)	
Great Britain inflation			−3.054	
			(2.029)	
Great Britain inflation (two q. lag)			−0.892	
			(1.901)	
Great Britain pr. consumption			0.115	
			(1.389)	
Great Britain pr. consumption (two q. lag)			1.245	
			(1.397)	
Japan GDP growth				3.731*
				(2.073)
Japan GDP growth (two q. lag)				1.722
				(2.004)
Japan inflation				−7.805**
				(3.765)
Japan inflation (two q. lag)				−5.631
				(3.487)
Japan pr. consumption				−3.576
				(2.220)
Japan pr. consumption (two q. lag)				−2.336
				(2.212)
ECB deposit facility	−9.098	−8.455	−1.803	−12.814
	(6.730)	(9.966)	(5.240)	(8.457)
ECB deposit facility (two q. lag)	−14.694**	−24.691***	−10.549**	−13.956*
	(6.058)	(7.188)	(4.146)	(7.981)
WTI	−0.022	−0.150	−0.044	−0.219
	(0.115)	(0.159)	(0.080)	(0.131)
WTI (two q. lag)	−0.014	−0.266	0.019	−0.096
	(0.115)	(0.174)	(0.094)	(0.147)
1999	0.599	1.909	−0.839	2.837
	(2.167)	(2.972)	(1.890)	(3.035)
2000	−2.490	0.047	−1.898	−1.714
	(2.410)	(2.796)	(1.758)	(3.005)
2001	−9.307	−14.344	−9.009	−13.689
	(6.948)	(8.983)	(5.399)	(8.413)
2002	0.382	2.095	−5.125	−11.873*
	(4.418)	(6.190)	(3.710)	(6.412)
2003	−15.214***	−15.825**	−12.402***	−19.575***
	(4.588)	(6.197)	(3.725)	(6.176)
2004	−19.321***	−29.100***	−16.179***	−21.937***
	(5.115)	(7.668)	(4.101)	(6.815)
2005	−9.268	−16.551*	−9.567**	−18.036**
	(6.208)	(8.730)	(4.720)	(8.487)
2006	−4.949	−6.920	−3.572	−10.338
	(5.057)	(6.652)	(3.773)	(6.148)
2007	−0.604	−4.214	−1.539	−3.261
	(4.574)	(6.412)	(3.681)	(5.925)
2008	−4.311	1.516	−1.874	−7.470
	(4.067)	(5.667)	(3.343)	(5.412)
2009	−10.908**	−11.066	−10.915**	−13.184*
	(5.290)	(6.896)	(4.306)	(7.007)
2010	−11.522	−19.095*	1.274	−18.577*
	(7.340)	(10.171)	(6.520)	(9.547)
2011	−8.717*	−10.626	−0.665	−16.717**
	(4.576)	(6.631)	(3.923)	(6.632)
2012	−10.678**	−9.067	−2.689	−8.912
	(4.704)	(5.685)	(3.892)	(5.498)
2013	−1.848	−4.789	−1.809	−10.146
	(5.482)	(6.570)	(3.997)	(6.585)
2014	−6.149	−5.463	−2.734	3.357
	(5.095)	(6.073)	(3.595)	(6.484)
2015	−9.055	−13.345*	−7.509*	−0.542
	(5.538)	(6.709)	(3.751)	(7.731)
year2015	−9.579*	−16.603**	−9.127**	−12.054*
	(5.121)	(6.636)	(4.030)	(7.113)
Constant	11.669**	13.821**	5.860	10.567*
	(4.994)	(6.226)	(4.033)	(5.249)
Observations	66	66	66	66
R^2	0.730	0.637	0.653	0.656
Adjusted R^2	0.526	0.363	0.391	0.395
Residual Std. Error (df = 37)	5.566	7.516	4.531	7.359
F Statistic (df = 28; 37)	3.572***	2.322***	2.491***	2.516***

Note: *p<0.1; **p<0.05; ***p<0.01

suggests that when the deposit facility interest goes up banks get more interest when storing their money overnight at the ECB. This means that high interest rates incentive the banks to keep money off markets. The negative effect suggests that increasing volumes of money held at banks does hurt the stock market, since less money is in circulation which dampens investments. It seems straightforward that this effect is only mildly statistically significant for Japan since its financial economy is mostly detached form the Eurozone. Moreover, the statistical insignificance of the effect when lagged by one period can be explained by the outside lag of the political decision making process to have effect on the economy. The effects of a change in the central bank's monetary policy on an individual may not become visible before a certain time has passed.

All other coefficients for all other variables are not statistically significantly different from zero. The effect for changes in private consumption is negative for France Germany and Japan. For France, however, the effect becomes positive when lagged by two periods. The effect is positive for Great Britain. This could suggests again a difference in the propensity to safe and consume respectively. The variables to measure the world economy quarterly US GDP growth and the change in WTI oil prices have also no statistically significant effect which is surprising since the US economy is such strong factor determining global economic health. Generally, all year factors display a negative sign and are predominantly statistically insignificant. The negative sign comes with no surprise since the analysis takes the year 2006 as the baseline factor. This year was the peak performing year financially and economically. One year later, in 2007, the financial crisis started in the USA with Lehman Brothers breaking down and continued to spill over to Europe in 2008/2009 culminating in the Greek sovereign debt crisis. Thus, comparing the other ears with 2006 all years would perform worse and thus, have a negative impact on the stock indices performances.

The analysis is subject to certain limitations. First, it should be noted that one has to take results with caution: if GDP of an economy and stock market performance of its best firms are intertwined then the regression measures a reverse causality. The analysis tries to mitigate this endogeneity problem by introducing two lags for GDP growth and each other variable. However, is the reverse causality is too string and both variables would effectively measure the same concepts then the lag is the only variance in the regression. Second, a Breusch-Pagan test suggests that the analysis suffers from heteroscedasticity. We cannot accept the null and thus, have to assume that the variance of the residuals is dependent on the values of the changes in stock indices which renders coefficients inconsistent. Third, the analysis employs a Breusch-Godfrey test to look for serial autocorrelation. The test does indicate that we can accept the null and thus, can assume no serial autocorrelation is present in the data. Consequently, we assume that the standard errors are not underestimated. In summary, with biased coefficients we cannot conclude about the magnitude of the effect on the outcome variable, but we can conclude about its statistical significance since standard errors are efficient.

Appendix

Heteroscedasticity Diagnose
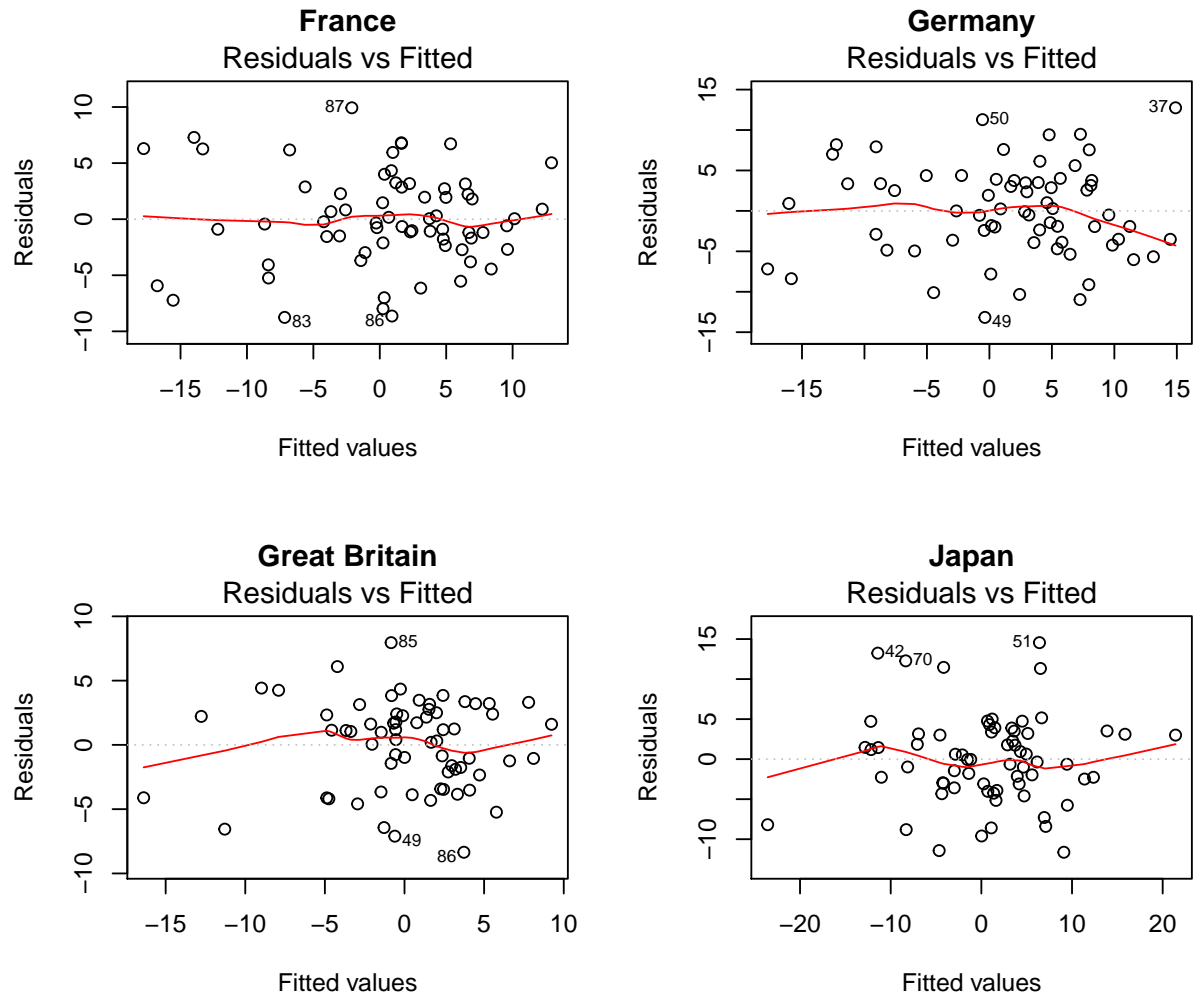
Looking at the four graphs we see that the basic models suffer to a certain degree from heteroskedasticity. This stems from outliers which bias the results in the graphs. We conclude that the overall degree of hetereoskedasticity is acceptable since the general relationship seems to be random.

Diagnose of non-normality of Errors

France
Normal Q–Q

Germany
Normal Q–Q

Great Britain
Normal Q–Q

Japan
Normal Q–Q
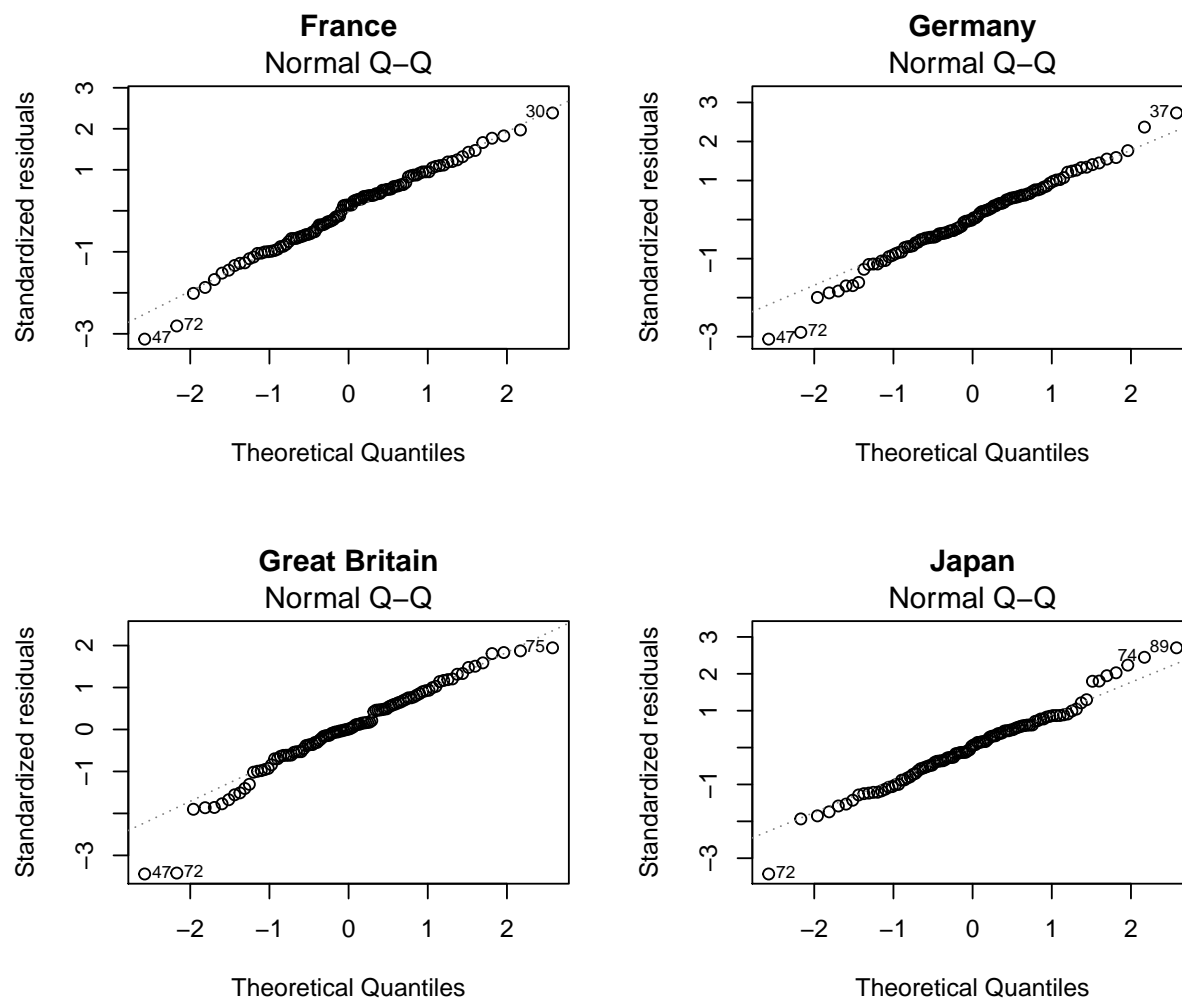
The graphs give and idea of the distribution of the error term in the regression. Ideally, the error terms should be normally distributed, and not show a right or left skew. In these graphs, however, we show a cummulative distribution function. That means that we want small residuals in the lower quantiles of the distriution and large residuals in the upper quantiles of the distribution of the error term. Put differently, we would expect a crosswise line from the lower left bottom to the upper right corner. All four lines sugest such a crosswise pattern indicating the degree of normality of error terms.

Variance Inflation Factor Test

L.FRA.GDP	L2.FRA.GDP	L.FRA.infl
5.7970	6.9642	2.9568
L2.FRA.infl	L.FRA.prvconsm	L2.FRA.prvconsm
3.1128	3.4968	3.7890
L.ECB.dep.change	L2.ECB.dep.change	L.WTI.dollar.change
5.1291	4.1551	3.5579

L2.WTI.dollar.change L.USA.GDP L2.USA.GDP 3.4883 4.1173 5.1125 year1999 year2000 year2001 3.0217

2.3672 2.5531 year2002 year2003 year2004 3.1726 4.6743 3.1014 year2005 year2007 year2008 2.5370 2.0063 3.3942 year2009 year2010 year2011 6.5329 2.5389 2.6836 year2012 year2013 year2014 3.6441 3.1484 3.7193 year2015 3.1800 L.DEU.GDP L2.DEU.GDP L.DEU.infl 3.6208 2.9685 2.7871 L2.DEU.infl L.DEU.prvconsm L2.DEU.prvconsm 2.9167 2.2895 2.3909 L.ECB.dep.change L2.ECB.dep.change L.WTI.dollar.change 6.1681 3.2089 3.7126 L2.WTI.dollar.change L.USA.GDP L2.USA.GDP 4.3465 4.2484 3.7719 year1999 year2000 year2001 2.7704 2.5483 2.5544 year2002 year2003 year2004 3.9108 5.0694 2.9432 year2005 year2007 year2008 2.7349 2.1358 3.1631 year2009 year2010 year2011 6.8808 2.9241 2.1499 year2012 year2013 year2014 2.8709 2.4532 2.9936 year2015 2.9292 L.GBR.GDP L2.GBR.GDP L.GBR.infl 3.9515 5.2048 3.8411 L2.GBR.infl L.GBR.prvconsm L2.GBR.prvconsm 3.3955 3.2215 3.4291 L.ECB.dep.change L2.ECB.dep.change L.WTI.dollar.change 4.6917 2.9370 2.5839 L2.WTI.dollar.change L.USA.GDP L2.USA.GDP 3.5312 4.7292 4.1065 year1999 year2000 year2001 2.7532 2.5191 2.5395 year2002 year2003 year2004 3.0783 4.0778 2.6054 year2005 year2007 year2008 2.4797 2.0459 3.3929 year2009 year2010 year2011 7.7806 2.8171 2.7727 year2012 year2013 year2014 2.9234 2.3654 2.5746 year2015 2.9722 L.JPN.GDP L2.JPN.GDP L.JPN.infl 6.2184 5.8945 4.4343 L2.JPN.infl L.JPN.prvconsm L2.JPN.prvconsm 4.0255 5.5906 5.5538 L.ECB.dep.change L2.ECB.dep.change L.WTI.dollar.change 4.6325 4.1256 2.6352 L2.WTI.dollar.change L.USA.GDP L2.USA.GDP 3.2406 4.6215 4.5469 year1999 year2000 year2001 2.5343 2.8524 2.6460 year2002 year2003 year2004 3.2219 4.9968 2.6225 year2005 year2007 year2008 2.4353 2.0318 3.4060 year2009 year2010 year2011 6.3231 3.0514 2.0971 year2012 year2013 year2014 3.0085 2.9168 4.1464 year2015 3.5098

Breusch-Pagan Test

```
Breusch-Pagan test
```

data: M13 BP = 36.3541, df = 28, p-value = 0.1338

```
Breusch-Pagan test
```

data: M14 BP = 27.9204, df = 28, p-value = 0.4687

```
Breusch-Pagan test
```

data: M15 BP = 23.9006, df = 28, p-value = 0.6868

```
Breusch-Pagan test
```

data: M16 BP = 37.3411, df = 28, p-value = 0.1115

Breusch-Godfrey Test

```
Breusch-Godfrey test for serial correlation of order up to 2
```

data: M13 LM test = 22.7414, df = 2, p-value = 1.153e-05

```
Breusch-Godfrey test for serial correlation of order up to 2
```

data: M14 LM test = 24.1847, df = 2, p-value = 5.602e-06

```
Breusch-Godfrey test for serial correlation of order up to 2
```

data: M15 LM test = 15.5284, df = 2, p-value = 0.0004247

```
Breusch-Godfrey test for serial correlation of order up to 2
```

data: M16 LM test = 17.964, df = 2, p-value = 0.0001257

Model Variation: Including year dummies

Model Variation: Only country-specfic covariates

Table 8: Model with Year Dummies

	Dependent variable:			
	CAC	DAX	FTSE	Nikkei
	(1)	(2)	(3)	(4)
L.FRA.GDP	7.765**			
	(3.036)			
L.FRA.infl	−6.423**			
	(2.637)			
L.FRA.prvconsm	−3.222			
	(2.923)			
L.DEU.GDP		1.711		
		(1.816)		
L.DEU.infl		−6.526		
		(4.950)		
L.DEU.prvconsm		−1.672		
		(2.054)		
L.GBR.GDP			2.598	
			(1.649)	
L.GBR.infl			−3.021**	
			(1.496)	
L.GBR.prvconsm			0.045	
			(1.330)	
L.JPN.GDP				2.351
				(1.735)
L.JPN.infl				−8.865***
				(3.026)
L.JPN.prvconsm				−2.687
				(1.933)
L.ECB.dep.change	−14.347**	−12.364	−4.502	−17.833**
	(6.413)	(8.764)	(4.555)	(7.559)
L.WTI.dollar.change	0.020	−0.001	−0.005	−0.035
	(0.112)	(0.163)	(0.080)	(0.123)
L.USA.GDP	3.325	3.987	1.936	5.337*
	(2.133)	(2.874)	(1.662)	(2.662)
year1999	−6.091	−6.636	−5.446	−7.684
	(5.772)	(7.560)	(4.446)	(7.135)
year2000	−1.251	−1.027	−6.277*	−12.438**
	(4.561)	(6.171)	(3.607)	(5.819)
year2001	−13.612***	−13.755**	−9.784**	−16.905***
	(4.857)	(6.557)	(3.759)	(6.080)
year2002	−15.391***	−19.996***	−12.011***	−16.361**
	(4.979)	(6.843)	(3.876)	(6.309)
year2003	−7.310	−7.575	−5.462	−12.219
	(5.765)	(7.772)	(4.463)	(7.285)
year2004	−6.370	−5.465	−3.597	−9.222
	(4.917)	(6.514)	(3.720)	(6.015)
year2005	−1.381	−2.716	−1.860	−3.113
	(4.762)	(6.402)	(3.653)	(5.988)
year2007	−4.273	0.527	−3.170	−6.582
	(4.467)	(6.070)	(3.434)	(5.568)
year2008	−11.662**	−13.140*	−8.280**	−12.448**
	(5.023)	(6.555)	(4.101)	(6.148)
year2009	0.981	−2.270	5.413	−6.976
	(6.127)	(8.190)	(4.809)	(7.322)
year2010	−8.347*	−6.248	−1.546	−13.189**
	(4.782)	(6.471)	(3.674)	(6.281)
year2011	−9.819**	−7.555	−2.814	−7.453
	(4.667)	(6.079)	(3.634)	(5.623)

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Table 9: Final Model (only GDP growth with two quarter lag)

	Dependent variable:			
	CAC	DAX	FTSE	Nikkei
	(1)	(2)	(3)	(4)
L.FRA.GDP	9.544***			
	(3.396)			
L2.FRA.GDP	0.636			
	(2.830)			
L.FRA.infl	−7.124**			
	(2.716)			
L.FRA.prvconsm	−3.266			
	(2.944)			
L.DEU.GDP		2.013		
		(1.988)		
L2.DEU.GDP		−1.750		
		(1.881)		
L.DEU.infl		−6.130		
		(5.049)		
L.DEU.prvconsm		−2.344		
		(2.184)		
L.GBR.GDP			2.169	
			(1.719)	
L2.GBR.GDP			3.164	
			(1.986)	
L.GBR.infl			−3.347**	
			(1.494)	
L.GBR.prvconsm			−0.085	
			(1.345)	
L.JPN.GDP				3.118*
				(1.830)
L2.JPN.GDP				−0.443
				(1.220)
L.JPN.infl				−9.521***
				(3.068)
L.JPN.prvconsm				−3.169
				(2.086)
L.ECB.dep.change	−11.930*	−10.899	−2.441	−12.868
	(6.937)	(9.323)	(4.989)	(8.471)
L.WTI.dollar.change	0.013	−0.039	0.005	−0.037
	(0.113)	(0.169)	(0.080)	(0.123)
L.USA.GDP	2.186	3.764	0.638	4.169
	(2.319)	(3.126)	(1.825)	(2.817)
L2.USA.GDP	−3.064	−1.116	−1.742	−3.563
	(2.391)	(2.995)	(1.675)	(2.716)
year1999	−4.044	−6.401	−2.723	−3.842
	(6.064)	(8.254)	(4.732)	(7.638)
year2000	0.043	0.196	−6.059	−10.695*
	(4.756)	(6.636)	(3.631)	(6.007)
year2001	−14.363***	−14.736**	−9.989**	−17.334***
	(4.912)	(6.706)	(3.754)	(6.242)
year2002	−14.758***	−21.727***	−11.162***	−16.065**
	(5.061)	(7.233)	(3.864)	(6.347)
year2003	−5.080	−8.825	−4.533	−10.172
	(6.173)	(8.393)	(4.475)	(7.491)
year2004	−4.452	−5.684	−1.918	−6.562
	(5.163)	(7.201)	(3.883)	(6.317)
year2005	0.604	−3.378	−0.165	−1.192
	(5.096)	(6.894)	(3.759)	(6.152)

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