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A Study on Size Anomalies in UK Financial Stock Returns

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Abstract

Since the 2008 Global Financial Crisis, global efforts have been collected together to prevent such catastrophe from negatively influencing the entire economy such as designating and regulating the Systemically Important Financial Institutions. Following the methodologies by Gandhi and Lustig (2015), this paper attempts to uncover firstly whether there is a new size anomaly in UK financial stocks and construct a new size factor that can explain the size anomaly found. By way of construction, the new size factor uncovers the common variation and the industry specific risks found in financial companies. Lastly, the results show industry–specific government guarantees that protect the largest financial institutions.

Key Words : Size Anomaly, Financial Stock Returns, Size Factor
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Chapter 1 Introduction

The financial industry, in almost every sense, takes a crucial role in the entire economic system all over the world. A manifest of such role was well displayed when the 2008 Global Financial Crisis hit all, even in physical, economic sense globally. Not confining to the 2008 incident, especially since then, there have been diverse studies conducted to measure a systemic risk to that of the financial industry as its impact on all aspects of economy has proved deadly. Standing next in line in terms of size, the UK financial industry was no exception as many of its financial institutions have reserved its seat as a global systematic important financial institution.

Prior studies on the systemic risk, in all respects, were majorly done, whether domestically or globally, without accounting for the financial industry. The most obvious reason would be the difference in industry characteristics, so as to say that there are distinctive differences between manufacturing and the financial industry. For example, the financial industry, when compared to nonfinancial industry, carries big amounts of liability, due to industry characteristics, and also with slightly adjusted definition. Moreover, the financial industry displays its unique risk whereby for those financial institutions handling loan, remittances and etc. businesses, like banks, are exposed to large bank runs that can be found nowhere else.

Per above, the risks involved in financial industries can cause big chaos to the socio-economic well-being of a country, such as a bank run. The Global Financial Crisis of 2008 is a good example of this, where the collapse of financially developed nations’ systems crashed the globe into a default state. And it is in this context that the governments rushed in to help, preventing from the whole systems from collapsing by granting implicit guarantees against mega financial institutions. These issues have been well discussed not only in the media, but also in the academic realm. Schich and Lindh (2012) researched the governments' implicit guarantees through analyzing credit spread and credit ratings. According to the authors, those implicit guarantees helped down greatly in bringing down funding costs of financial liabilities.

On a relevant, there have been continuous efforts in finding a common risk factor in explaining the stock returns of financial returns. According to Gandhi and Lustig (2015), when a bank grows so large as to become a "too big to fail" bank, its expected stock returns should be smaller than those of small banks' as governments rise up to stand to absorb some of the tail risks. On November 2011, following the Global Financial Crisis in 2008, G20 countries concurred on designating Systemically Important Financial Institutions ("SIFI") to prevent in advance the financial systems falling into frail. On a domestic level, these efforts have also been pronounced whereby UK designated Domestic Systemically Important Financial Institutions ("DSIFI"). This brings up to question the possibility whereby the government, on top of tighten regulation on the big financial institutions, will lead to support and prevent another financial crisis from crashing in through implicit guarantees. Therefore, this paper finds its essence and importance in finding out whether there exists these implicit government guarantees do affect decisions in pricing assets and if there exists a common risk factor among the UK financial institutions.

Chapter 2 Prior studies

Many researches on size anomalies have been conducted ever since size effect discovered by Banz (1981) and Basu (1983). Fama and French (1992, 1993) claimed that while the traditional CAPM model could not explain the systemic errors, their book-to-market could. However, such claims have been criticized as the empirical tests were confined only to the US market and not enough theoretical explanations to support. Lakonishok, Shleifer, and Vishny (1994), in turn, explained that the high-value stock returns shown in the past continue simply because of expectations of investors.

However, most of these studies do not encompass the financial stocks. They are told to be excluded because they are considered structurally different from manufacturing firms not only because of their operational environments but most significantly, because of high leverage. Post the Global Financial Crisis in 2008, there have been many studies conducted, especially on banks. It was in due time that there should be a study conducted on the financial stocks and an explanation on a common risk factor that explains the returns of financial stocks.

More recently, there have been some more fiundings on the industry-specific risk factors on the financial industry. Kelly, Lustig, and Van Nieuwerburg (2011) stated that the tail risks found in financial industry plays a role as one of the variables that decides the price of options in the market. According to Kelly, Lustig, and Van Nieuwerburgh (2011), the reason for relatively lower price of out-of-the-money put option index in the recent financial crisis is because the government absorbs some of the tail risks found in the banking stocks.

Aside from studies on tail risks of the financial industry, there are also some studies on a more individual level, especially on the banking sector. According to Fahlenbrach, Prilmeier, and Stulz (2012), the more open a bank’ s company culture is on risk−taking, the more influenced is the stock price returns. Fahlenbrach, Prilmeier, and Stulz (2012) found out that banks that inflicted sever losses in the 1998 crisis again caused more losses than other banks in the 2008 Global Financial Crisis. The author asserts this to be due to the subsidies for the losses caused in 1998 the banks received as they were more incentivized to take on more risks yet again in the next crisis.

The research on the industry−specific risk factors on the financial industry has been actively conducted after the Global Financial Crisis hit the world markets hard, especially on explaining a common risk factor that could explain the common risks of the financial industry. Acharya, Pedersen, Phillipon, and Richardson (2010) suggested a Systemic Expected Shortfall (“SES”) model that supports expected shortfalls model that measures the expected shortfall. SES, a model that considers leverage and tail risks of financial leverage, is explained to be an effective method in measuring systemic risks.

Adrian and Brunnermeier (2010) suggested Conditional Value at Risk (“CoVaR”) as a way of measuring systemic risks. CoVaR is a methodology where by systemic risks are forecasted through calculating an individual company’ s Value at Risk (“VaR”) when other financial institutions are in trouble. According to Adrian and Brunnermeier (2010), CoVaR is a way of measuring systemic risks, reflecting the characteristic that a downfall on a single financial institution can quickly spread to negatively affect the entire industry.

In addition to this trend, Gandhi and Lustig (2015) newly regards bank’ s specific tail risk as a new risk factor and conducts an empirical tests by adding a new risk factor to the Fama and French’ s (1993) 5 risk factors. Gandhi and Lustig (2015) finds out, by applying this test, that the new size factor carries a negative coefficient in the large-sized banks and shows a positive coefficient values on the small-sized banks. The authors argue that because the large banks have the most contagious and important function not only within the financial industry but also on the entire economy, they carry less risks of default due to government’ s backing up, whereas the small banks are simply too small and not important enough for the government to intervene and rescue them.

Chapter 3 Data and methodology

1. Data

The sample data are of the listed financial institutions within the London Stock Exchange. Just as there are financial institution-specific classification codes for the US companies in Center for Research in Security Prices (CRSP), such equivalent exists in Datastream, from which the company names were driven. The individual financial stock' s monthly returns also considered the dividend returns and were gathered from Datastream. All of the stocks that were not listed as of June 2015 were excluded from the test as well as those with negative book values. The risk free rates were those of 3-months UK Treasury bills while bond risk factors were derived from returns on 10-yr UK government bonds and FTSE Sterling Corporate Bond Index. The sample period is from April 2005 to June 2015 and a total of 205 financial institutions were tested.

Intuitively, the government fancies the whole balance sheet of financial institutions, not just their whole equity. Therefore, instead of only looking at market capitalization as a proxy for size, book value may be a noteworthy proxy for size. Thus, the strategy of portfolios building strategy sorted by market capitalization is also applied to that of the book value. The accounting data were derived from Bloomberg for all dealt companies.

2. Methodology

1) Measuring main variables

This section deals the methodologies put together for the study on the size-sorted portfolios of financial institution stock. As the dependent variable, excess returns of individual financial stocks returns on the risk-free rate, were used to start sizing the portfolios returns on the standard risk factors that give explanation on the cross-sectional movements of non-financials stocks and bonds. This is done by contrasting the returns of the financial institutions stock portfolios to the returns of non-financial stocks and bonds with the same uncovering to normal risk factors. In order to do this, just as done by Gandhi and Lustig (2015), three-factor model of Fama and French (1993) are used. I find that small financial institutions, either sorted in market capitalization or book value, outperform the benchmark portfolios of stocks and bonds, while the large financial institution stocks underperform.

Financial institutions manage both portfolios of equities and bonds, of which the portfolios vary in differing maturities and credit risks. To reflect this into my study, as was done by Gandhi and Lustig (2015), two bond risk-factors are added in addition to the three stock risk factors,

$$f_i = [market\ smb\ hml\ ltg\ crd], \tag{1}$$

where f_i is 5x1. The above terms, market, smb, and hml represent the returns on the three Fama-French stock factors which are namely the market, small minus big and high minus low factors, respectively. Following the methodologies put through by Fama and French (1993) and Gandhi and Lustig (2015), to calculate the Fama-French factors, market capitalization data were used of all the stocks in the London

Stock Exchange. From 2005 to 2015, the stocks were divided on each year’ s June−end market capitalization into Small and Big groups. As for the value factor, book to market ratios were used and was divided into three groups as of each year’ s June−end. The group with the lowest 30% book−to−market ratios were marked Low, the middle 40% as Medium and the highest 30% as the High. Total of 6 portfolios were formed on the two groups divided by size and three groups divided by the value factor (S/L, S/M, S/H, B/L, B/M, B/H). The size factor (SMB) is the difference between the average of returns in the Small group (S/L, S/M, S/H) and the Big group (B/L, B/M, B/H) and the value factor (HML) is the difference between the average of returns in the High group (S/H, B/H) and the Low groups (S/L, B/L). I use *ltg* as the excess returns of the 10−yr UK government bonds over 3−month UK Treasury Bills from Bank of England. I use *crd* to represent the excess returns of the FTSE Sterling Corporate Bond index over the risk−free rate, which is the 3−month UK Treasury Bills, each respectively from *FTSE* and *Bank of England*.

2) Descriptive statistics on the 5x5 portfolios

Table 1 below shows the summary statistics on the 5x5 portfolios formed on the financial stocks on size and value factors. Every year on June−end, every financial stock is divided into 5 portfolios from Small to Big on the market capitalization and again 5 portfolios on the value factor which is the book−to−market ratio from Low to High. Table 1 lists each portfolio’ s average, standard deviation and t−statistics. No statistical significance was found on the changes of both the size and the value factor.

3) Portfolio formation for empirical testing

For empirical testing, portfolio formation methodologies of Gandhi and Lustig (2015) were used against for solely the financial institution stocks. Every financial stock dealt in this study were divided into 5 portfolios based on the size (market capitalization) and value (book-to-market ratio). Following Gandhi and Lustig (2015) every year December-end, the stocks were divided into 5 portfolios based on size and such rankings were maintained every year from January to December for 12 months. Each portfolio’s returns were calculated value-weighted by market capitalization and book-to-market ratios.

As explained earlier but additionally, per Gandhi and Lustig (2015), book values of equity of the financial stocks were considered as governments absorb tail risks of the financial stocks based on considering the book values of companies not the contemporary market capitalization. Therefore, portfolios based on book value of equity were added in addition to the portfolios based on size or the market capitalization.

Chapter 4 Size effect in UK financial stock returns

1. Risk−adjusted returns on financial institutions stock portfolios

To examine the common risk factors that affect the returns of the UK financial stocks, Fama and French (1993) three factor model was used. The excess returns of previously formed 5x5 portfolios on the size and value factors were regressed against the market beta, size factor (SMB), value factor (HML) and two additional bond factors. Of particular importance was on the constant term (alpha) and whether it increases/decreases on the size and value factors and they are of statistical significance.

First the excess returns of each of the portfolio *i* sorted by market capitalization (Size) were regressed on the Fama and French three factors and two bond risk factors to estimate the vector of betas β_i:

$$R^{\mathrm{i}}_{t+1} - R^{f}_{t+1} = \alpha^{i} + \beta^{i} f_{t+1} + \varepsilon^{i}_{t+1} \qquad (2)$$

where R^{i}_{t+1} is the monthly return on the ith size−sorted portfolio.

Table 2 shows the results of the regression specified in equation (2) OLS regression. Panel A lists the regression results on the market capitalization−sorted while Panel B shows the results of portfolios sorted on book value. The portfolios are ranked from smallest (1) to largest (5) with addition of difference between the largest - smallest (5−1).

Each line lists the loading values, t−statistical values and adjusted R2.

The results for both the market capitalization and book value−sorted are displayed as follows. Panel A shows the regression results for the portfolios sorted on market capitalization. The constant values in Panel A shows a distinctive decreasing trend as the portfolios approached to the largest while statistical significance is relatively weakly shown. Of the factors listed in Table 2, market factor seems to be the most explanatory factor among the pack to explain the excess returns of individual portfolios. The value factor (SMB) shows a constant value of 0.326 at the smallest portfolio while showing statistical significance. An interesting point is that in Table 2 Panel A, the portfolio of difference between the largest and the smallest (5−1), coefficient value of SMB shows relatively more statistical significance in explaining the smallest portfolio rather than the largest. On the other hand, HML factor shows no statistical significance in all of the sized portfolios. These results are in align with those of the study done by Gandhi and Lustig (2015), where the alpha values showed steady decline, while market factor was the most explanatory factor of all.

There is a relatively clear size pattern in the loadings on the two bond risk factors, clearly for the contrast between smallest and largest portfolios, despite the nonexistent statistical significance. The patterns of the loadings in the other portfolios are relatively mixed despite the correct direction. The findings track relatively closely to those of Gandhi and Lustig (2015), where the loadings on the bond risk factors also showed clear size pattern. The loading values rise from negatives to positive as the portfolio sizes go up for both *LTG* and *CRD*. Their findings show an alignment to the finds of

Flannery and James (1984) as they interpret this bond factor loading as a proxy for sensitivity of interest rates caused by mismatch between assets and liabilities.

Panel B shows the regression results for the portfolios sorted on book value. Berk (1995) argued that because of noises like the liquidity factor, there is a particular relationship between the expected returns and the market capitalization which in suits unfit for market capitalization to gauge for the size of companies. According to Gandhi and Lustig (2015), a company may have high market capitalization if it creates ample cashflow but it could also have a high market capitalization if a low expected–return company creates continuous cashflow disregarding the relatively amounts. Therefore, just as the study done by Gandhi and Lustig (2015), portfolios sorted on book value were also included in the empirical tests.

Compared to Panel A, Panel B shows loadings that are lower in amounts. The constant value in the smallest portfolio was −58 bps while it increased steadily to −173 bps and a slight rise to −131 bps in the biggest portfolio. In addition, just as it was in Panel A, market factor seems to be the most explanatory factor among others. The SMB factor showed similar trends to Panel A and HML factor showed statistical insignificance again. The pattern of the two bond risk factors is similar to that of Panel A, where the loadings trends of the size show the similar direction and trend, but this time with a little of statistical significance in the third portfolio of both the *ltg* and *crd* factors. The results are also similar to what was done by Gandhi and Lustig (2015), where the alphas decreased monotonically with market factor as the most explanatory one.

2. On characteristics regression

According to the study done by Lee and Park (2011), when running an OLS regression on financial stocks, because both time-series and cross-sectional data are used, there need be a pooled regression conducted to see the effect independent variables have on the dependent variables. Therefore, yearly return of financial stocks were put as a dependent variable and values of book value and market capitalization and regressed against it.

When regressed with independent variables as the book value and market capitalization, it was found out that an 1% increase in market capitalization would cause 0.014% decrease in yearly returns while when book value was put as the independent variable, 1% increase in book value would cause 0.2% decrease in the yearly return. Noting the negative relationship between the returns and the market capitalization and book value through the regression results, which could indirectly point to a new size factor, it could be stated that there rises the need to further search for a new common size factor that could possibly explain the returns of financial stocks. In the original study done by Gandhi and Lustig (2015), the coefficient was negative for book value (−2.23) but positive for market capitalization (2.79), indicating that a 1% increase in book value above the sample averages lowers annual returns by 2.23 bps.

Chapter 5 New size factor in UK financial stock returns

In order to see whether there exists a size factor that specially exist in the financial industry, Gandhi and Lustig (2015) conducts a Principal Component Analysis ("PCA") on the residuals from the equation (2) model to search for the possibility of an additional risk factor. According to the authors, the key to activating a financial industry-wide bailout is the common variation in the payoffs of banks, the issue of which has been studied rather relatively by Achay and Yorulmazer (2007) and Farhi and Tirole (2012). Per methodology used by Gandhi and Lustig (2015), I conduct the Principal Component Analysis on the residuals extracted from the time-series analysis on each of the size-sorted portfolio. By doing so, I strive to suggest a common risk factor that could possibly explain the size anomalies in the returns of the financial industry.

1. Principal Component Analysis ("PCA") on the residuals

The PCA was conducted on the residuals extracted from the regression analysis processed on each size-sorted portfolio. Through this method, values of inherent vectors were extracted from each components and they are put forth as first and second principal components (PC_1, PC_2) and their vectors as (w_1, w_2). The results are shown on Table 6. The explanatory power of the variation in the residuals are accounted by PC_1 and PC_2 at 52.5% for the market capitalization-sorted portfolio where as they explain 50.2% for the book value-sorted portfolio. The numbers in brackets are the standard errors generated by bootstrapping 10,000 samples. The first two columns show the residuals sorted by market capitalization sorts while the last two are book sorted. The two columns of each size factor are similar; thus I focus on the results obtained using the market capitalization, as this sort provides more observations and therefore higher precisions for estimation, per the methodologies adopted by Gandhi and Lustig (2015).

Gandhi and Lustig (2015) explain the first principal component w_1 as the level factor because it shows similar values across all sized portfolios. However, they propose w_2 as the nominee for the new size factor as it shows steady decrements through the rising of sized portfolios. Similar to the results given by Gandhi and Lustig (2015), Table 3 shows that while w_1 shows no decreasing momentum throughout the sized portfolios, w_2 shows steady decreasing trends except for portfolio #3. Thus, it is fair to state that just as it was conducted by Gandhi and Lustig (2015), it would be feasible to reveal and create the new size factor. In the study done by the key paper, similar patterns are shown where the loadings of w_2 show decreasing trends along the increase in size portfolios for both market capitalization and book value. The loadings of market capitalization is used for the abovementioned reason and showed value decrease from 0.53 to −0.37 in the largest of the portfolios.

2. Constructing the new size factor

By using the values of w_1 and w_2 derived from the PCA, a new size factor can be constructed per the methodologies adopted by Gandhi and Lustig (2015). The procedures are as follow. First, the residuals matrix of T x 5 is multiplied with the matrix of first two principal components vector (5x2). The principal components (w_1, w_2) are renormalized to (w_1, w_2) so that they add to one. The multiplication of the residuals and the principal components vector result in (Tx2) matrix and the second principal component can each be expressed as $PC_{1,t}$ = $\varepsilon_t \hat{w}_1$, $PC_{2,t}$ = $\varepsilon_t \hat{w}_2$. The renormalized vector values of the second principal component on the market capitalization portfolios, $\hat{w}_2$, are as follows:

$$[5.1621, -4.615, -0.478, 1.5223, -0.591]$$

The size factor or the second principal component is the right fit between the two components because the average normal risk-adjusted returns align with covariance with the returns on the portfolios, thus making it a good factor for explaining the size anomaly or pattern in normal risk-adjusted returns.

Along with the above explanation, in order to check whether the size factor actually explains the average normal risk-adjusted returns, I construct a new independent variable. Because the weights on the calculation, the renormalized, this would be equivalent to a size factor that stands for returns from buying small-sized stocks and selling large-sized stocks. The new independent variable is a (Tx1) vector matrix form and stands for the returns of each time-specific size sorted portfolio multiplied by the weights of the second principal components. $R[PC_2]t+1 = \hat{w}_2 R_t$. This portfolio is long in small financial institutions and short in large financial institutions. Because it is a new size factor, derived from applying the PCA on the residuals, it is also orthogonal to the existing risk factors. To test the statistical significance, the above new size factor, $R[PC_2]$, is again regressed on the excess returns of the portfolios along with the five existing factors, as conducted in equation below.

$$R^{i}_{t+1} - R^{f}_{t+1} = \alpha^{i} + \beta^{i} f_{t+1} + \beta^{i}_{PC,2} R[PC_2]_{t+1} + \varepsilon^{i}_{t+1} \qquad (3)$$

Table 4 shows the OLS regression results for the new size factor, per the methods put in play by Gandhi and Lustig (2015), as well as the existing five equity and bond factors. Similar to Table 3, Panel A shows the market capitalization-sorted while Panel B shows the book value-sorted. The constant values for both Panel A and Panel B show decreasing movements as the portfolio sizes get larger. Market factor seems to be the most explanatory dependent variable while the newly added PC_2 factor also shows not only similar patterns in size anomalies but also high statistical significance. In the original study, when the new size factor is included, the alpha values also decline in size, smaller than 250 bps over the entire sample.

3. On the new size factor

As indicated in the introduction part, there have been active researches done on the implicit guarantees provided by the government on the financial institutions. Schich and Lindh (2012) stated that financial institutions with high spread and credit rating can reduce funding costs due to the implicit guarantees provided by the government. In addition, Gandhi and Lustig (2015) argued that because large banks are implicitly supported by the government due to its sheer size, it will show lower returns when compared to the small banks.

According to Gandhi and Lustig (2015), there is a strong correlation between economic cycles and the banking panics. When taking a closer look into history, in the US, ever since the banking panic in 1873, except for the very first case, all the banking panics have occurred during the recession periods within the economic cycle. However, this does not seem to apply to non-financial companies. According to Gieseke, Longstaff, Schaefer, Strebulaev (2011), when looking at the 150 years of US corporate history, the relationship between default risks of corporate bonds and economic cycles has shown to be very weak.

As evident by the 2008 Global Financial Crisis, the impact defaults of large financial institutions has on the economy proved to be far greater than in recessions rather than the booming periods. Therefore, it can be reasonably conjectured that the government would absorb tail risks of large sized financial institutions per economic cycles, but mostly during the recession periods. Thus, there must be some further looking into the reason if the stock returns of large financial institutions indeed are lower during the recessions than the booming era.

Because the PC_2 derived from the PCA on the residuals show positive (+) values in small sized firms as show negative (−) values in large sized firms, it be also shown as a return of portfolio on the strategy of buying small-sized financial institution stocks and selling large-sized financial institution stocks. By measuring the PC_2 values against the economic cycle, it should be meaningful to see whether, as conjectured above, the values show procyclical movements or not.

Figure 1 shows the 12 month moving average of values of the principal component values. The lines represent 12month moving averages from t - 11 to t and the shaded areas represent the recession periods proclaimed by the OECD. The recession periods are from October 2007 to May 2009 and

August 2011 to May 2012. In these periods, the moving averages of PC_2 show lowering movements which show that the principal components indeed are procyclical to economic phases. As in the original study done by Gandhi and Lustig (2015), in general, PC_2 values showed decreases during the recessions and financial crises, except for two occasions, the double-dip recession in the 1980s and the 2001 recession.

Table 6, Panel A, shows the value at the trough of the OECD economic cycle (the end of the financial crisis) of GBP100 invested at the peak of the economic cycle (the start of the financial crisis) in the size portfolio. On average, the size portfolio loses GBP38.62 during a recession or financial crisis. As evident in Panel B, during the first 12 months of the recessions, largest losses are concentrated. Panel B shows, into n months of recession, the average value of the portfolio. With twelve months into recession, the portfolio lost almost GBP68 of its value. The similar was also shown in the results achieved in the original study by Gandhi and Lustig (2015), whereby the hedged strategy lost more than $40.08 per recession and the unhedged lost $36.61 during a recession or crisis from the $100 par value.

4. Business cycle variation in common and idiosyncratic risks

In addition, to further test the pro-cyclical traits of the PC_2 factor, standard deviation values of the residuals were calculated during the economic cycles. Thus, by dissecting into the recession and entire sample periods the idiosyncratic risks of the sized-portfolios, I wanted to see whether the idiosyncratic risks of the small-sized portfolios show greater values than the large-sized portfolios.

According to Gandhi and Lustig (2015), if there are large enough shocks to the idiosyncratic risks, there could be some negative influences on the defaults of financial institutions. Also, intuitively, small-sized financial institutions are much more prone to idiosyncratic risks than the large-sized ones. Therefore if the small-sized financial stocks show stronger volatility, this would translate to higher returns from which I could indirectly confirm the pro-cyclical traits of the PC_2 factor. Table 7 shows the standard deviation values for the sized portfolios in both the recession and the entire periods. Panel A shows time-series values on a portfolio-level while Panel B shows cross-sectional individual bank values. From the third portfolio for both panels, it shows that the standard deviations of the residuals are larger than those of the entire sample periods. While this trait is not specifically shown in the first two portfolios, it can be still seen that the second principal component, PC_2, shows pro-cyclical traits in the UK economy. The results are alike to the trends seen from Gandhi and Lustig (2015), where by, generally, the values of standard deviations are greater for the recession periods both on a portfolio and individual bank levels, indicating the smaller sized financial institutions' much more exposure to idiosyncratic risks.

5. Size and Co-skewness

This section deals with hints, if any, of government support on the large financial institutions. Harvey and Siddique (2000) asserted that co-skewness is one of the factors that decides stock returns. Also, according to Kelly, Lustig and Nieuwerburgh (2011) and Gandhi and Lustig (2015) the negative (-) co-skewness on large-sized bank stock returns can be decreased by providing shareholders of banks the out-of-the-money put options. Thus, it can be reasonably conjectured that large financial institutions should have less co−skewness with the market than the small ones.

Relating to above studies, I strived to find out whether there exists other co−skewness on the size factor. First, to measure the co−skewness, squared market factor was added to the existing five factors on the regression equation (2).

Table 8 shows the forecasted values of the regression. The coefficient values of the market squared factor does seem to show much statistical significance except for the largest portfolio in the market capitalization−sorted in Panel A and the largest and largest minus smallest portfolios in the book value−sorted in Panel B. The findings are surprising, because given that large financial institutions have and use more leverage, they should have less co−skewness which is not shown. These results match to those found by Gandhi and Lustig (2015), whereby there is found positive and statistically significant difference in the loadings of the squared market return between the largest and the smallest portfolio. These findings are surprising unless there is considered the effect of government guarantees on the large financial institutions.

Chapter 6 On tail risk pricing and the government

This section deals with the specific tail risk in the financial institutions is priced in the stock market and how it relates to both the regulatory regime and the major governmental announcements regarding bailouts to the financial industry. As constructed beforehand, the average return of the new size factor is the price of banking tail risk insurance, also as indicated by Gandhi and Lustig (2015). For individual financial institution, the effect on the cost of equity capital is measured by multiplying the loading on the new size factor with this risk price. When the result of this multiplication results in a negative number, I regard it as tail risk subsidy and otherwise as tail risk tax, as done by Gandhi and Lustig (2015).

1. Size of largest financial institutions

As conducted by Gandhi and Lustig (2015), I want to relate the tail risk pricing, as captured by the size factor, to different financial institutions and even on the large, individual ones. Aside from special provisions supported to the commercial banks, large insurance competition, considered as SIFI, benefit from the government through special financial packages. Table 7 shows the results of the industries of banks, financial services, life and non-life insurances within the UK financial industry. It' s shown that within the financial industry, only the banking and the financial service industry account for positive tail risk subsidy. Over the entire sample, the subsidy to both the banking and the financial industry is 0.02%. The subsidy is computed as the risk price (9.21%) multiplied by the loadings on the PC_2 of respective industry. The loadings are negative and statistically significantly different from zero for the banking and financial services industry at the 10% level while, being statistically significant to a certain level, the loadings are positive for both the insurance industries.

Table 9 also shows the same trend for the biggest banks in the UK financial industry. The tail risk is largest for RBS (Royal bank of Scotland) at 0.1% and being statistically significant at the 1% level. All of the largest banks show negative PC_2 values while such is not the case for Prudential, also a too-big-to-fail-declared financial institution in the UK. The results are alike to the trends since by the key paper, Gandhi and Lustig (2015), where the values for size are all positive and statistically significant for the biggest, individual banks. However, despite the alike negative loading values for the PC_2 factor in my study, the trends of increasing values for the size values with the increase of market cap of individual banks is not shown as the values for size in my study do not vary much differently from one

2. Announcement effects

In Table 10, TBTF represents the value-weighted return of four financial institutions that were declared too big to fail by the UK government in 2007. The table looks at financial crisis announcements in UK as published by the Bank of England and the Financial Times to examine the financial institution tail risk pricing that is embedded in the five financial institutions around these bailout announcement dates. Following the methodologies of Gandhi and Lustig (2015), I report the regressions for 30, 45, 60, 90 and 105 days regression around the announcement dates. In the 30-day window after the first financial crisis announcement date, the loadings increase by

0.03 which amounts to an annualized 0.3% tail risk subsidy per year. As originally shown by Gandhi and Lustig (2015), this effect shows gradual decrements as the event windows increase along with upcoming announcement dates.

Chapter 7 Conclusion

In this study, I strive to document a size anomaly in the financial stocks that is different from the size effect that has been well-studied in prior studies for the non-financials. In particular, I wanted to analyze the financial stock returns in UK to first see whether there is a size effect and find ways to understand this effect in more detail. As for such, by way of construction, following the methodologies put forward by Gandhi and Lustig (2015), the size effect found in UK financial stock returns can be explained by the covariance with a new size factor that is calculated from the residuals from the components of financial institutions stock returns that are orthogonal to the standard, existing risk factors. As done by Gandhi and Lustig (2015), this new size factor is a measure of financial-industry specific tail risk. Through empirical testing of the new size factor, I found that the new size factor explains the common variation in the stock returns of the financial institutions in UK and also acts out as a measure of the financial institution-specific tail risk. To the limits of my study, I found out that the government provides support for the tail risk through subsidy, however, the extent of support through guarantees was not found in correlation to size of the individual financial institution. In terms of ways this paper could further be augmented, more factors besides the two bond risk factors could be added, such as default spread and credit ratings, as financial institutions hold different types of risk credit assets.

Table I
Descriptive statistics on 5x5 portfolios of financial stocks formed on market cap and BM

Rank	Mkt cap	BM	Average Return	Standard deviation	t−values
1	1	1	0.099	0.880	3.313
2	1	2	0.031	0.344	3.640
3	1	3	0.133	1.725	3.113
4	1	4	0.066	0.614	3.811
5	1	5	0.028	0.409	2.470
6	2	1	0.011	0.471	1.688
7	2	2	0.019	0.436	3.836
8	2	3	0.008	0.531	1.221
9	2	4	0.010	0.517	1.569
10	2	5	0.008	0.569	1.144
11	3	1	0.021	1.013	3.668
12	3	2	0.010	0.780	2.246
13	3	3	0.010	0.831	2.163
14	3	4	0.012	0.706	2.948
15	3	5	0.012	0.885	2.534
16	4	1	0.018	2.196	4.431
17	4	2	0.011	1.912	3.341
18	4	3	0.016	2.272	4.423
19	4	4	0.019	2.404	4.378
20	4	5	0.021	2.419	4.750
21	5	1	0.011	16.007	2.091
22	5	2	0.004	10.065	1.217
23	5	3	0.005	8.742	1.634
24	5	4	0.007	6.950	2.095
25	5	5	0.012	4.204	3.228

Table II
Risk-adjusted returns on size-sorted portfolio of financial stocks

This table presents the estimates from the OLS regression of monthly value-weighted excess returns on each size-sorted portfolio of UK financial stocks on the three Fama and French (1993) stock and two bond risk factors. *market smb*, and *hml* are the three Fama-French stock factors: the market, small minus big, and high minus low, respectively. *Ltg* is the excess return on an index of long-term government bonds and *crd* is the excess return on an index of investment-grade corporate bonds. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The alphas have been annualized by multiplying by 12 and are expressed in percentages. Standard errors are adjusted for heteroscedasticity and autocorrelation using Newey-West (1987) with three lags. The full sample is from 2005 to 2015.

Panel A: Market cap (Dec-sort)						
	Small	2	3	4	Large	5-1
Alpha	7.780*	0.369	0.688**	0.937**	-0.131	-7.911*
	-2.33	-1.11	-3.04	-3.2	-0.43	-2.34
MKT	1.140**	0.687***	0.811***	0.979***	1.058***	-0.0822
	-3.07	-7.24	-14.6	-9.58	-6.94	-0.2
SMB	2.435**	0.694***	0.453***	0.15	-0.159	-2.593**
	-2.63	-6.62	-8.14	-1.43	-1.22	-2.74
HML	0.388	0.212*	0.193**	0.146	0.891***	0.503
	-0.63	-2.2	-2.83	-1.35	-6.78	-0.79
LTG	-5.631	0.0884	0.0614	0.386	0.416	6.046
	-1.37	-0.28	-0.22	-1.25	-1.4	-1.42
CRD	-6.943	0.105	0.0883	0.427	0.507	7.45
	-1.34	-0.3	-0.28	-1.23	-1.45	-1.39
adj. R-sq	0.032	0.434	0.681	0.687	0.81	0.064

Panel B: Book value (Dec-sort)						
	Small	2	3	4	Large	5-1
Alpha	3.176	1.205***	0.824*	0.931**	-0.151	-3.327
	-1.78	-3.95	-2.35	-3.22	-0.49	-1.81
MKT	0.880***	0.848***	0.788***	0.910***	1.065***	0.185
	-4.01	-12.58	-5.82	-8.84	-6.85	-0.63
SMB	1.150**	0.745***	0.466***	0.083	-0.161	-1.311**
	-3.09	-7.01	-3.92	-0.71	-1.24	-3.35
HML	0.391	0.268*	0.0178	0.174	0.904***	0.514
	-1.33	-2.61	-0.17	-1.5	-6.94	-1.61
LTG	-1.926	-0.202	0.348	0.668*	0.389	2.315
	-0.95	-0.53	-1.19	-2.04	-1.28	-1.04
CRD	-2.569	-0.204	0.402	0.755*	0.478	3.046
	-1.01	-0.48	-1.17	-2.02	-1.34	-1.1
adj. R-sq	0.037	0.552	0.454	0.637	0.809	0.085

Table III
Principal components of size-sorted financial stock returns

This table presents the loadings for the first and second principal components (w_1, w_2) extracted from the residuals of the regression specified in the early equation. UK financial companies are sorted into deciles by market capitalization. The last row indicates the percentage of variation explained by each principal component. Standard errors in brackets are generated by bootstrapping from the data 10,000 times. First, we bootstrapped the returns for each size-sorted portfolio and the risk factors 10,000 times. For each bootstrapped sample, we regress the returns on the standard risk factors. We then compute the first and second principal components from the residuals of this regression. This results in 10,000 samples of the first and second principal components, which we use to compute the standard errors.

	Market Capitalization		Book Value	
Portfolio	w_1	w_2	w_1	w_2
Small	0.0443	0.7239	0.0875	0.7717
	[0.002]	[0.006]	[0.003]	[0.005]
2	0.1343	0.6473	0.0947	−0.5382
	[0.002]	[0.006]	[0.002]	[0.005]
3	0.6253	−0.0670	0.5924	0.1557
	[0.001]	[0.002]	[0.001]	[0.002]
4	0.6258	0.2135	0.6551	0.1969
	[0.001]	[0.003]	[0.001]	[0.002]
Large	0.4443	−0.0829	0.4510	−0.2278
	[0.001]	[0.003]	[0.002]	[0.004]
%	30.2%	22.4%	29.7%	20.5%

Table IV
Size-factor-adjusted returns for size-sorted portfolios of financial stocks

This table presents estimates from OLS regression of monthly value-weighted excess returns on each size-sorted portfolio of UK financial stocks on the three Fama and French stock and two bond risk factors, and the second principal component weighted returns. *mkt, smb,* and *hml* are the three Fama-French factors: the market, small minus big, and high minus low, respectively. *Ltg* is the excess return on an index of long-term government bonds and *crd* is the excess return on an index of investment-grade corporate bonds. PC_2 is the time-series of the returns of the size-sorted portfolios weighed by the loadings of the second principal component W_2. The weights of the second principal component have been renormalized so that they sum to one. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The alphas have been annualized by multiplying by 12 and are expressed in percentages. Standard errors are adjusted for heteroscedasticity and autocorrelation using Newey-West (1987) with three lags.

Panel A: Entire period

	Small	2	3	4	Large	5−1
Alpha	0.273	0.534	0.701**	0.870**	−0.104	−0.378
	−0.85	−1.49	−2.99	−3.01	(−0.33)	(−0.89)
MKT	0.535***	0.700***	0.812***	0.974***	1.060***	0.525***
	−6.64	−7.32	−14.62	−9.5	−6.9	−3.45
SMB	0.641***	0.734***	0.456***	0.133	−0.152	−0.794***
	−6.64	−6.88	−8.33	−1.25	(−1.15)	(−5.66)
HML	0.269**	0.215*	0.193**	0.145	0.891***	0.622***
	−2.65	−2.29	−2.82	−1.32	−6.76	−4.83
LTG	−0.107	−0.0325	0.0524	0.435	0.396	0.503
	(−0.35)	(−0.10)	−0.18	−1.39	−1.32	−1.18
CRD	−0.121	−0.0447	0.0773	0.488	0.482	0.604
	(−0.36)	(−0.12)	−0.24	−1.37	−1.38	−1.24
PC2	0.189***	−0.00415	−0.000307	0.00170*	−0.000682	−0.190***
	−96.52	(−1.81)	(−0.26)	−2.62	(−1.13)	(−87.30)
adj.R-sq	0.99	0.451	0.678	0.688	0.808	0.985

Figure 1
Size factor in normal risk−adjusted returns of financial stocks

Size factor in normal risk−adjusted returns of financial stocks. The solid lines plot the 12−month(backward−looking) moving average (months t − 11 through t) of the times−series of the weighted sum of the residuals from the OLS regression of monthly value−weighted excess stock returns for each size−sorted portfolio of UK financial stocks on the Fama−French and bond risk factors. The weights are given by the second principal component and sum to one. The dashed line represents the index of industrial production. The gray−shaded regions represent OCED recessions. The OECE recession dates are published by OECD.

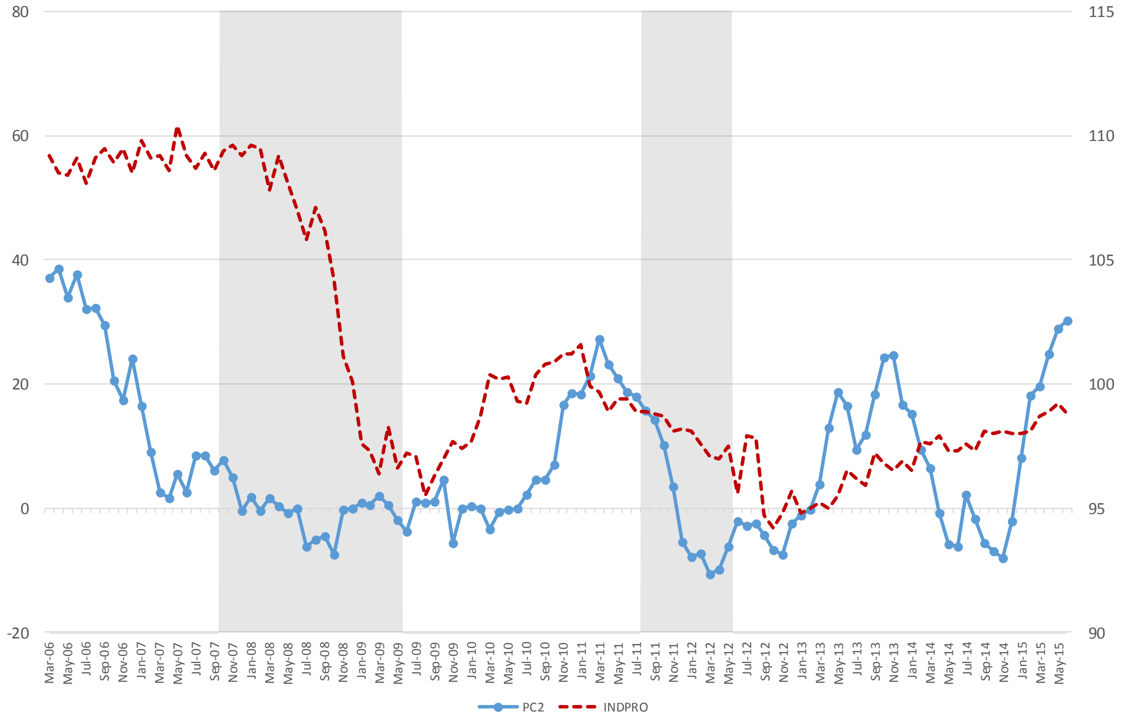

Table V
Cumulative return on second principal component portfolio in recessions and financial crises

This table shows the value of $100 invested in a portfolio that goes long in small financial stocks and short in large financial stocks. The weights of the portfolio are given by the second principal component, renormalized so that they sum to one (w_2). $100 is invested in this portfolio at the "Start" date and its value, given in the third column, is measured on the "End" date. The column labeled *Value* represents the value of $100 invested at the peak (or start of the crisis) as of the trough (or end of the crisis) on this portfolio. The average is computed for all recessions marked by OECD dating conventions. The bottom panel shows the value of a $100 investment *n* months into the recession

Panel A
Portfolio value at Trough

Start	End	Value
10: 2007	05: 2009	25.79
08: 2011	05: 2012	51.45
Average		38.62

Panel B
Average portfolio value n months after Peak

	Value
Month 1	117.54
Month 2	120.17
Month 3	111.36
Month 4	116.06
Month 5	86.15
Month 6	74.92
Month 12	32.35

Table VI
Measuring Residual Risk Exposure

This table represents the standard deviation of residuals from OLS regression of monthly value−weighted excess returns of each size−sorted portfolio of UK financial stocks on the three Fama and French (1993) stock and two bond risk factors. In Panel A the row labeled "Recession" computes the (times−series) standard deviation of residuals during recession months and the row labeled "Full Sample" computes the (times−series) standard deviation for the 2005 to 2015 sample. In Panel B we examine the cross−sectional standard deviation of the residuals of banks in each bin for each period *t*. Panel B reports the time−series average of the cross−sectional standard deviation for each bin. The row labeled "Recession" lists the standard deviation of residuals during recession months and the row labeled "Full Sample" lists the standard deviation for the full sample. The standard deviations have been annualized by multiplying by root (12) and are expressed in percentages

Panel A: Portfolios					
Period	1	2	3	4	5
Recession	15.270	8.422	8.803	10.720	13.422
Entire Sample	20.916	11.553	8.097	9.595	9.690
Panel B: Individual Banks					
Recession	47.586	47.176	36.520	35.874	31.880
Entire Sample	49.938	51.260	36.664	32.985	23.626

Table VII
Betas to Market Squared

This table presents the estimates from the OLS regression of monthly value-weighted excess returns on each size-sorted portfolio of UK financial stocks on the three Fama and French (1993) stock and two bond risk factors and market^2, market smb, and hml are the three Fama-French stock factors: the market, small minus big, and high minus low, respectively. *Ltg* is the excess return on an index of long-term government bonds and *crd* is the excess return on an index of investment-grade corporate bonds. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The alphas have been annualized by multiplying by 12 and are expressed in percentages. Standard errors are adjusted for heteroscedasticity and autocorrelation using Newey-West (1987) with three lags.

Panel A: Market cap

	Small	2	3	4	Large	5-1
Alpha	1.904*	0.0434	0.641*	0.608	−0.654*	−2.558**
	−2.27	−0.15	−2.22	−1.92	(−2.32)	(−2.76)
MKT	0.686***	0.658***	0.799***	1.013***	1.085***	0.398
	−4.33	−7.07	−12.9	−11.2	−9.14	−1.83
SMB	0.874***	0.676***	0.458***	0.181	−0.151	−1.026***
	−4.32	−7.13	−8.08	−1.79	(−1.37)	(−3.98)
HML	0.116	0.163*	0.185**	0.127	0.786***	0.670***
	−0.83	−2.05	−2.74	−1.17	−9.12	−4.12
LTG	0.0334	0.172	0.0975	0.29	0.334	0.301
	−0.04	−0.59	−0.35	−1.01	−1.21	−0.34
CRD	0.0515	0.191	0.128	0.311	0.405	0.354
	−0.05	−0.59	−0.42	−0.95	−1.25	−0.34
MKT^2	−0.0182	0.00748	0.00202	0.0185	0.0275*	0.0457
	(−0.77)	−0.86	−0.31	−1.95	−2.49	−1.67
adj.R-sq	0.024	0.431	0.678	0.695	0.824	0.059

Panel B: Book value

	Small	2	3	4	Large	5-1
Alpha	1.084	0.967**	0.643	0.813*	−0.691*	−1.775*
	−1.46	−3.01	−1.58	−2.25	(−2.40)	(−2.06)
MKT	0.642***	0.780***	0.816***	0.915***	1.094***	0.451
	−4.07	−10.88	−5.86	−8.61	−9.13	−1.95
SMB	0.631***	0.627***	0.483***	0.0945	−0.153	−0.784***
	−3.81	−7.76	−4.29	−0.79	(−1.39)	(−3.86)
HML	0.184	0.254**	0.0179	0.161	0.798***	0.614***
	−1.42	−2.64	−0.17	−1.45	−9.18	−4.25
LTG	0.42	0.0838	0.266	0.654*	0.303	−0.117
	−0.62	−0.26	−0.89	−1.99	−1.08	(−0.14)
CRD	0.395	0.121	0.304	0.737	0.371	−0.0245
	−0.52	−0.33	−0.87	−1.96	−1.12	(−0.03)
MKT^2	−0.021	−0.000799	0.0112	0.00644	0.0284*	0.0494*
	(−0.95)	(−0.09)	−0.81	−0.86	−2.6	−2.07
adj.R-sq	0.03	0.548	0.453	0.635	0.824	0.083

Table IX
Bank Tail Risk Pricing for financial institutions

This table presents the estimates from OLS regression of monthly excess returns on a value−weighted index of UK financial stocks, sector divided by the standards given by Datastream on the Fama−French stock factors, bond factors and the second principal component weighted returns. The table also reports results for 4 individual banks. All the individual financial institutions had values as of 2005 for which all the data were calculated. PC_2 is the time−series of the returns of the size−sorted portfolios weighed by the loadings of the second principal component w_2. The weights of the second principal component have been renormalized so that they sum to one. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are adjusted for heteroscedasticity and autocorrelation using Newey−West (1987) with three lags. The implicit subsidy is the risk price (the 2005 to 2015 average return on PC_2 9.21%) times the negative of the loading on PC_2. The full sample is from 2005 to 2015.

	Index of financial stocks				Individual financial institutions			
	Banks	Finan. Service	Life Ins.	Non−life Ins.	HSBA	BARC	RBS	STAN
Mkt Cap (Apr 05)	35,885	295.2	6,194	589.0	92,866	34,749	49,904	12,182
MKT	0.950***	1.227***	1.295***	0.493***	0.722***	1.291***	1.081***	1.387***
	(5.86)	(12.2)	(10.3)	(4.3)	(3.47)	(4.54)	(6.93)	(6.5)
SMB	−0.24	0.16	−0.04	−0.2	−0.27	−0.25	−0.04	−0.14
	(−1.8)	(1.86)	(−0.4)	(−2)	(−1.5)	(−0.9)	(−0.2)	(−1)
HML	0.989***	0.0524	0.453***	0.165	0.540**	1.669***	2.272***	0.008
	(9.31)	(0.54)	(3.65)	(1.9)	(3.24)	(8.95)	(12)	(0.04)
LTG	0.483	0.0823	0.493	0.406	0.720	−0.53	0.81	−0.62
	(1.41)	(0.20)	(1.74)	(0.9)	(1.50)	(−0.5)	(1.34)	(−1)
CRD	0.619	0.090	0.483	0.495	0.879	−0.54	0.928	−0.64
	(1.53)	(0.18)	(1.53)	(1)	(1.54)	(−0.4)	(1.4)	(−0.8)
PC2	−0.00169*	−0.00207	0.0034*	0.006**	−0.00060	−0.00079	−0.0073***	−0.0013
	(−2.1)	(−1.3)	(2.07)	(3.3)	(−0.5)	(−0.4)	(−4.1)	(−1)
Size	0.016	0.019	0.031	0.056	0.006	0.007	0.067	0.012
adj.R−sq	0.777	0.713	0.758	0.372	0.497	0.561	0.703	0.445

Table X
Bailout Announcements

This table represents the results of OLS regression $R_t^{TBTF} - R_t^f = \alpha + \beta_1 PC_2 + \beta_2 PC_2 + \epsilon$ where TBTF represents the value−weighted return of 5 financial institutions that were declared too big to fail by the Comptroller in 2007, PC2 represents the daily return of the portfolio that goes long in small UK financial stocks and short in large UK financial stocks, the weights for the portfolio are given by the second principal component and sum to one, and D represents a dummy variable that equals one after the announcement date and zero otherwise. The regression is estimated over a 30−, 60−, 90−, and a 105−day window around the announcement date. A seven−day window around the exact announcement date is excluded from the sample while estimating coefficients. Dates for the announcements are from Bank of England and Reuters. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are adjusted for heteroscedasticity and autocorrelation using Newey−West(1987). Announcement date details are as follows.

Event	Coeff	30D	45D	60D	90D	105D
Event 1	PC2	−0.83	−0.83	−0.83	−0.83	−0.83
		−13.91	−15.91	−16.48	−19.60	−21.81
	PC2D	−0.03	−0.02	−0.02	0.00	0.02
		−0.28	−0.23	−0.22	0.03	0.33
Event 2	PC2	−0.85	−0.86	−0.83	−0.86	−0.84
		−15.47	−11.14	−12.82	−19.01	−20.10
	PC2D	0.22	0.21	0.06	0.03	−0.01
		2.08	1.42	0.54	0.38	−0.15
Event 3	PC2	−1.05	−1.03	−0.99	−0.95	−0.94
		−14.81	−15.65	−15.73	−17.67	−19.47
	PC2D	0.06	−0.07	−0.10	−0.07	−0.09
		0.50	−0.60	−0.90	−0.78	−1.04
Event 4	PC2	−1.06	−1.04	−1.00	−0.96	−0.95
		−14.74	−15.59	−15.76	−17.45	−19.39
	PC2D	0.08	−0.06	−0.07	−0.06	−0.08
		0.65	−0.48	−0.64	−0.70	−0.95
Event 5	PC2	−1.14	−1.10	−1.07	−1.02	−0.98
		−16.67	−16.75	−18.58	−18.89	−18.21
	PC2D	0.06	0.03	0.05	0.01	−0.02
		0.45	0.22	0.50	0.08	−0.20
Event 6	PC2	−1.00	−1.00	−0.99	−0.97	−0.95
		−7.67	−9.57	−10.60	−14.17	−14.91
	PC2D	−0.19	−0.13	−0.08	−0.08	−0.10
		−1.12	−0.94	−0.65	−0.83	−1.14
Event 7	PC2	−1.01	−0.98	−0.96	−0.98	−0.95
		−8.60	−9.49	−10.92	−15.26	−16.49
	PC2D	−0.21	−0.10	−0.13	−0.08	−0.14
		−1.38	−0.66	−1.05	−0.79	−1.56

Event	Coeff	30D	45D	60D	90D	105D
Event 8	PC2	−1.02	−1.01	−1.00	−1.00	−0.98
		−8.03	−9.70	−11.09	−15.12	−16.13
	PC2D	−0.18	−0.07	−0.04	−0.04	−0.10
		−1.04	−0.46	−0.35	−0.39	−1.13
Event 9	PC2	−1.17	−1.08	−1.10	−1.06	−1.04
		−10.77	−9.83	−12.91	−14.58	−15.01
	PC2D	0.25	0.14	0.17	0.03	0.01
		1.52	0.93	1.37	0.34	0.11
Event 10	PC2	−0.99	−1.09	−1.00	−1.03	−1.02
		−6.21	−9.96	−10.15	−13.57	−14.60
	PC2D	−0.05	0.09	−0.11	−0.05	−0.06
		−0.25	0.65	−0.84	−0.54	−0.69
Event 11	PC2	−1.02	−1.07	−1.02	−1.04	−1.03
		−8.04	−10.21	−11.06	−14.42	−15.42
	PC2D	0.05	0.13	−0.07	−0.04	−0.06
		0.29	0.95	−0.56	−0.47	−0.76
Event 12	PC2	−0.84	−0.97	−0.91	−1.05	−0.99
		−4.68	−10.34	−12.41	−13.91	−13.57
	PC2D	−0.31	−0.18	−0.20	−0.12	−0.17
		−1.54	−1.47	−2.19	−1.29	−1.98
Event 13	PC2	−1.05	−1.01	−1.02	−1.05	−1.05
		−5.88	−8.95	−11.92	−12.31	−15.90
	PC2D	−0.09	−0.09	−0.14	−0.11	−0.12
		−0.50	−0.76	−1.44	−1.21	−1.54

Announcement dates	Details (All details taken Reuters)
2/17/08	The Government nationalizes Northern Rock, Britain's fifth largest mortgage lender, after five months of seeking a private sector buyer. The Bank of England had bailed it out in September 2007, after the credit crunch hit the bank's ability to raise cash in money markets.
4/22/08	The BoE unveils the Special Liquidity Scheme to swap banks' risky mortgage assets for at least £50bn of Government debt. It will run until the week of October 20, 2008.
9/17/08	Lloyds TSB agrees to rescue rival HBOS, scooping up Britain's biggest home loan lender in an all-share deal facilitated by the Government. The BoE extends the Special Liquidity Scheme to January 30, 2009.
9/18/08	Financial Services Authority (FSA) imposes a ban on short-selling financial stocks until January 16, 2009.
9/29/08	Britain nationalizes Bradford & Bingley after talks fail to find an outright buyer for the mortgage lender. The Treasury says it plans to take over B&B's £50bn mortgage portfolio and sell its deposits and branches to Spanish bank Santander.
10/3/08	FSA announces it will raise the compensation limit for savings deposits to £50,000 from £35,000, effective from Oct 7th.
10/8/08	BoE cuts interest rates by half a percentage point in coordination with other central banks.
10/13/08	Britain pumps in £37bn of taxpayers' cash to bail out three major banks - Royal Bank of Scotland (RBS), Lloyds TSB, and HBOS. The government says it will take equity stakes in each of the banks.
11/6/08	The BoE makes a shock 1.5% point cut in the interest rate to 3%, their lowest level in more than half a century.
11/24/08	Britain announces it will pump £20bn into the economy to 2010, including tax cuts and £3bn pounds of capital spending. The stimulus package amounts to about 1% of GDP.
11/28/08	The Government buys a 58% stake in RBS for £15bn after shareholders shunned the bank's share offer.
1/8/09	The BoE cuts the interest rate by 0.5% to a record low of 1.5%. Rates in Britain had never fallen below 2% - not even during the Great Depression of the 1930s.
1/19/09	The Government launches a second bank rescue plan, under which the BoE will set up an asset purchase program to buy private sector assets with an initial fund of £50bn. It will also allow banks to insure against extreme losses and guarantee their debts.

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