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Comparison of efficiency characteristics between the banking sectors of US and UK during the global financial crisis of 2007–2011☆

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ABSTRACT

This paper investigates the effect of bad or good news (asymmetric effect) on the time-varying betas of firms in the banking industries of the UK and the US during good periods (booms) and bad periods (recessions). Daily data from eleven UK and US firms of different sizes from the banking industries are applied in the empirical tests. The data ranges from 2004 to 2011, which includes the global financial crisis of 2007–2011. The time-varying betas are created by means of the bivariate BEKK GARCH model and then linear regressions are applied to test for the asymmetric effect of news on the beta. The asymmetric effects are investigated based on both market and non-market shocks. We find that most banks in the UK and the US seem to support the market efficiency hypothesis during both periods. The level of market efficiency however seems to decline significantly from the pre-crisis to the crisis period. These results shed light on the level of market efficiency and hedging strategies.

1. Introduction

Over the past few decades the abnormality of stock prices has been investigated extensively. This resulted in the emergence of two competing mutually independent hypothesis that makes an attempt to explain certain aspects of stock price behaviour.

The theory of asset mispricing explains certain anomalies of stock price behaviour via the behavioural finance argument. Asset mispricing presents an explanation to the evident over/underreaction of stock prices to information, which essentially suggests market inefficiency.[2]

The market efficiency theory serves to enforce the efficient market hypothesis, Fama (1970, 1991), Fama and French (1992, 1993, 1998, 2002). Chan (1988) and Ball and Kothari (1989), all provide evidence that there exists a predictive asymmetry in conditional betas' response to shocks. Implying that the beta of individual stock rises (falls) in response to abnormally negative (positive) returns, and argue that this asymmetric response to good and bad news explains the performance of stock returns. Ball and Kothari (1989) show that in an efficient market time-varying expected returns are caused by, variation in expected returns on the market portfolio, relative risk of a firm's investments, and leverage. Thus if the firm beta changes asymmetrically in response to news (shocks) this provides support for the efficient market hypothesis (Cho & Engle, 1999).[3] Thus the detection of asymmetry in betas lends support towards market efficiency as the degree of mispricing is now less since some of it can be explained by the changing in beta.

Our research views this controversy from a different perspective, through the analysis of stock returns of the UK and the US firms from the banking industries leading up to and during the financial crisis of the 2007–2011 period. In particular we study the effect of good and bad news during good periods (booms) and bad periods (recessions) on the time-varying betas of stock returns using a bivarite BEKK GARCH modelling framework. Although there is an extensive body of literature on the controversy surrounding asset mispricing and market efficiency, to the best of our knowledge there is no published research[4]

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[2] De Bondt and Thaler (1989), Chopra, Lakinishok, and Ritter (1992), Ritter (1991)), Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), and Dharan and Ikenberry (1995) all present evidence of market inefficiency in terms of overreaction to information. Evidence of underaction is just as frequent as shown by Ball and Brown (1968), Bernard and Thomas (1990), Jegadeesh and Titman (1993), Cusatis, Miles, and Wooldridge (1993) Desai and Jain (1997), Ikenberry, Rankine, and Stice (1996), Lakonishok and Vermaelen (1990), Ikenberry, Lakonishok, and Vermaelen (1995), Michaely, Thaler, and Womack (1995), Asquith (1983), Agrawal, Jaffe, and Mandelker (1992), Roll (1986), Ikenberry and Lakonishok (1993) and, more recently, Frazzini (2006).

[3] Cho and Engle (1999) finding evidence of asymmetric effects in betas of US firms, claim that this implies that abnormities of stock prices can be explained by changes in expected returns through a change in beta, thus supporting the claims of Chan (1988) and Ball and Kothari (1989).

[4] Veronesi (1999) presents a two state continuous time hidden Markov chain model to explain the stock market under-reaction to bad news in good times. We use a BEKK GARCH framework analysing the impact of good and bad news in good and bad periods and present empirical evidence for UK and US banking industries' classifications leading up to and during the recent financial crisis period.

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which looks at this puzzle during this financial crisis period and our findings make a contribution in this area. Also given the lack of research in this area for the UK and the US banking industries this paper makes a vital contribution to the literature.

We proceed by describing briefly the global financial crisis of 2007–11 in Section 2. The conditional CAPM and the time-varying betas are presented in Section 3. In particular we explain how we interpret the asymmetric betas, justifying our arguments. In Section 4 we describe the data and the BEKK GARCH modelling framework we employ in further detail. In Section 5 we present the BEKK results. Section 6 explains the theoretical underpinnings of time-varying betas and the general framework that we employ to capture the effect of good and bad news leading up to and during the financial crisis period. The results of the asymmetric effects and their interpretation are in Section 7. We conclude in Section 8.

2. Banking industry trends during the 2007–11 global financial crisis

At least two significant trends in the banking industry contributed to the lending boom and housing frenzy that laid the foundations for the crisis. First, instead of holding loans on banks' balance sheets, banks moved to a new model based on an "originate and distribute" concept by repackaging loans and passing them on to various other financial investors, thereby off-loading risk through "structured" products such as *collateralized debt obligations* (CDOs). Second, banks increasingly financed their asset holdings with shorter maturity instruments leaving them particularly exposed to a dry-up in funding liquidity. (Brunnermeier, 2009) In hindsight, it is clear that one distorting force leading to the popularity of structured investment vehicles was *regulatory and ratings arbitrage*. Moving a pool of loans into off-balance-sheet vehicles, and then granting a credit line to that pool to ensure a AAA-rating, allowed banks to reduce the amount of capital they needed to hold to conform with Basel I regulations although the risk for the bank remained essentially unchanged.[5] The US Financial Crisis Inquiry Commission concluded that "the crisis was avoidable and was caused by widespread failures in financial regulation, including the Federal Reserve's failure to stem the tide of toxic mortgages and dramatic breakdowns in corporate governance." The International Monetary Fund estimated that large US and European banks lost more than $1 trillion on toxic assets and bad loans from January 2007 to September 2009.[6] UK banks were hard hit due to their holdings in problematic securitized mortgage products from the US and the situation was aggravated as mortgages made to UK borrowers moved into defaults as UK housing prices crashed.[7] September 2008 witnessed the Lloyds Bank make 12.2 bn takeover of the ailing Halifax Bank of Scotland (HBOS), the UK's largest mortgage lender, and by mid-2009, the UK government has spent approximately $740 bn on capital injections and debt guarantees for the country's largest banks, including the Royal Bank of Scotland (RBS), Barclays, HSBC and Lloyds (Fresh & Bail, 2009). In April 2009 the UK Chancellor Alistair Darling revealed that the credit crunch will lead to the largest budget deficit in UK financial history of £175 bn, with a total government debt set to double to £1 trillion by 2014.[8]

3. The (conditional) CAPM and time-varying betas

One of the assumptions of the capital asset pricing model (CAPM) is that all investors have the same subjective expectations on the means, variances and co-variances of returns.[9] According to Bollerslev, Engle, and Wooldridge (1988), economic agents may have common expectations on the moments of future returns, but these are conditional expectations and therefore random variables rather than constant.[10] The CAPM that takes conditional expectations into consideration is sometimes known as conditional CAPM. This conditional CAPM provides a convenient way to incorporate the time-varying conditional variances and co-variances (Bodurtha & Mark, 1991).[11] An asset's beta in the conditional CAPM can be expressed as the ratio of the conditional covariance between the forecast error in the asset's return, and the forecast error and the conditional variance of the forecast error in the market return.

The following analysis relies heavily on Bodurtha and Mark (1991). Let $R_{i,t}$ be the nominal return on asset i (i = 1, 2, …, n) and $R_{m,t}$ the nominal return on the market portfolio m. The excess (real) return of asset i and the market portfolio over the risk-free asset return is presented by $r_{i,t}$ and $r_{m,t}$ respectively. The conditional CAPM in excess returns may be given as

$$E\left(r_{i,t}|I_{t-1}\right) = \beta_{iIt-1}E\left(r_{m,t}|I_{t-1}\right) \quad (1)$$

where,

$$\beta_{iIt-1} = \mathrm{cov}\left(R_{i,t}, R_{m,t}|I_{t-1}\right)/\mathrm{var}\left(R_{m,t}|I_{t-1}\right) = \mathrm{cov}\left(r_{i,t}, r_{m,t}|I_{t-1}\right)/\mathrm{var}\left(r_{m,t}|I_{t-1}\right) \quad (2)$$

and $E(|I_{t-1})$ is the mathematical expectation conditional on the information set available to the economic agent's last period $(t-1)$, I_{t-1}. Expectations are rational, based on Muth's (1961) definition of rational expectation, where the mathematical expected values are interpreted as the agent's subjective expectations. According to Bodurtha and Mark (1991), asset i risk premium varies over time due to three time-varying factors: the market's conditional variance; the conditional covariance between asset's return; and the market's return and/or the market's risk premium. If the covariance between asset i and the market portfolio m is not constant, then the equilibrium returns $R_{i,t}$ will not be constant. If the variance and the covariance are stationary and predictable, then the equilibrium returns will be predictable.

The asymmetric effect[12] of news on the volatility of stock returns has been investigated and evidenced in many past studies (Black, 1976; French, Schwert, & Stambaugh, 1987; Nelson, 1991; Schwert, 1989). The effect refers to the volatility trends in individual stocks and market indices where one can observe a rise in volatility following negative returns and a fall following positive returns.

The effect can be rationalised in terms of a leverage (financial and operational) based explanation or one based on the determinants of market risk premium. The former stems from the notion of viewing equity as a call option on the value of the firm's assets where the option becomes worthless when the asset value falls below the liabilities (i.e. the strike price). Thus, if the value of a leveraged firm drops, its equity becomes highly leveraged, causing an increase in volatility[13] (Black, 1976;

[5] Although the subsequent Basel II accord took some steps to correct this preferential treatment of non contractual credit lines, but it was not satisfactory as Basel II implemented capital charges based on asset ratings, but banks were able to reduce their capital charges by pooling loans in off-balance-sheet vehicles.

[6] These losses are expected to top $2.8 trillion from 2007 to 10. US banks' losses were forecast to hit $1 trillion and European bank losses will reach $1.6 trillion. The IMF estimated that US banks were about 60% through their losses, but British and Eurozone banks only 40%.

[7] The delinquency rate of 30% on non conforming home loans in the UK even exceeded that of the US, which stood at only 27% (Glover, 2009).

[8] These figures were sourced from the financial times and the BBC website.

[9] See Markowitz (1952), Sharpe (1964) and Lintner (1965) for details of the CAPM.

[10] According to Klemkosky and Martin (1975), betas will be time varying if excess returns are characterised by conditional heteroscedasticity.

[11] Hansen and Richard (1987) have shown that omission of conditioning information, as is done in tests of constant beta versions of the CAPM, can lead to erroneous conclusions regarding the conditional mean variance efficiency of a portfolio.

[12] This is also referred to as the "leverage effect".

[13] Christie (1982) shows that equity volatility is increasing in financial leverage, and hence there is a negative relationship between the variance of returns and the value of equity. However, Christie (1982) and Black (1976) point out that financial leverage and operational leverage are not enough to fully account for the asymmetry of volatility.