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Did the financial crisis affect the market valuation of large systemic U.S. banks?

Georgios Bertsatos[a], Plutarchos Sakellaris[a], Mike G. Tsionas[a,b,*]

[a] Athens University of Economics and Business, Department of Economics, Patission 76, Athens, 104 34, Greece
[b] Lancaster University Management School, LA1 4YX, UK

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ABSTRACT

We examine the impact of the financial crisis on the stock market valuation of large and systemic U.S. bank holding companies (BHCs). Using the Bertsatos and Sakellaris (2016) model of fundamental valuation of bank equity, we provide evidence that the financial crisis has not altered investors' attitudes towards bank characteristics. In particular, before, during, and after the crisis, investors in large and systemic U.S. BHCs seemed to penalize leverage, albeit temporarily. Both before and after the crisis, they reward size in the short run. This pattern is appearing only briefly during the crisis. We also show that bank opacity plays no role in market valuation either in the short run or in the long run. Last but not least, we find evidence that stress testing has been informative to the market and that those BHCs that failed at the post-crisis stress tests were not subsequently valued differently by the market.

1. Introduction

The valuation by market participants of U.S. bank holding companies' (BHCs) stock has fluctuated considerably over the decade of 2004–2014. As regards the price-to-book ratio of equity (PB), we have also observed large, secular declines during and after the financial crisis that erupted in 2007. Calomiris and Nissim (2014) document this secular decline for the universe of U.S. BHCs and explain it in terms of declines in the values of intangibles along with unrecognized contingent obligations. The declines in market valuation have been particularly sharp for the group of very large and systemic U.S. BHCs – a group that has received substantial scrutiny by the market. These are the BHCs that participated in a series of capital assessment exercises and stress tests conducted by U.S. federal regulators starting in 2009 and include eight Global Systemically Important Banks (GSIBs).

Given the unprecedented scrutiny that these BHCs have been subjected to, we ask whether this has altered the way in which investors value these BHCs and at the same time whether stress testing has been informative to the market. Previewing our results, the answer is: not significantly so. To be clear, we do not explore explanations of the secular decline in the PB ratios of bank equity, a matter that has been addressed convincingly by Calomiris and Nissim (2014). These changes in market PB ratios are best thought of as reflecting broadly corresponding changes in equilibrium valuations. Instead, we investigate to what extent short-run deviations between market PB ratios and their fundamental values have changed in nature after the financial crisis and the imposition of the new regulatory requirements. Instead of the cross-sectional variation of PB ratios, we focus on the time-series cross-sectional variation of PB ratios with co-integrating techniques. Another feature that differentiates our work from Calomiris and Nissim (2014) is that we concentrate only on the group of the largest U.S. BHCs.[1] We contrast market movements in BHCs' PB ratios to those derived from the Dynamic Dividend Discount Model (3DM), a model of fundamental valuation developed by Bertsatos and Sakellaris (2016), and analyze divergences between these two valuations. 3DM has attractive features: it establishes an equilibrium

* Corresponding author at: Athens University of Economics and Business, Department of Economics, Patission 76, Athens, 104 34, Greece.
E-mail address: m.tsionas@lancaster.ac.uk (M.G. Tsionas).

[1] The BHCs in our sample are substantially larger (minimum value of assets is 28.6 billion USD) than those classified as large BHCs in their sub-sample (minimum value is 2 billion USD).

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relationship among the PB ratio of equity and measures of fundamentals such as the cost of equity, the expected growth of net income (NI) and modified dividend payout ratio (DPR), and allows for temporary deviations from that relationship.

Our empirical work proceeds in two steps. First, we establish that for large and systemic U.S. BHCs there is an economically meaningful and stable long-run equilibrium relationship between the PB ratio of equity and the aforementioned fundamental variables. Second, we examine whether any short-run divergences of market valuation from this equilibrium relationship are related systematically to observable bank characteristics such as leverage, opacity and size. A striking result that we obtain is that, at any given point in time, there is a large heterogeneity in the degree to which PB ratios of these BHCs are temporarily above or below their long-run equilibrium valuation. Furthermore, these divergences are rather persistent over time. On average, less than three tenths of the gap closes each quarter. We show that divergences from fundamental valuation in PB ratios are created as the market, in general, under-reacts in the short run to changes in fundamentals. The degree of divergence depends on bank characteristics such as leverage and size but not on opacity. In the long run, we show that the estimates of fundamental PB ratios given by 3DM have properly priced risk, growth and cash flows, as proxied by cost of equity, expected growth of net income and modified dividend payout ratio, respectively, throughout the period examined.

We find that short-run divergences between market and fundamental valuation are related systematically to observable bank characteristics such as leverage and size controlling for various macroeconomic variables. In particular, the market tended to temporarily undervalue BHCs with higher leverage, relative to their fundamental valuation, throughout the period we are analyzing. Size seems to have had a positive effect before and after the crisis. In other words, larger BHCs displayed higher overvaluation relative to fundamentals, albeit temporarily so. This effect temporarily disappeared during the crisis but returned after the crisis. We also examine the role of bank opacity and find that it does not affect market participants' valuations in the short run.[2] On the whole, these results indicate that the recent financial crisis has not altered substantially the way that market participants value very large and systemic U.S. BHCs. Moreover, we find evidence that either the GSIB status or the failure at the post-crisis stress-testing exercises (Comprehensive Capital Analysis Review, CCARs) have not affected market valuation of their PB ratios. The only exception is the earlier stress test, i.e. the Supervisory Capital Assessment Program (SCAP), which seems to have had a negative effect on PB market valuation for the failed BHCs. Last but not least, we find evidence that stress testing was informative to the market participants.

In the next section, we present the model of fundamental share valuation, and in section three we discuss our empirical analysis and findings. Finally, in section four we offer some concluding remarks.

2. A bank valuation model

We compute the fundamental values of the BHCs in our sample applying the 3DM of Bertsatos and Sakellaris (2016). According to 3DM, there is an equilibrium relationship between the PB ratio and the cost of equity, expected growth of net income and modified dividend payout ratio.

$$PB = f\left(\overset{-}{r}, \overset{+}{g_{NI}}, \overset{+}{DPR}\right) \tag{1}$$

This equilibrium relationship holds the same for all BHCs in the panel, and is approximated in estimation by a second-order Taylor expansion of $f(.)$. 3DM then applies the Pooled Mean Group (PMG) method of Pesaran et al. (1999) that allows PB ratios to diverge from this equilibrium relationship temporarily. The degree of persistence in such divergence is heterogeneous to each BHC in the panel.

Using the estimates of the long-run relationship (1), we calculate the predicted PB ratios. These are the PB values that would prevail under the estimated model if bank values were at long-run equilibrium.

3. Results and discussion

3.1. Data description

The BHCs in our sample participated in the 2008 Trouble Asset Relief Program (TARP), 2009 Supervisory Capital Assessment Program (SCAP), 2011, 2012, 2013 and 2014 Comprehensive Capital Analysis Review (CCAR), and 2013 and 2014 Dodd-Frank Act Stress Tests (DFAST) exercises conducted by the Fed. Data used is quarterly, from 2003:Q4 to 2014:Q1, i.e. $T = 42$, and refers to values at the end of each quarter. We collected data from Datastream mainly and secondarily from BHCs' SEC filings (10-K and 10-Q) when this was necessary. The aggregate number of BHCs that participated in the 2008 TARP, 2009 SCAP and the consecutive CCARs is 31. Since six of them are either unlisted or subsidiaries of international holding companies and for one of them we have small number of observations, our sample is reduced to 24 BHCs.

Data Construction:

We define **PB** ratio as the market value of equity over its book value at the end of each quarter. There are two issues with this definition that we must address. First, that valuation models reflect the price of a common share. Therefore, all non-common equity should be excluded and only common equity should be used. Second, that at each quarter's end, investors do not know the true value of PB, because the quarter-end's book value of common equity (BVCE) gets published one or two months later. We assume that, in order to calculate PB at quarter-end, investors use in the denominator a forecast of this quarter-end BVCE.

The estimated PB ratio with the forecast of BVCE is constructed as follows: We make this forecast by multiplying the last quarter's (known) BVCE with $(1+g)$, where g is the average of the last five BVCE growth rates, i.e.:

$$g_t = \frac{\sum_{i=1}^{5}\left(\frac{BV(CE)_{t-i} - BV(CE)_{t-i-1}}{BV(CE)_{t-i-1}}\right)}{5} \tag{2}$$

where, $BV(CE)_{t-i}$ is the BVCE at the t-i quarter. Furthermore, we calculate market value of common equity as the product of quarter-end's close price and number of outstanding shares. The number of outstanding shares is adjusted for splits and reverse splits.

We construct **COE**, the cost of equity, assuming that CAPM holds, as the sum of the risk-free rate and beta times equity risk premium (ERP):

$$r_i = r_f + b_i\left[E(R_M) - r_f\right] = r_f + b_i \cdot ERP \tag{3}$$

where, r_i is the BHC-specific COE, r_f is the risk free rate, b_i is the BHC-specific beta coefficient and $E(R_M)$ is the expected market return.

[2] There may be other reasons that market valuation of banks could show (persistent) divergences from fundamental valuation. For example, emerging markets developments, exposure to certain commodities such as oil, fines and impending settlements, and most recently prospects of negative deposit interest rates. Incorporating these are out of the paper's scope. We thank an anonymous referee for this comment.