The financial conglomerate discount: Insights from stock return skewness

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Abstract

The value of financial conglomerates is often discounted than comparable combinations of stand-alone firms. This article explores the hypothesis that expected stock returns contribute significantly to determine this puzzle. In order to approximate the future returns, we measure the skewness of stock returns. The main finding is that diversified banks are largely discounted when their stock returns are less skewed than comparable undiversified firms. This evidence is line with the argument that business diversification destroys upside potential, to the extent that investors expect to receive higher returns from diversified banks than from comparables. The outcomes integrate the existing interpretation for the financial conglomerate discount by drawing attention on the role of expected returns for corporate valuation.

Keywords: financial conglomerates; discount; expected returns; skewness

JEL classification: G21; G32

1 Introduction and review of the literature

The corporate value of financial conglomerates is frequently observed to be discounted in respect to the aggregate value of comparable portfolios of stand-alone firms. This fact is known in the literature as the "financial conglomerate discount" and is seen as a puzzle, which has not received yet an exhaustive interpretation. In fact, this evidence brings to the conclusion that corporate value would increase if conglomerates got dismantled. In other words, business diversification would destroy value to banking corporations.[1]

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[1]Some articles refer to this issue as the"diversification discount" rather than "conglomerate discount," so to emphasize the perverse effect of business diversification for corporate valuation. Throughout this paper, when we quote papers on this subject, we will not make a distinction between the two headings and

Among others, Laeven and Levine (2007) show that diversified banks that engage into lending and non-lending services are discounted compared to undiversified banks. The authors do not identify the causal factors, but they suggest that the discount would arise from agency conflicts that would be especially severe inside large diversified banks. Schmid and Walter (2009) reveals the existence of a persistent conglomerate discount for several types of corporate structures taken by large and diversified financial intermediaries. Van Lelyveld and Knot (2009) show that the discount attached to bank-insurance conglomerates is correlated to their size, risk profile, and the familiarity of investors with the conglomerate business model. Stiroh and Rumble (2006) contend that one "dark side" of diversification inside financial holding companies (FHCs) is to increase their exposure to volatile activities, with consequences for the firm value through missed investment opportunities and increased costs.[2]

The banking literature on this topic is quite limited. The articles cited above agree in documenting the existence of the conglomerate discount, but they do not study exhaustively the determinants for such puzzle. The previous articles that analyze non-financial conglomerates have mainly explained the so-called "cash flow portion" of the discount by showing that business diversification reduces cash flows introducing distortions like capital mis-allocation (Lang et al., 1994; Berger and Ofek, 1995) and agency problems (Lins and Servaes, 1999; Denis et al., 1997). However, there would be also the "expected return portion" to consider (Lamont and Polk, 2001). In fact, assessing corporate value requires to discount the future cash flows at an opportunity rate that reflects the risk of the investment.[3] Expected returns - likewise cash flows - are key elements for corporate valuation. Few papers in the literature hint that investors may not be able to fairly assess conglomerates. Van Lelyveld and Knot (2009) argue that irrational investors end up to mis-price complex and opaque conglomerates, in line with the discussion in Hadlock et al.

will use the term "financial conglomerate discount."Maksimovic and Phillips (2013) provide an overview of the literature dealing with the conglomerate discount inside non-financial industries. However, the empirical evidence is still quite mixed, as for example Campa and Kedia (2002) and Villalonga (2004) obtain results that do not confirm the existence of the conglomerate discount.

[2]The question whether financial conglomerates *on average* trade at a discount remains not solved entirely, since there is evidence that diversification improves the performance of financial conglomerates, as for example Baele et al. (2007) and Elsas et al. (2010).

[3]The discounted cash flow methodology is explained in more depth from Ross et al. (2011), among others.

(1999). Saunders and Walter (2012) maintain that both universal banks and financial conglomerates bear discounts that origin from capital mis-allocation as well as portfolio-selection effects, due to investors that are not able to "take the view" of complex corporate structures while they prefer to remain undiversified. The above papers corroborate the idea that it would be meaningful to investigate expected returns in order to understand more precisely the valuation of financial conglomerates. Nonetheless, until now we could not find empirical research that corroborates this claim. Instead, the aim of this article is to provide quantitative evidence for the argument that we can interpret the financial conglomerate puzzle by casting attention on the role of expected returns for corporate valuation.

We analyze banks in the United States during 2005-2017 and use the skewness of stock returns in order to identify bank expected returns, thereby following the stream of research that argues that stock return skewness reveals information on future expected performance.[4] The argument is that stocks with right-tailed returns have higher probability of benefiting from huge gains than of suffering from huge losses, therefore investors, ceteris paribus, prefer assets with positive skewness and demand higher expected returns to negatively skewed stocks in order to compensate the risk of bad performance. We follow the approach of Lang et al. (1994) and Berger and Ofek (1995), among others, that is known as "chop shop." This methodology requires that we construct for each diversified bank of the sample a comparable combination of stand-alone firms. The main idea is to compare the value of the bank to the value of the mimicking portfolio of firms. The difference between the two quantities approximates the size of the discount attached to the conglomerate; i.e. the bank is asserted as discounted if it has lower value than its mimicking portfolio. Corporate value is measured primarily with Tobins'q, see Laeven and Levine (2007). Instrumental variable regressions show that the value of diversified banks is substantially lower than the value of comparable undiversified firms when their expected

[4]The seminal papers advancing the hypothesis that skewness and expected returns are inversely related are Arditti (1967) and Scott and Horvath (1980). The empirical evidence remains though mixed. For example, Brunnermeier et al. (2007) and Barberis and Huang (2008) provide a theoretical framework that justifies the link between skewness and expected returns. Among others, the correlation between skewness and expected returns is negative in the articles of Mitton and Vorkink (2007), Bali and Murray (2013) and Conrad et al. (2013), while it is positive in the articles of Stilger et al. (2016) and Bali et al. (2017).

returns are higher than the returns of the comparables. This evidence is in line with the hypothesis that business diversification subtracts upside potential. As a consequence of the worse prospects, investors demand higher returns from diversified banks rather than from comparable combinations of single-segment firms. In fact, investors will hold financial conglomerates only if they get a discount, otherwise they will remain undiversified and buy separately the conglomerate units.

The results are robust to the computation of both sample-based skewness (Mitton and Vorkink, 2007, 2010; Boyer et al., 2010; Del Viva et al., 2017), as well as option-implied skewness (Malz, 2014). The main advantage of using option-implied moments is that they are forward-looking quantities, i.e they are more consistent with the concept of expected returns (Chang et al., 2013; Conrad et al., 2013). We further verify the link between skewness and realized (i.e. ex-post) stock returns. In fact, under the rational expectation hypothesis, on average the realized ex-post stock returns correspond to the ex-ante required returns. In our sample realized returns and skewness correlate negatively, implying that rational investors accept lower expected returns for right-skewed stocks. Furthermore, additional asset pricing tests detect that bank stock returns entail a premium for negative skewness.

The set of outcomes confirm that a substantial share of the financial conglomerate discount is driven by interactions arising between business diversification and future returns. This statement adds to the current wisdom that frictions within the cash flow management of large corporations are the main responsible for the driver of conglomerate discount

The article proceeds as follows. Section 2 introduces the sample and the main variables that we use in the analysis. Section 3 performs empirical tests in order to verify the hypothesis that diversified banks trade at a discount compared to portfolios of standalone firms because of differences in the expected returns explained by skewness-based measures. Section 4 conducts robustness tests. Section 5 concludes.

2 Sample and variables

2.1 Sample

S&P Global Market Intelligence Platform provides quarterly accounting and market based data for financial companies classified as "bank" in the United States during the time span 2005q1-2017q4. The series of monthly stock prices are downloaded from Thomson Reuters Datastream. Table 1 reports descriptive statistics for the variables of the empirical analysis. The goal is to illustrate that expected returns contribute significantly to the discount attached to diversified banks.

2.2 Excess value

The vast majority of the literature studies the conglomerate discount implementing the so-called "chop-shop" approach, initiated by LeBaron and Speidell (1987), Lang et al. (1994), and Berger and Ofek (1995). The idea is to replicate the conglomerate by constructing a portfolio of stand-alone firms in such a way that the conglomerate and the portfolio offer a similar degree of business diversification. If a conglomerate is worth less than the comparable portfolio, then we identify the conglomerate as discounted. This finding implies that value would increase if the conglomerate got dismantled, namely when the units are independent and do not form a unique corporation.

We cannot apply the "chop-shop" approach straightforward to our banks, because in the database we cannot find their number of divisions or segments. To deal with this issue, we follow Laeven and Levine (2007), who analyze data of financial conglomerates. For each firm j we define the excess value as the difference between the Tobin's q and the imputed "activity adjusted" Tobin's q.[5] Tobin's q is the sum of common equity market value, book value of preferred shares, and book value of total debt divided by book value of total assets. Using Tobin's q has the important advantage that we can compare value

[5] Lang et al. (1994) and Berger and Ofek (1995) are the seminal papers that find evidence for the conglomerate discount by testing the Tobin's q of firms. More recently Laeven and Levine (2007) uses Tobin's q to analyze financial conglomerates. Mitton and Vorkink (2010) analyzes the company excess value by taking the natural logarithm of Tobin's q. Given that inside our sample the distribution of the variable for Tobin's q is not very highly skewed, we prefer to report the regression results obtained as using the point value of Tobin's q. Our results do not change qualitatively when we use the log-value.

across firms without needing to adjust for risk or leverage, as motivated by Lang et al. (1994) and Laeven and Levine (2007).

We define the Tobin's q imputed to bank j as the value attached to a portfolio made by a specialized commercial bank and a specialized investment bank. The weight of the two firms inside the portfolio is proportional to the loans-to-assets ratio α of the conglomerate Laeven and Levine (2007). Namely, the idea is to compute the value of a combination of two firms which taken together provide the same asset diversification of the conglomerate. Specialized commercial (specialized investment) banks are identified by α lying above 90 percent (below 10 percent). To summarize, the excess value for bank j at time t is computed as follows:

$$\textit{Activity-adjusted } q_{j,t} = \left(\alpha_{j,t} q^1 + (1 - \alpha_{j,t})\, q^2\right) \tag{1}$$

$$\begin{aligned} Excess\ value_{j,t} &= q_{j,t} - \textit{Activity-adjusted } q_{j,t} = \\ &= q_{j,t} - \left(\alpha_{j,t} q^1 + (1 - \alpha_{j,t})\, q^2\right) \end{aligned} \tag{2}$$

$$\alpha_{j,t} = \frac{Loans_{j,t}}{Total\ assets_{j,t}}$$

$$q^1 = Mean\ q\ for\ specialized\ commercial\ banks$$

$$q^2 = Mean\ q\ for\ specialized\ investment\ banks$$

On average the excess value for our diversified banks is 0.038 (see Table 1). This implies that the firms are not able to generate substantial value in excess to the value of the comparable portfolios. However, Laeven and Levine (2007) point out that using Tobin's q to evaluate banks may pose some concerns. We take this issue into consideration as we test in the following analyses also an alternative measure for corporate value. Specifically, we compute the ratio of share price to book value per share. The price-to-book ratio is frequently used by market practitioners for company valuation, especially in the case of financial institutions. Empirical studies do often use the price-to-book ratio to gauge the growth option of the firm (Bernardo et al., 2007). Based on the price-to-book ratio the

excess value of our banks is on average negative, meaning that diversified banks generate less value than comparables.

2.3 Excess skewness

According to Arditti (1967) and Scott and Horvath (1980) stocks with positive skewness exposure command a pricing premium. In fact, investors have a strict preference for positive skewness. When stock returns are positively skewed, the distribution has more mass for large positive outcomes than for large negative outcomes, meaning that it is more likely that the firm will benefit from positive gains than suffering losses. The consequence is that investors will pay a premium for assets entailing positive return skewness. In contrast, negative skewness indicates a high probability of shortfalls. Investors will incur downside potential only for a pricing discount, in order to be compensated by higher expected returns. The approach of our study relies on the approximation of expected returns with skewness-based measures (Mitton and Vorkink, 2007, 2010; Boyer et al., 2010). For each bank j and quarter t, the following quantity approximates the total skewness over the last twelve monthly stock returns r:

$$\hat{\gamma}_{j,t} = \frac{\frac{1}{12}\sum_{t=1}^{12}\left(r_{j,t} - \bar{r}_j\right)^3}{\hat{\sigma_j}^3} \tag{3}$$

The total skewness in our sample is on average 0.130. In the robustness section of the paper we disentangle the contribution from idiosyncratic skewness and systematic skewness (or, coskewness). In addition, we also test a measure of skewness extracted from stock options data.

Denoting the skewness measure with $\hat{\gamma}_{j,t}$, for each firm j we define the "excess skewness" analogously to the excess value. Namely, the excess skewness is the skewness exceeding the skewness computed for the portfolio of firms replicating the asset diversification of bank j:

$$Excess\ \hat{\gamma}_{j,t} = \hat{\gamma}_{j,t} - \left(\alpha_{j,t}\hat{\gamma}^1 + (1-\alpha_{j,t})\,\hat{\gamma}^2\right) \tag{4}$$

The quantity in (4) compares the skewness of bank j to the skewness of its mimicking portfolio. When the excess skewness is negative, it means that investors might demand a

higher expected return to the bank than to the portfolio, i.e. a discount in the corporate value of j.

Table 1: Descriptive statistics of variables

Variable	Mean	Median	Standard deviation
$\hat{\gamma}$	0.130	0.083	0.666
q	0.147	0.139	0.066
Price/book	1.470	1.341	0.642
Total assets	88,900,000	5,445,157	306,000,000
α	0.634	0.662	0.138
Return on assets	0.882	0.970	1.180
Not performing assets/assets	1.356	0.870	1.518
Excess value	0.038	0.030	0.067
Excess price/book	-0.110	-0.238	0.640
Excess $\hat{\gamma}$	0.238	0.192	0.667

2.4 Corporate value and skewness by proxies for diversification

This subsection gives an overview in simple and unconditional terms on how far corporate value and skewness behave with business diversification. The excess value in (2) assumes that bank business diversification is inversely proportional to the loans-to-assets ratio. Namely, a firm with a low ratio should operate into a variety of activities beside the "traditional" loan making. Table 2 separates firms by quartiles of loans-to-assets. The skewness in the first quartile is almost half of the skewness in the other quartiles where we have a large number of diversified firms.

Arguably, firm diversification and size should move in parallel, since we expect that a big company has a large variety of investments. Table 3 illustrates that banks in the highest quartile of size have also the lowest loans-to-assets ratio, confirming that the largest banks are relatively less active in loan making. These firms display less skewness than the other firms, and the pattern gives insights similar to Table 2.

Table 4 splits the sample by quartiles of Tobin's q. Firms with a higher value are also the institutions that have smaller share of the total assets of the sample. Thus, Table 4 exhibits more clearly than Table 3 that size correlates negatively with the value of banks.

The skewness of the banks with highest Tobin's q is higher than the skewness inside first and second quartile.

Table 5 estimates simple pooled least squares regressions. The significant signs that we estimate for the logarithm of total assets and for the loans-to-assets ratio confirm that both skewness and value decrease significantly with bank size and diversification. Encouraged by such evidence, in the next section we analyze in more depth to what extent the value of banks is related to skewness effects. For Tables 2-5, the Kruskal-Wallis test rejects always the null hypothesis that across quartiles the mean value of our variables are taken from the same population.

Finally, within the sample we are able to isolate the firms classified as financial holding companies (FHCs). Amendments to the bank holding company Act in 1999 (i.e. the Gramm-Leach-Bliley Act) permitte a bank holding company to declare itself a FHC and thereby to engage in financial activities, including securities underwriting and dealing, insurance agency and underwriting activities, and merchant banking activities. Arguably, FHCs are more diversified than not-FHCs. As expected, Table 6 shows that FHCs are less skewed. Overall, these additional outcomes reinforce the idea that diversification subtracts skewness to bank returns.

Table 2: Quartiles of loans-to-assets

Quartiles of α	$\hat{\gamma}$	**q**	**Total assets**	α
1	0.076	0.149	260,000,000	0.440
2	0.147	0.138	50,300,000	0.620
3	0.159	0.143	33,500,000	0.697
4	0.137	0.158	11,100,000	0.780
Kruskal-Wallis rank test (χ^2)	20.329***	57.168***	504.184***	-

* p<0.05, ** p<0.01, *** p<0.001

Table 3: Quartiles of total assets

Quartiles of total assets	$\hat{\gamma}$	**q**	**Total assets**	α
1	0.266	0.144	1,537,232	0.670
2	0.114	0.151	3,811,772	0.663
3	0.124	0.160	10,300,000	0.631
4	0.015	0.133	340,000,000	0.573
Kruskal-Wallis rank test (χ^2)	118.664***	174.875***	-	400.561***

* p<0.05, ** p<0.01, *** p<0.001

Table 4: Quartiles of q

Quartiles of q	$\hat{\gamma}$	**q**	**Total assets**	α
1	0.108	0.074	186,000,000	0.612
2	0.089	0.122	94,300,000	0.641
3	0.136	0.157	51,700,000	0.643
4	0.187	0.235	23,300,000	0.641
Kruskal-Wallis rank test (χ^2)	22.674***	-	21.117***	47.551***

* p<0.05, ** p<0.01, *** p<0.001

Table 5: The effect of size and loans-to-assets (α) on bank total skewness and Tobin's q

	(1)	(2)	(3)	(4)
	$\hat{\gamma}$	$\hat{\gamma}$	q	q
Log(total assets)	-0.0509***		-0.00427***	
	(0.00429)		(0.000408)	
α		0.233***		0.0392***
		(0.0622)		(0.00648)
Constant	0.944***	-0.0184	0.215***	0.122***
	(0.0702)	(0.0405)	(0.00682)	(0.00411)
N	6130	6130	6129	6129
R^2	0.020	0.002	0.014	0.007

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Financial holding companies (FHCs) versus non financial holding companies (non FHCs)

Banks	$\hat{\gamma}$	**q**	**Total assets**	α
FHCs	0.098	0.142	144,000,000	0.611
Non FHCs	0.177	0.154	7,010,220	0.669
Wilcoxon-Mann-Whitney test (F)	5.138***	8.134***	-27.405***	17.177***

* p<0.05, ** p<0.01, *** p<0.001

3 The effect of bank excess skewness on excess value

The goal of this section is to verify the hypothesis that we can explain the discount in the value of diversified banks by measuring stock return skewness to approximate their future performance. We follow the approach of Mitton and Vorkink (2010), that use instrumental variable regressions to relate firm excess value to excess skewness. More precisely, we estimate the following panel regression model in two steps:

$$Excess\ value_{j,t} = \beta_0 + \beta_1 Excess\ skewness^*_{j,t} + \theta X_{j,t} + \nu_t + \upsilon_j + \epsilon_{j,t} \tag{5}$$

where the excess value of bank j for quarter t is regressed on the excess skewness for the same quarter. $X_{j,t}$ is the vector of instruments that includes the logarithm of total assets, the return-on-assets, and the ratio of not performing assets over assets. ν_{t} and υ_{j} capture time and bank fixed effects, as they control for potential time-invariant and firm-specific characteristics that could bias the outcomes. The error term of the regression is denoted with $\epsilon_{j,t}$. The $excess\ skewness^*_{j,t}$ is the series of values predicted by a preliminary estimation where the excess skewness for quarter t is made regress on the $t-1$ skewness and stock return Mitton and Vorkink (2010):

$$Excess\ skewness_{j,t} = \alpha_0 + \alpha_1 Skewness_{j,t-1} + \alpha_2 r_{j,t-1} + \tau_t + \psi_j + \omega_{j,t} \tag{6}$$

The linear prediction from the fitted model (6) provides the excess skewness at t as predicted on the base of the $t-1$ variables. This prediction enters as explanatory variable into (5).

Table 7 shows that the estimated coefficient β_1 is positive and significant. The magnitude of this effect is higher for the price-to-book ratio. This evidence confirms the working argument that the value of diversified banks is more largely discounted as long as their expected returns increase, i.e. our outcomes for banks are in line with Mitton and Vorkink (2010) for non-financial firms.

Table 7: The effect of excess skewness on bank excess value

	(1) Excess value	(2) Excess price/book
Excess $\hat{\gamma}$	0.0108***	0.129***
	(0.00124)	(0.0115)
Log(total assets)	-0.0147***	-0.314***
	(0.00157)	(0.0146)
Return on assets	0.00785***	0.0409***
	(0.000487)	(0.00455)
Not performing assets/assets	-0.0180***	-0.205***
	(0.000478)	(0.00447)
Constant	0.286***	5.031***
	(0.0248)	(0.231)
Bank fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
N	5434	5432
R^2	0.292	0.353

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4 Robustness Tests

4.1 Idiosyncratic skewness and coskewness

Total skewness can be decomposed into idiosyncratic skewness and coskewness (or, systematic skewness). In principle, both components should matter for asset pricing, although

there is no clear evidence if one of the two is predominant.[6]. Coskewness measures the amount of covariance with the squared market return that a security's returns adds to the investor's portfolio. Positive coskewness tells whether both the stock and the market portfolio undergo extreme positive deviations at the same time. According to the seminal paper of Kraus and Litzenberger (1976), market valuations incorporate only coskewness. Harvey and Siddique (2000) find that conditional coskewness explains the cross-sectional variation of expected returns across assets. In contrast, Mitton and Vorkink (2007) show that idiosyncratic skewness plays an important role for equilibrium prices as well. To take this decomposition into consideration, we disentangle the coskewness of bank j at time t following Kraus and Litzenberger (1976), and denote with $\hat{\gamma}(KL)_{j,t}$ the coskewness coefficient in the following equation:

$$\hat{\gamma}(KL)_{j,t} = \left[\sum_{t=1}^{12}(r_{m,t}-\bar{r}_m)^2(r_{j,t}-\bar{r_j})\right] / \left[\sum_{t=1}^{12}(r_{m,t}-\bar{r}_m)^3\right], \tag{7}$$

where r_m, t denotes the market return. Following Mitton and Vorkink (2007), we test also one further measure for the coskewness of bank j, namely the coefficient $\hat{\gamma}(MV)_{j,t}$ estimated from the following regression on the squared market excess return:

$$r_{j,t} - r_f = \alpha + \beta_j(r_{m,t} - r_f) + \hat{\gamma}(MV)_{j,t}(r_{m,t} - r_f)^2 + \epsilon_{j,t}, \tag{8}$$

where r_m, t is the market portfolio return and r_f is the risk-free rate of return. The coefficient in (3) as computed for the residuals ϵ from (8) allows to quantify the idiosyncratic skewness of bank j at t (Mitton and Vorkink, 2007).[7]Table 8 shows that the idiosyncratic skewness of the sample is 0.107, namely slightly below the total skewness of 0.130 as re-

[6]Boyer et al. (2010) show that stock returns are negatively correlated with expected idiosyncratic skewness, in line with the theories in Mitton and Vorkink (2007), Brunnermeier et al. (2007), Barberis and Huang (2008), Brunnermeier and Parker (2005)

[7]Some scholars measure coskewness and idiosyncratic skewness with different techniques than how we proceed in the analysis. For example, Harvey and Siddique (2000) construct a direct measure of coskewness using the residuals from the regression of excess returns on contemporaneous market excess returns. Del Viva et al. (2017) approximates idiosyncratic skewness computing (3) for the residuals of a simple market model, while Boyer et al. (2010) determines (3) for the residuals of a market model that includes also the three factors of Fama and French (1993).

ported in Table 1. Instead, the coskewness of the sample is on average higher than the total skewness.

We compute the quantity in (4) for idiosyncratic skewness and coskewness and conduct regressions as in (5). Disentangling the excess of skewness into idiosyncratic and coskewness, we obtain that the two separated components have positive sign on the bank excess value. In particular, we notice that the coefficients on idiosyncratic skewness inside Table 9 are only slightly higher than the coefficients estimated on total skewness inside Table 7. Instead, the positive impact from excess coskewness on excess of bank value is quite low in absolute terms, although still statistically significant. The conclusion is that the baseline results that we get for total skewness are mainly driven by idiosyncratic skewness.

Table 8: Descriptive statistics of variables for idiosyncratic skewness and coskewness (KL and MV)

Variable	**Mean**	**Median**
$\hat{\gamma}(idiosyncratic)$	0.107	0.092
$\hat{\gamma}(KL)$	1.237	1.030
$\hat{\gamma}(MV)$	0.793	-0.175
Excess $\hat{\gamma}(idiosyncratic)$	0.100	0.084
Excess $\hat{\gamma}(KL)$	0.104	0.065
Excess $\hat{\gamma}(MV)$	2.388	0.606

Table 9: The effect of excess idiosyncratic skewness on bank excess value

	(1) Excess value	(2) Excess price/book
Excess $\hat{\gamma}(idiosyncratic)$	0.0140***	0.173***
	(0.00193)	(0.0181)
Log(total assets)	-0.0134***	-0.298***
	(0.00160)	(0.0149)
Return on assets	0.00790***	0.0415***
	(0.000493)	(0.00462)
Not performing assets/assets	-0.0178***	-0.203***
	(0.000483)	(0.00453)
Constant	0.266***	4.784***
	(0.0253)	(0.237)
Bank fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
N	5434	5432
R^2	0.276	0.332

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: The effect of excess coskewness on bank excess value

	(1) Excess value	(2) Excess price/book	(3) Excess value	(4) Excess price/book
Excess $\hat{\gamma}(KL)$	0.00324***	0.0348***		
	(0.000457)	(0.00428)		
Excess $\hat{\gamma}(MV)$			0.000291***	0.00342***
			(0.0000283)	(0.000264)
Log(total assets)	-0.0151***	-0.318***	-0.0194***	-0.370***
	(0.00160)	(0.0150)	(0.00163)	(0.0152)
Return on assets	0.00800***	0.0428***	0.00782***	0.0406***
	(0.000496)	(0.00466)	(0.000485)	(0.00454)
Not performing assets/assets	-0.0176***	-0.200***	-0.0180***	-0.204***
	(0.000487)	(0.00458)	(0.000475)	(0.00446)
Constant	0.294***	5.117***	0.363***	5.937***
	(0.0253)	(0.237)	(0.0258)	(0.241)
Bank fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
N	5434	5432	5434	5432
R^2	0.267	0.320	0.230	0.354

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.2 The relationship between bank skewness and realized stock returns

Under the rational expectation hypothesis, on average the realized ex-post stock returns correspond to the ex-ante required returns. In this subsection we analyze the relationship between skewness and realized bank returns. For every quarter t we compute the accumulate stock returns realized over the next three months. Table 11 displays that skewness and realized returns move into opposite directions. The Kruskal-Wallis test rejects the null hypothesis that the mean skewness and the mean realized returns across quartiles are not statistically different from each other. That is, high bank returns go along with low skewness.

Table 11: Average returns across quartiles of skewness and average skewness across quartiles of stock returns

Quartiles of $\hat{\gamma}$	$\hat{\gamma}$	r	**Quartiles of r**	r	$\hat{\gamma}$
1	-0.672	0.038	**1**	-0.147	0.158
2	-0.104	0.029	**2**	-0.012	0.140
3	0.296	0.024	**3**	0.054	0.136
4	0.999	0.016	**4**	0.214	0.084
Kruskal-Wallis rank test (χ^2)	-	9.265*		-	11.759**

* p<0.05, ** p<0.01, *** p<0.001

Finally, we perform a regression similar to (5) that verifies to what extent the bank discount is connected to realized stock returns. The independent variable is the excess realized return computed as in (4). According to our hypothesis, Table 12 shows that excess value is inversely related to excess realized returns.

Table 12: The effect of excess realized stock returns on bank excess value

	(1) Excess value	(2) Excess price/book
Excess realized returns	-0.0610***	-0.709***
	(0.00505)	(0.0468)
Log(total assets)	-0.0131***	-0.296***
	(0.00154)	(0.0143)
Return on assets	0.00852***	0.0488***
	(0.000480)	(0.00446)
Not performing assets/assets	-0.0171***	-0.194***
	(0.000472)	(0.00439)
Constant	0.262***	4.761***
	(0.0245)	(0.227)
Bank fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
N	5434	5432
R^2	0.317	0.383

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.3 Computing the stock return skewness for a longer time horizon

In (3) the skewness at t is calculated with the prior twelve monthly stock returns. In order to check that this choice does not affect substantially the final regression results, we compute skewness (total, idiosyncratic, and coskewness) also with 60 monthly stock returns (for example, Mitton and Vorkink (2007) and Boyer et al. (2010) use 60-month data for the estimation of skewness). Table 13 shows that our baseline results do not change qualitatively when we calculate the skewness measures over a longer time horizon.

Table 13: The effect of excess skewness on bank excess value. Return-based skewness computed on 60 months

	(1) Excess value	(2) Excess value	(3) Excess value	(4) Excess value
Excess $\hat{\gamma}$ (5y)	0.0167***			
	(0.00124)			
Excess $\hat{\gamma}(idiosyncratic\text{-5y})$		0.0102***		
		(0.00128)		
Excess $\hat{\gamma}(KL\text{-5y})$			0.00209*	
			(0.00103)	
Excess $\hat{\gamma}(MV\text{-5y})$				-0.00178***
				(0.000192)
Log(total assets)	-0.0147***	-0.0135***	-0.0170***	-0.0158***
	(0.00185)	(0.00189)	(0.00201)	(0.00187)
Return on assets	0.00627***	0.00685***	0.00758***	0.00772***
	(0.000619)	(0.000623)	(0.000640)	(0.000623)
Not performing assets/assets	-0.0182***	-0.0182***	-0.0179***	-0.0175***
	(0.000612)	(0.000620)	(0.000629)	(0.000622)
Bank fixed effects	Yes	Yes	Yes	Yes
N	3605	3605	3605	3605
R^2	0.282	0.266	0.242	0.263

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.4 Asset pricing tests

The goal of this subsection is to verify the hypothesis that stock returns of diversified banks incorporate a premium for negative skewness. To deal with this task we conduct a number of asset-pricing tests.[8] In the first place we analyze the pricing errors from different models. More specifically, we compare a standard three-factor Fama-French model (see Fama and French, 1993) to a model that includes a fourth factor for skewness (Harvey and Siddique, 2000).[9] The magnitude of the pricing error is assessed computing the F-statistic of Gibbons et al. (1989). For this exercise we specify the following four-factor model for the time series of returns exceeding the risk free rate r_f:[10]

$$r_{j,t} - r_f = \alpha + \beta_1 r_{MKT,t} + \beta_2 r_{SMB,t} + \beta_3 r_{HML,t} + \beta_4 \hat{\gamma}_{j,t} + \varepsilon_t \tag{9}$$

Table 14 reports the estimates from (9). We notice that excess returns are sensitive to the market return, plus size and market-to-book factors. The negative sign on the regressor measuring skewness suggests that the return premium is negative for stocks with positive skewness. According to the test developed by Gibbons et al. (1989) the two models fit the observed returns, since for both models we cannot reject the null hypothesis that the pricing error is equal to zero. We obtain consistent results when we conduct the procedure of Fama and MacBeth (1973) in Table 15. Fama and MacBeth (1973) develop a two-step regression to test whether certain factors are able to describe stock returns, with the ultimate goal to find the premium from exposure to these factors. The negative sign on skewness that we observe in Table 15 indicates that a unit exposure to skewness over time decreases the expected risk premium at the five percent level of significance.

[8] Amaya et al. (2015) compute realized moments for equity returns. They show that strategies based on buying stocks in the lowest realized skewness decile while selling stocks in the highest realized skewness decile generates substantial returns.

[9] The details on how the Fama and French (1993) factors are calculated can be found at `http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_factors.html`.

[10] F $\sim$ (N, T-N-1), where T is the number of observations and N is the number of explanatory variables.

Table 14: Regression models for bank return in excess to the risk-free rate

	(1)	(2)
	$r - r_{\mathrm{f}}$	$r - r_{\mathrm{f}}$
r_{MKT}	0.402***	0.405***
	(0.0299)	(0.0299)
r_{SMB}	0.149*	0.144*
	(0.0647)	(0.0647)
r_{HML}	-0.522***	-0.521***
	(0.0378)	(0.0377)
$\hat{\gamma}$		-0.0123***
		(0.00298)
Constant	0.0155***	0.0170***
	(0.00208)	(0.00211)
N	6130	6130
R^2	0.051	0.054
F-test	60.065***	69.788***

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 15: Second step of the asset pricing test developed by Fama and MacBeth (1973)

	(1)	(2)
	$r - r_{\mathrm{f}}$	$r - r_{\mathrm{f}}$
r_{MKT}	0.00189*	0.00219*
	(0.000899)	(0.000896)
r_{SMB}	0.0101***	0.0106***
	(0.00102)	(0.00104)
r_{HML}	0.00207	0.000258
	(0.00275)	(0.00282)
$\hat{\gamma}$		-0.0225*
		(0.00991)
Constant	0.0238***	0.0223***
	(0.00202)	(0.00210)
N	147	147
R^2	0.425	0.445

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.5 Option-implied skewness

Chang et al. (2013) and Conrad et al. (2013) claim that the skewness of the option-implied return distribution provides a better prediction for the future expected returns than the historical return-based skewness. The aim of this section is to analyze option-based skewness in relation to bank diversification and value. To accomplish the task we obtain stock option data from Datastream. However, only a very small group of banks has listed stock options. Some data start in 2008, but we are left with a very unbalanced panel. Table 16 shows descriptive statistics for this group, compared to the rest of the banks without listed options.

Table 16: Banks with stock options versus banks without stock options

	Banks without stock options Mean	**Banks with stock options** Mean	**Wilcoxon-Mann-Whitney test (F)**
Total assets	47,700,000	420,000,000	-37.918
q	0.149	0.126	8.86
Price/book	1.504	1.220	11.152
Stock returns	0.025	0.046	-4.476
Loans/assets	0.644	0.566	12.622
$\hat{\gamma}$	0.153	-0.077	9.269
$\hat{\gamma}$**(RN)**	-	0.342	-
N	5519	679	-

Clearly, the banks with listed options are the biggest institutions of our sample. These corporations are more largely diversified, as can be assessed from the loans-to-assets ratio equal to 56 percent, whereas this quantity is 64 percent for the remaining banks. The return-based total skewness for well diversified banks is -0.077, against the much higher skewness of 0.153 in the other banks. Again, there seems to be a positive return premium for negative skewness that results in low values for Tobins'q and price-to-book ratio.

We are able to develop a measure for the skewness implied by stock options. We calculate the risk-neutral density with the following algorithm. Denote the risk-neutral density of S_τ as seen at time t by $\pi_{t,\tau}(\cdot)$. If a smooth strike X-continuum of expiry τ call option prices were observable at time t, $\mathrm{c}_{t,\tau}(X)$, then under absence of arbitrage, this density could be inferred in a model-free way. As shown first by Breeden and Litzenberger (1978) we have

$$\pi_{t,\tau}(X) = e^{r\tau}\frac{\partial^2 \mathrm{c}_{t,\tau}(X)}{\partial X^2}. \tag{10}$$

In reality, only a discrete set of strikes are available, which means that a considerable amount of smoothing and curve fitting is needed before equation (10) can be used to produce sensible numbers. Figlewski (2010, Section 2) provides a taxonomy of methods that are used for this purpose. We prefer to use the non-parametric clamped spline approach from Malz (2014), which is designed to avoid arbitrage opportunities that may arise for other non-parametric approaches. In line with all other techniques, the procedure requires data of reasonably good quality on the Black-Scholes implied volatility smile. The volatility smile changes over time and with different tenors, resulting in the so-called volatility surface $\sigma(t, X, \tau)$. The volatility surface translates into the market price of European call options:

$$c(t, X, \tau) = BS\left(S_t, X, \tau, \sigma(t, X, \tau), r_t, q_t\right), \tag{11}$$

with r_t and q_t the continuously compounded interest rate and cash dividend yield of the underlying asset. We focus here on a single tenor τ, rather than the entire surface. The technique can be summarized in three steps:

1. Interpolate and extrapolate the volatility smile using a cubic spline function that is *clumped* at the endpoints. This corresponds to the assumption, that for very deep out-of-the-money options the implied volatility is the same and equal to the furthest strikes in the input data. Clamping the interpolated smile ensures the call valuation function to be monotonic and convex in the exercise price, avoiding in this way violations of no-arbitrage restrictions.

2. In order to calculate option prices, we use (11) by taking interpolated implied volatilities as arguments.

3. Numerically difference the call valuation function with respect to the exercise price in order to approximate the density function $\pi_{t,\tau}(X)$. Therefore, the exercise-space is discretized with a step size Δ:

$$\pi_{t,\tau}(X) \approx e^{r_t \tau} \frac{1}{\Delta^2} \left[c\left(t, X + \Delta, \tau\right) + c\left(t, X - \Delta, \tau\right) - 2c\left(t, X, \tau\right)\right]. \tag{12}$$

As $\Delta \to 0$, (12) converges to the risk-neutral density.

The skewness coefficient computed for the risk-neutral density expressed by (12) is denoted with $\hat{\gamma}(RN)$.

Although with a small number of options data we can only bring a small contribution to the main argumentation, the descriptive statistics of Table 16 confirm the statement that diversification and skewness are inversely related. In Table 17 we estimate simple regressions that explain option-based skewness as a function of size and loans-to-asset ratio. The negative coefficients that we obtain for the risk neutral skewness corroborate our opinion that diversification as captured by large size or low loans-to-assets ratio erodes skewness.

Table 17: The effect of size and loans-to-assets on on bank options-implied risk-neutral skewness

	(1)
	$\hat{\gamma}$(RN)
Log(total assets)	-0.318***
	(0.0326)
α	0.704***
	(0.162)
Constant	5.983***
	(0.624)
N	679
R^2	0.143

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5 Conclusions

This article contributes to the understanding of the conglomerate puzzle from a different standpoint than the prior literature. While earlier articles have attempted to explain such puzzle in terms of cash flows inefficiencies, we draw the attention on the importance of expected returns for corporate valuation. We measure stock return skewness to explore the hypothesis that differences among the expected returns deduced by skewenss contribute

to determine the value discount of financial conglomerates in respect to comparable undiversified firms.

The empirical outcomes corroborate the argument that business diversification reduces the upside potential of banks' equity, i.e. it increases the likelihood to underperform. As long as low skewness command high return premiums for the future, then the results lead to the conclusion that investors demand high returns from diversified banks in order to compensate the lack of good prospects. Thus, the financial conglomerate discount would reflect equityholders' expectations against the disruptive consequences for corporate value that follow increasing business diversification.

Finally, by proposing to use skewness for the identification of future returns, we illustrate that methodologies developed in the asset pricing research can be employed in synergy with the corporate financial literature to address jointly the study of company valuation.

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