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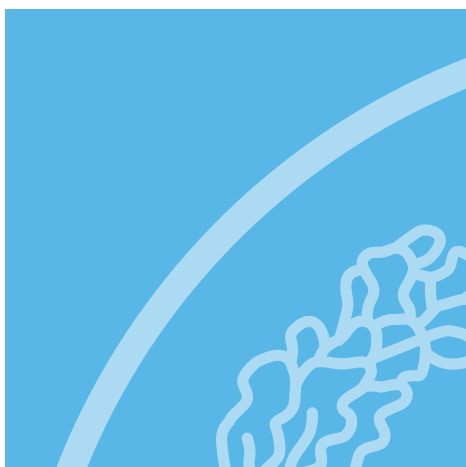## At the Center of Banking Since 1853®

Why Have Banks' Market-to-Book Ratios Declined?

October 2016

WHY HAVE BANKS' MARKET-TO-BOOK RATIOS DECLINED?[1]

As has been widely observed, the ratio of price-to-tangible book value (P/TBV) for banks has declined in the post crisis period.[2] In this research note we show that most of the decline in price-to-tangible book value of equity in the post-crisis period is driven by the fall in banks' profitability as measured by the return on tangible common equity (ROTCE).[3] We also show that both the decline in P/TBV and ROTCE is particularly pronounced for banks above $10bn in total consolidated assets. We then explore possible explanations for this finding, including the role of major changes in regulatory policies.

Understanding the sources of the decline in the market value of banks' equity is important for an assessment of the efficacy of post-crisis regulatory reforms. New regulations have required banks to hold substantially more capital and made their balance sheets substantially more liquid, thereby making banks more resilient to adverse economic and financial shocks. However, if changes in regulation have also caused the market value of bank equity to decline, then its benefits are substantially reduced as banks are unable to benefit via reduced costs of raising capital. Moreover, as pointed out by Baker and Wurgler (2015) bank equity risk increases markedly with market leverage (measured as the quasi-book value of assets to the market value of equity), thus a decrease in the market value of bank equity leads to an increase in bank equity risk.[4] This outcome has led some researchers to suggest that banks' have become riskier, challenging the efficacy of post-crisis reforms.[5]

DECREASE IN PRICE-TO-TANGIBLE-BOOK-VALUE RATIO

Exhibit 1 illustrates the sizeable decline in P/TBV that has occurred post-crisis, and how that decline becomes more pronounced as bank size increases. For instance, for banks greater than $250bn in total assets P/TBV multiples compressed from 3.7x to 1.8x, whereas for banks between $1bn and $10bn in total assets P/TBV multiples declined from 2.3x to 1.5x. That is, P/TBV multiples between the largest banks and community banks are roughly equal in the post-crisis period while they were significantly higher for the largest banks pre-crisis.

BANK PROFITABILITY AND ITS RELATIONSHIP TO PRICE-TO-TANGIBLE-BOOK-VALUE RATIO

Exhibit 2 compares the decline in ROTCE and the decrease in P/TBV since the pre-crisis period across all five bank groups. The bank groups that experienced more pronounced declines in ROTCE were also the ones that experienced P/TBV multiples to compress the most since the pre-crisis. Moreover, the correlation between

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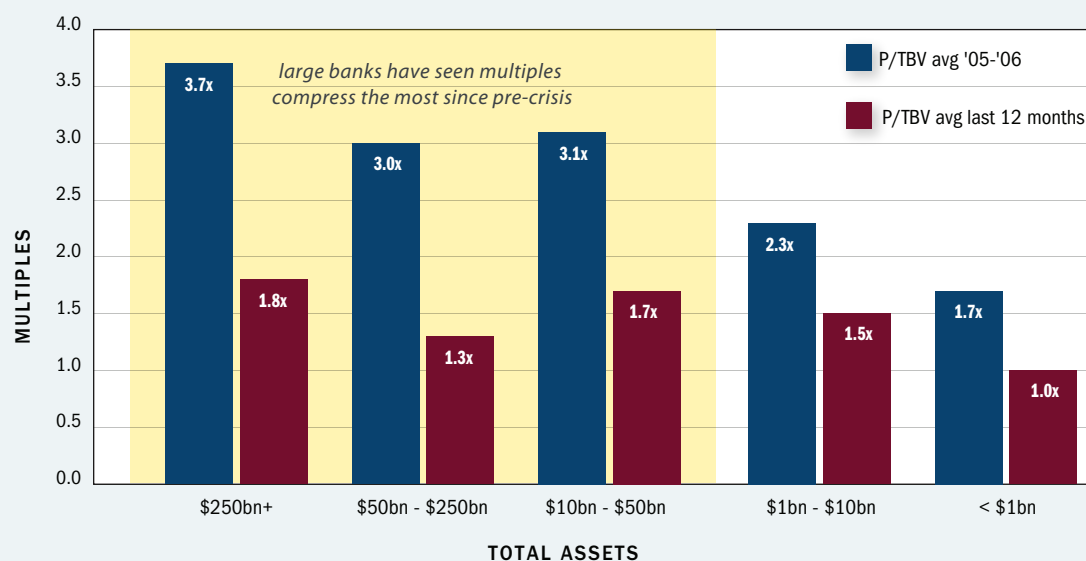1   We would like to thank Will Nace and Richard Ramsden at Goldman Sachs for very helpful suggestions.

2   *See*, Calomiris, Charles and Doron Nissim "Crisis-related shifts in the market valuation of bank activities," *Journal of Financial Intermediation* 23, November 2014, pp. 400-35 and the references therein.

3   ROTCE is measured as the ratio of core income to tangible common equity. Core income is defined as net income attributable to the holding company less realized gains on securities (after tax) plus goodwill impairment losses (after tax). Tangible common equity equals shareholders' common equity less intangible assets, excluding mortgage servicing assets and purchased credit card relationships and nonmortgage servicing assets.

4   Baker, Malcom and Jeffrey Wurgler, "Would stricter capital requirements raise the cost of capital? Bank capital regulation and the low risk anomaly," *American Economic Review* vol. 105, May 2015, pp. 315-320.

5   *See* Sarin, Natasha and Lawrence Summers "Have big banks gotten safer?" Brookings Papers on Economic Activity Conference Draft, September 2016.

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EXHIBIT 1: DECREASE IN PRICE-TO-TANGIBLE BOOK VALUE AT U.S. BANKS

large banks have seen multiples compress the most since pre-crisis

Legend:
- P/TBV avg '05-'06
- P/TBV avg last 12 months

TOTAL ASSETS	P/TBV avg '05-'06	P/TBV avg last 12 months
$250bn+	3.7x	1.8x
$50bn - $250bn	3.0x	1.3x
$10bn - $50bn	3.1x	1.7x
$1bn - $10bn	2.3x	1.5x
< $1bn	1.7x	1.0x

MULTIPLES

the decline in bank profitability and the compression of P/TBV multiples is slightly above 40 percent for banks with more than $10bn in total assets and just above 10 percent for smaller banks. Thus, it is necessary to identify the key factors that account for the fall in ROTCE to explain why banks' market-to-book ratios declined relative to the pre-crisis period.
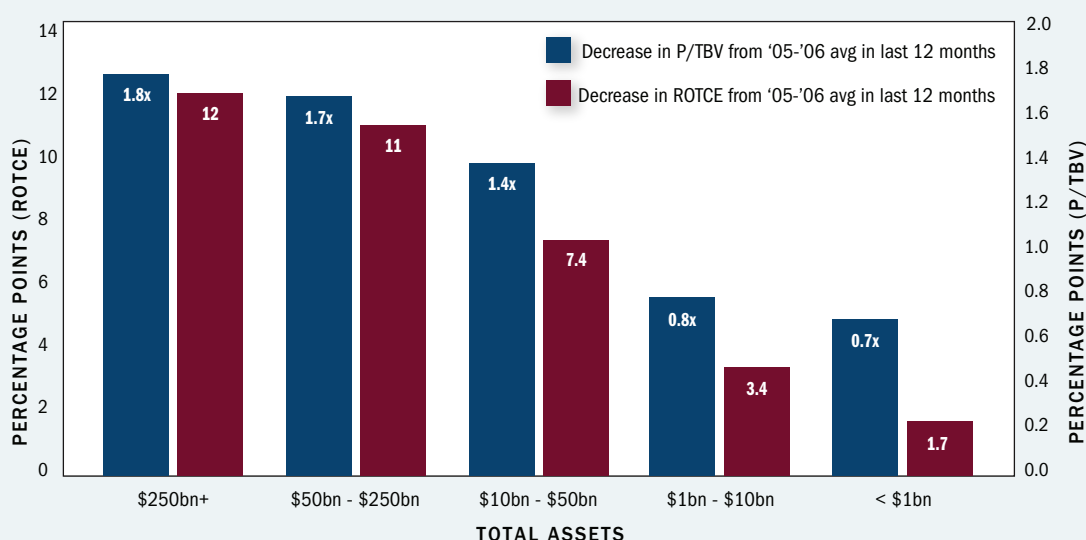
POTENTIAL CAUSES OF A DECLINE IN ROTCE

The decline in ROTCE appears to have several causes, with the sources varying by bank size. Our key explanations for the decline in ROTCE are as follows:

» A decline in book leverage (measured as tangible assets to tangible common equity) explains a sizable fall in ROTCE across all banks with total consolidated assets above $10bn.

» A sizeable decline in fee income has reduced ROTCE at the largest banks (measured as banks above $250bn in total assets)

EXHIBIT 2: DECREASE IN ROTCE AND PRICE-TO-TANGIBLE BOOK VALUE AT U.S. BANKS

Legend:
- Decrease in P/TBV from '05-'06 avg in last 12 months
- Decrease in ROTCE from '05-'06 avg in last 12 months

TOTAL ASSETS	Decrease in P/TBV (P/TBV)	Decrease in ROTCE (percentage points)
$250bn+	1.8x	12
$50bn - $250bn	1.7x	11
$10bn - $50bn	1.4x	7.4
$1bn - $10bn	0.8x	3.4
< $1bn	0.7x	1.7

PERCENTAGE POINTS (ROTCE) / PERCENTAGE POINTS (P/TBV)

Note: The decrease in ROTCE and P/TBV are calculated using quarterly averages between 2005 and 2006 and the past 12 months.

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TABLE 1: DECOMPOSITION OF THE FALL IN ROTCE ACROSS BANK GROUPS

	+$250bn	$50bn - $250bn	$10bn - $50bn	$1bn - $10bn	< $1bn
'05-'06 average ROTCE	**27.2%**	**21.8%**	**18.9%**	**14.2%**	**9.2%**
Reduced leverage	(4.2%)	(4.8%)	(4.3%)	(2.0%)	(2.8%)
Reduced net interest margins	(0.9%)	(1.5%)	(0.6%)	(0.7%)	0.4%
Reduced fee income	(5.0%)	(1.2%)	(1.0%)	(0.1%)	(0.1%)
Reduced efficiency	(1.9%)	(3.5%)	(1.6%)	(0.6%)	0.8%
Average ROTCE over the last 12 months	**15.1%**	**10.8%**	**11.5%**	**10.8%**	**7.5%**

Note: *Based on quarterly averages from '05-'06 to the last 12 months. All changes are relative to tangible common equity. Bank size is measured as of the second quarter of 2016.*

» For banks with total assets in the $50bn - $250bn range, the decline in ROTCE is instead explained by a reduction in efficiency—defined as the ratio of noninterest expense to net revenue—as the noninterest expense rose more quickly than net revenues in the post-crisis period.

» Lastly, and perhaps surprisingly, net interest margins have narrowed only modestly across all banks groups, suggesting that the low level of interest rates and the relatively flat yield curve have had less adverse impact on bank profitability than commonly assumed.

To better understand the causes of the decline in ROTCE since the pre-crisis period, Table 1 shows a decomposition of the fall in bank profits from before the crisis to currently across the following four factors:

» Reduction in leverage;

» Reduced net interest margins;

» Reduced fee income; and

» Reduced efficiency.

REDUCTION IN LEVERAGE. Leverage is defined as the ratio of tangible assets to tangible common equity. Mechanically, lower leverage reduces a bank's ROTCE as profits are distributed over a larger equity base, thus this is the first factor to be considered.

REDUCED NET INTEREST MARGINS. A key role of banks' business model is to borrow at short maturities and lend at longer maturities. Currently, the low interest rate and the relatively flat yield curve are expected to reduce bank profitability. The effect of interest rates on bank profits is measured by looking at the change in the ratio of net interest income to average assets.
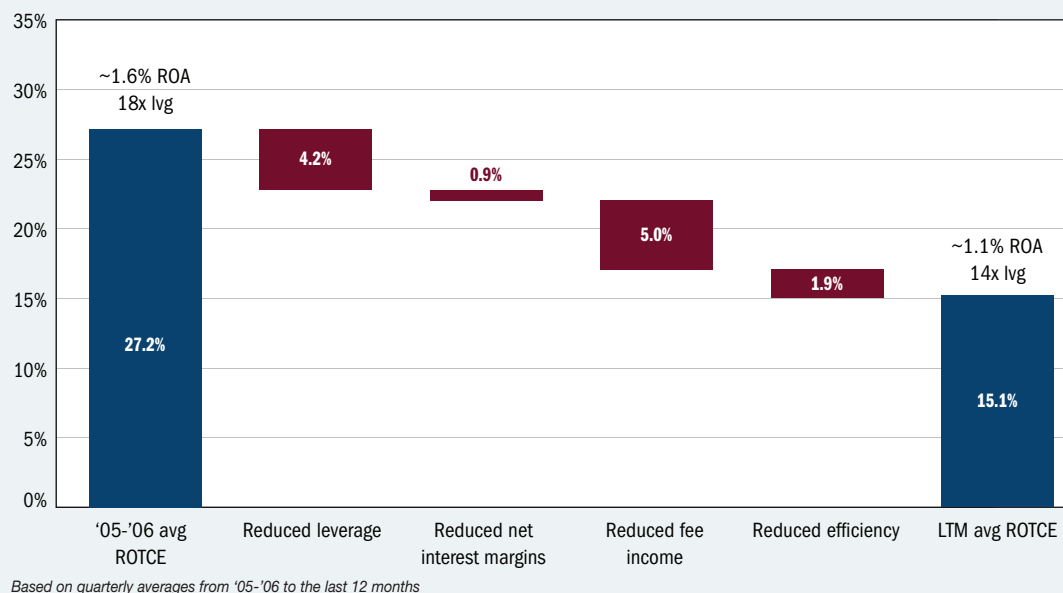
REDUCED FEE INCOME. Fee income includes trading income, advisory and underwriting fees. The impact of fee income on bank profitability is calculated via the change in the ratio of noninterest income to average assets. [6]

REDUCED EFFICIENCY. Efficiency is defined as the ratio of noninterest expenses to net revenues and captures the extent of which the slower growth in net revenues is being offset by cost reductions.

Across all bank types listed in Table 1, but especially for banks with total assets above $10bn, the decline in leverage explains a sizable portion of the fall in ROTCE since the pre-crisis. As described in more detail below, the decline in leverage is largely a result of the higher capital requirements and greater emphasis on common equity introduced by the Basel III capital standards and U.S. stress tests. The greater impact on larger banks is not surprising given that stress testing, the

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6   Other factors besides the slope of the yield curve affect net interest margins. *See*, Covas, Francisco, Ben Rump and Egon Zakrajsek "Stress-Testing U.S. Bank Holding Companies: A Dynamic Panel Quantile Regression Approach," *International Journal of Forecasting*, vol. 30, no.3, pp. 691-793.

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EXHIBIT 3: WATERFALL FOR BANKS WITH TOTAL ASSETS GREATER THAN $250BN

~1.6% ROA
18x lvg

4.2%

0.9%

5.0%

1.9%

~1.1% ROA
14x lvg

27.2%

15.1%

| '05-'06 avg ROTCE | Reduced leverage | Reduced net interest margins | Reduced fee income | Reduced efficiency | LTM avg ROTCE |

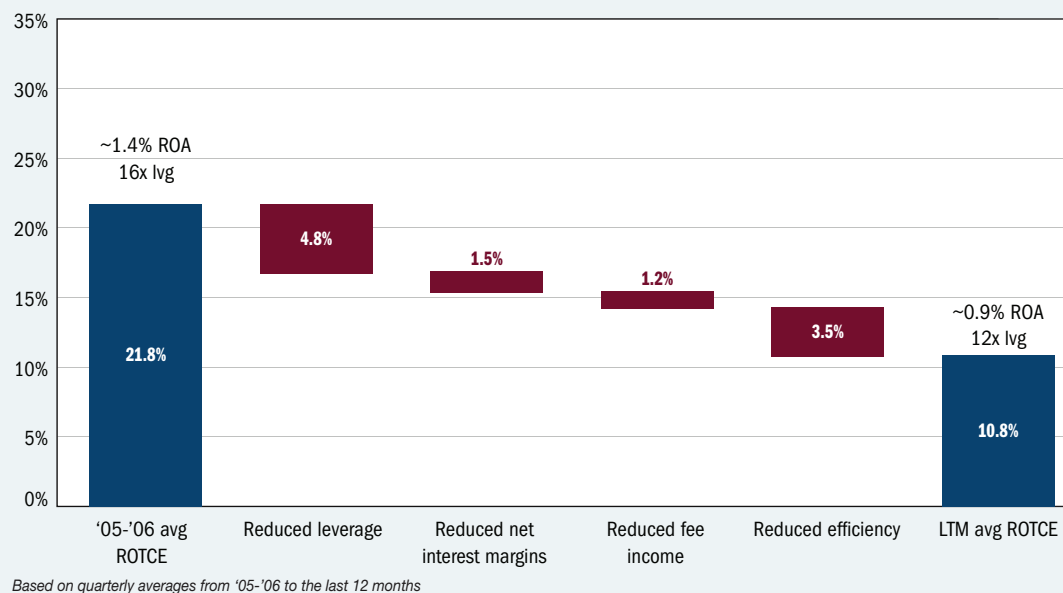*Based on quarterly averages from '05-'06 to the last 12 months*

GSIB surcharge, living wills, the more stringent credit limits on inter-GSIB exposures, a shift from short to long-term liabilities under the total loss absorbing capacity standard only apply to larger banks.

A reduction in fee income also accounts for a large part of the decline in profitability at the largest banks post-crisis, and is also likely driven by changes in regulation. In contrast, the current low interest rate environment and the relatively flat yield curve appear to account for only a relatively small share of the decline in ROTCE since the pre-crisis period. These results suggest that much of the decline in bank profitability is the result of regulatory changes rather than changes in macroeconomic conditions. Note, however, that the decomposition in Table 1 may understate the impact of low interest rates on bank profitability. Both lower leverage and higher costs of regulation may boost net interest margins.

EXHIBIT 4: WATERFALL FOR BANKS WITH TOTAL ASSETS BETWEEN $50BN AND $250BN

~1.4% ROA
16x lvg

4.8%

1.5%

1.2%

3.5%

~0.9% ROA
12x lvg

21.8%

10.8%

| '05-'06 avg ROTCE | Reduced leverage | Reduced net interest margins | Reduced fee income | Reduced efficiency | LTM avg ROTCE |

Based on quarterly averages from '05-'06 to the last 12 months

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Specifically, the decline in leverage should lower bank interest expenses while higher capital and stricter liquidity requirements could result in higher loan rates. Under these outcomes, the decomposition described in Table 1 would understate the impact of low interest rates on bank profitability. We will continue to update this analysis regularly to check if the changes in regulatory policies will eventually boost net interest margins.

For the largest banks - those above $250bn in total assets - the most important driver of the decline in ROTCE is the reduction in fee income as shown in Exhibit 3. In particular, reduced fee income accounts for a 5 percentage point reduction in ROTCE while the decrease in leverage accounts for a 4.2 percentage point decrease in profits. As shown in Table 2, the decline in fee income is widespread across the major subcomponents of noninterest income. That said, the decline in securitization income, servicing fees, and other noninterest income is more pronounced relative to the decline in trading revenues, advisory fees and deposit fees. The revenue items included under other noninterest income are often bank-specific and more difficult to summarize, but an analysis of the several items listed under noninterest income for the largest U.S. banks indicates that the decline in credit and debit card interchange fees accounts for a sizable portion of the reduction in other noninterest income post-crisis.

As noted above, the bulk of the decline in fee income is likely driven by changes in regulation in the post-crisis period. The decline in securitization income may owe to the substantial increase in risk-weights for securitization exposures under Basel III and the

TABLE 2: DECLINE IN FEE INCOME ACROSS SELECTED BANK GROUPS

	+$250bn	$50bn - $250bn	$10bn - $50bn
Reduced fee income	(5.0%)	(1.2%)	(1.0%)
Lower securitization income	(1.6%)	(0.1%)	(0.0%)
Lower servicing fees	(1.0%)	(0.0%)	(0.1%)
Lower deposit fees	(0.4%)	(0.5%)	(0.4%)
Lower fiduciary fees	0.0%	(0.2%)	(0.1%)
Lower IB, trading, advisory fees	(0.5%)	(0.3%)	(0.2%)
Lower gains & losses on sales	(0.5%)	(0.1%)	0.1%
Lower other fee income	(1.1%)	0.0%	(0.3%)

Note: Based on quarterly averages from '05-'06 to the last 12 months. All changes are relative to tangible common equity. See the appendix for additional details.

risk retention requirements for non-qualified residential mortgages. The fall in credit card interchange fees and deposit fees are likely driven by the 2009 Credit Card Act and the Durbin Amendment included in the Dodd-Frank Act. Of note, litigation expenses – which are included under reduced efficiency - don't account for a sizable share of the decline in the profitability of the largest banks post-crisis because it includes only bank performance over the past 12 months. Most litigation expenses incurred as a result of mortgage-related litigation and settlements were reported in the second-half of 2013 and 2014.

As shown in Exhibit 4, a significant share of the decline in ROTCE is explained by a decrease in efficiency for banks between $50bn and $250bn in total assets. Specifically, the decline in efficiency accounts for 3.5 percentage point fall in ROTCE, while the decrease in leverage accounts for a 4.8 percentage point decrease in ROTCE. As shown in Table 3, the decrease in efficiency for these banks is mainly driven by higher compensation and higher other noninterest expense relative to net revenues. As is the case of other noninterest income, the

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other noninterest expense subcomponent is bank-specific and a brief analysis of the items suggests that the higher growth in expenses is fairly widespread across a number of noninterest expense items for banks between $50bn-$250bn in total assets and may reflect also higher costs of compliance with the new regulations (stress tests, consumer compliance, etc.).

Finally, as shown in Exhibit 2 the decline in P/TBV for the banks in the $1bn-10bn range appears to be greater than what can be explained by a decline in ROTCE. The extra decline for the mid-sized banks could owe to a reduced likelihood these banks would grow by acquiring other banks or would be acquired. Reportedly, banks are now reluctant to grow larger than $10bn in assets because of the substantially greater amount of regulation that occurs at that size cutoff.

FINAL REMARKS

There is a growing literature on systemic risk that relies on the market value of banks' equity to measure the financial performance of a bank under stress. If the decline in the market value

TABLE 3: DECLINE IN EFFICIENCY ACROSS SELECTED BANK GROUPS

	+$250bn	$50bn - $250bn	$10bn - $50bn
Reduced Efficiency	(1.9%)	(3.5%)	(1.6%)
Higher compensation	(1.5%)	(1.8%)	(1.1%)
Higher fixed assets and premises	0.2%	(0.3%)	0.5%
Higher goodwill impairment losses	0.2%	0.1%	0.2%
Higher other noninterest expense	(0.8%)	(1.6%)	(1.2%)

Note: Based on quarterly averages from '05-'06 to the last 12 months. All changes are relative to tangible common equity. See the appendix for additional details.

of equity of banks is being driven by regulatory changes than either the market value of equity is not a very useful measure to assess the resiliency of banks or the increase in capital requirements did not improve the safety of the financial system. This is an important issue since some researchers have questioned the accuracy of the U.S. stress tests or wondered about the effectiveness of the major changes in regulatory policies solely based on the behavior of market leverage in the post-crisis period. Our results suggest that the decline in the market value of banks' equity is in large part driven by regulatory changes in the post-crisis period and underscore the need to conduct a holistic assessment of the costs and benefits of regulations introduced post-crisis. ∎

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APPENDIX

This appendix describes the decomposition of the decline in the return on tangible-common equity into its 4 subcomponents: (i) lower leverage; (ii) reduced net interest margins; (iii) reduced fee income; (iv) and reduced efficiency as described in Table 1.

Let ROTCE in the period prior to the crisis (hereafter period 0) be defined as:

$$ROTCE_0 = \frac{\pi_0}{E_0}$$

where π denotes core income and E represents tangible common equity. Similarly, the post-crisis period is denoted by 1. The change in ROTCE can be decomposed into changes in leverage and changes in the return on tangible assets using the following definitions:

$$(ROTCE_1 - ROTCE_0) = \left(\frac{\pi_1}{E_1} - \frac{\pi_0}{E_0}\right)$$

$$= \underbrace{\left(\frac{A_1}{E_1} - \frac{A_0}{E_0}\right) \times \frac{\pi_0}{E_0} - \frac{1}{2}\left(\frac{\pi_1}{A_1} - \frac{\pi_0}{A_0}\right)\left(\frac{A_0}{E_0} - \frac{A_1}{E_1}\right)}_{\text{Lower leverage}} + \underbrace{\left(\frac{\pi_1}{A_1} - \frac{\pi_0}{A_0}\right) \times \frac{A_0}{E_0} - \frac{1}{2}\left(\frac{\pi_1}{A_1} - \frac{\pi_0}{A_0}\right)\left(\frac{A_0}{E_0} - \frac{A_1}{E_1}\right)}_{\text{Lower return-on-assets}}$$

where A denotes tangible assets. Furthermore, we can decompose the change in the return-on-tangible assets into three subcomponents:

» Reduced net interest margins;

» Reduced fee income; and

» Reduced efficiency.

The weights of each of the three components are given, respectively, by:

$$\alpha_1 = \left(\frac{NI_1}{TA_1} - \frac{NI_0}{TA_0}\right)(1 - EF_0)(1 - \tau)\frac{A_0}{E_0}$$

$$\alpha_2 = \left(\frac{FI_1}{TA_1} - \frac{FI_0}{TA_0}\right)(1 - EF_0)(1 - \tau)\frac{A_0}{E_0}$$

$$\alpha_3 = \left(\frac{NI_0 + FI_0}{TA_0}\right)(EF_0 - EF_1)(1 - \tau)\frac{A_0}{E_0}$$

where NI denotes net interest income, FI represents fee income, TA total average assets, τ is the effective tax rate, and EF represents efficiency, which is defined as the ratio of noninterest expense to the sum of net interest income and fee income. The weights are also normalized so that the sum of α_1 through α_3 equals 1. A similar decomposition is used to estimate the causes of the decline in fee income (shown in Table 2) and the reduction in efficiency (shown in Table 3).

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