Liujing Zeng, Hue Hwa Au Yong, Sirimon Treepongkaruna, Robert Faff

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Liujing Zeng
Department of Accounting and Finance, Monash University

Hue Hwa Au Yong
Department of Accounting and Finance, Monash University

Sirimon Treepongkaruna
Department of Accounting and Finance, Monash University

Robert Faff
UQ Business School, The University of Queensland

Abstract

This paper investigates whether there is a banking risk premium that helps explain the returns of US publicly listed firms. We assess this research question in the context of the CAPM and the Fama-French three-factor model. We use bank size to create the banking factor return (BNK) – the return on a mimicking portfolio that is long (short) big (small) banks. We find a positive premium for BNK and our analysis supports a risk-based interpretation, since the premium is priced. Our findings are notable since they point to a slight superiority of CAPM augmented by BNK over the counterpart that augments the Fama-French model with BNK.

Keywords: Asset Pricing, Banking Risk Factor, Mimicking Portfolio, Bank Size.
JEL Codes: G12; G21.

1 Introduction

A well-developed banking system fosters economic growth through its expertise in monitoring and reallocating capital (Cole, Moshirian and Wu, 2008; Parlour, Stanton and Walden, 2012) and growth is clearly an important driver of broad economic activity and corporate profitability. As such, one can readily argue that there should be an important nexus between banking sector performance and market-wide stock returns. However, little is known about whether and to what extent such a banking-stock market linkage really exists – in large part, due to the fact that empirical finance research typically excludes banks from the sampling process[1]. Aside from other considerations, the banking sector is simply too large to be totally ignored in asset pricing research since the financial sector makes up

Corresponding author: Robert Faff, r.faff@business.uq.edu.au, Professor of Finance, Director of Research, UQ Business School, University of Queensland 4072, Queensland Australia, Phone: +61 7 3346 8055.

[1] The exclusion of banks is often justified by the observation that they are «special in nature» (Diamond, 1991), as, for example, banks are very highly leveraged and highly regulated.

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a substantial fraction of the domestic equity market. Indeed, financial institutions comprise almost 25% of the market value of all firms listed on the NYSE in recent years.

Accordingly, adopting an asset pricing framework, our aim is to empirically investigate the potential role of a banking factor in the US stock market. Specifically, we examine the robustness of the banking factor in two asset pricing settings: the CAPM (Sharpe, 1964; Lintner, 1965); and the Fama and French three-factor model (Fama and French, 1993). By focusing on a banking factor, our paper extends the work of Chou, Ho and Ko (2012) who document that common factors extracted from industry returns explain stock returns over and above that of size, book-to-market and momentum.

Prior literature suggests that the financial functions provided by banks are important in promoting economic growth at the firm and country levels. From an individual firm's perspective, banks play a central role to enhance firms' intrinsic value since banks have the ability to research and identify profitable ventures, monitor managers, ease risk management and most importantly, to facilitate resource mobilization and provide liquidity (Levine, 2005). At the aggregate country level, banks are important in promoting economic growth by being «liquidity providers of last resort» and facilitating the implementation of monetary policy (Gatev and Strahan, 2006). In addition, Cole *et al.* (2008) contend that the banking industry is special in that it is the primary source of credit to both public and private firms in all industries. Therefore, banks are said to play an important and perhaps unique role that no other industry can substitute.

The recent global financial crisis that originated in the US demonstrates that equity markets are vulnerable to the changes in bank risk such as credit risk, liquidity risk and insolvency risk. That is, banks' poor risk management along with other market factors can lead to bank failures, which can cause financial turmoil in the whole equity market (Bartram and Bodnar, 2009). Further, Allen, Bali and Tang (2012) show that their measure of aggregate bank systemic risk, which captures the aggregate level of risk taking in the financial sector, is useful in forecasting macroeconomic declines six months in advance. Therefore, we argue that there is a strong nexus between the performance of banks and the equity market. More specifically, we hypothesise that the performance of banks helps explain the cross-sectional variation in equity returns.

Bank size, measured by market capitalisation, is found to be significant in determining bank performance in previous studies. Viale, Kolari and Fraser (2009) identify that the returns of large banks are higher than their smaller counterparts. Demsetz and Strahan (1995, 1997) show that there are significant differences in the diversification and financial leverage strategies of large and small banks. Larger banks are better diversified (geographically[2] and product-wise) but are also highly leveraged and less liquid. As a result, larger banks tend to have a greater systematic risk (market beta) than smaller banks, although their overall (total) risk is not significantly different from the latter[3]. Thus, while the overall level of a bank's total risk may not be directly affected by firm size, the composition of the bank's risk is clearly influenced by the firm's type of investment,

[2] Petersen and Rajan (2002) contend that small banks cannot diversify away idiosyncratic volatility because small banks tend to be more localized and are subject to geographic restrictions.

[3] Allen and Jagtiani (1997) estimate a two-factor return generating model over the sample period 1974-1994 and also find that the systematic risk of generally large, publicly traded commercial banks is substantial (market betas greater than unity).

diversification opportunities, and financial leverage decisions, all of which are typically influenced by the size of the bank.

Furthermore, Elyasiani, Mansur and Pagano (2007) examine market betas for US banks and report that the systematic risk exposure of large banks is significantly higher than that of small banks. The finding that large banks take on greater market risk than their smaller counterparts is consistent with Demsetz and Strahan (1995, 1997). The larger beta of the large banks is possibly due to their greater credit risk, higher financial leverage, more extensive engagement in off-balance sheet activities (e.g., trading and derivative positions), and the more aggressive attitudes of their managers toward risk[4].

Motivated by the above considerations, we form a US bank mimicking portfolio return (BNK), based on bank size (measured by market capitalisation). Specifically, the portfolio is long (short) the largest (smallest) banks[5]. Asset pricing tests are performed in which BNK is an included factor using monthly returns on US common stock portfolios over the period 1980 to December 2007. We find that BNK captures independent sources of cross-sectional variation in equity returns. The formal tests of the asset pricing models show that BNK has a significant and positive estimated risk premium and, hence, we conclude that this factor is systematic and priced in US equity returns.

The remainder of this paper is organized as follows. Section 2 presents the data and research method. Section 3 reports the findings, while Section 4 concludes.

2 Data and Research Method

2.1 Data

Monthly returns on US common stock portfolios, SMB and HML factors for the period from January 1980 to December 2007 are obtained from the «Ken-French» website[6]. The 25 US equity portfolios, constructed by Fama and French, are value-weighted and formed from the intersection of five size (MV) portfolios and five book-to-market (B/M) portfolios. The portfolios are rebalanced every June, using end-of-June MV information and six-month prior B/M information. The excess return on the market is the value-weighted return on all NYSE, AMEX, and NASDAQ stocks minus the 1-month Treasury bill rate.

[4] However, contrary to the theoretical expectations, there are also a few empirical studies whose results indicate that small banks outperform larger banks. Using a dataset of 7,635 observations on 1,384 commercial banks operating in the European Union between 1993 and 2001, Barros, Ferreira and Williams (2007) contend that smaller size banks have a higher (lower) probability of being a top (poor) performer. This finding is consistent with Barber and Lyon's (1997) study, which analyses the returns for a sizable holdout sample of financial firms from 1973 through 1994 in the US.

[5] An anonymous referee asks the question – to what extent do we identify a «banking factor» versus a «leverage» factor? This is a legitimate concern since banks are very highly leveraged – US banks have leverage ratios (debt/assets) at around 90%, which typically dwarf counterparts for non-financial firms at around 40%. For example, in a seminal study, Bhandari (1988) documents a leverage pricing effect in the US market. While we cannot categorically dismiss this concern, we are comforted by the fact that our banking factor really does concentrate in the tail of the leverage distribution, and derives from this often neglected set of financial firms. Nevertheless, resolution of this «demarcation dispute» is a worthy endeavour – beyond the scope of the current paper. We leave it to future research.

[6] We thank Ken French for making the data available. Details regarding the data are available from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/.

2.2 Creation of Bank Factor Mimicking Portfolio Based on Size (BNK)

Market capitalization (shares outstanding multiplied by the closing price) and monthly holding period returns of US bank stocks with SIC code 6020 are obtained from Center for Research in Securities Prices (CRSP). The creation of the US bank factor mimicking portfolio return (BNK) follows in the spirit of Fama and French (1993). Specifically, banking companies are sorted into five size portfolios, rebalanced each month. BNK is the difference, between equal-weighted returns on the highest quintile size portfolio and the equal-weighted returns on the lowest quintile size portfolio. The number of banks in our monthly sample ranges from 45 in January 1980 to 628 in December 2007 with an average of 357.

2.3 Method

2.3.1 *Individual Regressions*

Our primary empirical setup is based on the Fama and French (1993) three-factor model augmented by a banking risk factor[7]:

$$RP_{jt} - RF_t = a_j + b_j[RM_t - RF_t] + s_jSMB_t + h_jHML_t + k_jBNK_t + e_{jt} \tag{1}$$

where *RP* is the value-weighted return for test portfolio *j*; *RF* is the monthly risk-free rate; *RM* is the value-weighted market monthly return; *SMB*, *HML* and *BNK* are the factor-mimicking portfolios for size, book-to-market and US banks. The test portfolios are the standard 25 size and book-to-market sorted portfolios, which are formed from the intersection of five size and five book-to-market groups.

Our focus is on the ability of BNK to incrementally explain stock returns – both in time series and cross-sectionally. We are particularly interested in the extent to which asset pricing models can explain the variation of stock returns. Specifically, we compare the performance of equation (1) and the Fama-French three-factor model in explaining returns on the test portfolios created. The counterpart three-factor empirical model is:

$$RP_{jt} - RF_t = a_j + b_j[RM_t - RF_t] + s_jSMB_t + h_jHML_t + e_{jt} \tag{2}$$

We assess the explanatory power of equations (1) and (2) by comparing their adjusted R^2s and the statistical significance of the regression intercepts. As a first indication that the banking factor might be useful in pricing assets, we would expect the adjusted R^2s from equation (1) to be materially higher, and the regression intercepts from equation (1) to be smaller in magnitude and generally less significant. We also expect to observe significant estimated factor loadings on BNK.

[7] The research design for the single-beta CAPM and the Fama-French three-factor model is similar. The only difference is the number of factors. To conserve space, we present the research design for the Fama-French three-factor model only.

2.3.2 *GMM System Regressions*

In addition to running individual regressions, we perform a system-based test of the overall legitimacy of the asset pricing models. Specifically, we use a regression system that controls for both heteroskedasticity and contemporaneous correlation in the errors across equations. The advantage of running the regressions as a system is that it allows joint testing of the asset pricing restrictions. Following MacKinlay and Richardson (1991) and Chan and Faff (2005) we employ a generalized method of moments (GMM) systems regression approach.

As highlighted by MacKinlay and Richardson (1991), the key advantage of testing these models using GMM is that, unlike OLS-type type inferences, GMM does not rely on the assumption of normality over the residuals. GMM invokes no distributional assumptions, and so the extent to which the residuals disobey normality, the inferences based on GMM are more reliable. Further, it is applied using the «HAC» option – i.e., the GMM estimates will be robust to heteroskedasticity and autocorrelation of unknown form.

Our pricing tests are based on the banking factor augmented Fama-French three-factor model[8]:

$$E(RP_j) - RF = b_j[E(RM) - RF] + s_jE(SMB) + h_jE(HML) + k_jE(BNK) \tag{3}$$

where all variables are defined above. Equation (1) is the empirical counterpart of this model. After applying expectations to equation (1), a comparison with the asset pricing model of equation (3) reveals the cross-equation intercept restriction that constitutes the null hypothesis: H0: $\alpha_j = 0, j = 1, 2, ..., N$. The restricted version of equation (1) is then given by:

$$r_{jt} = b_j r_{mt} + s_j SMB_t + h_j HLM_t + k_j BNK_t + e_{jt} \tag{4}$$

where $j = 1, 2, ..., N$, $r_{jt} = RP_{jt} - RF_t$, and $r_{mt} = RM_t - RF_t$. We can usefully modify the current setting to allow a direct estimation of the premiums for each risk factor. This is achieved by augmenting the system with the mean equations for each factor as follows:

$$r_{mt} = \lambda_m + e_{mt} \tag{5}$$

$$SMB_t = \lambda_{smb} + e_{st} \tag{6}$$

$$HLM_t = \lambda_{hml} + e_{ht} \tag{7}$$

$$BNK_t = \lambda_{bnk} + e_{kt} \tag{8}$$

The parameters λ_m, λ_{smb}, λ_{hml} and λ_{bnk} are the means of each associated factor. Therefore, equations (5), (6), (7) and (8) apply a mean-adjusted transformation to

[8] We also test a banking factor augmented CAPM. As the research design for these models are similar, we suppress details to conserve space.

the independent variables of equation (4). After rearrangement, the null hypothesis becomes a test of:

H0: $\alpha^* = b_j\lambda_m + s_j\lambda_{smb} + h_j\lambda_{hml} + k_j\lambda_{bnk}$

In the system of equations (4) to (8)[9], there are $5N + 4$ sample moment equations. That is, there are 5 sample moments for each of N test equations and one sample moment condition that defines each factor premium – equations (5) to (8). Thus, the GMM test involves an evaluation of $5N + 4$ sample moments with $4N + 4$ unknown parameters (i.e. $\phi = b_1, b_2, ..., b_N, s_1, s_2, ..., s_N, h_1, h_2, ..., h_N, k_1, k_2, ..., k_N, \lambda_m, \lambda_{smb}, \lambda_{hml}, \lambda_{bnk}$). Accordingly, the GMM statistic involves N over-identifying restrictions[10]:

$$GMM = (T - N - K) \times g_T(\hat{\varphi})' . S_T^{-1} . g_T(\hat{\varphi}) \tag{9}$$

where $g_T(\hat{\varphi}) = \frac{1}{T}\sum_{t=1}^{T} f_t(\hat{\varphi})$ is the empirical moment condition vector, K is the number of factors and GMM is distributed as a chi-square statistic with N degrees of freedom. We select the weighting matrix as the well-known optimal choice – i.e. the inverse of the covariance matrix of the sample moments[11].

In addition to the overall GMM test outlined above, the current setting allows supplementary tests that each expected premium is zero, that is, H0: $\lambda_m = 0$; H0: $\lambda_{smb} = 0$; H0: $\lambda_{hml} = 0$; H0: $\lambda_{bnk} = 0$. We are particularly interested in the risk-premium on the banking factor λ_{bnk}. If our findings are consistent with a risk-based argument, then the premium should be significantly positive, indicating that exposure to the banking risk is rewarded with a higher return.

3 Results and Discussion

3.1 Descriptive statistics and preliminary analysis

Panel A of Table 1 reports basic descriptive statistics for the independent variables. The time-series mean of market risk premium (0.62% per month) and HML (0.39% per month) are significantly positive. The mean of BNK, is 1.15% per month, which is statistically significant at the 5% level. The descriptive statistics are suggestive that BNK might be priced in equity returns.

Panel B of Table 1 reports correlations between the market risk premium, SMB, HML and BNK. If BNK adds explanatory power to the explanation of US equity returns, we should expect low correlations between the Fama-French factor returns and BNK. Since the

[9] The five sample moments relate to: (*a*) the mean regression error term is zero; and the regression error term is orthogonal to each independent variable, namely, (*b*) r_{mt}; (*c*) SMB_t; (*d*) HML_t; and (*e*) BNK_t.
[10] A small-sample adjustment is applied following MacKinlay and Richardson (1991) – that is, instead of multiplying by «T», the adjusted factor of «T-N-K» is applied.
[11] Consistent TSLS estimates are used as the initial estimates of the parameter set needed to form the estimated covariance matrix.

Table 1: Basic Descriptive Statistics and Correlations of BNK with other Factors

	Panel A: Basic descriptive statistics			
	Rm	SMB	HML	BNK
Mean	0.0062*	0.0001	0.0039*	0.0115*
Median	0.0103	−0.0006	0.0037	0.0105
Maximum	0.1243	0.2196	0.1385	0.2243
Minimum	−0.2314	−0.1679	−0.124	−0.2885
Std. Dev.	0.0436	0.0321	0.0312	0.0463
Skewness	−0.7882	0.7554	0.0979	−0.5413
Kurtosis	5.8317	11.48151	5.4176	9.268
	Panel B: Correlations			
	Rm	SMB	HML	BNK
Rm	1			
SMB	0.2133*	1		
HML	−0.5047*	−0.3917*	1	
BNK	0.0742	−0.08033	−0.03176	1

This table reports basic descriptive statistics and correlations for the market risk factor, SMB, HML and BNK for the period January 1980 to December 2007. The SMB («Small» minus «Big») factor captures the return premium that small firms exhibit over large firms, and the HML («High» minus «Low») factor captures the return premium that high book-to-market firms exhibit over low book-to-market firms. The BNK factor captures the return premium that large banks exhibit over small banks.

* Significance at the 5% level.

correlation between the Fama-French factors and BNK is low and not statistically significant, it is again suggestive that BNK can provide additional explanatory power for US equity returns. Interestingly, the correlations between SMB and the market risk premium; and HML and the market risk premium are significant, indicating that SMB and HML might capture some risk represented by a security's systematic risk. However, this preliminary work is only indicative and further analysis will be performed based on the system regressions.

One potential concern is that the introduction of any new factor purporting to be important for pricing might be undermined by its lack of pervasiveness or relevance across the test assets. Accordingly, following Kan and Zhang (1999), we perform tests seeking to rule out that the BNK factor is simply a 'useless factor'. More specifically, we perform a joint test of whether the BNK loadings are different from each other and from zero. This (unreported) analysis produces a chi-squared statistic with a p-value < 0.001. As such, we can categorically rule out this potential concern – in all cases there is emphatic rejection of the joint hypothesis.

Another concern is that an alleged new pricing factor might simply reflect the variation observed in known empirical factors. For example, Lamont, Polk and Saa-Requejo (2001) explore whether their financial constraints factor is a reflection of known factors – they do this by regressing their factor on a set of established factor returns. The intuition is that a viable factor should not be subsumed by these known factors – in the sense that (a) the intercept terms in these regressions should differ from zero and (b) the R^2 should be relatively low. We present regression results for similar regressions of the BNK factor returns on the market factor, Fama-French factors and the Carhart (1997) momentum factor in Table 2.

The three regressions reported in Table 2 show that the CAPM, Fama-French or Carhart models do not subsume BNK, as the intercepts are all positive and statistically significant (at the 1% level). Moreover, the adjusted R^2 of all three regressions show that

Table 2: Regressions of the BNK Factor on the Market and Fama French Factors

	Constant	Rm	SMB	HML	Momentum factor	Adj. R^2
Regression 1	0.0110**	0.0788				0.25%
	(4.30)	(1.36)				
Regression 2	0.0113**	0.0854	−0.1603	−0.0516		0.71%
	(4.31)	(1.27)	(−1.88)	(−0.52)		
Regression 3	0.0100**	0.1004	−0.1739*	−0.0241	0.1298*	1.82%
	(3.75)	(1.49)	(−2.04)	(−0.24)	(2.18)	

This table reports whether the banking risk factor reflects only known factors. We perform regressions of BNK returns on the market excess return (Panel A), Fama-French factor returns (Panel B) and Carhart four factor returns (Panel C). *t*-statistics are reported in parentheses below the estimates.

** (*) indicates statistical significance at the 1% (5%) level, respectively.

these models are clearly unable to explain the primary source of variation in BNK. As such, it seems that the BNK factor is capturing an independent source of cross-sectional return variation and is thus a viable candidate for use in an asset pricing model.

3.2 Asset Pricing Tests

3.2.1 *Banking Factor Augmented Fama-French Regressions*

Table 3 reports the results of individual regressions on the BNK augmented Fama-French model. The coefficients on the market factor and the Fama-French factors are very similar to standard Fama-French regressions, which are reported in Table 4. Specifically, the estimated market factor loading is positively significant for all 25 portfolios. The estimated loadings on SMB are significant and positive for each of the 20 portfolios that are across size groupings 1 to 4. However, as expected for the large size portfolios (size = 5), the estimated loadings on SMB are negative and significant. The estimated loadings on HML are significant for all but one of the 25 test portfolios. Specifically, as expected the loadings on HML are significant and positive for all portfolios except for the portfolios with the lowest book-to-market ratios.

The estimated loadings on the BNK factor are significant for 12 (out of 25) portfolios[12]. Interestingly, the estimated BNK loadings are significant in all of the small size portfolios and some of the medium size portfolios. Small firms rely heavily on the financial system and may be affected by the banking effect (BNK) more extensively than large firms. Whatever the reason(s) may be, the bottom line is that BNK is useful in explaining small and medium size stocks returns.

Finally, the average adjusted R^2 for these 25 regressions is 89.6% which is negligibly higher than for the Fama-French regressions (89.4%). In addition, the estimated intercept terms are significant for 8 (out of 25) portfolios as opposed to 9 portfolios in Fama-French regressions reported in Table 4. The results of the individual regressions indicate

[12] It is not surprising that the loadings of BNK are negative for all small stock portfolios given that (*a*) BNK is constructed as the large banks' returns minus the small banks' returns; and (*b*) we might expect large (small) banks returns to be negatively correlated with small (large) stocks.

Table 3: Individual Regressions of BNK-augmented Fama-French Model using 25 Size and Book-to-Market Sorted Test Portfolios

Size	BM	a_j	b_j	s_j	h_j	k_j	Adj. R^2
1	1	−0.005*	1.0866*	1.2687*	−0.3988*	−0.1289*	0.909
		(−2.89)	(26.56)	(22.17)	(−6.04)	(−2.88)	
1	2	0.0016	0.9653*	1.2795*	0.0075	−0.0592*	0.931
		(1.42)	(30.08)	(16.28)	(0.12)	(−2.48)	
1	3	0.0026*	0.8921*	1.0147*	0.2209*	−0.0644*	0.941
		(3.39)	(37.45)	(29.43)	(4.93)	(−4.14)	
1	4	0.0035*	0.8724*	0.9616*	0.4112*	−0.0651*	0.919
		(3.54)	(31.02)	(25.05)	(9.94)	(−3.78)	
1	5	0.0031*	0.9677*	0.9962*	0.6216*	−0.1121*	0.927
		(3.53)	(43.48)	(25.48)	(16.46)	(−6.74)	
2	1	−0.0028*	1.1292*	0.9493*	−0.4003*	0.0092	0.957
		(−3.3)	(42.18)	(24.55)	(−7.72)	(0.58)	
2	2	−0.0012	1.0372*	0.8482*	0.194*	0.0384	0.927
		(−1.35)	(38.2)	(13.75)	(2.58)	(1.89)	
2	3	0.0004	0.9824*	0.7313*	0.4494*	0.0540*	0.921
		(0.55)	(41.71)	(12.81)	(6.7)	(2.28)	
2	4	0.0005	0.974*	0.733*	0.5993*	0.0526*	0.91
		(0.54)	(47.81)	(15.57)	(9.79)	(2.97)	
2	5	−0.0013	1.0975*	0.8585*	0.8043*	0.0050	0.931
		(−1.52)	(43.14)	(17.6)	(17.36)	(0.25)	
3	1	−0.0006	1.0348*	0.7101*	−0.5097*	0.0643*	0.950
		(−0.72)	(47.68)	(20.48)	(−16.51)	(3.46)	
3	2	−0.0006	1.0788*	0.4872*	0.2607*	0.0452	0.883
		(−0.6)	(35.75)	(5.97)	(3.37)	(1.38)	
3	3	−0.0015	1.0445*	0.4224*	0.5622*	0.0605*	0.870
		(−1.49)	(32.47)	(5.35)	(7.16)	(2.12)	
3	4	−0.0018	1.0335*	0.4082*	0.7231*	0.0639*	0.867
		(−1.74)	(42.9)	(6.81)	(9.51)	(2.02)	
3	5	0.0001	1.1131*	0.4391*	0.8373*	0.0003	0.862
		(0.03)	(34.54)	(5.92)	(14.55)	(0.01)	
4	1	0.0017	1.0346*	0.3956*	−0.4531*	0.0415*	0.938
		(1.61)	(38.2)	(8.71)	(−9.32)	(2.30)	
4	2	−0.0012	1.1217*	0.2054*	0.2975*	0.0242	0.874
		(−1.13)	(33.41)	(2.71)	(3.16)	(0.86)	
4	3	−0.0018	1.1297*	0.1975*	0.5727*	0.0256	0.860
		(−1.82)	(33.26)	(2.49)	(6.75)	(0.87)	
4	4	−0.001	1.0358*	0.1983*	0.6227*	0.0388	0.848
		(−0.96)	(29.98)	(4.51)	(8.98)	(1.6)	
4	5	−0.0018*	1.1135*	0.1666*	0.7949*	0.073*	0.839
		(−2.01)	(28.29)	(2.92)	(14.11)	(2.89)	
5	1	0.0023*	0.9177*	−0.309*	−0.412*	0.0101	0.939
		(3.25)	(45.81)	(−10.67)	(−10.62)	(0.53)	
5	2	0.0006	1.0691*	−0.2605*	0.1473*	−0.0204	0.890
		(0.78)	(51.97)	(−5.49)	(2.03)	(−0.83)	
5	3	−0.0013	1.0341*	−0.2256*	0.3112*	0.0065	0.850
		(−1.12)	(38.01)	(−3.81)	(4.29)	(0.23)	
5	4	−0.0017*	1.0016*	−0.2081*	0.6336*	0.0100	0.867
		(−2.00)	(38.11)	(−4.93)	(10.63)	(0.51)	
5	5	−0.0015	1.083*	−0.1598*	0.7602*	−0.0242	0.788
		(−1.18)	(26.38)	(−2.87)	(13.94)	(−1.07)	
Average Adj. R^2							0.896

This table reports the results of individual regressions of a BNK-augmented Fama-French model on 25 size and book-to-market sorted portfolios for the period January 1980 to December 2007 according to:

$$r_{jt} = \alpha + b_j r_{mt} + s_j SMB_t + h_j HML_t + k_j BNK1_t + e_{jt}$$

where r_{jt} is the excess return on portfolio j in month t, r_{mt} is the excess return on the market portfolio in month t, SMB_t is the return on size mimicking portfolio in month t, HML_t is the return on the book-to-market mimicking portfolio in month t, BNK_t is the return on the banking factor mimicking portfolio (based on banks' market capitalisation) in month t. The dependent variable portfolios are the intersections of 5 portfolios formed on size and 5 portfolios formed on book-to-market (BM): smallest (1) to largest (5). t-statistics are reported in parentheses below the estimates. Adjusted R^2s (Adj. R^2) are reported for each regression and the final row of the table reports the average adjusted R^2 across the 25 regressions.

* significant at the 5% level.

that the BNK-enhanced Fama-French model marginally improves on the performance of the standard Fama-French model in explaining variations in equity returns.

3.2.2 *System Regressions*

Table 5 presents the results of the restricted system based GMM estimations and tests of the non-linear cross-equation restrictions implied by the CAPM, the BNK-augmented CAPM, the Fama-French model and the BNK augmented Fama-French model[13]. In the system regressions, we focus our analysis on the GMM statistics and the estimated factor premiums. If the estimated factor premium is positive and significant, we conclude that the factor is systematic and priced in the cross section of equity returns. On the other hand, if the factor premium is insignificant, or negative and significant, we conclude that the factor is not priced and therefore not systematic.

For the CAPM system regression, the estimated premium on the market factor (λ_m) is positive and significant at the 1% level, implying that the market risk premium is systematic and priced in the cross-section of equity returns. Similar to the CAPM system regression, the estimated Fama-French system presents a positive and significant market risk premium at the 1% level. Recall that in the individual regressions, estimated market beta is significant for each of the 25 test portfolios, regardless of which model is implemented. Therefore, our results suggest that the market factor is the dominant variable in explaining equity returns in the context of a time-series regression.

However, the above does not necessarily imply that the CAPM is the best specification of expected returns. In the individual regressions, loadings on the Fama-French factors, including HML, are found significant in explaining the time-series of equity returns. The system regressions reinforce this finding. HML has a significant positive factor premium at the 5% level. In addition, the estimated book-to-market premium annualises to a very realistic figure of about 4.3% per annum. The estimated value premium (HML) confirms Chen, Petkova and Zhang's (2008) observation that the ten-year moving average HML return is around 5% per annum.

Furthermore, the result suggests that book-to-market is priced in stock returns and not explained by the market factor. Hence, the system analysis indicates that the book-to-market factor is capturing priced risk that is systematic and that is not explained by the market factor[14]. In contrast to the HML case, the results in Table 5 show that SMB is not a priced factor even though it helps explain the cross-sectional variation in equity returns reported in Table 3.

To directly test whether BNK is priced, we augment both the CAPM and the Fama-French models with the banking factor, BNK. The results are shown in the third and fourth system regressions, respectively. The estimated factor premium for BNK (λ_{bnk}) is

[13] Heteroskedasticity and autocorrelation consistent covariance matrices (Ferson and Foerster, 1994) are applied in all cases.

[14] We need to apply due caution about the «pricing» argument. The existence of these premiums may be the result of behavioural biases or market inefficiency. It remains an open question whether the book-to-market premium truly represents risk.

Table 4: Individual Regressions of the Fama-French Model on 25 Size and Book-to-Market Sorted Portfolios

Size	BM	a_j	b_j	s_j	h_j	Adj. R^2
1	1	−0.0064*	1.0756*	1.2893*	−0.3922*	0.904
		(−4.37)	(25.8)	(21.81)	(−5.5)	
1	2	0.0010	0.9602*	1.289*	0.0105	0.930
		(0.90)	(30.13)	(16.52)	(0.18)	
1	3	0.0019*	0.8866*	1.025*	0.2242*	0.938
		(2.58)	(36.56)	(30.19)	(5.35)	
1	4	0.0027*	0.8668*	0.972*	0.4146*	0.916
		(2.97)	(31.21)	(25.84)	(10.3)	
1	5	0.0018*	0.9582*	1.0141*	0.6274*	0.918
		(2.11)	(43.31)	(23.88)	(14.48)	
2	1	−0.0027*	1.13*	0.9478*	−0.4007*	0.957
		(−3.24)	(42.41)	(25.12)	(−7.67)	
2	2	−0.0008	1.0405*	0.8421*	0.192*	0.926
		(−0.86)	(38.74)	(14.13)	(2.5)	
2	3	0.001	0.987*	0.7226*	0.4466*	0.919
		(1.33)	(43.58)	(13.3)	(6.45)	
2	4	0.0011	0.9785*	0.7245*	0.5966*	0.907
		(1.22)	(47.51)	(16.24)	(9.59)	
2	5	−0.0012	1.0980*	0.8577*	0.8041*	0.931
		(−1.52)	(43.6)	(17.88)	(17.39)	
3	1	0.0002	1.0403*	0.6998*	−0.513*	0.948
		(0.23)	(48.61)	(21.08)	(−15.63)	
3	2	−0.0001	1.0827*	0.4799*	0.2583*	0.881
		(−0.12)	(36.32)	(6.14)	(3.28)	
3	3	−0.0008	1.0497*	0.4127*	0.5591*	0.867
		(−0.83)	(33.45)	(5.45)	(6.93)	
3	4	−0.0011	1.0389*	0.3979*	0.7198*	0.863
		(−1.16)	(44.19)	(6.97)	(9.15)	
3	5	0.0001	1.1131*	0.4391*	0.8373*	0.863
		(0.04)	(34.52)	(5.97)	(14.53)	
4	1	0.0021*	1.0382*	0.3889*	−0.4552*	0.937
		(2.11)	(38.23)	(8.66)	(−9.06)	
4	2	−0.0010	1.1238*	0.2015*	0.2963*	0.874
		(−0.90)	(33.98)	(2.77)	(3.14)	
4	3	−0.0015*	1.1319*	0.1934*	0.5714*	0.860
		(−1.98)	(34.72)	(2.52)	(6.66)	
4	4	−0.0005	1.0391*	0.192*	0.6207*	0.847
		(−0.55)	(30.32)	(4.48)	(8.68)	
4	5	−0.001	1.1197*	0.1549*	0.7912*	0.834
		(−1.05)	(28.45)	(2.83)	(13.04)	
5	1	0.0024*	0.9186*	−0.3106*	−0.4126*	0.939
		(3.54)	(45.89)	(−11.11)	(−10.59)	
5	2	0.0004	1.0673*	−0.2573*	0.1484*	0.889
		(0.47)	(51.51)	(−5.63)	(2.08)	
5	3	−0.0012	1.0347*	−0.2266*	0.3108*	0.850
		(−1.15)	(38.7)	(−4.05)	(4.34)	
5	4	−0.0016*	1.0024*	−0.2097*	0.6331*	0.867
		(−1.99)	(39.2)	(−5.06)	(10.57)	
5	5	−0.0017	1.0809*	−0.1559*	0.7615*	0.788
		(−1.47)	(26.24)	(−2.82)	(13.9)	

This table reports the results of individual regressions of a Fama-French model on 25 sized and book-to-market sorted portfolios for the period January 1980 to December 2007 according to:

$r_{jt} = \alpha + b_j r_{mt} + s_j SMB_t + h_j HML_t + e_{jt}$

where r_{jt} is the excess return on portfolio j in month t, r_{mt} is the excess return on the market portfolio in month t, SMB_t is the return on size mimicking portfolio in month t, HML_t is the return on the book-to-market mimicking portfolio in month t. The dependent variable portfolios are the intersections of 5 portfolios formed on size and 5 portfolios formed on book-to-market (BM): smallest (1) to largest (5). t-statistics are reported in parentheses below the estimates. Adjusted R^2s (Adj. R^2) are reported for each regression and the final row of the table reports the average adjusted R^2 across the 25 regressions.

* significant at the 5% level.

Table 5: Generalised Method of Moments (GMM) System Tests of the Asset Pricing Models

	GMM	λ_m	λ_{SMB}	λ_{HML}	λ_{BNK}
CAPM	37.99*	0.0086**			
	(0.046)	(4.55)			
FF	39.14*	0.0083**	0.0016	0.0036*	
	(0.036)	(4.36)	(1.35)	(2.18)	
CAPM BNK	35.90	0.0079**			0.0135**
	(0.073)	(4.16)			(6.31)
FF BNK	38.73*	0.0081**	0.0013	0.0038*	0.0124**
	(0.039)	(4.28)	(0.99)	(2.44)	(5.87)

The test of the BNK-augmented Fama-French model is based on the following system:

(4) $r_{jt} = b_j r_{mt} + s_j SMB_t + h_j HML_t + k_j BNK_t + e_{jt}$

(5) $r_{mt} = \lambda_m + e_{mt}$

(6) $SMB_t = \lambda_{smb} + e_{st}$

(7) $HML_t = \lambda_{hml} + e_{ht}$

(8) $BNK_t = \lambda_{bnk1} + e_{kt}$

The generalised method of moments test statistic (GMM), testing that the asset pricing models hold, is distributed as a chi-square with N degrees of freedom. The associated p-value is contained in parentheses below the GMM statistic. The associated t-statistic for the factor premium is contained in parentheses below the coefficient estimates. The t-statistics are corrected for heteroskedasticity and autocorrelation using the (HAC) Newey-West estimator. The sample period is January 1980 to December 2007.

** and * denote significance at the 1% and 5% levels, respectively.

positive and significant at the 1% level in both models. The premium is approximately 1.35% per month and annualises to over 15%[15]. The significant premium suggests that the banking risk factor has an important role in explaining stock returns.

A notable finding in Table 5 is that the overall GMM tests for the CAPM, Fama-French model and BNK-enhanced Fama-French model agree that the asset pricing restrictions are rejected at the 5% level (despite the existence of the significant factor premiums). The GMM test statistics for these cases all have small p-values, which suggests that the asset pricing models cannot adequately price assets. However, the BNK-augmented CAPM is weakly supported by the data – the overall GMM statistic fails to reach significance at the 5% level, though it is significant at the 10% level. Even though market risk, HML and BNK are priced, it appears that there are other factors which are important for explaining the cross-sectional variation in equity returns. Despite this implication, the BNK-enhanced CAPM and the BNK-enhanced Fama-French model have higher p-values compared to the CAPM and the vanilla Fama-French three-factor model. This means that BNK augmented asset pricing models, while not perfect, can better explain variations in equity returns compared to the two standard asset pricing models in the literature.

3.2.3 *Robustness Tests*

The number of sample moment conditions can become too large relative to the number of data points when running the GMM tests on large systems of equations (Cochrane,

[15] The estimated premium is similar to the BNK premium of 1.15% per month reported in Table 1.

2001, pp. 225-6), threatening the reliability of any testing based on them. We address this issue and reduce the number of moment conditions in the robustness test by subdividing the test assets into two subgroups (the odd-numbered and even-numbered portfolios). Unreported results confirm the findings above that the BNK factor has a significant and positive estimated premium in both the BNK-enhanced CAPM and Fama-French model. Therefore, we conclude that BNK is systematic and priced in US stock returns.

4 Summary and Conclusions

The aim of this paper is to test whether there is a banking risk premium that helps capture variation in US stock returns. In part, we are motivated by the literature suggesting that the banking sector plays an important role in promoting future economic growth. Yet asset pricing studies exclude banks because they are «special» in nature. We find that the banking risk factor captures independent sources of cross-sectional variation in equity returns. Further, the positive and significant loadings on BNK suggest that BNK adds power in explaining variation in equity returns, even in the presence of the market, size and book-to-market factors. More specifically, BNK has the ability to explain small or medium size stocks' returns. The formal tests of the asset pricing models show that BNK has a significant and positive estimated risk premium, hence, we conclude that this factor is systematic and priced in US equity returns. The finding that the banking risk factor (BNK) is priced and systematic in the US market has important implications for future asset pricing research conducted in other markets and settings.

So what are the key takeaways from our research? At a general level we argue that serious consideration needs to be given to incorporating a banking factor in future asset pricing research. For investors, our work helps focus attention on the merits of investing in banks. While it is true that the expected return on banking stocks might exceed that which is predicted by the CAPM or even the Fama-French model, such a premium might simply reflect a compensation for a banking factor risk premium. In other words, investors need to pay more attention to whether (and to what extent) any investment strategy that focuses on holding financial stocks is one that «succeeds» because it captures alpha or because it rides a form of beta – a banking beta. Future research should aim to give more guidance in this regard.

References

Allen L. and Jagtiani J. (1997) 'Risk and Market Segmentation in Financial Intermediaries' Returns', *Journal of Financial Services Research*, 12, pp. 159-173.

Allen L., Bali T.G. and Tang Y. (2012) 'Does Systemic Risk in The Financial Sector Predict Future Economic Downturns', *Review of Financial Studies*, 25, pp. 3000-3036.

Barber B. and Lyon J. (1997) 'Firm Size, Book-to-Market Ratio, and Security Returns: A Holdout Sample of Financial Firms', *Journal of Finance*, 52, pp. 875-883.

Barros C.P., Ferreira C. and Williams J. (2007) 'Analysing the Determinants of Performance of Best and Worst European Banks: A Mixed Logit Approach', *Journal of Banking and Finance*, 31 (7), pp. 2189-2203.

Bartram S.M. and Bodnar G.M. (2009) 'No Place to Hide: The Global Crisis of Equity Markets in 2008/2009', *Journal of International Money and Finance*, 28, pp. 1246-1292.

Bhandari L.C. (1988) 'Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence', *Journal of Finance*, 43, pp. 507-528.

Carhart M.M. (1997) 'On Persistence in Mutual Fund Performance', *Journal of Finance*, 52, pp. 57-82.

Chan H. and Faff R. (2005), 'Asset Pricing and the Illiquidity Premium', *Financial Review*, 40, pp. 429-457.

Chen L., Petkova R. And Zhang L. (2008) 'The Expected Value Premium', *Journal of Financial Economics*, 87, pp. 269-280.

Chou P.H., Ho P.H. and Ko K.C. (2012) 'Do Industries Matter in Explaining Stock Returns and Asset-Pricing Anomalies?', *Journal of Banking and Finance*, 36, pp. 355-370.

Cochrane, J. (2001). *Asset Pricing. Princeton University Press*, New Jersey, Princeton.

Cole R.A., Moshirian F. and Wu Q. (2008) 'Bank Stock Returns and Economic Growth', *Journal of Banking and Finance*, 32, pp. 995-1007.

Demsetz R.S. and Strahan P.E. (1995) 'Historical Patterns And Recent Changes In The Relationship Between Bank Holding Company Size And Risk', *FRBNY Economic Policy Review*, 1 (2), pp. 13-26.

Demsetz R.S. and Strahan P.E. (1997) 'Diversification, Size and Risk at Bank Holding Companies', *Journal of Money, Credit, and Banking*, 29, pp. 300-313.

Diamond D. (1991) 'Monitoring and Reputation: The Choice Between Bank Loans and Directly Placed Debt', *Journal of Political Economy*, 99, pp. 689-721.

Elyasiani E., Mansur I. and Pagano M.S. (2007) 'Convergence and Risk-Return Linkages across Financial Service Firms', *Journal of Banking and Finance*, 31, pp. 1167-1190.

Fama E. and French K. (1993) 'Common Risk Factors in the Returns on Stocks and Bonds', *Journal of Financial Economics*, 33, pp. 3-56.

Ferson W.E. and Foerster S.R. (1994) 'Finite Sample Properties of the Generalized Method of Moments in Tests of Conditional Asset Pricing Models', *Journal of Financial Economics*, 36, pp. 29-55.

Gatev E. and Strahan E.P. (2006) 'Banks Advantage in Hedging Liquidity Risk: Theory and Evidence from the Commercial Paper Market', *Journal of Finance*, 61, pp. 867-892.

Kan R. and Zhang C. (1999) 'Two-Pass Tests of Asset Pricing Models with Useless Factors', *Journal of Finance*, 54, pp. 203-235.

Lamont O., Polk C. and Saa-Requejo J. (2001) 'Financial Constraints and Stock Returns', *Review of Financial Studies*, 14, pp. 529-554.

Levine R. (2005) 'Finance and Growth: Theory and Evidence', in Aghion, Philippe, Durlauf and Steven (Eds.). *Handbook of Economic Growth*, North-Holland, Amsterdam, pp. 865-934.

Lintner J. (1965) 'The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets', *Review of Economics and Statistics*, 47, pp. 13-37.

MacKinlay C. and Richardson M. (1991) 'Using Generalized Method of Moments to Test Mean-Variance Efficiency', *Journal of Finance*, 46, pp. 511-527.
Parlour C.A., Stanton R. and Walden J. (2012) 'Financial Flexibility, Bank Capital Flows, and Asset Prices', *Journal of Finance*, 67, pp. 1685-1722.
Petersen M.A. and Rajan G.R. (2002) 'Does Distance Still Matter? The Information Revolution in Small Business Lending', *Journal of Finance*, 57(6), pp. 2533-2570.
Sharpe W.F. (1964) 'Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk', *Journal of Finance*, 19, pp. 425-442.
Viale M.A., Kolari W.J. and Fraser R.D. (2009) 'Common Risk Factors in Bank Stocks', *Journal of Banking and Finance*, 33, pp. 464-472.