Common factors and balance sheet structure of major European banks

ANTONIO ROMA

1. Introduction

This paper explores the relationship between listed European banks' fundamental characteristics and the riskiness of their stock returns. In financial theory, the risk associated with stock returns is measured by the covariance, or more specifically a *factor loading*, on some fundamental variable(s) affecting the return on all stocks in a systematic way.[1] I investigate whether the size of these factor loadings, and therefore the stock riskiness, may be generated by specific fundamental characteristics of the listed bank.

I measure the structural characteristics of banks through a number of different balance sheet indicators and try to associate them to the stock riskiness, as measured by the factor loadings on specific fundamental factors affecting the stock market at large. I specify and fit a factor model for banks' stock returns, and estimate factor loadings on common factors. The aim is to verify, through a cross-section analysis, whether any balance sheet characteristic of the banks examined may account for the size of their factor loading on specific fundamental common factors. I am not concerned with the analysis of banks' fun-

☐ Università degli Studi di Siena, Dipartimento di Economia Politica, Siena (Italy) and London Business School, London (Great Britain); e-mail: roma@unisi.it.

[1] Univariate models, like the CAPM, or multivariate models, see section 3.

BNL Quarterly Review, vol. LIX, no. 237, June 2006, pp. 123-70.

damental balance sheet characteristics per se[2] but only insofar as they may contribute to explain the riskiness of stock returns and may provide guidance for assessing stock trading strategies. Following an option-based theory of banking activity (Merton 1974, 1977 and 1978), I expect the factor loadings of a bank's stock on its assets to vary in a systematic way according to business conditions. In particular, 'weaker' banks should become more risky in a recession. In this light, it is interesting to examine the cross-section of banks' factor loadings estimated during a recession. I argue that the fundamental factors that are best suited to such analysis are the fundamental macroeconomic factors proposed by Chen, Roll and Ross (1986), especially the term spread, default spread and market index, which may directly proxy for the value of banks' assets.

A larger body of literature exists on the connection between the structural characteristics and market value of US banks than for European banks.

A first stream focuses on the effects of diversification of banks' sources of income. Rogers and Sinkey (1999) examine the balance sheets of US banks which earn substantial non-interest income and find that they are generally the larger and safer banks with low interest margin. Brewer, Jackson and Mondschean (1996) study the effect of the diversification of US Savings and Loan associations into different types of loans and mortgages on stock return volatility and find that, for specialized financial institutions, stock return volatility decreases with investment diversification. For European banks, Vennet (2002) also presents the view that 'universal' banks that diversify their income are less risky, in that they have a lower factor loading on a single risk factor: the market index.

Other papers study the effect of individual balance sheet characteristics on stock returns. Flannery and James (1984) find that the bank stocks' well documented[3] sensitivity to unanticipated changes in interest rates (proxied by holding period returns on short term bonds) may be related to the banks' reported gap between short term assets and liabilities.

---

[2] For example, an interesting paper by Cebenoyan and Strahan (2004) finds regularities between European banks' pattern of loan trading and their capitalization ratios, without implications for stock returns.

[3] See also Benink and Wolff (2000).

As far as bank loan loss reserves are concerned, some evidence exists that unexpected increases in banks loan loss reserves may have positive implications for bank stock prices (see Whalen 1994), and that in specific circumstances (loans to Less Developed Countries) provisioning by one bank may have contagion effects on other banks (Grammatikos and Saunders 1990, Docking, Hirschey and Jones 1997). Brewer, Jackson and Moser (1996) investigate the relationship between the volatility of returns and fundamental variables for stocks of 99 US Savings and Loan associations, for the period 1985:3-1989:4. They find the volatility to be significantly related to financial institutions' leverage, the maturity gap of the fixed income portfolio, liquidity, ratio of operating expenses to total income, as well as to derivative instruments activity.

Recent papers take into consideration the multivariate dimension of stock market risk. Cooper, Jackson and Patterson (2003, hereafter CJP) examine the risk-return characteristics of portfolios of US bank stocks sorted according to individual banks' fundamental variables, including loan loss reserves and leverage. They conclude that sorting portfolios of bank stocks according to changes in single fundamental variables like earnings per share, non interest income and leverage, produces extra returns without any increase in risk. They test for the risk involved in the sorted portfolios by adopting a linear multifactor model of the Fama and French (1992) type.

The present analysis is in the spirit of CJP in that I use banks' characteristics in order to construct portfolios that are sorted accordingly. I conjecture that certain balance sheet features may indicate the ownership of riskier assets and therefore translate into higher factor loadings of the corresponding portfolio, also according to an option-based model of the banks' activity (Merton1978). I also try to relate the banks' different characteristics to different risk factors, i.e. examine whether banks with different characteristics are subject to significantly different types of risk. This analysis can be attempted in the context of a multi-factor framework, in which different activities carried out by banks contribute to different dimensions of risk, which we assess separately. Some of these risks may map well into financial and macroeconomic variables.

The idea is that different bank activities are subject to different risk factors, and I argue that a 'macroeconomic' (to follow the definition of Connor 1995) linear factor model along the lines of Chen Roll and Ross (1986, hereafter CRR) is more appropriate to examine the risk characteristics of bank stocks. This is because some CRR-type factors, such as term and default spreads, map directly into the banks' sources of income.

The plan of the paper is as follows: in section 2 I highlight theoretical arguments providing some guidance on the riskiness of different banks. In section 3 I first specify and estimate a multi-factor model for the banking industry sector. In section 4 I estimate the same model for individual banks. I adopt both a simple and a more articulate specification. I then carry out, in section 5, a preliminary cross-section analysis of the correlation between estimated factor loadings and banks' fundamental characteristics. In section 6 I sort banks into portfolios according to univariate fundamental characteristics, and formally test whether the sorted portfolios have significantly different factor loadings on the CRR factors. Section 7 concludes the paper.

2. Basic theory

The basic business of a bank, from the balance sheet point of view, may be characterized as the issue of unlimited liability riskless debt in order to invest in risky assets.[4] In order to be able to repay the riskless liabilities (deposits), a bank must also invest in an implicit put option on the risky assets, so that the nominal value of deposits can always be recovered. This is because, as pointed out by Merton (1974, 1977 and 1978), a riskless debt can be broken down into the sum of a risky debt and a put

[4] A number of mechanisms are in place in order to guarantee the absence of risk for depositors, and prevent moral hazard that would lead bankers to gamble depositors' money in a ruthless way. OECD banks must maintain minimum capital requirements (so-called Basle requirements) and reserve ratios on deposits, which limit the amount of leverage that individual banks may achieve. In many countries, partial insurance on deposits is provided by government or banking industry agencies. Also, in the normal course of their business, banks set aside a portion of their operative earnings as provisions against the default of some of their assets. Given that banks make a positive spread between lending and deposit rates, the present value of which is lost in the event of default, an incentive may arise not to destroy goodwill by over leveraging. In order to maintain sound reserves against bad assets, banks generally set aside as provisions for future losses a portion of operative earnings exceeding what is considered tax deductible in their jurisdiction, in order not to eat into regulatory capital in case of loan losses.

option on the assets backing the risky debt. In such a stylized characterization, a bank can purchase the put option from a third party (e.g. a government agency as in the case of the United States FDIC) in order to partially or completely cover the value of outstanding deposits. An alternative route is to set aside enough reserves to equal the value of the put option. In this sense, the level of reserves against bad loans maintained by banks through the management of loan loss reserves may be viewed as the premium paid to offer their borrowers a put option on their assets. Should a risky loan default, the bank will absorb the loss through the loan loss reserves and keep depositors insulated from the loss.

If banks' reserves against loan losses are indeed maintained at the correct level implied by the 'put option theory', basic option pricing principles will imply, other things being equal, that the correct level of banks' reserves should be a monotonically decreasing function of the value of the assets, and a monotonically increasing function of the riskiness of banks' assets, i.e. of the volatility of the assets. Banks which hold the more volatile assets should maintain, over time, a higher level of reserves against loan losses per unit of investment.[5] However, the same theory will also yield implications for the value of banks' equity, i.e. the market value of banks' stock. Merton (1978) fully spells out the symmetric implications for the value of a bank's equity as a function of the value and 'quality' (volatility) of the assets in which the bank has invested. One interesting implication is that, in fact, the value of a bank's stock is a non linear function of the value of its assets. When the value of the risky assets a bank has invested in goes sufficiently low while the bank is still in operation, even if the bank maintains appropriate reserves, the value of the levered equity (the value of the assets plus the value of the put option minus the nominal value of deposits) of a bank holding riskier assets will move more, as a function of the underlying assets, than the value of a safer bank. In other words, in the case of a bank with more volatile assets the factor loading on the value of the underlying assets will be higher when banks approach the bankruptcy boundary.

Such a pure theory may be difficult to test directly due to the unobservability of the prices and volatilities of banks' assets, as discussed

---

[5] If the risky assets against which insurance is sought are tradable, standard option pricing methods could be used to asses the correct level of these reserves. Bank assets are not fully tradable, although tranches of large bank loans often are, and it is in general not possible to evaluate the true riskiness of an individual bank's portfolio of loans in detail from the outside.

in the next section. I cannot test whether banks' reserves are continuously maintained to mimic the value of a put option on the banks' assets. If they were, a testable implication would be that, if we consider sample periods around a market crash and/or deep economic recession, when banks are more likely to go bankrupt, the stocks of 'riskier banks' should have a higher factor loading on the value of the assets they invested in. This is evident from equation 14 for the value of bank equity in Merton (1978), for example.

From an empirical perspective, we may adopt the assumption that higher loan loss reserves are at least one of the parameters of a riskier bank. Financial analysis of bank stocks usually adopts a few indexes derived from balance sheet data to summarize the quality of a bank and its resilience to adverse business conditions. Generally speaking, a high capital base and high operational efficiency denote a less risky bank. At the same time, the relative composition of revenues (interest income versus non-interest income) may indicate a bank more geared towards interest rate or securities market risk. In traditional analysis, abundant loan loss reserves per unit loan, being a 'coverage indicator', may be associated with a less risky bank. However, from the elements of bank valuation theory just recalled, this last conclusion is not automatically warranted, and we may instead expect a positive association between higher loan loss reserves and bank stock riskiness. Moreover, the different characteristics of a riskier bank may be correlated, and therefore should all be taken into consideration. In broad terms, we would expect reserves and provisions against loan losses to be positively related to factor loadings for the reasons just mentioned, (low) efficiency indicators to also be positively related to factor loadings, and capital adequacy to be negatively related to factor loadings. Different types of revenues may be positively or negatively related to factor loadings. I attempt below to highlight empirical regularities in the riskiness of bank stocks.

3. Determinants of bank sector stock returns

My aim is to test whether there is an association between banks' different balance sheet structures and their factor loadings on macroeconomic factors. From the preceding discussion, we also have a theory predicting that, in bad times, the value of the equity of banks that have invested in more risky assets will be more sensitive to the change in value of the assets. To test this hypothesis we would need to observe the value and quality of the banks' assets. Unfortunately, as already mentioned, it is not really possible to directly observe whether a bank holds assets that are riskier than those held by another bank. However, if we hypothesise that banks that hold larger reserves against bad loans do own more risky loans, i.e. loans whose value is more volatile, in bad times (when the value of assets is very low) the equity of these banks should consequently have a higher factor loading against the value of the underlying assets. This effect should be even more pronounced if reserves are under dimensioned. Given that we cannot observe the change in value of the exact portfolio of assets held by individual banks, the value of these assets can only be proxied by one or more market indicators. I choose to proxy the value of assets by many different indicators. This results in a multi-factor model for the value of banks' equity, where the independent variables may also be interpreted as proxies for the value of banks' assets. The variation in banks' equity (the difference between assets and liabilities) arises to a large extent from the default risk of risky loans, term structure risk, stock market risk and the general level of economic activity. But these are precisely the CRR factors. In other words, the reference portfolio of banks' assets is unobservable and we can only proxy it by market indexes and fundamental variables.[6] More specifically, in CRR variation in stock prices is explained by real economic growth (as far as the real component is concerned) and by inflation, as well as by variables that affect the state of the economy, such as the oil price. Key explanatory variables are also *i*) variation in the market return, *ii*) variation in the default premium and *iii*) variation in the term premium. However, in the case of banks, not only the stock price, but also the value of their assets will be a direct function of the factors *i*), *ii*) and *iii*) and, to a lesser extent, a function of real production and inflation.[7] Banks assets and

[6] This is akin to the well-known problem of the impossibility of observing the market portfolio in tests of the CAPM, but far less serious in that we know the composition of banks' balance sheet by asset class; we just do not have information about individual loans.

[7] Also, in addition to exerting a general influence on all stock valuations, the market factor may directly impact banks profitability through the commission income. The commissions that banks earn for their asset management/administration services will be a function of market trends, as in declining markets asset management

equity are obviously directly subject to default risk and term structure risk, as they issue liabilities with certain values (riskless deposits) to invest in risky credits and in general fixed income assets with longer maturity. The market factor, in addition to exerting a general influence on all stock valuations, may directly impact banks' profitability through the commission income earned on asset management services. However, given the nature of banks' assets, finding suitable proxies is straightforward. The fundamental factors proposed by CRR will proxy for the dynamics of banks' assets and will explain the behaviour of banks' stock exactly because they mimic the value of banks' assets. Following the theory summarised in section 2, some systematic cross-section differences in estimated CRR factor loadings should emerge during economic and market recessions.

The CRR macro-factor specification has been subject to considerable debate, especially when contrasted to the Fama and French (1992) interpretation of fundamental factors as the return on portfolios mimicking firms' characteristics. The Fama and French approach, which explains stock returns with the return on specially selected portfolios of stocks, typically delivers a superior statistical fit. This may render CRR factors redundant when associated with Fama and French factors (He and Ng 1994). Flannery and Protopapadakis (2002) provided evidence that the effects of macroeconomic variables on stock prices may be reliably detected using a heteroscedastic specification of the CRR-type factor model applied to daily stock market data. In my empirical application, I seek to explore the determinants of returns on bank stocks. As I have argued, CRR-type factors are definitely more appropriate as they effectively capture the key fundamental determinants of banks' activity and valuation.[8]

If CRR factors proxy for the value of the banks' assets, when we estimate a linear factor model on banks' stock returns we may gain some insight into the relationship between the value of banks' assets and the value of their equity. This relationship may not be constant or linear, as highlighted in section 2.[9]

---

services will be less appealing to bank customers (although structured products embedding different forms of risk protection may be sold in bear markets).

[8] Fama and French (1992, p. 429) specifically exclude financial firms from their factors as they are not well suited for their model.

[9] It is clear in my analysis that a formal test that banks with riskier assets have higher factor loadings in bad times is also a test of the joint hypothesis that high reserves for unit loan signal riskier assets.

3.1. *Stock return model*

I consider a CRR-type stock return model, incorporating heteroscedasticity along the lines of Flannery and Protopapadakis (2002). In the model, the stock return depends on common systematic factors and on macroeconomic news which is released only on specific dates. Moreover, given that daily stock return data are used, day of the week dummy variables are also included. The stock specific error in the equation describing returns is considered to be heteroscedastic. Its variance depends on past values, on the macroeconomic news periodically released and on the day of the week. Formally we have:

$$r_{it} = \alpha_i + \sum_{k=1}^{K} \beta_i^k F_{kt} + \sum_{k=1}^{M} \delta_k DM_{kt} + \sum_{k=1}^{4} \gamma_k D_{kt} + u_t, \qquad (1)$$

$$u_t = \varepsilon_t h_t, \qquad (2)$$

$$h_t^2 = h_0^2 + \alpha u_{t-1}^2 + \beta h_{t-1}^2 + \sum_{k=1}^{M} \Delta_k DM_{kt} + \sum_{k=1}^{4} \Gamma_k D_{kt}. \qquad (3)$$

In the model r_{it} denotes return on day t on the i^{th} stock (or portfolio of stocks) which is determined by a number of (ideally uncorrelated) factors (F_{kt}). One of the common factors F_k may be the return on the market as a whole. However, we assume (and test) that additional factors may explain stock returns. There is an extensive body of literature on the nature of the additional factors F_k (see Connor 1995 for a synthetic treatment).[10] Following CRR, I use the term spread (TERMSPRE), the default spread (DEFSPRE), the percentage variation in oil price and in US$/euro exchange rate (OIL and ER), and the market return (STOXX).

In summary, TERMSPRE represents the difference between the holding period return on a long term government bond and the risk-free rate; DEFSPRE represents the difference between the holding period return on a long-term corporate bond and on a long-term govern-

[10] Essentially, either macroeconomic variables are used, or portfolios of stocks mimicking company/industry characteristics, or statistically extracted factors, which cannot however be fully re-conducted to real world variables.

ment bond; both TERMSPRE and DEFSPRE were constructed according to the CRR definition; OIL is the percentage variation in the oil price; ER is the percentage variation in the US$/euro exchange rate; STOXX is the percentage variation in the Stoxx index. I denote by BANKS the percentage variation in the Stoxx Banks index. See appendix A for precise definitions of variables.

In the return and variance equations 1 and 3 DM_{kt} represents news on macroeconomic variables, which is released at a frequency lower than that of stock returns. DM_{kt} will be equal to zero for most t, and differs from zero when unanticipated information hits the market. D_{kt} is a day of the week dummy variable, for Monday, Tuesday, Thursday and Friday.

Turning to the macroeconomic news DM_{kt}, I considered the variables that have been found in the literature to have significant impact on stock returns. Flannery and Protopapadakis (2002) find that for US stock market returns only news about the Consumer Price Index (CPI), Producer Price Index (PPI), money growth (M2), and Housing Starts influences returns, while GDP news (negatively) affects variance. I used similar variables released for the euro zone (countries adopting the euro), and computed the unanticipated component by subtracting the market anticipation of each release (as provided by Bloomberg) from the data released. The Bloomberg published surveys are monitored by all market participants and immediately compared with the data release.

I was not able to use the equivalent of Housing Starts for the euro zone. Given the short sample period, I also included monthly Industrial Production news, instead of the quarterly GDP news, following CRR. Of course the right-hand side of the return equation 1 can also be viewed as a model for the value of banks' assets.

By disregarding equations 2 and 3 we obtain a homoscedastic model, and by further setting δ_k and γ_k to zero we obtain the CRR model (model 1'):

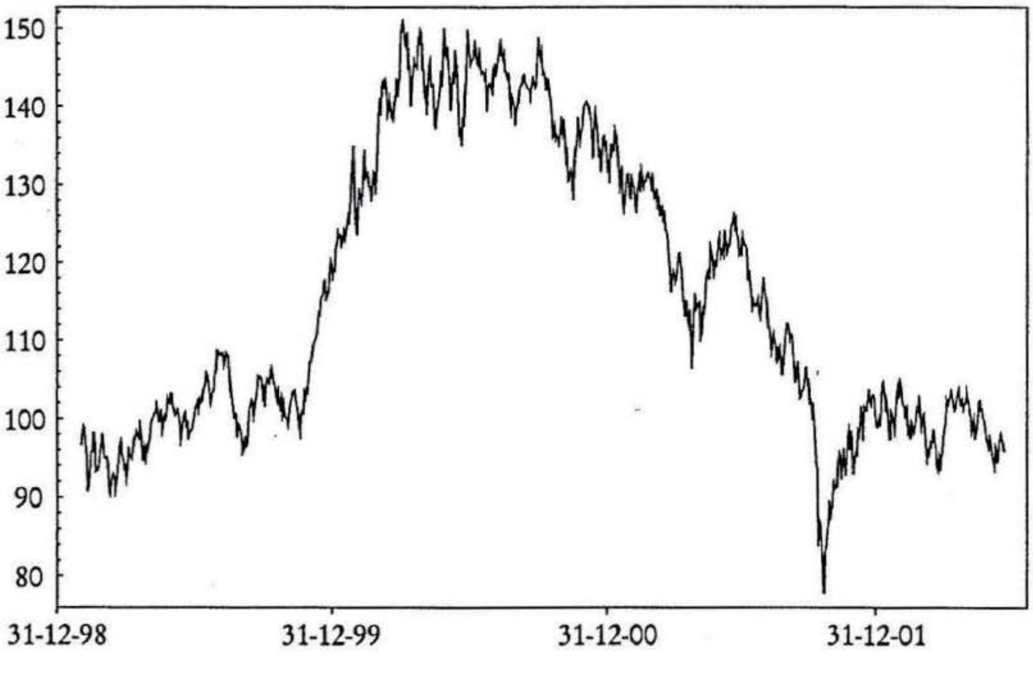
$$r_{it} = \alpha_i + \sum_{k=1}^{K} \beta_i^k F_{kt} + u_{it}. \tag{1'}$$

3.2. *Factor data*

Daily data for the above described variables for the period January 4, 1999 to April 30, 2003 were obtained from Bloomberg. To put the sample period considered into perspective, figure 1 shows the time series behaviour of the SX5E (Stoxx) index. The year 1999 was characterized by a sharp market rally towards the end of the year, which started to fade in 2000, turning into the economic downturn and market crashes of 2001 and downtrend of 2002.

FIGURE 1

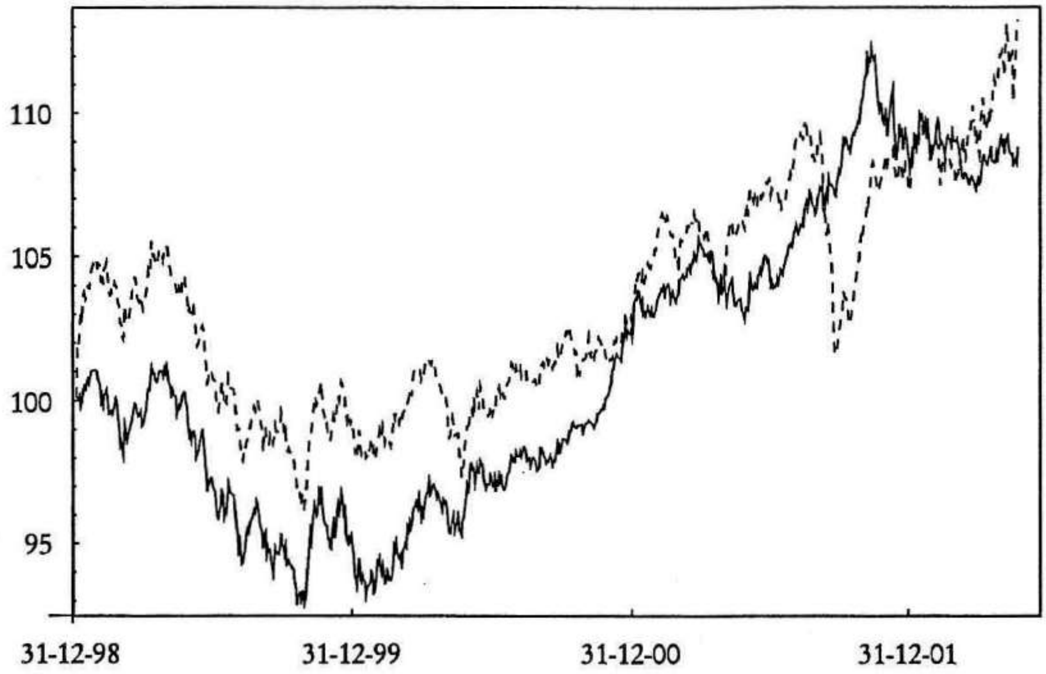
STOXX INDEX



In particular, the year 2001 was characterized by a pronounced variation of all factors. Stock market variability was high (the Stoxx annualized volatility was 28%), with the burst of the 'new economy bubble' early in the year, and the dramatic crash and subsequent recovery of the markets following the September 11 attack in the US. The period from March 2001 to November 2001 was declared by the NBER as an official recession in the US. Monetary policy reaction during the year caused the euro 1-month interest rate to drop from 4.84% at the beginning of the year to 3.32% at the end of the year, and to 2.89% at the end of 2002. The oil price also moved substantially, especially in the last quarter of 2002, due to political fears about a potential Middle East crisis. The euro weakened throughout against the US dollar throughout the period. However, as figure 2 clearly demonstrates, the default spread volatility was also highest in 2001, with flights to quality following every stock market drop.

FIGURE 2

GOVERNMENT AND CORPORATE BOND INDEX



The figure shows the behaviour of the government bond index (solid line) and corporate bond index (dashed line)

The high variation in all the variables may have provided the optimal sample to test the theory from the econometric point of view. The sharp market drops of 2001 and 2002 raised concerns about banks' profitability, and represent an interesting and extreme period to test whether banks' individual characteristics affected their stock return. In particular, given the sharp decrease in the value of banks' main assets, we can try to test whether we can notice a 'flight to quality' among banks' shareholders in this period, whereby banks that appear to own riskier assets are more heavily penalized by the market.

3.3. *Statistical analysis of common factors and of the bank sector index*

The time series behaviour of the chosen factors and their relationship with the bank sector index return (BANKS) was preliminarily investigated for the sample period January 4, 1999 to December 31, 2002 (1006 daily observations). Results are reported in table 1. In the table, Panel A reports the correlation among the factors. The term structure (TERMSPRE), default spread (DEFSPRE), and exchange rate variable (ER) are significantly correlated with the market index (STOXX) over the sample period. TERMSPRE is also significantly correlated with DEFSPRE (as expected, given that the definition of DEFSPRE includes TERMSPRE – see Appendix A) and with the exchange rate variable.

TABLE 1

FACTORS CORRELATION AND INDUSTRY INDEX REGRESSIONS

PANEL A

	TERMSPRE	DEFSPRE	OIL	ER	STOXX
TERMSPRE	1				
DEFSPRE	−0.408	1			
OIL	−0.013	0.003	1		
ER	0.197	−0.111	−0.023	1	
STOXX	−0.254	0.322	0.045	−0.185	1

Panel A shows the correlation matrix for the factors considered (s.e. ≃ 0.03) and the Stoxx index return.

PANEL B

C	TERMSPRE	DEFSPRE	OIL	ER	STOXX*	R^2
0.0127					0.7776	0.74
(0.499)					(53.48)	
−0.0006	−0.5718	1.8292	0.0079	−0.3958	0.7481	0.75
(−0.024)	(−5.865)	(16.154)	(0.844)	(−10.519)	(48.420)	

Panel B shows the results of the regression $BANKS_t = C + b_1\, TERMSPRE_t + b_2\, DEFSPRE_t + b_3\, OIL_t + b_4 ER_t + b_5\, STOXX_t + \varepsilon_t$ (t-stats in parenthesis).

* When more than one factor is considered, the residuals of a regression of STOXX on the other factors are used.

Estimation results for the model

$$BANKS_t = \alpha + \sum_{k=1}^{K} \beta^k F_{kt} + \sum_{k=1}^{M} \delta_k \, DM_{kt} + \sum_{k=1}^{4} \gamma_k D_{kt} + u_t$$

$$u_t = \varepsilon_t h_t$$

$$h_t^2 = h_0^2 + \alpha u_{t-1}^2 + \beta h_{t-1}^2$$

over the entire sample period 1999-2002. In the table, factor loadings F_{kt}, k = 1, 5 are denoted TERMSPRE, DEFSPRE, OIL, EUR, MK. The macroeconomic variables dummies DM_{kt}, k = 1, 4 are denoted CPI, INT, PPI, IND. The day of the week dummies D_{kt}, k = 1, 4 are denoted MON, TUE, THU, FRI. t-stats are in parenthesis.

PANEL C

C	TERMSPRE	DEFSPRE	OIL	ER	STOXX*	R^2	
–0.020	–0.735	2.153	–0.019	–0.422	0.748	0.78	
(–0.413)	(–7.670)	(14.870)	(–2.325)	(–10.185)	(37.824)		
CPI	INT	PPI	IND	MON	TUE	THU	FRI
–1.215	–0.004	–1.604	0.028	–0.014	0.017	0.106	0.019
(–0.901)	(–0.005)	(–1.793)	(0.118)	(–0.211)	(0.251)	(1.490)	(0.266)
h_0	α	β					
0.021	0.071	0.894					
(1.758)	(3.443)	(24.679)					

Panel C shows the estimates of the factor loadings obtained.
* When more than one factor is considered, the residuals of a regression of STOXX on the other factors are used.

In order to soften the effect of collinearity between the market index variable STOXX and the other factors, a new market variable, MK, was defined (following McElroy and Burmeister 1988) as the residuals of a regression of STOXX on the other four factors. The market factor thus defined summarizes all the market forces that cannot be explained by macro-factors.

Next, the relationship between the factors and bank sector index returns, BANKS, was investigated using regression analysis (model 1'). Panel B of Table 1 reports the results. With the exception of OIL, all other factors are significant in explaining BANKS. However, the adjusted R^2 improves only marginally when using other factors in addition to the market. Nevertheless, maintaining the five factor structure allows more structural insight as it makes it possible to properly attribute explanatory power to the factors underlying the behaviour of the stock market index. For example, it is well known that banks have a high β on the market. However, once the effect of the default spread is disentangled from the market factor, it appears that some of the variability of banks' stocks with respect to the market can be traced back to their exposure to the default spread.

The model 1, 2 and 3 was also estimated for BANKS, but it was not possible to obtain a reliable estimate for the coefficients on the dummy variables in the variance equation 3, due to a convergence problem in the maximum likelihood procedure. A simplified equation for variance dynamics was therefore adopted. Nevertheless, the estimates of the factor loadings obtained are very similar to those obtained under model 1' and discussed above (Panel C). The dummy variables for the macroeconomic announcements and the day of the week are not statistically significant, while there is some evidence of heteroscedasticity.

4. Individual banks

We now focus on European bank stocks listed on different European exchanges. Following the introduction of the euro to European financial markets in January 1999, these stocks are quoted in the same currency. The aim is to measure whether banks with higher (lower) loadings on factors proxying for the value of their assets are also the banks with higher (lower) balance sheet indicators of risky positions. In other words, we try to ascertain whether fundamental balance sheet indicators can be taken to be the factor loadings.

The factor model was estimated on individual banks' stock returns. The sample of banks consists of 27 banking groups listed on the main markets of the euro zone (Germany, France, Italy, Ireland, Spain, Portugal, Belgium, Holland), i.e. with shares traded in euro. These banks are well covered by analysts of at least three main global brokers in Europe (this, and market capitalization, were the criteria for selecting them), and their fundamentals are well know in the market. The names and descriptions of these banks appear in table 2. I con-

TABLE 2

SAMPLE OF EUROPEAN BANKS USED
IN THE INDIVIDUAL SECURITIES ANALYSIS

Bank code	Bank name*	Country	Approx. market cap euro bn (end of 2002)
dexb-bb	Dexia	Belgium	13.0
bpin-pl	Banco BPI	Portugal	1.6
bkir-id	Bank of Ireland	Ireland	10.0
forb-bb	Fortis	Belgium	21.0
bcp-pl	Banco Comercial Portugues	Portugal	5.3
bkt-sm	Bankinter	Spain	1.8
besnn-pl	Banco Espirito Santo	Portugal	3.7
aaba-na	ABN AMRO Holding	Holland	24.3
pop-sm	Banco Popular Español	Spain	8.6
bip-im	Bipop-Carire (Fineco)	Italy	1.6
kbc-bb	KBC Bankverzekerings	Belgium	9.0
albk-id	Allied Irish Banks	Ireland	12.0
bpvn-im	Banco Popolare di Verona e Novara	Italy	4.0
dbk-gr	Deutsche Bank	Germany	26.0
cbk-gr	Commerzbank	Germany	4.0
bpl-im	Bipielle Investimenti	Italy	1.7
hvm-gr	Bayerishe Hypo- und Vereinsbank	Germany	7.8
bmps-im	Monte dei Paschi	Italy	6.0
bbva-sm	Banco Bilbao Vizcaya Argenta	Spain	30.0
gle-fp	Société Générale	France	24.0
uc-im	Unicredito Italiano	Italy	24.0
spi-im	San Paolo Imi	Italy	12.0
bnl-im	Banca Nazionale del Lavoro	Italy	2.4.0
bnp-fp	BNP Paribas	France	35.0
cl-fp	Crédit Lyonnais	France	19.0
bin-im	Banca Intesa	Italy	14.0
brm-im	Banca di Roma (Capitalia)	Italy	3.0

* All banks' names are as of May 2002.

sidered daily data on these stocks for the period 4 January 1999 to 30 April 2003, obtained from Bloomberg.[11]

Individual stock returns were regressed on the five common factors (using the variable MK as the market factor) for the four-year period 1999-2002, and separately for each calendar year (model 1'). Table 3 summarizes the results.

TABLE 3

SIZE AND SIGNIFICANCE OF ESTIMATED FACTOR LOADINGS*

PANEL A: NUMBER OF SIGNIFICANT FACTOR LOADINGS

	TERMSPRE	DEFSPRE	OIL	ER	MK	CONST
1999	9	5	4	16	26	1
2000	3	13	3	3	26	0
2001	8	26	9	5	27	2
2002	24	25	1	3	26	1
99-02	18	26	2	19	27	0

PANEL B: AVERAGE FACTOR LOADINGS

	TERMSPRE	DEFSPRE	OIL	ER	MK	CONST
1999	0.52	–0.29	0.03	–0.30	0.71	0.08
2000	0.18	1.69	0.01	–0.11	0.44	0.06
2001	–0.65	1.96	–0.05	–0.14	0.73	–0.08
2002	–2.98	2.09	0.01	–0.20	0.73	0.05
99-02	–0.72	1.84	–0.01	–0.23	0.69	0.00

* The Table summarizes by sample period the number of significant factor loadings at the 5% confidence level in the individual securities regression $rit = C + b_{1i}\ TERMSPRE_t + b_{2i}\ DEFSPRE_t + b_{3i}\ OIL_t + b4iER_t + b_{5i}\ STOXX_t + \varepsilon_{ti}$, (Panel A) and the average value of the estimated factor loadings across all banks (Panel B).

While the market factor (MK) is statistically significant at the 5% level in each year and in the entire 1999-2002 sample, the number of statistically significant coefficients for the other factors varies across the years. However, the DEFSPRE coefficient is significant for all banks

[11] As each national market observes different holidays, daily data on the fundamental factors for each stock were aligned with that of the stock, resulting in slightly different samples that differ according to the few differences in holidays.

but one in the entire 1999-2002 period, and significant for almost all banks for the years 2001 and 2002. It is likely that the strong significance of this variable for the entire sample 1999-2002 depends on the behaviour in the subsamples 2001 and 2002. In the presence of weak economic conditions, the value of banks' stock appears significantly related to the value of a proxy for the banks' main assets, i.e. risky loans.

On the other hand, the number of significant coefficients for the other factors vary considerably across the five different samples. In 1999 and in 2000 the significance of factors other than the market factor is also scattered and cannot be generalized.

A similar analysis was carried out for the model 1, 2 and 3 and is reported in Table 3bis. However, this non-linear model was successfully estimated for each bank only for the entire period 1999-2002, due to convergence problems in the maximum likelihood procedure in the subsamples. The significance of factor loadings on both MK and DEFSPRE remains very high (over 2/3 of significant coefficients), although in a few cases the additional explanatory variables tend to capture some of the stock price variation (Panel A). Moreover, for the entire 1999-2002 period, the coefficients estimated on the factors F_k are very similar to those obtained for the simple homoscedastic model 1' (Panel B). In the subsequent analysis, coefficients from model 1' have been used, although the cross-sectional analysis of section 5 was also carried out using factor loadings from model 1, 2 and 3.

TABLE 3BIS

ESTIMATION RESULTS FOR THE MODEL

$$r_{it} = \alpha_i + \sum_{k=1}^{K} \beta_i^k F_{kt} + \sum_{k=1}^{M} \delta_k DM_{kt} + \sum_{k=1}^{4} \gamma_k D_{kt} + u_t$$

$$u_t = \varepsilon_t h_t$$

$$h_t^2 = h_0^2 + \alpha u_{t-1}^2 + \beta h_{t-1}^2 + \sum_{k=1}^{M} \Delta_k DM_{kt} + \sum_{k=1}^{4} \Gamma_k D_{kt}$$

over the entire sample period 1999-2002. In the table, factor loadings F_{kt}, k = 1, 5 are denoted TERMSPRE, DEFSPRE, OIL, EUR, MK. The macroeconomic variables dummies DM_{kt}, k = 1, 4 are denoted CPI, INT, PPI, IND. The day of the week dummies D_{kt}, k = 1, 4 are denoted MON, TUE, THU, FRI.

PANEL A: NUMBER OF SIGNIFICANT COEFFICIENTS

α_i	TERMSPRE	DEFSPRE	OIL	EUR	MK	CPI	INT	PPI	IND	MON	TUE	THU	FRI
3	12	21	1	14	20	4	2	1	2	4	2	1	2

h_0	α	β	CPI	INT	PPI	IND	MON	TUE	THU	FRI
2	13	11	1	3	1	0	2	2	1	0

PANEL B: AVERAGE VALUE OF THE COEFFICIENTS

α_i	TERMSPRE	DEFSPRE	OIL	EUR	MK	CPI	INT	PPI	IND	MON	TUE	THU	FRI
0.09	–0.64	2.15	–0.02	–0.24	0.69	3.03	0.09	–0.80	–0.33	–0.15	–0.12	–0.06	–0.10

h_0	α	β	CPI	INT	PPI	IND	MON	TUE	THU	FRI
1.89	0.09	0.70	2.52	7.65	12.43	0.25	0.24	0.28	0.43	0.21

The size and cross-sectional variation of the estimated factor loadings were examined next. Given the strong association of the DEFSPRE variable with stock returns and its low variability compared to MK, significant factor loadings on DEFSPRE are expected to be larger than factor loadings on MK. In the samples in which the default spread is significant for almost all banks (1999-2002, 2001 and 2002) according to model 1', the cross-sectional variation in the DEFSPRE coefficient is high. For the entire sample in 1999-2002 this factor loading has values between 0.16 and 2.97. This variation is greater than the cross-section variation of the MK factor loadings (0.24 to 1.09 for MK). Factor loadings on TERMSPRE, when significant, are generally negative, while no clear sign pattern emerges for factor loadings on OIL and ER.

The significance of the default spread is not at all surprising given that banks' equity variation will be strongly associated with this variable. However, banks are also subject to term structure risk, but this effect does not show up systematically in the cross-section of factor loadings. Part of the reason may be due to the negative correlation between TERMSPRE and DEFSPRE, which decreases their significance (especially in the case of the weaker explanatory variable TERMSPRE). In addition, if we consider the impact of term structure effects on bank stock price resulting from the variation of banks equity, we realize this is very limited. In fact, for the majority of the banks examined, quantitative assessment of market risk (following the Basle I directive) seems to have been implemented and term structure risk appears very much under control. All the banks examined emphasize their approach to risk management in their annual reports, aimed at controlling all market risks, and often report the average Value at Risk (VAR) of their securities portfolio. The bulk of market risk is usually interest rate risk, which is subject to some kind of Asset Liability Management approach. The reported VAR numbers are generally reassuring.[12] On the other hand, if the amount of term structure risk (and

---

[12] This is not to say that banks are not subject to significant interest rate risk. However, interest rate risk may be related in a more cyclical fashion to (short and long) interest rate fluctuations. Interest rates are in fact a typical business cycle variable, and their variation affects banks' earnings both at the top line level (interest rate margin is affected by interest rate variation via the different stickiness of lending and deposit rates at different interest rate levels), and at the provisions level via the effect on bad loans. Typically, banks cannot compress deposit rates at low levels of interest rate, while at the same time lending rates decrease, and the interest margin is com-

generally market risk) on the banks' books could be quantified, the impact on share price could in principle be marked to market. This would require access to a bank's internal information. However, the message that comes from the annual reports of the banks examined is that term structure risks are very limited, and therefore should not be very important in explaining the high frequency variation in the price of their equity. Table 4 summarizes the information available on market risk from the 2001 consolidated annual reports of the banks examined. Although trading portfolios (mainly fixed income securities) are much larger than banks' equity, daily VAR represents on average less than 0.25% of equity. Given these numbers, it is not surprising that, in most of the cases, the term spread variable does not significantly explain bank stock returns.

On the other hand, credit risk, which is the bulk of banks' operating risk, is of a completely different order of magnitude and not yet subject to detailed quantitative measurement. From my time series analysis, the effect of credit risk on bank stocks, as proxied by the default spread, is clearly quite pronounced.[13]

5. Cross-section variation of the factor loadings

In this section I try to understand whether the difference in balance sheet indicators of European banks is also reflected in the factor loadings of their stock on fundamental factors, which may proxy for the value of their assets. I am especially interested in the correspondence between balance sheet indicators relating to reserves for loan losses and factor loadings. In fact, according to the theory summarized in section 2, if we accept the assumption that higher reserves for loan losses signal riskier assets, the bank stock should consequently have a higher factor loading on market factors that proxy, in a significant way, for

---

pressed. On the contrary, with an increasing interest rate, lending rates increase faster and the interest rate margin increases. These will be 'slow' effects that build up over the bank reporting period, and will not be easy to detect in daily share price variation.

[13] VAR, on a daily basis, is on average well below 0.25% of banks' equity. Due to active portfolio management and stop losses, it is unlikely that this measurement can be annualized in a linear fashion. The stock of credit risk, as measured by loan loss reserves, is of the same order of magnitude as banks' equity.

TABLE 4

VALUE AT RISK OF TRADING PORTFOLIO*

Bank	Shareh. equity, euro ml	Trading portf., euro ml	Avg. VAR, euro ml	Avg. VAR to shrh. eq. %	Avg. VAR to trading port %	VAR horizon	Confidence interval %	Notes
dexb-bb	8,337	116,780	18,125	0.22	0.02	10 days	99	Average of first 9 and last 3 months, where trading exposure was quite different
bpin-pl	909	2,859	n.a.	n.a.	n.a.	n.a.	n.a.	Adopts maturity gap and VAR approach
bkir-id	3,798	8,673	8	0.21	0.09	1 day		Effect of 1% parallel upward shift in term structure
forb-bb	13,844	19,447	n.a.	n.a.	n.a.	n.a.		Uses basis point sensitivity of swap curve rates, VAR and duration of net equity
bcp-pl	2,187	4,783	4,5	0.21	0.09	10 days	99	1% parallel shift of yield curve, historical stress tests
bkt-sm	847	777	9,38	1.11	1.21	1 day	95	Stress test (125 b.p., –30% on stock market, 5% change in FX, volatility 60%)
besnn-pl	1,404	5,489	31,22	2.22	0.57	10 days	99	
aaba-na	11,787	152,455	41	0.35	0.03	1 day	99	Stress test

* The table reports information about the banks' risk control derived from their 2001 consolidated financial statements.

TABLE 4 (*cont.*)

Bank	Shareh. equity, euro ml	Trading portf., euro ml	Avg. VAR, euro ml	Avg. VAR to shrh. eq. %	Avg. VAR to trading port %	VAR horizon	Confidence interval %	Notes
pop-sm	2,296	617	0,269	0.01	0.04	1 day	95	Stress tests, duration, sensitivity to shift in yield curve and change in volatility
fco-im	2,119		n.a.	n.a.	n.a.	1 day	99	VAR at 31.12.01 = 3.3M whereas the 10 day VAR was 10.7m
kbc-bb	9,480	66,224	13,98	0.15	0.02	10 days	99	Av. VAR is for equity portfolio only. Basis point value: change in portfolio value for trading equity portfolio only
albk-id	5,626	20,414	13	0.23	0.06	1 day	99	Interest sensitivity gap analysis
bpvn-im	1,937	2,787	n.a.	n.a.	n.a.			
dbk-gr	35,663	365,319	41,02	0.12	0.01	1 day	99	Av. VAR is total for corporate and investment bank group division trading units. Stress testing
cbk-gr	12,043	104,455	13	0.11	0.01	7 days	99	Stress testing
bpl-im	1,756	5,208	n.a.	n.a.	n.a.			Covariance approach, stress tests

TABLE 4 (*cont.*)

Bank	Shareh. equity, euro ml	Trading portf., euro ml	Avg. VAR, euro ml	Avg. VAR to shrh. eq. %	Avg. VAR to trading port %	VAR horizon	Confidence interval %	Notes
hvm-gr	25,110	n.a.	76	0.30	n.a.	1 day	99	
bmps-im	5,308	11,467	9,77	0.18	0.09	1 day	99	Sensitivity analysis
bbva-sm	17,498	93,246	24,18	0.14	0.03	1 day	99	Sensitivity analysis
gle-fp	15,750	128,597	38	0.24	0.03	1 day	99	Stress test, sensitivity, Vega
uc-im	9,466	29,367	3,69	0.04	0.01	1 day	99	Duration
spi-im	8,002	16,798	7,5	0.09	0.04	10 days	99	Sensitivity analysis (100 b.p.), worst case scenario
bnl-im	3,613	6,471	13,5	0.37	0.21	1 day	99	Av. VAR is for Dec. 2001. Year av. approx. 8 mill.
bnp-fp	24,610	98,559	30	0.12	0.03	10 days	99	Gross Earning at Risk (GEaR), stress tests
cl-fp	8,207	17,816	19	0.23	0.11	1 day	99	50 stress scenarios
bin-im	14,061	56,419	15	0.11	0.03	1 day	99	Volatility sensitivity (Vega), Delta risk
cap-im	5,624	16,179	n.a.	n.a.	n.a.	1 day	99	VAR at 31.12.01=24.8M, 30.6.01=15M, 31.12.2000=10M. Expected shortfall method

the value of its assets. This pattern should emerge in economic downturn. By including other possible balance sheet indicators in the analysis, I try to understand whether this effect may also be captured by other banks' characteristics, i.e. given, for example, by differences in leverage (Tier 1 capital), or general bank efficiency. In the literature a number of fundamental characteristics that affect banks' stock returns have been identified (see section 1). I try to explain why, in specific circumstances, stock returns should be affected by the value of fundamental indicators and, in particular, whether the evidence is consistent with an option based approach to the valuation of banks.

5.1. *Fundamental indicators*

The set of characteristics considered are those that capture the main items of the operating margin (interest income, commission income, loan loss provisions, administrative expenses) and of the balance sheet (leverage, reserves for loan losses). Freedom of establishment for financial institutions within the European Union and the consequent harmonization of their business, as well as relatively similar accounting standards, make the banks considered fairly homogeneous. Nevertheless, it was necessary to carry out a careful analysis of the financial reporting conventions of banks located in different European countries to assess their fundamental balance sheet characteristics in a consistent way. See Appendix B for more details.

A large set of fundamental indicators was initially used to describe banks' fundamental characteristics, including most of the indicators considered in the previous literature, but the focus was narrowed down to the most meaningful ones.[14]

For each of the banks considered and for each year the following indicators were computed (from the consolidated financial statement):

---

[14] For example, a number of different measures of asset quality were considered, but some indicators were eliminated from the analysis as they were strongly correlated with others (namely non-performing loans to total loans, coverage ratio, loans to total assets; see Appendix B).

ASSET QUALITY INDICATORS

NII =	$\frac{\text{Net Interest Income}}{\text{Total Income}}$	
COM =	$\frac{\text{Commission Income}}{\text{Total Income}}$	
Tier1 =	Tier 1 ratio, as reported by each bank	
I4 =	$\frac{\text{Reserve for Loan Losses}}{\text{Total Loans}}$	× 100
I5 =	$\frac{\text{Provision for Loan Losses}}{\text{Average Total Loans}}$	× 100
CI =	$\frac{\text{Cost}}{\text{Income}}$	

I focused on the components of the operating margin and eliminated from the analysis indicators that are highly influenced by extraordinary items, such as earning per share. It is also difficult to gather consistent data on off-balance-sheet commitments for European banks. With these qualifications, I looked at essentially all the fundamental indicators previously considered in the literature.

The definition of the fundamental accounting indicators was standardized across the different European banks as far as possible. Although banks' financial results will be simultaneously influenced by the state of the economy, we could expect their structure (percentage incidence of different profit and loss items on operating margin, or on balance sheet) to be relatively constant in the short term. I test below the hypothesis that some key ratios are stable over time. If this is the case, these ratios could then be considered (following the original idea of Rosenberg 1974) as structural characteristics through which the factors considered affect banks' stocks, i.e. as proxies for factor loadings.

These asset quality indicators appear to be fairly stable over time. Table 6 reports a transition matrix analysis in which, after ranking an indicator in a particular year as High, Medium or Low (three quantiles, H, M, L), the probability of the indicator being in the same quantile the following year is reported. As can be seen, the probability that a bank ranking H, M or L according to a fundamental indicator will continue to have the same rank the following year is very high.

I then tried to assess whether the different sensitivity of the main European banks' stock price to the common factors may be due to the different value of the indicators of their fundamental characteristics.

While I have a theory for the effect of loan loss reserves (I4, and possibly I5) on factor loadings, I also try to verify whether the other indicators have any systematic effect. Intuitively, we may think about mechanisms through which different balance sheet indicators can expose a bank to CRR factors in a different way. Intuitively, the term structure factor may be associated with interest income, the market factor may be associated with commission income, the default spread will be associated with provisions. CRR factors may impact differently on banks with different structures of assets and revenues.

TABLE 5

CORRELATION BETWEEN FUNDAMENTAL INDICATORS*

	I4	I5	Tier1	NII	COM	CI
I4	1.00000					
I5	0.67952	1.000000				
Tier1	−0.25997	−0.36952	1.000000			
NII	−0.22305	0.001807	−0.151290	1.000000		
COM	0.15509	0.279490	−0.084553	−0.36959	1.000000	
CI	0.23274	0.129380	−0.363290	−0.60424	0.353330	1.000000

* Correlation matrix between the average value (over the four years considered) of the fundamental indicators of the banks studied.

Table 5 reports the cross-sectional correlation between the four-year average of the fundamental indicators considered. Given the small cross-section sample, it is not possible to detect many significant correlations. However, in many cases the correlation is on the edge of significance. This implies that the fundamental indicators other than I4 and I5 (on which we are focusing) may also in turn be systematically correlated with factor loadings.

5.2. *Cross-section regressions*

I carry out a preliminary exploration to gain a better insight before testing the empirical implications of the theory put forward in section 2 more formally.

As a first exploratory analysis, I cross-sectionally regressed the estimated factor loadings on common factors of all the banks on the fundamental indicators. Factor loadings estimated from model 1, 2 and 3 were used when the entire sample 1999-2002 was considered, and factor loadings from the simpler model 1' were considered in the sub-periods.[15] This gives an initial indication as to whether the fundamental characteristics of European banks influence their sensitivity to movements in the key factors.[16]

As some of the indicators are correlated in the cross-section (see Table 5) and therefore provide the same type of information (and given the very small sample), in the end a parsimonious regression specification was adopted in which factor loadings for each factor were regressed in turn against a single fundamental indicator. The factor loadings of all banks against each factor were regressed on each of the asset quality indicators for each year and for the period 1999-2002. The cross-section regressions take the form:

$$\hat{\beta}_i^{kt} = a^{kj} + b^{kj}\, IND_i^{jt} + e_{it},$$

where $\hat{\beta}_i^{kt}$ is the estimated factor loading of bank stock i on factor k in period t (i = 1, ..., 27; t = 1999, 2000, 2001, 2002 and 1999-2002); IND_i^{jt} is the value of the fundamental indicator j (j=I4, I5, Tier 1, NII, COM, CI) of bank i in period t; k = TERMSPRE, DEFSPRE, ER, OIL, MK. This results in 30 regressions for each estimation period (5 factors on 6 asset quality indicators).

Given the strong persistence of fundamental indicators highlighted by table 6, the contemporaneous value of the fundamental indicators was used as an explanatory variable in these regressions, i.e. the fundamental characteristics of each bank as of 31.12.99 were correlated to the factor loadings estimated with 1999 daily data. This may be justified not only because of the strong stability of the banks' ranking according to these indicators, but especially because of the heavy coverage of these banks by financial analysts of major brokerage houses, which results in their balance sheet items being quite well anticipated by the market. For the period 1999-2002 the average value of each indi-

[15] The results of the cross-section regressions for the entire period 1999-2002 are not materially different if estimates from model (1') are considered.

[16] A cross-section regression like those used here was employed by Flannery and James (1984) to assess whether banks' factor loading on short-term bond holding period returns was related to the balance sheet mismatch between short term assets and liabilities.

TABLE 6

RANK STABILITY*

	I4	I5	Tier 1	NII	COM	CI
1999	0.8519	0.7407	0.6800	0.7692	0.6154	0.7308
2000	0.8519	0.6667	0.7407	0.8889	0.7407	0.7778
2001	0.7407	0.6667	0.5926	0.7778	0.8148	0.8148

* The table reports the probability that a bank with a certain rank according to the value of a fundamental indicator maintains its rank in the subsequent year. After ranking the bank as High, Medium or Low, according to the value of the indicator in a particular year, the probability of the indicator, being in the same percentile the following year, is computed and reported.

cator across four years was used. A general caveat is in order, as these exploratory regressions are carried out on very few observations and the dependent variables are potentially very noisy estimates of factor loadings. Appendix C reports the results of the same analysis carried out through a pooling regression, which allowed me to make simultaneous use of fundamental indicators and factor loadings estimates obtained for different years.

If the entire 1999-2002 period is considered (Table 7), banks' asset quality indicators (I4 and 15) positively affect the size of estimated factor loadings on DEFSPRE and MK (I4 only). Recall that the factor loadings of all banks on DEFSPRE and MK are the only two that are

TABLE 7

CROSS-SECTION REGRESSIONS 1999-2002

	TERMSPRE	DEFSPRE	OIL	ER	MK
I4	−0.0864	0.2145***	0.0012	−0.0216	0.0538*
	(0.0559)	(0.0828)	(0.0032)	(0.0253)	(0.0322)
I5	−0.3760	1.1621**	−0.0034	−0.0489	0.1941
	(0.3329)	(0.4913)	(0.0188)	(0.1494)	(0.1939)
Tier 1	−0.0390	−0.0129	0.0027	−0.0652**	0.0256
	(0.0748)	(0.1197)	(0.0041)	(0.0303)	(0.0433)
NII	2.0409**	−1.6779	0.0365	0.1129	−1.0080**
	(0.7932)	(1.3803)	(0.0486)	(0.3906)	(0.4758)
COM	−2.9366***	2.9743*	0.0512	−0.0510	1.0687*
	(1.0018)	(1.7509)	(0.0631)	(0.5092)	(0.6379)
CI	−2.3018**	3.7029**	−0.0510	−0.2124	1.5227***
	(0.9673)	(1.5367)	(0.0581)	(0.4679)	(0.5408)

The Table reports the results of univariate OLS regressions in which the factor loadings of all banks on common factors, estimated over the period 1999-2002, are individually regressed over the average value of the banks' fundamental indicators and a constant (not reported). In the table the regression coefficients of each factor loading on each of the fundamental indicators are reported, with standard errors in parenthesis. ***, ** and * denote significance respectively at the 1%, 5% and 10% level.

consistently statistically significant in explaining the time series of bank stock returns (Table 3). Results for asset quality indicators are therefore entirely consistent with my argument that if we interpret a high value of I4 and possibly I5 as a feature of a bank with riskier assets, then higher estimated factor loadings should follow. The weaker impact of asset quality on the MK factor loading is not too surprising considering that the market is itself a proxy (although a worse one than DEFSPRE) for the value, and indirectly the financial stability, of the companies banks lend money to. Results for sub-samples also appear to be in accordance with my conjecture, as discussed below.

The results in Table 7 for the capital adequacy indicator Tier 1 seem to indicate that banks with higher capital are perceived as less subject to exchange rate risk. However, factor loadings on ER are only consistently significant for a small portion of the sub-samples (namely 1999), and results are more difficult to interpret.

The fundamental indicators that capture the proportion of banks' net revenues derived from interest income and commission income (NII and COM) affect factor loadings on TERMSPRE as expected. They also, with opposite sign, affect the factor loadings on DEFSPRE, although in a marginal way, and on MK (Table 7). The positive effect of NII on the TERMSPRE factor loading seems to indicate that banks that have a larger share of their revenue deriving from interest income are more exposed to term structure risk.

In interpreting these results it must be taken into account that the NII and COM indicators are negatively correlated in the cross-section of banks, as a bank that derives a higher percentage of its revenues from interest income will inevitably derive a lower percentage of its revenues from commission income. Hence the effect of NII and COM on the estimated factor loadings will in general be of opposite sign. Other caveats in interpreting these results stem from the facts that TERMSPRE and DEFSPRE are negatively correlated by construction and opposite effects of NII and COM on TERMSPRE and DEFSPRE factor loadings may be a purely statistical feature, and the fact that estimated factor loadings on TERMSPRE are again only significant in one of the sub-samples (namely 2002).

It is interesting to see that the factor loadings on the market factor are positively associated with alternative income, i.e. a larger share of income coming from commissions (COM) and consequently negatively associated with interest income share (NII). The market factor

MK is orthogonal to other factors, so this result is not a statistical consequence of correlation between factors. As observed in previous sections, a bank with higher commission income is more exposed to the market through its intermediation and asset management lines of business, and therefore the effect on the market factor loading is consistent with expectations.

From table 7 we also note that the cost-income ratio has also an effect on factor loadings, especially those on TERMSPRE (negative), on DEFSPRE (positive) and on MK (positive). These results are again not easy to interpret. The cost-income ratio appears (also from the correlation matrix in table 5) as a sort of 'catch all' indicator, correlated with all the others. That is, a bank with a high-cost income ratio is in general a lower quality bank, which has also high provisions for bad loans, low Tier 1 capital and low interest income. The cost-income indicator may provide a synthesis of a bank's riskiness that is useful in explaining factor loadings.

When the same cross-section estimation is carried out through a pooling regression (Appendix C), the estimated effects are quite similar and the qualitative results are almost identical, but the statistical significance of the results already presented in table 7 is enhanced. The only differences between the results of the pooling regression and those presented in table 7 are that Tier 1 no longer affects factor loadings on ER but appears instead to affect factor loadings on DEFSPRE in a negative way (which is a sensible result, as higher capital adequacy should make a bank less sensitive to bad loans). Meanwhile, COM no longer positively influences the factor loading on DEFSPRE, which reinforces the idea that the effect of COM on DEFSPRE might be spurious and due to the correlations between NII and COM on the one hand, and TERMSPRE and DEFSPRE on the other.

When looking at individual years (Tables 8-11), the results are more variable. However, some significant association between factor loadings and asset quality can be detected for the years 2002, 2001 and, marginally, 2000, while no association is found for 1999. In particular, for 2001 the result shows that the balance sheet indicator I4 (reserves for loan losses over loans) and I5 (provisions for loan losses over loans) do have explanatory power for the size of the banks' factor loading on the default spread and the market. The association between the I4 indicator and the default spread factor loading is remarkable (see figure 3). It is interesting that the measure of 'bad loans risk' more strongly associated with market behaviour is based on a balance sheet stock variable (a proxy for total stock of bad loans) rather than on the same year provision against new bad loans. Also, the high responsiveness of 'bad banks' stock return to default spread seems to kick in at a time of a sharp economic and stock market downturn, when investors start to be highly concerned about the downside risk of their equity investment. This is consistent with the theory referred to in section 2.[17] Also, commission income and, to a lesser extent, interest income and cost income ratio appear associated with the factor loading on the market in most years, but especially in the bull market period of 2000, when asset quality does not appear to influence stock riskiness.

TABLE 8

CROSS-SECTION REGRESSIONS 1999*

	TERMSPRE	DEFSPRE	OIL	ER	MK
I4	−0.0053	−0.0085	−0.0001	−0.0403	0.0119
	(0.0460)	(0.0916)	(0.0088)	(0.0403)	(0.0200)
I5	0.1863	0.1706	−0.0481	−0.0293	0.0882
	(0.3188)	(0.6381)	(0.0607)	(0.2868)	(0.1397)
Tier 1	−0.0350	−0.1787*	0.0266***	−0.1092**	−0.0130
	(0.0572)	(0.1080)	(0.0095)	(0.0463)	(0.0249)
NII	−0.3059	−1.5828	−0.1530	0.1046	−0.6186
	(0.9347)	(1.8168)	(0.1751)	(0.8344)	(0.3830)
COM	−2.3561**	0.8536	0.2349	−0.5007	1.0899**
	(1.0562)	(2.2793)	(0.2150)	(1.0290)	(0.4472)
CI	0.7955	−1.1654	−0.0092	0.1195	−0.2949
	(0.9063)	(1.7979)	(0.1748)	(0.8200)	(0.3917)

* The table reports the results of univariate OLS regressions, in which the factor loadings of all banks on common factors (estimated in 1999) are individually regressed over the value of the banks' fundamental indicators at the end of 1999, and a constant (not reported). In the table I report the regression coefficients of each factor loading on each of the fundamental indicators, with standard errors in parenthesis. ***, ** and * denote significance respectively at the 1%, 5% and 10% level.

[17] To understand why asset quality should affect the value of banks, remember that majority of bank assets are loans. In normal times, the provisions against loan losses set aside in the accounting period (charged in the Profit and Loss account) should approximately cover the amount of loans going bad in the year. In bad years, the incidence of the provisions for loan losses over loans will increase. However, in catastrophic times such provisions may not be sufficient, and the probability that reserves already accumulated in the balance sheet will be burned increases. Therefore, a bank with worse asset quality indicators will be riskier, and this may be reflected in a higher sensitivity to the relevant factors.

TABLE 9

CROSS-SECTION REGRESSIONS 2000*

	TERMSPRE	DEFSPRE	OIL	ER	MK
I4	0.0066	0.1287*	0.0017	-0.0015	0.0275
	(0.1033)	(0.0762)	(0.0041)	(0.0147)	(0.0320)
I5	0.0077	0.0863	0.0239	0.0231	0.0150
	(0.6207)	(0.4830)	(0.0240)	(0.0882)	(0.1953)
Tier 1	0.1111	-0.0359	-0.0077*	-0.0250	-0.0010
	(0.1207)	(0.0953)	(0.0046)	(0.0167)	(0.0386)
NII	2.4663*	-1.3332	0.1403***	-0.0732	-0.9234**
	(1.3389)	(1.0785)	(0.0487)	(0.2025)	(0.4094)
COM	-5.8826***	1.6398	-0.0402	0.3411	1.6249***
	(1.4153)	(1.3951)	(0.0721)	(0.2528)	(0.4796)
CI	-1.5884	2.1711	0.0123	0.1367	1.2250**
	(2.0316)	(1.5412)	(0.0810)	(0.2913)	(0.5991)

* The table reports the results of univariate OLS regressions, in which the factor loadings of all banks on common factors (estimated in 2000) are individually regressed over the value of the banks' fundamental indicators at the end of 2000, and a constant (not reported). In the table I report the regression coefficients of each factor loading on each of the fundamental indicators, with standard errors in parenthesis. ***, ** and * denote significance respectively at the 1%, 5% and 10% level.

TABLE 10

CROSS-SECTION REGRESSIONS 2001*

	TERMSPRE	DEFSPRE	OIL	ER	MK
I4	-0.0682	0.4218***	-0.0025	-0.0294	0.0987***
	(0.0582)	(0.1203)	(0.0053)	(0.0348)	(0.0363)
I5	-0.2246	0.4757	-0.0055	-0.1742*	0.2141**
	(0.1592)	(0.3954)	(0.0148)	(0.0914)	(0.1061)
Tier 1	0.0592	0.0852	-0.0031	0.0576*	0.0401
	(0.0577)	(0.1438)	(0.0052)	(0.0328)	(0.0399)
NII	0.4633	-0.3233	0.0288	-0.0348	-0.6309
	(0.7293)	(1.8062)	(0.0655)	(0.4344)	(0.4925)
COM	-1.6092*	2.8143	-0.0514	-0.6986	1.3566**
	(0.8967)	(2.2736)	(0.0846)	(0.5455)	(0.6004)
CI	-1.2779**	1.7180	-0.0522	-0.9671***	1.1557***
	(0.6466)	(1.6745)	(0.0613)	(0.3626)	(0.4216)

* The table reports the results of univariate OLS regressions, in which the factor loadings of all banks on common factors (estimated in 2001) are individually regressed over the value of the banks' fundamental indicators at the end of 2001, and a constant (not reported). In the table I report the regression coefficients of each factor loading on each of the fundamental indicators, with standard errors in parenthesis. ***, ** and * denote significance respectively at the 1%, 5% and 10% level.

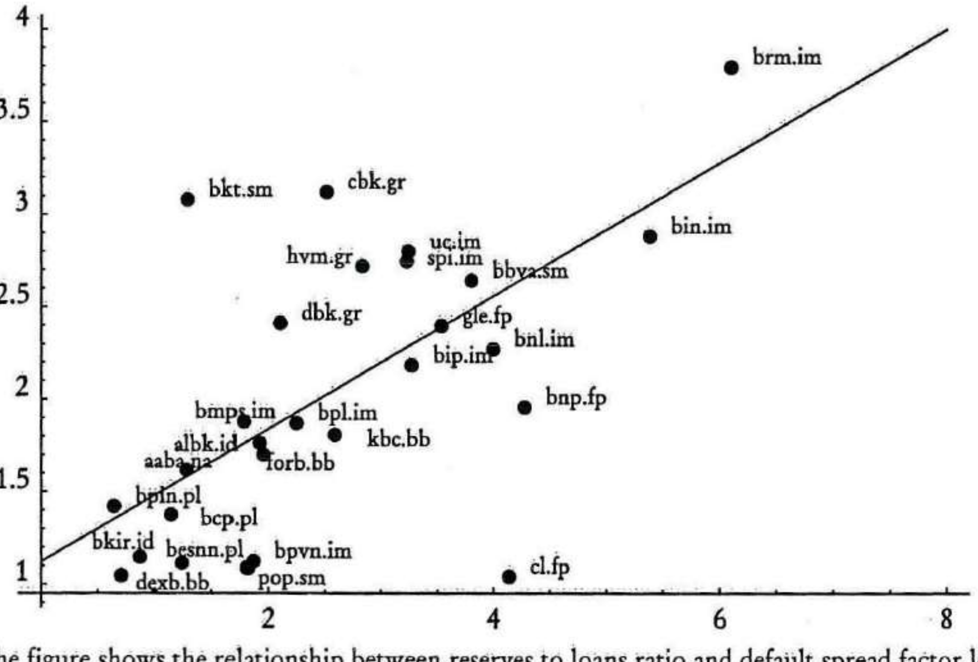
TABLE 11

CROSS-SECTION REGRESSIONS 2002*

	TERMSPRE	DEFSPRE	OIL	ER	MK
I4	-0.3883	0.2699**	0.0030	-0.0206	0.0700
	(0.2540)	(0.1087)	(0.0053)	(0.0216)	(0.0434)
I5	-0.4935	0.8574	-0.0225	-0.1416	0.0124
	(1.2774)	(0.5599)	(0.0253)	(0.1021)	(0.2199)
Tier 1	-0.5308	-0.1681	-0.0006	0.0135	0.0772
	(0.3647)	(0.1626)	(0.0073)	(0.0313)	(0.0633)
NII	9.4142**	-1.9537	-0.1084	-0.3440	-1.5355**
	(3.7415)	(1.8739)	(0.0812)	(0.3394)	(0.6500)
COM	-0.9119	1.5523	0.0116	-0.4818	0.3224
	(5.9454)	(2.7007)	(0.1193)	(0.4823)	(1.0189)
CI	-6.3523*	3.8048**	0.0196	0.0484	0.9416
	(3.7186)	(1.6510)	(0.0796)	(0.3157)	(0.6536)

* The table reports the results of univariate OLS regressions, in which the factor loadings of all banks on common factors (estimated in 2002) are individually regressed over the value of the banks' fundamental indicators at the end of 2002, and a constant (not reported). In the table I report the regression coefficients of each factor loading on each of the fundamental indicators, with standard errors in parenthesis. ***, ** and * denote significance respectively at the 1%, 5% and 10% level.

FIGURE 3



The figure shows the relationship between reserves to loans ratio and default spread factor loading in 2001. On the x axis, the I4 indicator, on the y axis, factor loading of each bank on DEFSPRE.

As discussed earlier, the asset quality characteristics of banks change slowly over the sample period, so the same credit quality does not appear to have been a great concern for market valuation during the years 1999 and 2000 to become an important variable in explaining stock return in 2001 and 2002. The years 1999 and 2000 were characterized by an expanding US and European economy and by a bullish stock market. In good times, it may be plausible that the focus of risk valuation shifts away from credit quality concerns. In particular, it is plausible that in good years, when securities markets offer interesting opportunities that appeal to their clients (e.g. mutual fund business tends to expand), banks with a higher exposure to commission income tend to do better than the sector, as they are more geared to profitable intermediation activity.

Still, it appears that the model for 2001 may not be fully specified. As can be seen from figure 3, some outliers (like BKR.SM, CL.FP) hint that something else was going on in some cases. There is a discrepancy in these cases between the size of the factor loading on the default spread (as measured by the DEFSPRE factor) and the asset quality indicator I4. It is possible that, in the case of these outliers, the DEFSPRE variable does not reflect the amount of default risk in the banks' portfolio. Recall that DEFSPRE measures the default spread for European corporates. A few European banks did have some non-European exposure in the US and Latin America.

6. Portfolio analysis

In order to test the association of banks' fundamental characteristics with the factor loadings on common factors, model 1' was also estimated on portfolios of bank stocks sorted according to fundamental characteristics. For each indicator the 27 stocks were sorted at the beginning of each year into three portfolios containing stocks with Low, Medium and High value of the indicator. The time series of equally weighted daily returns for each portfolio was then calculated. At the end of the year, the three portfolios were re-balanced according to the next year values of the fundamental indicator. Given the strong stability of the rankings according to the fundamental indicators, re-balancing was almost marginal.[18]

Next, for each indicator, the return of the portfolio with Low, Medium and High value of the fundamental characteristic was regressed on the common factors. This exercise was carried out for the entire 1999-2002 period and for each of the sub-periods. The idea was to see whether the size of the loadings on common factors is related to the level of the fundamental characteristics in a systematic way, as the exploratory regressions of the previous section would suggest. This will estimate factor loadings of the three portfolios with higher precision and therefore any pattern in the estimated loading as a function of fundamental characteristics will be detected in a more robust way. Table 12 shows the estimated factor loadings on the common factors of portfolios with Low, Medium and High value of each fundamental indicator. The table shows that patterns similar to those detected in the exploratory analysis are found for the period 1999-2002. It is evident from the DEFSPRE column of table 12, for example, that the size of the factor loading on DEFSPRE increases as portfolios with higher values of loan loss reserves to loans are considered, and the same pattern can be found for the loading on the market factor (MK column). Moreover, the factor loading on the market factor increases systematically with the share level of commission income and decreases with interest income.

The patterns are also similar for the individual periods, with the exception of the 1999 period.

We can formally test the hypothesis that portfolios with a higher value of the fundamental variable have higher factor loadings.

Table 13 tests the hypothesis that the factor loadings of the three sorted portfolios on a common factor are equal. This hypothesis can never be rejected for 1999, but it is practically always rejected in all the other periods as far as the loading on the market variable is concerned, although in many cases in table 12 the pattern of the factor loadings size was not monotonic across the three portfolios. For the factor

[18] Time series of daily returns were also calculated with portfolios of bank stocks sorted according to the value of the indicators lagged by 16 months, so that the value of the indicator is precisely known, from the preceding year company annual report, at the time of portfolio construction and re-balancing. In this way, the initial 16 months of return data were lost, but data until 30 April 2003 were also used. However, the results of the subsequent analysis were almost unchanged, so sorting according to contemporaneous indicators was adopted in the end.

TABLE 12

FACTOR LOADINGS OF SORTED PORTFOLIOS*

		TERMSPRE			DEFSPRE			OIL			ER			MK		
		L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
1999	I4	0.6338	0.8213	0.4418	0.6097	0.6667	0.2174	−0.0659	−0.1997	−0.2891	−0.0020	0.0266	0.0472	0.5909	0.5574	0.5658
	I5	0.7507	0.6784	0.4732	0.6452	0.7394	0.0467	−0.1420	−0.1730	−0.2935	0.0139	0.0578	0.0017	0.6122	0.5382	0.5739
	Tier 1	0.4506	0.8449	0.4969	0.3548	0.7314	0.3134	−0.1942	−0.1702	−0.2512	0.0082	0.0588	−0.0126	0.5499	0.6015	0.5123
	NII	0.7419	0.9313	0.4222	0.6282	0.9270	0.1991	−0.2148	−0.1747	−0.2083	0.0657	0.0175	0.0063	0.5519	0.5438	0.6082
	COM	0.9675	0.4355	0.3974	0.6851	0.3288	0.4100	−0.2392	−0.1595	−0.2271	0.0129	0.0434	0.0279	0.6019	0.5839	0.5094
	CI	0.3943	0.7816	0.6269	0.4477	0.3790	0.6327	−0.1654	−0.2663	−0.1675	0.0162	0.0085	0.0587	0.6078	0.5672	0.5580
2000	I4	−1.0450	−0.5494	−1.2379	0.9519	1.1360	1.7121	0.1492	0.1071	0.1709	0.0251	0.0024	0.0096	0.5486	0.5011	0.7607
	I5	−0.8104	−0.9345	−0.8753	1.0637	1.3294	1.4631	0.0915	0.1416	0.1900	0.0236	0.0012	0.0163	0.5582	0.6445	0.5179
	Tier 1	−0.8438	−0.9764	−0.8416	1.4521	1.5028	0.9230	0.1822	0.1363	0.1022	0.0285	0.0006	0.0026	0.5002	0.6770	0.6045
	NII	−0.9531	−0.5451	−1.0014	1.3698	1.1891	1.2294	0.1160	0.1361	0.1650	−0.0047	−0.0013	0.0352	0.6973	0.4338	0.5692
	COM	−0.6192	−0.7709	−1.2178	0.8139	1.4586	1.2897	0.1146	0.1642	0.1181	0.0016	0.0239	−0.0068	0.3494	0.5525	0.8065
	CI	−0.7501	−0.7281	−1.1554	1.0078	1.5091	1.1832	0.1312	0.1592	0.1203	0.0284	0.0162	−0.0086	0.5300	0.4799	0.7614
2001	I4	0.0616	−0.1766	−0.5752	1.6528	1.8842	2.4926	−0.4022	−0.4829	−0.4940	−0.0255	−0.0328	−0.0414	0.5717	0.7008	0.9454
	I5	0.0243	−0.5447	−0.3187	2.1565	2.0269	2.1000	−0.4005	−0.6385	−0.3715	−0.0311	−0.0372	−0.0346	0.6976	0.8550	0.7612
	Tier 1	−0.3145	−0.4031	−0.2188	1.9300	2.4010	2.0039	−0.4208	−0.5558	−0.4450	−0.0355	−0.0311	−0.0368	0.7176	0.8613	0.7626
	NII	−0.5160	−0.1539	−0.1745	2.3676	1.7695	2.0100	−0.5558	−0.4036	−0.4182	−0.0389	−0.0427	−0.0264	0.9088	0.6960	0.6927
	COM	−0.2132	−0.4712	−0.1214	1.9270	2.0531	2.2439	−0.4515	−0.5679	−0.3492	−0.0486	−0.0398	−0.0185	0.6822	0.8657	0.7069
	CI	0.0504	−0.4265	−0.3895	1.8903	2.3341	2.0390	−0.3366	−0.4723	−0.5303	−0.0192	−0.0462	−0.0343	0.5719	0.8200	0.8452

* The table shows the estimated factor loadings on the common factors of portfolios with Low, Medium and High value of each fundamental indicator.

TABLE 12 (*cont.*)

		TERMSPRE			DEFSPRE			OIL			ER			MK		
		L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
2002	I4	−2.7827	−3.5510	−5.2828	1.7664	2.5849	2.4113	0.0375	−0.1055	0.0537	−0.0109	−0.0153	0.0418	0.5479	0.7203	0.9793
	I5	−3.7563	−5.0865	−3.2118	2.5228	2.3714	2.1240	−0.0050	0.0781	−0.1349	−0.0033	0.0410	−0.0169	0.7858	0.9400	0.6129
	Tier 1	−4.3431	−4.4506	−4.1841	2.4422	2.1632	2.4501	0.0130	0.0951	−0.1276	0.0054	0.0515	−0.0146	0.8439	0.8335	0.8000
	NII	−4.6007	−5.0002	−3.3414	2.4515	2.4329	2.1403	0.0499	−0.0410	−0.0526	0.0386	−0.0062	−0.0121	0.8530	0.9390	0.6855
	COM	−3.8800	−3.7950	−4.7054	2.6563	2.3347	2.2100	0.0982	−0.0746	0.0093	0.0127	−0.0176	0.0356	0.7868	0.7599	0.8580
	CI	−2.0030	−5.8445	−4.7317	2.1263	2.7186	2.3076	−0.1080	−0.0335	0.1013	−0.0271	0.0097	0.0515	0.4898	1.0639	0.8877
99-02	I4	−0.4129	−0.4665	−1.0725	1.7089	2.2204	2.5108	−0.1478	−0.2489	−0.2568	−0.0105	−0.0184	−0.0070	0.5690	0.6759	0.8820
	I5	−0.5240	−0.9534	−0.5511	2.2611	2.3629	2.0427	−0.2158	−0.2502	−0.2240	−0.0106	−0.0079	−0.0174	0.7113	0.8249	0.6427
	Tier 1	−0.8194	−0.7011	−0.7530	2.2325	2.3864	2.1552	−0.1963	−0.2317	−0.2671	−0.0118	−0.0018	−0.0283	0.7276	0.7883	0.7339
	NII	−0.7988	−0.7409	−0.6085	2.4450	2.2905	2.0028	−0.2591	−0.2279	−0.2061	−0.0071	−0.0259	−0.0073	0.8086	0.7668	0.6629
	COM	−0.4644	−0.7494	−0.9128	2.2365	2.2008	2.2338	−0.2262	−0.2296	−0.2206	−0.0224	−0.0103	−0.0084	0.6833	0.7302	0.7747
	CI	−0.2853	−0.9827	−0.8969	1.8389	2.6368	2.2426	−0.1679	−0.2780	−0.2293	−0.0048	−0.0223	−0.0063	0.5326	0.8684	0.8161

TABLE 13

DIFFERENCE IN FACTOR LOADINGS OF SORTED PORTFOLIOS*

		TERMSPRE	DEFSPRE	OIL	ER	MK
1999	I4	2.8914	1.2069	2.5933	1.7520	0.1570
	I5	1.1353	3.9471	1.5868	2.7113	0.6465
	Tier 1	2.8970	1.1021	0.6868	3.4391	1.2761
	NII	4.1418	2.4061	0.1208	2.7344	0.8286
	COM	5.3273*	0.5446	0.5431	0.7636	1.3076
	CI	2.1187	0.4604	1.4332	2.4379	0.2505
2000	I4	5.4178*	5.1852*	0.9505	1.2310	21.2843***
	I5	0.1573	1.7304	1.1300	1.4693	8.7662**
	Tier 1	0.1976	3.2258	0.9711	2.6584	10.3335***
	NII	3.0952	0.3136	0.3351	4.6523*	29.6841***
	COM	2.8493	3.9595	0.5037	2.3393	36.8864***
	CI	1.9485	3.2500	0.2668	2.1384	22.3151***
2001	I4	6.6372**	6.0166**	1.3588	0.4156	34.7819***
	I5	4.0390	0.0788	4.1863	0.0766	7.5725**
	Tier 1	0.6469	5.2412*	2.5380	0.1203	8.6799**
	NII	3.6976	6.2345**	3.1252	0.8700	14.7784***
	COM	2.3254	1.3555	3.3107	1.3376	23.0319***
	CI	4.4136	3.0182	4.5410	1.1684	19.7982***
2002	I4	42.9120***	6.5227**	2.1021	3.7366	52.1513***
	I5	26.4316***	1.1826	3.0673	4.3805	29.8137***
	Tier 1	0.5122	0.8090	2.3060	3.5464	0.9487
	NII	23.0127***	0.8523	0.9671	3.3819	34.2350***
	COM	13.9516***	1.6321	1.5945	3.5803	6.5555**
	CI	36.6446***	1.5079	2.4374	4.5570	49.7383***
99-02	I4	22.6082***	18.3540***	4.3951	0.8057	83.8258***
	I5	10.2705***	2.8680	0.4312	0.5471	38.5823***
	Tier 1	0.7187	1.7420	1.8630	3.9464	6.9820**
	NII	2.5469	7.0816**	1.2200	1.8191	36.1283***
	COM	8.0105**	0.0424	0.0286	1.0737	11.9204***
	CI	18.1107***	12.8759***	2.8963	2.0487	67.1562***

* The table tests the hypothesis that the factor loadings of the three sorted portfolios (according to the fundamental indicators) on each of the common factors, reported in table 12, are equal. The values of the χ^2 statistic of the restricted system of regressions for the three portfolios, in which the factor loading is set to be the same, are reported. ***, ** and * denote rejection respectively at the 1%, 5% and 10% level.

TABLE 14

AVERAGE RETURN OF ONE-DIMENSIONAL SORT PORTFOLIOS*

	L	M	H	χ^2
I4	−0.012	−0.033	0.014	1.81
I5	−0.021	−0.009	−0.014	0.09
Tier 1	−0.032	0.000	−0.015	0.81
NII	0.004	−0.039	−0.014	1.56
COM	−0.034	−0.023	0.027	2.58
CI	−0.003	−0.052	0.027	4.43

* The table shows the average daily return over the period 1999-2002 of portfolios containing bank stocks with indicator values in the L, M and H quantile. The χ^2 statistic is computed under the null hypothesis that the returns are equal.

loading on the DEFSPRE variable, we can also reject the hypothesis that the factor loadings are the same for portfolios with different exposure to bad loans in recent years and in the entire period. Factor loadings on TERMSPRE also appear to be different, especially in 2002 and in the entire period, as a function of the exposure to various indicators. These results suggest that, if banks' stocks are sorted into portfolios according to the level of (and not the change in) banks' specific fundamental indicators, the factor loadings on risk factors of the sorted portfolios are systematically affected. As a consequence, the risk of these portfolios will be different. However, if we consider average returns of the sorted portfolios (see table 14), we cannot find significant differences in the average return of portfolios sorted in a univariate way according to each indicator. This means that portfolios containing stocks with value of one fundamental indicator in the L, M or H quantile do not have a significantly different average return.

7. Conclusions

In this paper an attempt has been made to determine whether the stock returns of European banks which appear to run a riskier business on the face of fundamental balance sheet indicators are indeed more sensitive to some common factors usually employed to map securities risks.

Option pricing theory suggests that the value of the stocks of banks holding riskier assets will be more sensitive to the value of the assets held when the bank is facing an economic downturn in which the value of its assets is low. A detailed description of banks' assets being unavailable, these are proxied for using some typical indexes, which also correspond to CRR macro-factors. It is argued that a CRR-type factor model, possibly in the enhanced version proposed by Flannery and Protopapadakis (2002), may adequately capture variation in bank stock returns. Even at daily frequency, factors other than the market index are statistically significant in explaining bank stock returns. Not surprisingly, the default spread seems to contribute significantly to the explanation of bank stock returns, as this factor captures the variation in the value of banks' risky loans. Other factors which intuitively have a close relationship with the banks' core activity of maturity transformation, such as the term spread, are instead not particularly significant in our sample. This may denote that the associated risks were well immunized by the banks examined.

An assumption is made that makes it possible to identify banks holding riskier assets, identifying them as banks with higher reserves against loan losses. In the sample period considered, these banks also tend to have worse values of other indicators that denote the efficiency of banking activity, i.e. they tend to have less capital and higher costs.

If a CRR-type model of stock returns is estimated for European banks, their fundamental characteristics may indeed account for the size of the factor loadings on common factors. The results seem to indicate that, in the period 1999-2002 (in which the banks considered were traded in euro), the factor loading against the market factor and against the default spread may be systematically related to banks' fundamental characteristics such as asset quality indicators (especially reserves for bad loans over loans), to the composition of income (share of interest and commission revenue) and to a general indicator of banks' efficiency like the cost-income ratio. The main result appears to be that banks with higher levels of loan loss reserves and provisions appear to be more risky, and to a certain extent this conclusion also applies to banks with a higher cost-income ratio. Some of these patterns are clearly evident for the years 2000, 2001 and 2002, but could not be detected for 1999. It is possible that some of these regularities are associated with a declining business cycle, in which investors' concerns about banks' bad loans, operations and efficiency are more acute and therefore more precisely reflected in market quotes. On the other hand, it appears that in the bull market period within our sample banks with higher share of commission income have a higher factor loading on the market index.

These findings may be useful to construct conditional estimators for the factor loadings, along the lines of Rosenberg and McKibben (1973). Moreover, to the extent that CRR factors are priced, i.e. exposure to a factor must be compensated by appropriate expected return (as CRR find), bank stock risk may be related to balance sheet characteristics. The issue of the pricing of common factor risk and expected return on bank stocks as a function of fundamental characteristics appears to be a promising area of research. From an asset management point of view, the approach presented may be useful to determine the appropriate portfolio of bank stocks to be held in different phases of the business cycle, and to assess the risk of the trading position. From a bank management point of view, knowledge of how the strategy and business characteristics of the bank are appreciated by the shareholders may be useful.

Moreover, the type of analysis proposed here may help establish better links between stocks fundamental research, usually carried out through balance sheet analysis (actual and forecasted), and market valuation.

APPENDIX A

To empirically construct the factors F_k, I considered the following basic variables:

- ER44: Merrill Lynch – Total return index, EMU Corporates, BBB Rated, 7-10 Yr;
- EUG4TR: Bloomberg/EFFAS – Total return index, Euro Gov. Bonds, 7-10 Yr;
- IL0001M: Euro 1m libor;
- EUCRBRD: European dated Brent Crude Oil spot price, mid, US dollar;
- EUR: US$/Euro Exchange rate, mid;
- SX5E: Dow Jones Euro Stoxx 50 Price Index;
- SX7P: Dow Jones Euro Stoxx Banks Price Index.

The following fundamental factors were constructed from the above basic variables:

- TERMSPRE = [(EUG4TR(t) – EUG4TR(t–1))/EUG4TR(t–1)] × 100 – IL0001M(t–1)/360;
- DEFSPRE = [(ER44(t) – ER44(t–1))/ER44(t–1)] × 100 – TERMSPRE – IL0001M(t–1)/360;
- OIL = [(EUCRBRD(t) – EUCRBRD(t–1))/EUCRBRD(t–1)] × 100;
- ER = [(EUR(t) – EUR(t–1))/EUR(t–1)] × 100;
- STOXX = [(SX5E(t) – SX5E(t–1))/SX5E(t–1)] × 100;
- BANKS = [(SX7P(t) – SX7P(t–1))/SX7P(t–1)] × 100.

The announcements of the macroeconomic variables used are as follows:

Variable	First available	Release time
Consumer price – Euro-11 CPI (YoY)	25.3.1999	11:00 am
Consumer price – Euro-zone CPI (YoY)	16.3.2001	11:00 am
EU11 PPI (ex. constrct.) (MoM)	12.10.1999	11:00 am
Euro-zone PPI (MoM)	10.3.2001	11:00 am
Industrial production wd adj. (YoY)	30.4.1999	11:00 am
Euro-zone ind. prod. sa (MoM)	20.4.2001	11:00 am
ECB announces interest rates	4.3.1999	12:45 am
Euro-11 M3 money supply (YoY)	26.3.1999	9:00 am

Source: Bloomberg.

APPENDIX B

The source of individual banks' balance sheet data is the year-end consolidated balance sheet published by each bank. In collecting balance sheet data for European banks, the most difficult task was trying to be as consistent as possible in choosing the underlying values to be used to calculate fundamental indicators. This task was complicated by the fact that the financial statements of these banks were subject, in the years considered, to different accounting standards and regulations from their respective central banks. The resulting ratios give a fair idea of the quality of the banks' assets and, more significantly, of the evolution of their asset quality, although they are not completely comparable, especially between banks from different countries. All inputs were extracted from the original audited consolidated financial statements of the year in question, but it was often necessary to refer to the notes of the balance sheet and the income statement to obtain more precise information. The definitions of the components for different ratios are listed below:[1]

Net Interest Income: Used for the NII ratio. Calculated by subtracting interest expenses from interest income as stated on the income statement. Dividends from participations are not included.

Commission Income: Used for the COM ratio. Commission income minus fees, as stated on the Profit and Loss (P&L) statement.

Total Income: Used for the NII, COM and CI ratios. This is the sum of 'Net Interest Income', 'Net Commission Income', 'Net Trading Income', 'Net Insurance Income' (when applicable), 'Dividend Income', 'Gains/Losses on participating interest' and 'Other operating Income'. The item 'Gains/Losses on participating interest' is sometimes included under the heading 'Revenues from securities and participating interest' (e.g.: ABN), which also includes dividend income, or 'Securities available for sale' (e.g.: BNP-Paribas). In some cases, when the impact on the P&L is significant and if they can be separated from other items, these gains have been excluded from Total Income in order to smoothen revenues (e.g.: DB). Note that this item does not include revenue from group transactions, revenue from equity accounted investments and non-recurring income.

Total Loans: This item is used in the asset quality ratios I2 and I4. In this study, total loans refer to the loans made to customers. With the exception of Deutsche Bank, which reports under US GAAP, the total loans to customers includes the carrying value of reverse repo agreements and securities borrowing arrangements. Also note that I use the gross loans, i.e. before the subtraction of allowances for specific loan loss risk. Interbank loans are not included in the study, as I consider them to be 'risk free'.

Non-performing loans (NPL): Used for the I1, I2, I3 and I6 ratios. This is the item that makes comparisons between banks most difficult, as it is a subjective measure of the loans that are at risk in the portfolio. In addition, not all banks actually publish an NPL figure. When that is the case, the proxy for this figure can be one of the following (whichever is published in the *Annual Report*): Overdue loans ≥ 90 days (e.g.: BCP), Loans on a non-accrual basis (e.g.: CBK), Doubtful loans (SocGen) or Impaired loans (e.g.: DB).

[1] Initially, 6 asset quality indicators were constructed, denominated I1-I6, but in the end only I4 and I5 were used in the analysis.

Total Assets: Used for the I1 ratio. Total assets as on balance sheet.

Reserve for loan losses: Used for the I3, I4 and I6 ratios. This figure reflects the total provisions that have been made specifically for credit loss risk on customer loans for the period in consideration. It does not include general risk allowances or any allowances that appear on the liability side of the balance sheet. It corresponds to the difference between total loans and net loans, as it is directly deducted from the loans account on the balance sheet.

Provision for loan losses: Used for the I5 ratio. This is the provision that is allocated to the reserve for loan losses for specific credit risk on customer loans. It is usually equivalent to the corresponding item on the income statement, although it was often corrected for provisions for bank loans or financial investment risk. However, these were usually minor changes.

Average Total Loans: Used in the I5 ratio. This is computed by taking the arithmetic mean of total loans at the beginning and at the end of the year under observation.

Shareholder's Equity: Used for ratio I6. This includes all items from shareholders' equity part of the balance sheet, including funds from minority shareholders and preferred shareholders when applicable. The general banking risk fund is not taken into account.

Cost: Used in the CI ratio. This comprises all operating expenses, such as staff costs, SG&A and other expenses. It is taken straight from the income statement.

The only bank for which I was not able to find all the data necessary to calculate these ratios was Fortis. For Banco Espirito Santo no figures were available for 1999, and I therefore used Bloomberg figures and my ratios for the year 2000 to interpolate proxy ratios for 1999.

As can be seen, the Spanish banks have particularly high asset quality. This is due to the fact that the Bank of Spain imposed a statistical provision in excess of the specific credit risk provision of Spanish banks. Unfortunately, I was not able to distinguish between the two kinds of provision and this general provision is therefore included in the allowance for loan losses.

One last problem was the change in accounting standards for Deutsche Bank in 2000 from IAS to US GAAP. I solved the problem by taking pro-forma figures for 1999 so as to make the ratios comparable between the two years. This is the only exception in which I used restated figures. Note that under IAS in 1999 the NPL/loan ratio was 1.16% whereas under US GAAP the same ratio was 4.17%.

APPENDIX C

The following table reports the results of the pooling regression

$$\hat{\beta}_i^{kt} = b^{kj}\ IND_i^{jt} + D_1^{kj}\ I_{1999} + D_2^{kj}\ I_{2000} + D_3^{kj}\ I_{2001} + D_4^{kj}\ I_{2002} + e_{it}$$

where $\hat{\beta}_i^{kt}$ is the estimated factor loading of bank stock i on factor k in year t ($i = 1, \ldots, 27$, $t = 1999, 2000, 2001, 2002$); k = TERMPRE, DEFSPRE, ER, OIL, MK. IND_i^{jt} is the value of the fundamental indicator j (j=NII, COM, Tier 1, I4, I5, CI) of bank i in period t; I_{1999} etc. represent an indicator which is equal to one when the dependent and independent variables are within the given year, and zero other ways. In the table the regression coefficients b^{kj} of each factor loading on each of the fundamental indicators IND_i^{jt} are reported, with standard errors in parenthesis. ***, ** and * denote significance respectively at the 1%, 5% and 10% level.

	TERMSPRE	DEFSPRE	OIL	ER	MK
I4	-0.1184	0.1861***	0.0014	-0.0227	0.0490***
	(0.0734)	(0.0507)	(0.0033)	(0.0131)	(0.0168)
I5	0.1154	0.6803***	-0.0016	-0.0641	0.0971
	(0.3381)	(0.2365)	(0.0154)	(0.0605)	(0.0793)
Tier 1	0.0956	-0.1355**	0.0070	-0.0194	0.0337
	(0.0891)	(0.0622)	(0.0040)	(0.0157)	(0.0209)
NII	3.4195***	-0.7226	-0.0343	-0.0787	-0.9277***
	(1.084)	(0.8160)	(0.0556)	(0.2025)	(0.2519)
COM	-3.1949**	1.3697	0.0322	-0.0046	1.1075***
	(1.4543)	(1.0645)	(0.0677)	(0.2655)	(0.3336)
CI	-2.5717**	1.9192**	-0.0143	-0.1165	0.7247***
	(1.1471)	(0.8335)	(0.0538)	(0.2095)	(0.2698)

REFERENCES

BENINK, H.A. and C.C.P. WOLFF (2000), "Survey data and the interest rate sensitivity of US bank stock returns", *Economic Notes*, vol. 29, no. 2, pp. 201-13.

BREWER, E., W.E. JACKSON and T.S. MONDSHEAN (1996), "Risk, regulation, and S&L diversification into non traditional assets", *The Journal of Banking and Finance*, vol. 20, no. 4, pp. 723-44.

BREWER, E., W.E. JACKSON and J.T. MOSER (1996), "Alligators in the swamp: the impact of derivatives on the financial performance of depository institutions", *Journal of Money, Credit, and Banking*, vol. 28, no. 3, pp. 482-97.

CEBENOYAN, A.S. and P.E. STRAHAN (2004), "Risk management, capital structure, and lending at banks", *Journal of Banking and Finance*, vol. 28, no. 1, pp. 19-43.

CHEN N., R. ROLL and S.A. ROSS (1986), "Economic forces and the stock market", *Journal of Business*, vol. 59, no. 3, pp. 383-403.

CONNOR, G. (1995), "The three types of factor models: a comparison of their explanatory power", *Financial Analysts Journal*, May-June, pp. 42-46.

COOPER, M.J., W.E. JACKSON and G.A. PATTERSON (2003), "Evidence of predictability in the cross-section of bank stock returns", *The Journal of Banking and Finance*, vol. 27, no. 5, pp. 817-50.

DOCKING, D.S., M. HIRSCHEY and E. JONES (1997), "Information and contagion effects of bank loan-loss reserve announcements", *Journal of Financial Economics*, vol. 43, no. 2, pp. 219-39.

FAMA, E.F. and K.R. FRENCH (1992), "The cross section of expected stock returns", *The Journal of Finance*, vol. 47, no. 2, pp. 427-65.

FAMA, E.F. and K.R. FRENCH (1993), "Common risk factors in the returns on stocks and bonds", *Journal of Financial Economics*, vol. 33, no. 1, pp. 3-56.

FLANNERY, M.J. and C.M. JAMES (1984), "The effect of interest rate changes on the common stock returns of financial institutions", *The Journal of Finance*, vol. 39, no. 4, pp. 1141-53.

FLANNERY, M.J. and A.A. PROTOPAPADAKIS (2002), "Macroeconomic factors do influence aggregate stock returns", *The Review of Financial Studies*, vol. 15, no. 3, pp. 751-802.

GRAMMATICOS, T. and A. SAUNDERS (1990), "Additions to bank loan-loss reserves: good news or bad news ?", *Journal of Monetary Economics*, vol. 25, no. 2, pp. 289-304.

HE, J. and L.K. NG (1994), "Economic forces, fundamental variables, and equity returns", *Journal of Business*, vol. 67, no. 4, pp. 599-609.

LAKONISHOK, J., A. SCHLEIFER and R. VISHNY (1994), "Contrarian investment, extrapolation, and risk", *The Journal of Finance*, vol. 49, no. 5, pp. 1541-78.

MCELROY, M.B. and E. BURMEISTER (1988), "Arbitrage pricing theory as a restricted nonlinear multivariate regression model", *Journal of Business & Economic Statistics*, vol. 6, no. 1, pp. 29-42.

MERTON, C.R. (1974), "On the pricing of corporate debt: the risk structure of interest rates", *Journal of Finance*, vol. 29, no. 2, pp. 449-70.

MERTON, C.R. (1977), "An analythic derivation of the cost of deposit insurance and loan guarantees – An application of modern option pricing theory", *Journal of Banking and Finance*, vol. 1, no. 1, pp. 3-11.

MERTON, C.R. (1978), "On the cost of deposit insurance when there are surveillance costs", *The Journal of Business*, vol. 51, no. 3, pp. 439-52.

ROGERS, K. and J.F. SINKEY (1999), "An analysis of nontraditional activities at U.S. commercial banks", *Review of Financial Economics*, vol. 8, no. 1, pp. 25-39.

ROSENBERG, B.A. (1974), "Extra-market components of covariance in security returns", *Journal of Financial and Quantitative Analysis*, vol. 9, no. 2, pp. 263-73.

ROSENBERG, B.A. and W. MCKIBBEN (1973), "The prediction of systematic and specific risk in common stock", *Journal of Financial and Quantitative Analysis*, vol. 2, no. 8, pp. 317-33.

VENNET, V.R. (2002), "Cost and profit efficiency of financial conglomerates and universal banks in Europe", *Journal of Money, Credit, and Banking*, vol. 34, no. 1, pp. 254-82.

WALHEN, J.M. (1994), "The nature of information in commercial bank loan loss disclosure", *The Accounting Review*, vol. 69, no. 3, pp. 455-78.