Estimating the cost of equity for financial institutions

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Resumen

En este artículo se estima el coste de capital para una muestra amplia de entidades financieras europeas. Para ello, se consideran dos métodos principales: i) un modelo de descuento de dividendos para un índice general de mercado, conjuntamente con un modelo unifactorial para estimar el coste de capital de las entidades cotizadas individuales, y ii) un modelo multifactorial de series temporales que combina factores de los mercados de renta variable y de renta fija. Se encuentra que, si bien los dos enfoques producen, en general, resultados similares, tanto en lo que respecta a sus niveles como a la dinámica de las series temporales, las discrepancias entre ambos pueden ser sustanciales. En definitiva, el modelo de descuento de dividendos es un enfoque menos intensivo en datos, que puede ser más efectivo para realizar un seguimiento del coste de capital en tiempo real. En cambio, los modelos multifactoriales son más intensivos en datos y, por lo tanto, menos adecuados para un seguimiento regular. Sin embargo, al mismo tiempo, esta última metodología es más útil para capturar el impacto de desarrollos que no capta el índice general de mercado, gracias a su estructura multifactorial.

Abstract

This article estimates the cost of equity for a large sample of European financial institutions. To this end, two main approaches are considered: (i) a dividend discount model for a broad market index, combined with a single-factor framework to estimate the cost of equity for individual stocks; and (ii) a multi-factor time-series model combining stock and bond-market factors. It is found that, while the two approaches generally yield similar results, both in terms of their levels and their time series dynamics, discrepancies can be substantial. All in all, the dividend discount model is a less data-intensive approach that may be more effective to monitor the cost of equity in real time. In contrast, multi-factor models are more data intensive and hence less convenient for regular monitoring. At the same time, though, this latter methodology is more useful to capture the impact of developments not captured by the broad market index, owing to its multi-factor structure.

1 Introduction

The banking system is facing a challenging environment since the global financial crisis. In addition to the absorption of the losses generated by that crisis, over the last years banks have been subject to a low interest rate environment that has put more pressure on profitability. The COVID-19 pandemic, which erupted in March 2020 in Europe, has intensified these difficulties even more. In this context, it is important to assess the sustainability of banks' business models. At the most basic level, sustainability requires that banks' profits remain in the long run above the costs that they face to fund their activity. Among these costs, the cost of equity is an essential one, as equity is the main loss-absorbing element protecting depositors and other counterparties against banks' losses.

The cost of equity is the total return that investors expect for holding the equity of a particular firm, and being compensated for the risk that this entails. Investors may receive this return through either price appreciation of the stock itself or through dividends. It is usually expressed in annualised terms. However, due to the intrinsic uncertainty in the stock market, there is no guarantee that investors will earn this expected return at any pre-specified horizon. As a matter of fact, the cost of equity is not formally agreed, because it is an implicit and unobservable measure. This contrasts with debt funding, where the cost is explicitly set at issuance. For this reason, it is necessary to develop econometric models to estimate it.

One of the most popular approaches to estimate the cost of equity is based on the dividend discount model proposed by Fuller and Hsia (1984). This methodology is commonly employed by various national and international institutions to estimate banks' cost of equity [see e.g. European Central Bank (2016)] but it has also been used to estimate the cost of equity for non-financial firms [see Alonso Sánchez and Marqués Sevillano (2006)]. Importantly, the most recent estimates show that a non-negligible proportion of euro area banks are currently unable to yield a return on equity higher than the overall cost of equity [see European Central Bank (2019)]. This result draws a very dark picture about the prospects of the euro area banking system. At the same time, though, such a conclusion is surrounded by a cloud of uncertainty, as it relies on a particular estimation approach that cannot be tested in practice. Hence, such results might be sensitive to the model's assumptions. Furthermore, as the dividend discount model is usually calibrated for the average bank, certain banks' specificities might explain the positive gap identified between the estimated average cost of equity and the return on equity observed for individual institutions.

In this paper, we assess the reliability of the dividend discount model by comparing the results that it produces with the alternative multi-factor approaches previously employed for the US by Adrian, Friedman and Muir (2015) and Kovner and Van Tassel (2019), and Altavilla et al. (2021) for the euro area, among others. The cost of equity obtained with the dividend discount model is typically computed for the overall market. Then, the measure for a specific bank or group of banks is obtained by multiplying the original broad result by the beta from a Capital Asset Pricing Model (CAPM for short) [see Sharpe (1964) and Lintner (1965)]. Hence, a multifactor approach is a natural way to generalise the dividend discount model by introducing several factors to account for the existing cross-sectional heterogeneity in a more flexible way. However, the shift to a multi-factor setting also comes at a cost, because in this extended framework we can no longer easily incorporate the forward-looking dividend discount approach. Instead, we have to fully rely on backward-looking econometric regressions.

We estimate the cost of equity under our proposed alternative econometric approaches using data from a large sample of European financial institutions whose equity is traded in the stock markets. In the case of the multifactor model, we consider stock and bond-market factors, as well as a factor related to banks' profitability, and then select our preferred factor model using their optimal combination. We compare the results that our alternative approaches provide for the whole sample on average as well as their dynamic evolution through overlapping rolling estimation windows. Lastly, we also consider exponentially decreasing weights in the regressions with overlapping expanding windows, so that the cost of equity estimates reflect the conditions at specific points in time (the end of each overlapping window) more accurately, rather than the average conditions on each window.

The rest of the paper is organized as follows. Section 2 describes the two cost of equity modelling approaches that we consider. Section 3 shows the main empirical results and finally Section 4 concludes.

2 Existing methodologies to estimate the cost of equity

There are many different alternative approaches to estimate the cost of equity in the literature [see Duarte and Rosa (2015) for a review]. However, most of these approaches can be grouped into two main methodologies. The first one consists of the combination of time series and cross-sectional regressions to back out the cost of equity from historical data. In contrast, the second approach, which is based on a dividend discount model, is more reliant on forward looking information (surveys, forecasts) to estimate the cost of equity using some sort of discount formula for the forecasted future cash flows. Nevertheless, even in this second case, some historical or backward-looking information is also needed to obtain cost of equity estimates for specific firms or groups of firms, due to the unreliability of the available forward-looking information at the firm level.

2.1 Factor model: estimating the cost of equity from historical data

The first approach is based on a multi-factor framework. Under this setting, the cost of equity of a firm depends on the sensitivity of that firm to a series of risk factors, as well as on the price of risk of each for these factors. Intuitively, the price of risk for a particular factor measures the compensation demanded by the market for being exposed to that factor. Idiosyncratic risks of particular firms are not priced by the market, because they can be diversified away in a portfolio, so the exposures to global risk factors are the only relevant magnitudes in this formulation.

To implement this approach, we first need to identify the relevant risk factors. The simplest possible setting is the traditional CAPM, in which the only modelled factor is a proxy that is representative of the average return of the whole market[1]. Alternatively, we consider a multi-factor extension, which allows the inclusion of several factors in addition to the average market return proxy. As is well known [see for example Fama and French (1993)], the additional factors help to account for some pricing anomalies of the CAPM model. Once the relevant factors are selected, the cost of equity is estimated in two steps. In the first step, we fit time series regressions for each firm in our sample, in which we regress the equity return of that firm in excess of a risk-free rate proxy (or excess return for short), with respect to the risk factor(s) that we consider,

$$y_{it} - r_t = \alpha_i + \beta'_i \cdot X_t + \varepsilon_{it}, \qquad [1]$$

where yit, rt, and Xt denote the firm's stock return, the risk-free rate and the vector of selected risk factors, respectively, while β'_i is the vector of factor loadings for the factors in Xt. Intuitively, the degree of time-series co-variation between the returns of a firm and a given risk factor quantifies the exposure of that firm to that risk factor.

1 Barnes and López (2005), King (2009) and Da, Guo and Jagannathan (2012) have previously used the CAPM to estimate the cost of equity.

In the second step, we estimate the risk premium demanded by the market in excess of the risk-free rate as a cross sectional regression of the average realised excess returns of all the firms in our sample on the factor loadings estimated in the first step:

$$\bar{y}_\iota - \bar{r} = \lambda \cdot \hat{\beta}'_i + \epsilon_i, \qquad [2]$$

where $\bar{y}_\iota$ and $\bar{r}$ denote the average historical stock return and risk-free rates, respectively,and $\hat{\beta}'_i$ is the vector of factor loadings estimated in [1]. We can compute these average values for the whole sample, as well as for overlapping windows to obtain time-varying estimates. The errors ϵ_i in [2] might be correlated. In order to obtain consistent standard errors, we follow the approach of Fama and MacBeth (1973). Our goal is to estimate [2] at each point in the time series, obtaining a time-varying estimate of l, which we denote as lt, and then average those estimates. The standard error is estimated from that average, using the Newey and West (1987) procedure to account for autocorrelation. In order to maximize efficiency, we carry out the cross-sectional regressions using Weighted Least Squares (WLS), with weights proportional to the inverse of the variance of the residuals from [1]. The main output of this second step is an estimate of the vector l (lt for the time-varying estimates), which captures the prices of risk associated to each risk factor. Thus, the equity premium for each firm computed with this first approach is the sum of all the factor loadings for this firm, multiplied by their respective prices of risk:

$$EP_i = \tilde{\lambda}' \cdot \hat{\beta}_i, \qquad [3]$$

where $\tilde{\lambda}$ is the vector estimated in [2]. Finally, the cost of equity is the sum of the equity premium EPi, plus the mean risk-free rate.

2.2 Dividend discount model: estimating the cost of equity with forward looking information

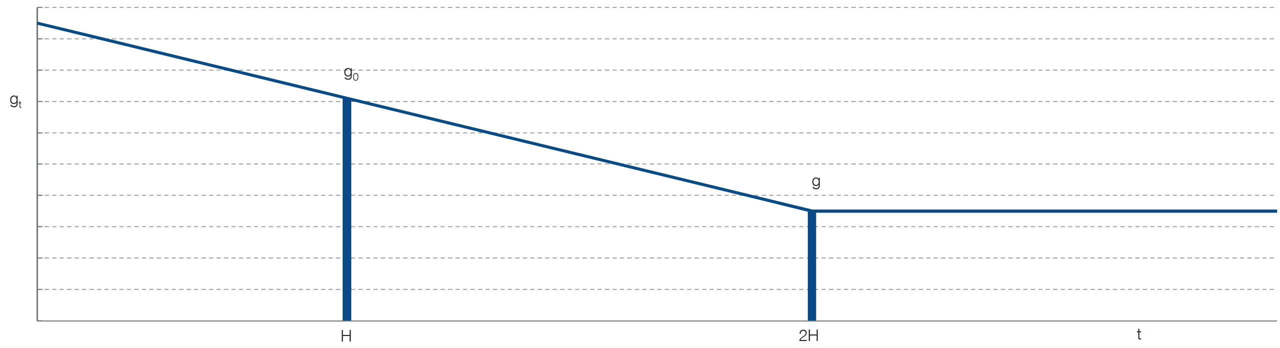
In this second case, we first estimate the cost of equity for the market as a whole. Specifically, we use as a reference a market index that is representative of the whole market and then we estimate the market's equity premium using the dividend discount model developed by Fuller and Hsia (1984). As shown in Chart 1, this model assumes that dividends initially grow at a rate g_0, but that this rate linearly changes over the following periods until it eventually converges 2H periods later to a long-term growth rate g.

Fuller and Hsia (1984) apply this methodology and show that the equity premium can be expressed as:

$$EP_{market} = \frac{D_0}{P_0}\left[(1+g) + H(g_0 - g)\right] + g - r, \qquad [4]$$

where D_0 / P_0 denotes the initial dividend yield and r the risk-free rate.

Chart 1
IMPLICIT DIVIDEND GROWTH IN THE DIVIDEND DISCOUNT MODEL



SOURCE: Authors' elaboration.

Usually, the initial dividend growth rate g_0 is obtained from analysts' expectations for corporate profits, while the long-term growth rate g comes from consensus GDP forecasts.

In principle, it would be operationally feasible to compute the equity premium directly for specific firms from the dividend discount model, based on the analysts' forecasts for those firms. However, this approach generally yields rather noisy results, as such forecasts tend to be more reliable and smoother on average for the whole market than for individual companies. For this reason, the standard approach [followed, for example in European Central Bank (2016)], is to compute the equity premium for a particular firm in a second step as the product of the equity premium estimated in [4] for the whole market and the CAPM beta of that firm.

$$EP_i = \beta_{CAPM,i} \cdot EP_{market}. \qquad [5]$$

Finally, as with the previous methodology, the cost of equity would be the result of summing the mean risk-free rate to EP_i.

3 Empirical analysis

In this section, we empirically estimate and compare the two approaches described in the previous section.

3.1 Factor model

We obtain from Datastream the weekly stock price data for the financial constituents of the Euro Stoxx 600 index from January 1999 until September 2020. These constituents include several financial sectors: banks, life and non-life insurance companies, as well as other financial services companies. This list includes euro area firms as well as firms from other EU and non-EU European countries.[2] We convert all non-euro area stock returns into euros. We exclude from the sample Greek companies, to avoid the distortions generated by the Greek sovereign debt crisis, and the two companies from the Euro Stoxx 600 index domiciled in Luxembourg.[3] We consider return index data, which is adjusted for dividend payments.

We compute weekly excess returns with respect to the Euro-Mark weekly deposit rate, which is our risk-free rate proxy.[4] In our view, the weekly frequency offers a good compromise between the daily frequency, where some stocks seem to offer insufficient liquidity, and the monthly frequency, which would make us lose many observations. As the liquidity of the stock data is not homogenous over the sample, we need to filter out some outliers to eliminate the distortions that they would generate. Specifically, we eliminate returns that are larger than 20% in absolute terms, which only affects 0.8% of the original raw data. We also eliminate those returns that equal 0%, which are mostly due to official holidays (many of them are common and easily identifiable across European countries, but some purely national holidays are largely specific for each country).

As our factor model specifications, we consider several alternative settings, drawn from three blocks of factors. The first one is based on stock-market factors. Specifically, we consider the three stock-market factors proposed by Fama and French (1993):

— The excess return of an overall European stock market index.[5]

— SMB or small-minus-big factor. This factor can be interpreted as a size factor, as it captures the stock return spread between small and large companies (below the 10th percentile and above the 90th percentile in size), with size measured by market capitalisation.

— HML or high-minus-low factor. This factor mimics the spread between companies with high and low book-to-value ratios (below the 30th percentile and above the 70th percentile in book-to-value ratios).

2 The non-euro area countries in the sample are the Czech Republic, Denmark, Norway, Sweden, Switzerland and the United Kingdom.

3 We eliminate the firms domiciled in Luxembourg due to the specificities of this international financial center, and in particular the predominance of custodian banks. The complete list is available from the authors on request.

4 This interest rates is based on Eurocurrency deposits, which consist on short term fixed-rate time deposits in a given currency (euros in this case), normally held in London. As this is a very active market, it generally offers liquid and reliable short term interest rate data. The Euro-Mark deposit rate is basically identical to the Euro Deposit rate since 1999, but it offers the advantage of a much longer history.

5 For consistency, we consider the market index from Fama and French. As it is expressed in dollars, we need to convert this index back to euros and to transform it from daily to weekly frequency. In any case, it is very similar to the Stoxx 600 Europe Index, as the correlation between the weekly returns of these two indices is about 98%.

We have downloaded the European time series for these factors from the Kenneth R. French web database.[6] As they are expressed in dollars, we have converted them back to euros.[7]

In addition, we also consider bond-market factors to complement the overall stock-market index, as an alternative to the SMB and HML stock-market factors. This variant was already considered by Fama and French (1993), but we explore an extended factor model that is specifically designed for the European market, following closely the specifications considered by Fama and French (1993) themselves and more recently by Gálvez and Mencía (2018), among others. Specifically, we include the following factors in our second specification:

— The excess return of the Fama and French overall European stock-market index.

— Term spread: 10 minus 2-year sovereign yield for Germany.

— Credit spread: Corporate 10 year A-rated yield minus the 10-year sovereign German yield.

— TED: 3-month Euribor minus 3-month OIS.

— Sovereign change: weekly change in the German sovereign yield.

— Sovereign volatility: cross sectional volatility of European sovereign yields.

The sovereign volatility factor can be interpreted as a fragmentation proxy, especially for the euro area, as recent experience shows that fragmentation tensions are reflected through an increasing dispersion of national sovereign yields.

Furthermore, following Adrian, Friedman and Muir (2015), we consider two additional factors:

— A financial sector premium factor (financial premium factor, for short), measured as the difference between the weekly returns of the Datastream financial index for Europe, and those of the Datastream non-financial index, also for Europe.

6 http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

7 In the cases of the SMB and HML factors, generating the time series in euros is not trivial, as it is necessary to start from the 6 size and book-to-market sorted portfolios (also reported in the Fama and French database), rather from the SMB and HML factors. Specifically, we first convert the 6 size and book-to-market sorted portfolios at a daily frequency back to euros. Then, we compute the weekly returns from these 6 indices. Finally, we use the formulas available in the Fama and French webpage to construct the SMB and HML factors from these six portfolios.

— A return-on-equity (RoE) factor, measured as the difference between the weighted average of the equity returns of banks in the 5th quintile in terms of RoE, and those of the 1st quintile.

For the sake of completeness, we also consider a CAPM single-factor specification, in which the only factor would be the overall market index.

Chart 2 shows the kernel densities of the factor loadings that we obtain when we estimate [1] for the whole sample. We can observe that the factor loadings on the overall market factor tend to cluster around 1 in all the estimations, from the one-factor CAPM setting to the other multifactor approaches. This is a standard result in the asset pricing literature, reflecting the fact that the overall stock index is a weighted average of all trading stocks. We observe a wider dispersion in the SMB and HML factor loadings, although the majority of the estimates are positive. Fama and French (1993) also obtained positive factor loadings on the SMB factor, which tended to be larger for smaller stocks. In contrast, they generally obtained negative coefficients for the HML factor, especially for the stocks with low book-to-value ratios. In the specification with bond-market factors (Chart 2b), we obtain highly dispersed estimates for the loadings on the TED and Sovereign change factors. This reflects the fact that the influence of these factors tend to be extremely idiosyncratic, possibly reflecting an estimation artefact rather than systematic influences. In contrast, the kernel densities of the credit spread, the term spread and sovereign volatility are much less disperse. In the Adrian, Friedman and Muir (2015) FCAPM specification (Chart 2c), the loadings of the RoE factor are tightly clustered around zero, suggesting an insignificant effect of this factor. The loadings of the financial sector risk premium, SMB and HML factors show similar densities, suggesting some redundancies.

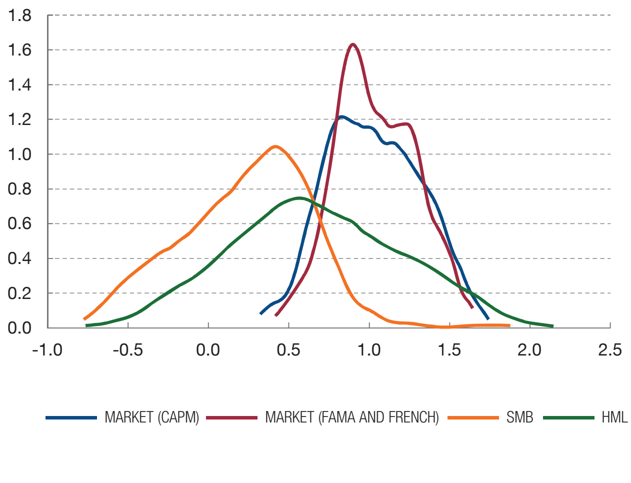
We then proceed with the second step, in which we estimate [2] to study whether these factors are priced by the market. Prior to the regression, we drop all the companies with a negative realised average excess return over the sample. Intuitively, a rational investor should not be willing to invest in a risky asset that offers a lower return than a risk-free asset. Although this may occur in finite samples, the probability of a negative realised excess return should tend to zero in the long run.

Table 1a shows the parameter estimates for the standard cross-sectional regressions, while Table 1b shows the Fama and MacBeth (1973) estimates. The first column in both tables exclusively considers the general market index as the only factor. This is why this column is labelled as CAPM. Column 2 only considers the Fama and French factors, while column 3 adds the financial premium and RoE factors. Then, the fourth column considers the bond-market factors instead of the stock-market factors. Finally, the fifth column pools all the stock and bond-market factors. A comparison of the adjusted R-squares shows that stock-market factors tend to provide a higher explanatory power than bond-market factors, but the

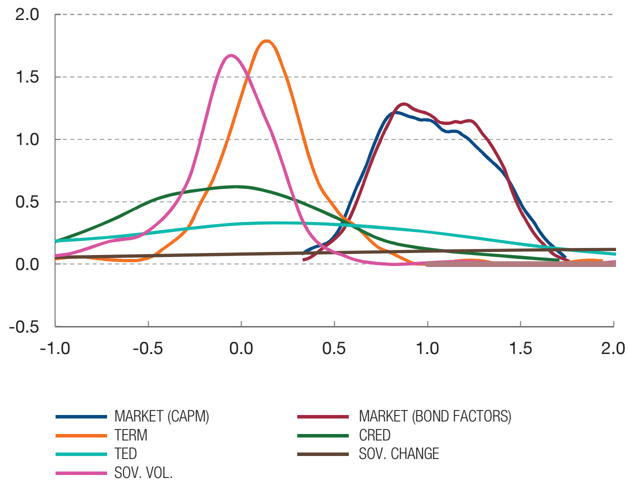
Chart 2
FACTOR LOADINGS OF THE TIME SERIES REGRESSIONS FROM THE FACTOR MODEL

Kernel densities of the factor loadings from time series regressions by firm of weekly excess returns on a series of factors.

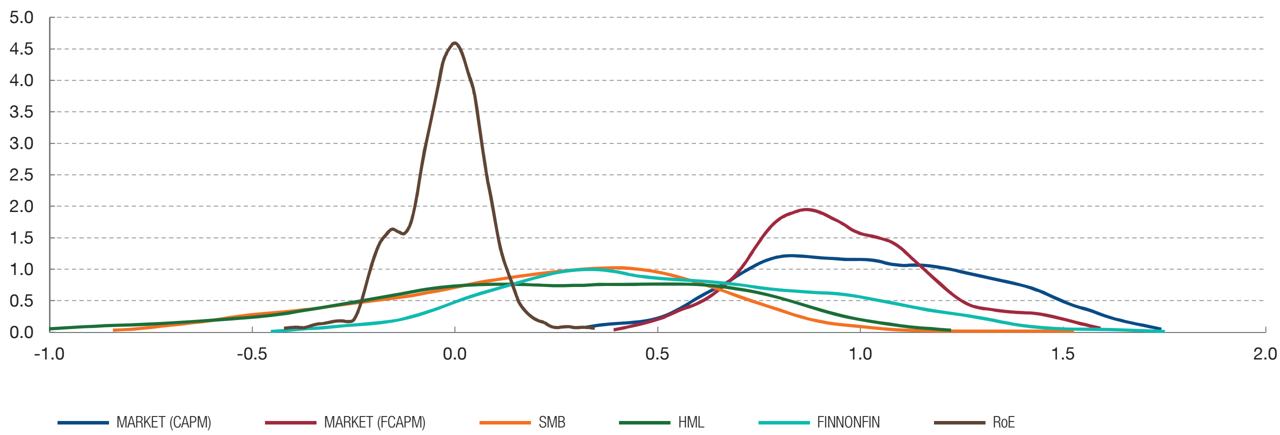
1 FAMA AND FRENCH SPECIFICATION



2 BOND MARKET SPECIFICATION



3 ADRIAN, FRIEDMAN AND MUIR FCAPM



SOURCE: Authors' elaboration.

financial premium and RoE factors do not add much explanatory power with respect to the Fama and French factors. In addition, only a few bond-market factors turn out to be statistically significant, whereas the three Fama and French factors are highly significant.

When we pool all the stock and bond-market factors in a single regression (fifth column in Tables 1a and 1b), then much of the statistical significance disappears, except for the market, HML and financial premium factors. Perhaps pooling all the factors in a single regression may overstretch too much the limited number of

Table 1
ESTIMATION OF THE PRICES OF RISK IN THE MULTI-FACTOR MODEL

The results reported in Panel (a) are the coefficients of a cross-sectional regression of average excess returns on the factor loadings resulting from a previous regression. The results reported in Panel (b) are averages of the coefficients of cross-sectional regressions of weekly excess returns on the factor loadings resulting from a previous regression [following Fama and MacBeth (1973)]. The previous regression consists on time series regressions by firm of weekly excess returns on a series of factors.

	(a) Cross-sectional regressions					(b) Fama and MacBeth (1973) regressions				
	CAPM	Fama and French	FCAPM	Bond Factors	All	CAPM	Fama and French	FCAPM	Bond Factors	All
Market	0.189***	0.252***	0.268***	0.231***	0.259***	0.183**	0.231***	0.243***	0.221***	0.223***
	(0.0121)	(0.0181)	(0.0278)	(0.0145)	(0.0277)	(0.0746)	(0.0723)	(0.0732)	(0.0703)	(0.0738)
SMB		0.0847***	0.0613**		0.043		0.0938**	0.060		0.043
		(0.0224)	(0.0296)		(0.0296)		(0.0437)	(0.0481)		(0.0406)
HML		-0.137***	-0.126***		-0.106***		-0.115**	-0.086		-0.0812*
		(0.0234)	(0.0276)		(0.0236)		(0.0502)	(0.0531)		(0.0457)
CRED				0.031	0.004				-0.011	0.001
				(0.0308)	(0.0307)				(0.0527)	(0.0515)
TERM				-0.086	-0.088				-0.060	-0.082
				(0.0601)	(0.0597)				(0.0653)	(0.0666)
TED				0.020	0.005				0.007	0.024
				(0.0152)	(0.013)				(0.0253)	(0.0266)
Sov. Change				-0.0132***	0.000				-0.0175***	0.000
				(0.0042)	(0.00504)				(0.00613)	(0.0062)
Sov. Vol.				-0.054	-0.053				-0.134	-0.090
				(0.0333)	(0.0325)				(0.091)	(0.0826)
Fin. Premium			-0.0884**		-0.0781**			-0.076		-0.061
			(0.0396)		(0.037)			(0.0608)		(0.0575)
RoE			0.207		0.192*			0.209		0.214
			(0.126)		(0.107)			(0.145)		(0.131)
Obs.	126	126	126	126	126	1,134	1,134	1,134	1,134	1,134
Adj. R-sq	0.647	0.785	0.794	0.7	0.793	0.284***	0.329***	0.349***	0.328***	0.373***

SOURCE: Authors' calculation.
NOTE: Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01.

observations in the cross section. However, the estimate on the HML factor offers some interesting insights, as it is generally negative and significant, even in the Fama and MacBeth regression pooling all the variables. We have investigated this issue in greater detail, and found that the coefficient of this factor was positive before the global financial crisis (not reported in the table). This may reflect a change in the nature of financial companies, especially banks. Specifically, they performed as growth stocks in normal times before the global financial crisis, but since then their stocks have become value stocks, as they are trading well below their book value in many cases. As a result, the negative coefficient that we observe for the HML factor in Table 1 effectively generates a higher risk premium in bad times, when the beta estimated in the first step tends to decrease.

3.2 Dividend discount model

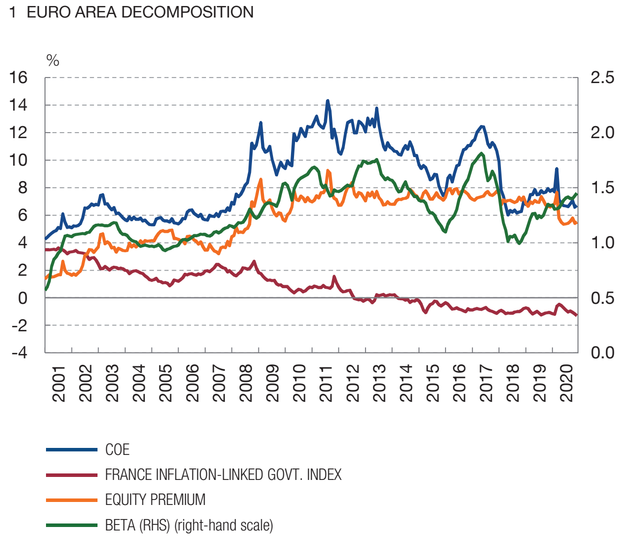
As we have explained in the previous section, this two-stage approach combines features from the dividend discount model of Fuller and Hsia (1984) with the CAPM. In the first stage, we estimate [4] for the Euro Stoxx index. We have downloaded the dividend-yield data for this index from Datastream.[8] We proxy the initial profits variable g_0 from the analysts' expectations collected by the Institutional Brokers Estimate System database (I/B/E/S), which reports a median forecast for the annual earnings growth rate of the Euro Stoxx, weighting the forecasts for each Euro Stoxx constituent by its market cap. Then, we use GDP expected long term growth, taken from Consensus Economics, as our proxy for long-term growth, g. Following European Central Bank (2016), we set H to 5 years. Thus, we assume that dividend growth initially equals the profit growth estimated by investors, with dividends accounting for a fixed proportion of profits, and that thereafter dividend growth will gradually converge towards expected long-term economic growth. In the second stage, we estimate the banking sector equity premium for each European country, following [5]. Specifically, we consider the product of the equity risk premium for the Euro Stoxx by the CAPM beta corresponding to the banking sectoral index of each country. Our sectoral indices are the Datastream national indices for the Banking sector. We compute the CAPM betas using daily data.[9] Finally, we use the yields on a French inflation-linked government bond index to compute the cost of equity from the equity premia in real terms.

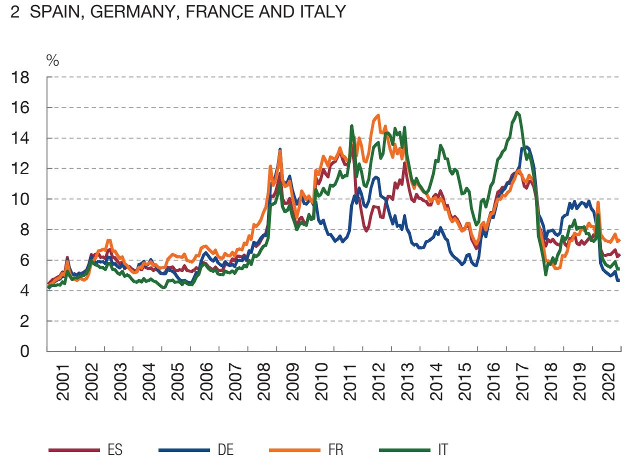
Chart 3 shows the monthly evolution of the cost of equity for the whole euro area (Panel a), as well as for its largest Members (Panel b). We also show in Panel a the evolution of some auxiliary variables: the equity premium for the whole Euro Stoxx and the CAPM beta for the euro area banking sector. We consider one-year rolling windows to estimate the CAPM beta, in order to obtain time-varying estimates that reflect possible changes in the values of these coefficients over the sample. Chart 3 shows that the cost of equity remained relatively stable at values close to 6% between 2000 and 2007, with limited cross-country differences. From the onset of the global financial crisis, we observe several relevant developments. First, the cost of equity rapidly increased for all countries to values above 8%. Secondly, the dispersion among countries quickly increased after 2010, roughly coinciding with the outbreak of the euro area sovereign debt crisis. From 2015 on a reduction in the dispersion across countries of the cost of equity can be observed, but not a reduction in their levels. In fact, the cost of equity estimates reached a peak around 2016-2017, in the aftermath of the turbulences generated by the Brexit referendum, and have not yet returned to those observed before the global financial crisis. Lastly, we observe

8 This corresponds to D_0 / P_0 in [4].

9 In this case, we are confident that we can consider the daily frequency in these CAPM regressions, as they only involve liquid indices, not individual stocks. Thanks to this higher frequency, we can shorten the size of the overlapping windows in these regressions, which makes the beta estimates much more representative of the latest developments at each point in time.

Chart 3
MONTHLY EVOLUTION OF THE COST OF EQUITY ESTIMATES FROM THE DIVIDEND DISCOUNT MODEL (2001-2020)





SOURCE: Authors' calculations.

a final spike in March 2020, related to the intense but short-lived financial turbulences at the beginning of the COVID-19 pandemic [see Fernández Lafuerza and Mencía (2020) for a thorough analysis of the cost of equity over this period].

3.3 Comparing the cost of equity estimates from the two methodologies

We compare in Table 2 the average cost of equity for the whole sample, estimated with our two alternative approaches for the largest European countries, the whole euro area and the rest of Europe. We show the results obtained from the dividend discount model and the two specifications of the factor model estimated in subsection 3.1: the CAPM and the specification with the three Fama and French factors, which is the multifactor specification providing more robust and consistently significant results.[10] For the whole sample, the dividend discount model yields results in the 6-9% range, while the factor approaches estimates lie in the 6-14% range. In particular, the dividend discount model tends to provide lower cost of equity estimates than the single-factor CAPM model, but higher values than the Fama and French specification, except for Germany. The Fama and French specification yields lower cost of equity estimates than the CAPM model, primarily because of the HML factor. In our results we see that higher market value institutions tend to be more exposed to this factor, having lower cost of equity. This effect is not

10 For consistency with the dividend discount model, we also consider the same French inflation-linked Government bond index to compute the cost of equity from the equity premium in the factor models.

Table 2
ESTIMATES OF THE COST OF EQUITY

In the CAPM and Fama and French models the cost of equity is aggregated at the country level performing a market value weighted average of the bank figures.

	Whole sample (1999-2020)					
	ES	DE	FR	IT	Euro	Other Europe
Discount model	7.90	7.60	8.60	8.40	8.50	6.5
CAPM	13.10	12.70	14.60	13.40	13.60	12.9
Fama and French	5.90	10.50	6.60	5.90	7.90	10.3

SOURCE: Authors' calculation.

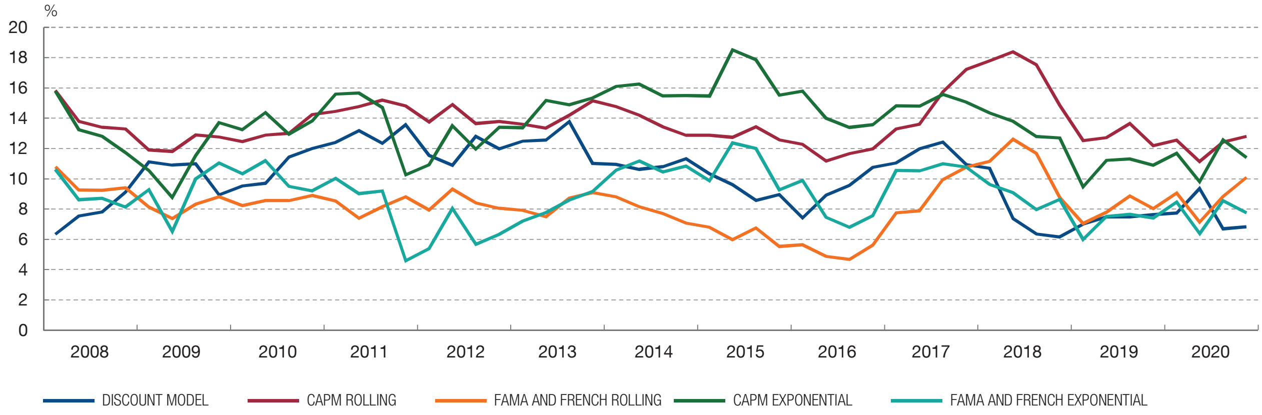
captured in the simple CAPM model (where higher market value institutions tend to have higher cost of equity). Since the results in Table 2 are weighted by market value, the Fama and French specification will tend to yield lower values. We should bear in mind that we can only estimate the cost of equity for listed companies. Therefore, the figures that we obtain may not be equally representative for each European countries. For instance, in Spain a large share of the banking sector is currently composed by listed banks. This is not the case in other European countries, where non-listed savings banks or cooperatives are more prevalent.

In addition, we also compare the time-series evolution of the different approaches in Chart 4. We consider two different methods to obtain time-dependent estimates of the cost of equity in the factor based approach. The first one simply uses nine-year overlapping rolling windows. Such long time windows are necessary to ensure that the results from the factor model are reliable and stable, as this approach is highly data-intensive. The second one uses expanding windows that end in the month of interest, but when computing the betas and the lambdas, observations are weighted with weights that decay exponentially the further away that the observations are from the present.[11] Hence, this second approach yields estimates that offer a more realistic picture of the situation at each point in time, rather than the average of the last 9 years as with the first approach. In both cases, the time-dependent cost of equity of all euro area institutions in the sample is aggregated by weighting those institutions by their market value. We can observe that all the series generally evolve similarly over the sample. The only exception is the sovereign-crisis period (from 2010 to 2012), in which the results from the Fama and French approach tend to diverge from the dividend discount model and the CAPM. In general, the exponentially-weighted approach seems to yield results that respond more quickly to changes in financial conditions (as captured by the dividend discount model), and it generally produces series with closer dynamics to the dividend discount model, suggesting that it is preferable to the simple overlapping window approach. For instance, once

11 At time t, observations of time $t_1 < t$ are weighted as $\exp(-2(t-t1)/9)$, with t and t_1 expressed in years.

Chart 4
HISTORICAL EVOLUTION OF THE COST OF EQUITY

Estimates label “Rolling” are based on nine year moving windows, while those labelled “Exponential” consider all past observations, exponentially weighted. The line labelled “Discount model Euro” is plotted using quarterly estimates.



SOURCE: Authors' elaboration.

again we observe a spike in the cost of equity in March 2020 with the discount model. We also observe a similar spike with the Fama and French multifactor model, albeit one month later, but only when we employ the exponentially weighted approach.

In a recent work, Altavilla et al. (2021) use the dynamic conditional beta approach of Engle (2016) to estimate time-varying betas. Compared with the overlapping windows method, they find that the conditional beta approach yields estimates that respond more timely to current developments. However, this approach requires assuming a fully parametric model for the time varying covariance matrix. In this sense, our exponentially weighted methodology is likely to be a more robust non-parametric approach, as it does not require to identify the true data generating process.

4 Conclusions

In this paper, we compare the cost of equity estimates resulting from the dividend discount model with those of a multifactor approach, estimated from a large panel of European financial institutions. We are reassured by our findings that the alternative approaches that we consider generally yield results with similar dynamics. However, the dividend discount model and our preferred multifactor approach can ocassionally yield very different estimates. It is very important to have this range in mind, in order to understand the high degree of uncertainty of cost of equity estimations. After our analysis, we still view the dividend discount model as the main benchmark for the regular monitorisation of the average cost of equity for a banking system. This approach is more forward-looking in nature than our alternative approach. It is also less data intensive, which is very helpful to update the cost of equity estimates at high frequencies or to immediately gauge the impact of certain shocks in the financial markets. At the same time, the multifactor model is more flexible to account for cross-sectional heterogeneity thanks to its ability to incorporate several factors. This is an essential feature if we want to develop cost of equity estimates that react to developments beyond those captured by the overall market index.

Our analysis leaves several important questions for future work. For instance, it would be very interesting to extend the multifactor framework by introducing forward looking elements in this setting, thus bringing together the best features of the two alternative approaches that we have considered. Furthermore, another interesting avenue would be to explore ways to incorporate national and bank-level specificities in the cost of equity measures. Lastly, it would also be potentially relevant to explore non-linear extensions, as non-linearities are particularly likely to exist in such an elusive measure as the cost of equity.

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