

Different Methods to Estimating the Cost of Equity: An Analysis on a Sample of Too Big to Fail Banks

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In this study, a comparison was made between the Capital Asset Pricing Model (CAPM), the most widely used methodology, and an actuarial method with the use of credit default swaps (CDSs) and the method based on the inverse of the multiple P/E. These three models are used to estimate the cost of equity. The comparison was made on a sample of 24 banks selected among the largest for assets in the world (too big to fail banks) belonging to 11 different countries. The results show that the CAPM estimates a premium for the higher risk than the one obtained with the actuarial method and the method based on the inverse of the P/E (except for 2013).

Keywords: cost of equity, CDS, probability of default, price to earnings ratio

Introduction

The methods based on expected flows, both income and financial, are those most used in professional practice for the estimation of equity value. In applying these methods, the discounting rate is the “critical factor” because an incorrect estimate can lead to misleading results in determining the economic value of a company (Guatri, 1998; Koller, Goedhart, & Wessels, 2010; Zanda et al., 2013). The application of these methods requires knowledge of the cost of capital that can be estimated in different ways (Bruner et al, 1998; Pratt, 2002).

This paper presents a comparison between different methods for determining the cost of equity: The Actuarial Method based on the determination of the probability of default (PD) by means of credit default swaps (CDSs), the Capital Asset Pricing Model (CAPM), and finally the method based on the use of P/E.

Sample Selection

The comparison is carried out on a sample of 24 large international banks (the so-called too big to fail) for a period from 2012 to 2014. The selected banks are in ascending order of total value of assets (see Table 1).

The banks belonging to the sample belong to 11 different countries and they are distributed according to Table 2.

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Table 1

Sample Composition: Name of the Company, Country and Total Assets

Banks	Country	Totale Assets US billions \$
HSBC Holdings plc	UK	2,627,027,600
JPMorgan Chase & Co	USA	2,573,126,000
BNP Paribas	France	2,503,748,814
Barclays Bank plc	UK	2,108,682,111
Bank of America Corporation	USA	2,104,534,000
Deutsche Bank AG	Germany	2,057,845,491
Credit Agricole S.A.	France	1,918,232,414
Citigroup Inc.	USA	1,842,530,000
Royal Bank of Scotland plc	UK	1,634,301,221
Societe Generale	France	1,574,349,661
Banco Santander S.A	Spain	1,504,391,973
Lloyds Banking Group plc	UK	1,325,155,280
ING Groep N.V.	Netherlands	1,199,167,024
UBS AG	Switzerland	1,057,768,565
Credit Suisse Group AG	Switzerland	927,027,630
The Goldman Sachs Group Inc.	USA	851,059,000
Royal Bank of Canada	Canada	832,445,848
Morgan Stanley	USA	801,510,000
Banco Bilbao Vizcaya Argentaria	Spain	749,112,552
Standard Chartered plc	UK	725,394,883
Commerzbank AG	Germany	670,194,767
DANSKE BANK A/S	Denmark	560,946,197
Nomura Bank International plc	Japan	421,498,488
Macquarie Group Ltd	Australia	141,925,236

Table 2

Sample Composition: Number of Companies for Country

Country	# Banks
Australia	1
Canada	1
Denmark	1
France	3
Germany	2
Japan	1
Netherlands	1
Spain	2
Switzerland	2
UK	5
USA	5
Totale	24

The Determination of the Cost Equity Using the Actuarial Method Based on the Determination of the PD Through Credit Default Swaps

According to the model proposed by Bierman and Hass in 1975 and Cheung in 1999, a similar approach is

used in the following to estimate a risk-adjusted rate for the equity. Assume that:

- investors are risk-neutral;
- p is the probability of default;
- entrepreneur/equity investors receive nothing in the case of default;
- there is no tax.

So, the model to calculate the cost of equity is:

$$K_e = (i_f + PD)/(1 - PD) \quad (1)$$

Where: K_e is the cost of equity; i_f is the free-risk rate as benchmark is used the 10 years government bond; and PD is the probability of default.

The first phase was the determination of the 5-year default credit spread of the chosen sample for a period of three years (2012-2014). As it can be seen in Table 3, there are, for each year, the prices of credit default swaps spreads and related ratings provided by Moody's.

Table 3

Credit Default Swaps Spreads and Moody's Rating of the Companies Over the Period 2012-2014

Banks	Country	2012		2013		2014	
		5Y CDS	Moody's	5Y CDS	Moody's	5Y CDS	Moody's
Banco Bilbao Vizcaya Argentaria	Spain	3.91%	Baa3	1.62%	Baa3	0.88%	Baa2
Banco Santander S.A	Spain	3.70%	Baa2	1.94%	Baa2	0.88%	Baa1
Bank of America Corporation	USA	2.18%	Baa2	1.01%	Baa2	0.72%	Baa2
Barclays Bank plc	UK	1.87%	A2	1.18%	A2	0.68%	A2
BNP PARIBAS	France	2.09%	A2	1.09%	A2	0.69%	A1
CITIGROUP INC	USA	2.02%	Baa2	0.96%	Baa2	0.77%	Baa2
Commerzbank AG	Germany	2.41%	A3	1.38%	Baa1	0.94%	Baa1
Credit Agricole S.A.	France	2.65%	A2	1.39%	A2	0.76%	A2
Credit Suisse Group AG	Switzerland	1.53%	A2	0.90%	A1	0.61%	A1
Danske Bank	Denmark	0.84%	Baa1	0.84%	Baa1	0.75%	A3
Deutsche Bank AG	Germany	1.64%	A2	0.96%	A2	0.79%	A3
HSBC Holdings plc	UK	1.24%	Aa3	0.82%	Aa3	0.54%	Aa3
ING GROEP NV-CVA	Netherlands	2.16%	A3	1.10%	A3	0.61%	A3
JPMorgan Chase & Co	USA	1.15%	A2	0.82%	A3	0.63%	A3
Lloyds Banking Group plc	UK	2.44%	A3	1.17%	A3	0.63%	A2
MACQUARIE	Australia	2.36%	A2	1.24%	A2	0.94%	A2
MORGAN STANLEY	USA	3.01%	Baa1	1.25%	Baa2	0.84%	Baa2
Nomura Bank International plc	Japan	3.23%	A3	1.15%	Baa3	0.86%	Baa1
Royal Bank of Canada	Canada	0.51%	Aa3	0.51%	Aa3	0.33%	Aa3
Royal Bank of Scotland plc	UK	2.52%	Baa1	1.49%	A3	0.79%	Baa1
Societe Generale	France	2.66%	A2	1.36%	A2	0.86%	A2
Standard Chartered plc	UK	1.33%	A2	1.15%	A2	0.96%	A2
The Goldman Sachs Group Inc.	USA	2.27%	A3	1.18%	Baa1	0.86%	Baa1
UBS AG	Switzerland	1.65%	A2	0.82%	A2	0.52%	A2

The second phase consisted in determining the PD based on the relationship based on the work of two Fitch researchers (rating agency)—Grossman and Hansen (2010). The model is the following with the loss severity equal to 60%.

$$PD = CDS_{5y}/Loss \text{ severity} \quad (2)$$

In Table 4, the probability of bankruptcy for the years examined was determined.

Table 4

Probability of Bankruptcy of the Companies Over the Period 2012-2014

	2012	2013	2014
Banks	PD	PD	PD
BBVA	6.52%	2.70%	1.47%
Banco Santander S.A	6.16%	3.23%	1.47%
Bank of America Corp.	3.63%	1.68%	1.20%
Barclays Bank plc	3.12%	1.97%	1.13%
BNP PARIBAS	3.48%	1.82%	1.15%
CITIGROUP INC	3.37%	1.60%	1.28%
Commerzbank AG	4.02%	2.30%	1.57%
Credit Agricole S.A.	4.42%	2.32%	1.27%
Credit Suisse Group AG	2.55%	1.50%	1.02%
Danske Bank	2.07%	1.40%	1.25%
Deutsche Bank AG	2.73%	1.60%	1.32%
HSBC Holdings plc	2.07%	1.37%	0.90%
ING GROEP NV-CVA	3.60%	1.83%	1.02%
JPMorgan Chase & Co	1.92%	1.37%	1.05%
Lloyds Banking Group plc	4.07%	1.95%	1.05%
MACQUARIE	3.93%	2.07%	1.57%
MORGAN STANLEY	5.02%	2.08%	1.40%
Nomura Bank International plc	5.38%	1.92%	1.43%
Royal Bank of Canada	2.17%	0.85%	0.55%
Royal Bank of Scotland plc	4.20%	2.48%	1.32%
Societe Generale	4.43%	2.27%	1.43%
Standard Chartered plc	2.22%	1.92%	1.60%
The Goldman Sachs Group Inc.	3.78%	1.97%	1.43%
UBS AG	2.75%	1.37%	0.87%

Subsequently, for each country, the value of 10-year nominal risk-free rates (the government bonds of the various countries under analysis) for the three-year period 2012-2014 was determined (see Table 5).

Table 5

Nominal Risk Free Rate of the Countries Over the Period 2012-2014

Risk free rate 10y Government Bonds			
Country	2012	2013	2014
Australia	2.80%	3.74%	3.43%
Canada	1.66%	2.43%	2.23%
Denmark	1.05%	1.73%	1.25%
France	2.23%	2.18%	1.64%
Germany	1.25%	1.56%	1.20%
Japan	0.77%	0.81%	0.54%
Netherlands	1.69%	1.97%	1.43%
Spain	6.64%	4.79%	2.89%
Switzerland	0.44%	1.01%	0.60%
UK	1.47%	2.50%	2.73%
USA	1.50%	2.60%	2.52%

Lastly, the cost of equity was determined using the Formula (1). The results are summarized in Table 6:

Table 6

Cost of Equity of the Companies Over the Period 2012-2014

	2012	2013	2014
Banks	Ke	Ke	Ke
BBVA	14.07%	7.70%	4.42%
Banco Santander	13.64%	8.29%	4.42%
Bank of America	5.33%	4.36%	3.76%
Barclays Bank plc	4.74%	4.56%	3.90%
BNP PARIBAS	5.92%	4.12%	2.82%
CITIGROUP	5.04%	4.27%	3.85%
Commerzbank	5.48%	3.95%	2.81%
Credit Agricole	6.96%	3.49%	2.94%
Credit Suisse Group	3.07%	2.55%	1.64%
Danske Bank	3.18%	3.17%	2.53%
Deutsche Bank	4.09%	3.21%	2.55%
HSBC	3.61%	3.92%	3.66%
ING GROEP	5.48%	3.88%	2.47%
JPMorgan Chase	3.48%	4.02%	3.61%
Lloyds Banking	5.77%	4.54%	3.82%
MACQUARIE	7.01%	5.93%	5.08%
MORGAN STA.	6.86%	4.79%	3.97%
Nomura Bank	6.50%	2.78%	2.00%
Royal Bank of Can.	3.91%	3.00%	2.79%
Royal Bank of Scot.	5.92%	5.11%	4.10%
Societe Generale	6.98%	4.55%	3.12%
Standard Chart.	3.77%	4.51%	4.40%
The Goldman Sachs	5.49%	4.66%	4.01%
UBS AG	3.28%	2.77%	1.48%

The Determination of the Cost of Equity through the CAPM

The cost of equity can be calculated through the use of the famous Capital Asset Pricing Model (CAPM) (Sharpe, 1964), according to the well-known formula:

$$Ke = i1 + \beta * (Rm - i1) \quad (3)$$

Where: Ke is the cost of equity; $i1$ is the free-risk rate as benchmark is used the 10 years government bond; β is beta factor that represent the systematic risk (Black, 1993; Hamada, 1969; Hill and Stone, 1980; Sholes and Williams, 1977; Thompson, 1976); and $Rm - i1$ is the equity risk premium (ERP).

The CAPM method has been widely studied by the literature (Black et al., 1972; Booth, 1999; Jagannathan and Wang, 1993; King, 2009) and is still applied in practice.

In this case, the “beta-factors” provided by Datastream-Thompson Reuters for the years 2012, 2013, and 2014 were used. The results are summarized in Table 7:

Table 7

Beta Factor Provided by Datastream Thompson Reuters of the Companies Over the Period 2012-2014

	2012	2013	2014
Banks	β	β	β
BBVA	1.611	1.644	1.513
Banco Santander	1.510	1.491	1.340
Bank of America	2.345	2.409	1.928
Barclays Bank plc	2.710	2.730	1.880
BNP PARIBAS	1.387	1.409	1.588
CITIGROUP	2.949	3.011	2.038
Commerzbank	1.921	1.934	1.611
Credit Agricole	1.760	1.822	2.101
Credit Suisse Group	1.676	1.677	1.553
Danske Bank	1.690	1.740	1.450
Deutsche Bank	1.570	1.591	1.403
HSBC	1.227	1.336	0.973
ING GROEP	2.497	2.665	2.322
JPMorgan Chase	1.521	1.517	1.425
Lloyds Banking	2.420	2.530	2.080
MACQUARIE	1.809	1.718	1.315
MORGAN STA.	2.263	2.322	1.789
Nomura Bank	1.600	1.670	1.780
Royal Bank of Can.	0.890	0.910	0.770
Royal Bank of Scot.	2.500	2.510	1.520
Societe Generale	2.010	2.125	2.404
Standard Chart.	1.350	1.290	1.260
The Goldman Sachs	1.500	1.489	1.519
UBS AG	1.858	1.724	1.520

The market premium (ERP) for the years 2012, 2013, and 2014 of the countries belonging to the banks is taken from the work of Fernandez, Linares, and Fernandez Acín (2015).

Table 8

Market Premium of the Countries Over the Period 2012-2014

Country	Equity risk premium %		
	2012	2013	2014
Australia	5.90	6.80	5.90
Canada	5.40	5.40	5.30
Denmark	5.50	6.40	5.10
France	5.90	6.10	5.80
Germany	5.50	5.50	5.40
Japan	5.50	6.60	5.30
Netherlands	5.40	6.00	5.20
Spain	6.00	6.00	6.20
Switzerland	5.40	5.60	5.20
UK	5.50	5.50	5.10
USA	5.50	5.70	5.40

Using the Formula (3), we have determined the cost of equity for the 24 banks in the period 2012-2014 and the results are presented in Table 9.

Table 9

Cost of Equity of the Companies Over the Period 2012-2014

	2012	2013	2014
Banks	Ke	Ke	Ke
BBVA	16.30%	14.65%	12.27%
Banco Santander	15.69%	13.74%	11.19%
Bank of America	14.39%	16.33%	12.93%
Barclays Bank plc	16.38%	17.52%	12.31%
BNP PARIBAS	10.42%	10.78%	10.85%
CITIGROUP	17.72%	19.77%	13.52%
Commerzbank	11.81%	12.20%	9.90%
Credit Agricole	12.62%	13.30%	13.83%
Credit Suisse Group	9.49%	10.40%	8.68%
Danske Bank	10.35%	12.86%	8.65%
Deutsche Bank	9.88%	10.31%	8.78%
HSBC	8.22%	9.85%	7.69%
ING GROEP	15.17%	17.96%	13.50%
JPMorgan Chase	9.86%	11.25%	10.22%
Lloyds Banking	14.78%	16.42%	13.33%
MACQUARIE	13.47%	15.42%	11.19%
MORGAN STA.	13.95%	15.84%	12.18%
Nomura Bank	9.57%	11.84%	9.97%
Royal Bank of Can.	6.47%	7.35%	6.31%
Royal Bank of Scot.	15.22%	16.31%	10.48%
Societe Generale	14.09%	14.60%	15.59%
Standard Chart.	8.90%	9.60%	9.15%
The Goldman Sachs	9.75%	11.09%	10.72%
UBS AG	10.48%	10.66%	8.51%

The Determination of Cost of Equity Through the Use of the Inverse of the Multiple P/E

The estimation method in question takes its cue from Gordon's well-known formula in perpetual regime for determining the value of a company. The formula is:

$$P = D / (K_e - g) \quad (4)$$

Where: P = price; D is the average expected dividend flow of the company taken into consideration; K_e is the cost of equity; and g is the expected growth rate.

Since the dividend is the part (the percentage is defined as the payout ratio) of income distributed to shareholders. So, you can write Formula (4) as:

$$P = E * \text{Payout} / (K_e - g) \quad (5)$$

Where: E = Expected average earnings (Earnings); Payout ratio = Profit distributed/Total income.

If we consider the reinvestment rate of the "c" profits, the complement to one of the latter represents the payout ratio. The Formula (5) becomes:

$$P = E * (1 - c)/(Ke - g) \quad (6)$$

$$P/E = (1 - c)/(Ke - g) \quad (7)$$

Since the growth rate “g” can be determined as a product retention rate or reinvestment rate “c” and return on equity (ROE) (Maccario, Sironi, & Zazzara, 2002).

$$g = c * ROE = (1 - \text{payout}) * ROE \quad (8)$$

If the ROE is considered as the rate of return on capital, in the medium and long term it can be compared to the cost of equity “Ke”. So, we can write $g = c * Ke$ and then Formula (7) becomes:

$$P/E = (1 - c)/(Ke - c * Ke) = (1 - c)/(1 - c) * Ke \quad (9)$$

We obtain that the cost of equity is equal to the inverse of its P/E.

$$Ke = 1/PE \quad (10)$$

Table 10

P/E and Cost of Equity of the Companies Over the Period 2012-2014

	2012	2013	2014	2012	2013	2014
Banche	P/E	P/E	P/E	Ke	Ke	Ke
BBVA	7.27	9.118	15	13.76%	10.97%	6.67%
Banco Santander	6.924	9.781	14.38	14.44%	10.22%	6.95%
Bank of America	9.375	11.673	12.881	10.67%	8.57%	7.76%
Barclays Bank plc	5.629	7.457	8.881	17.77%	13.41%	11.26%
BNP PARIBAS	4.952	8.747	9.954	20.19%	11.43%	10.05%
CITIGROUP	6.325	9.769	9.529	15.81%	10.24%	10.49%
Commerzbank	4.798	10.695	14.821	20.84%	9.35%	6.75%
Credit Agricole	3.642	6.744	9.268	27.46%	14.83%	10.79%
Credit Suisse Group	6.526	9.617	10.584	15.32%	10.40%	9.45%
Danske Bank	10.054	9.415	11.14	9.95%	10.62%	8.98%
Deutsche Bank	5.567	7.933	8.518	17.96%	12.61%	11.74%
HSBC	8.01	10.265	10.911	12.48%	9.74%	9.17%
ING GROEP	3.709	6.752	9.484	26.96%	14.81%	10.54%
JPMorgan Chase	7.109	9.17	10.19	14.07%	10.91%	9.81%
Lloyds Banking	8.237	11.878	10.475	12.14%	8.42%	9.55%
MACQUARIE	8.988	13.344	14.134	11.13%	7.49%	7.08%
MORGAN STA.	7.521	11.328	12.278	13.30%	8.83%	8.14%
Nomura Bank	10.632	14.128	13.204	9.41%	7.08%	7.57%
Royal Bank of Can.	10.11	10.666	11.911	9.89%	9.38%	8.40%
Royal Bank of Scot.	8.01	12.012	13.366	12.48%	8.33%	7.48%
Societe Generale	4.574	7.825	9.157	21.86%	12.78%	10.92%
Standard Chart.	9.571	9.539	10.391	10.45%	10.48%	9.62%
The Goldman Sachs	7.612	10.799	10.508	13.14%	9.26%	9.52%
UBS AG	8.088	14.699	13.333	12.36%	6.80%	7.50%

To this end, the values of the leading P/E were provided by Datastream-Thompson Reuters for the years 2012, 2013, and 2014. The data shown in Table 10 refer to P/E multiples and to the determination of cost of equity using the method in question.

A Comparison of Cost Equity Through the Used Methods

Three methods have been examined that are based exclusively on market data and through these the different costs of equities have been estimated. At this point, we proceeded to a comparison between the three models in the following way:

- Difference between the values obtained through the use of the CAPM and the values resulting from the use of credit default swaps was calculated.
- Difference between the values obtained through the use of the CAPM and the values resulting from the use of the inverse of the multiple P/E has been calculated.

The results are shown in Table 11.

As can be seen in Table 11 for each year and for all banks, the estimate of the calculation of the rate of reasonable remuneration was summarized using the three approaches used. It is evident that the difference between the application of CAPM and the approach with the use of CDS shows significant differences, on average of 6.5%, 9%, and 7.6% respectively in 2012, 2013, and 2014. Furthermore, the correlation matrix between the three variables is presented (see Table 12).

Table 12 shows that there is a positive and significant correlation, both in 2012 and in 2013, between the model based on the CAPM and the CDS-based model. While the correlation between the model based on CAPM and the model that uses the inverse of P/E is positive but not significant, on the other hand, it is important to note that the correlation between the CDS model and the model based on the inverse of P/E, in 2013 and 2014, presents a negative but not significant value.

The analysis seems to confirm, as in previous works, that for companies that are “safe” from the point of view of credit risk, the CDS model tends to underestimate the risk (Zanda, Oricchio, & Solimene, 2010). Conversely, the comparison between the method based on the CAPM and the use of the inverse of the CAPM showed instead a much smaller difference. In 2013 and 2014, the use of CAPM offers values of 3% and 1.90% higher than the method based on the inverse of P/E. In 2012, however, the situation is reversed because the method based on P/E has a higher yield, on average, of 2.87% and these results are very similar to those found by King in 2009.

Figure 1 shows the average values of cost of equity based on three models analysed.

It is possible to point out that the average trend in the cost of equity based on the three methods chosen is decreasing (except for the CAPM method which in 2013 shows a trend in countertendency). It is important to remember that for the CDS-based method there are two levers: PD and 10-year government bond rates. The average PD of all banks, on average, had a decreasing trend. With regard to government bonds, it should be noted that there has been a double trend: for banks that we could define as Anglo-Saxon matrix (UK, USA, Australia, and Canada), risk-free interest rates at 10 years showed a trend in rise, in virtue of the expansionist policies implemented by its Central Banks (Quantitative Easing operations). On the other hand, for banks of European origin there has been an opposite trend, i.e., a decrease in government bond yields in relation to the sovereign debt crisis of 2012 of the so-called PIGS (Portugal, Italy, Greece, and Spain) countries. On average, this effect meant that the trend in 10-year interest rates had a minimal effect on the general trend in rates of discounted remuneration calculated using the CDS method.

Table 11

Cost of Equity Estimated Through Three Models (CDS, CAPM and P/E) and Differences in the Period 2012-2014

Banks	2012					2013					2014				
	Ke_CDS [a]	Ke_CAPM[b]	Ke_P/E[c]	b-a	b-c	Ke_CDS [a]	Ke_CAPM[b]	Ke_P/E[c]	b-a	b-c	Ke_CDS [a]	Ke_CAPM[b]	Ke_P/E[c]	b-a	b-c
BBVA	14.07%	16.30%	13.76%	2.23%	2.54%	7.70%	14.65%	10.97%	6.95%	3.68%	4.42%	12.27%	6.67%	7.85%	5.60%
Banco Santander	13.64%	15.69%	14.44%	2.05%	1.25%	8.29%	13.74%	10.22%	5.44%	3.51%	4.42%	11.19%	6.95%	6.78%	4.24%
Bank of America	5.33%	14.39%	10.67%	9.07%	3.73%	4.36%	16.33%	8.57%	11.98%	7.77%	3.76%	12.93%	7.76%	9.16%	5.17%
Barclays Bank	4.74%	16.38%	17.77%	11.64%	-1.39%	4.56%	17.52%	13.41%	12.96%	4.11%	3.90%	12.31%	11.26%	8.41%	1.05%
BNP PARIBAS	5.92%	10.42%	20.19%	4.49%	-9.78%	4.12%	10.78%	11.43%	6.66%	-0.65%	2.82%	10.85%	10.05%	8.03%	0.81%
CIIGROUP	5.04%	17.72%	15.81%	12.68%	1.91%	4.27%	19.77%	10.24%	15.50%	9.53%	3.85%	13.52%	10.49%	9.67%	3.03%
Commerzbank	5.48%	11.81%	20.84%	6.33%	-9.03%	3.95%	12.20%	9.35%	8.25%	2.85%	2.81%	9.90%	6.75%	7.09%	3.16%
Credit Agricole	6.96%	12.62%	27.46%	5.66%	-14.84%	3.49%	13.30%	14.83%	9.80%	-1.53%	2.94%	13.83%	10.79%	10.88%	3.04%
Credit Suisse	3.07%	9.49%	15.32%	6.42%	-5.83%	2.55%	10.40%	10.40%	7.85%	0.00%	1.64%	8.68%	9.45%	7.04%	-0.77%
Danske Bank	3.18%	10.35%	9.95%	7.16%	0.40%	3.17%	12.86%	10.62%	9.69%	2.24%	2.53%	8.65%	8.98%	6.11%	-0.33%
Deutsche Bank	4.09%	9.88%	17.96%	5.79%	-8.08%	3.21%	10.31%	12.61%	7.10%	-2.29%	2.55%	8.78%	11.74%	6.23%	-2.96%
HSBC	3.61%	8.22%	12.48%	4.61%	-4.26%	3.92%	9.85%	9.74%	5.93%	0.11%	3.66%	7.69%	9.17%	4.03%	-1.48%
ING GROEP	5.48%	15.17%	26.96%	9.68%	-11.79%	3.88%	17.96%	14.81%	14.09%	3.15%	2.47%	13.50%	10.54%	11.03%	2.95%
JPMorgan Chase	3.48%	9.86%	14.07%	6.38%	-4.20%	4.02%	11.25%	10.91%	7.23%	0.35%	3.61%	10.22%	9.81%	6.61%	0.40%
Lloyds Banking	5.77%	14.78%	12.14%	9.01%	2.64%	4.54%	16.42%	8.42%	11.88%	8.00%	3.82%	13.33%	9.55%	9.52%	3.79%
MACQUARIE	7.01%	13.47%	11.13%	6.46%	2.34%	5.93%	15.42%	7.49%	9.49%	7.92%	5.08%	11.19%	7.08%	6.11%	4.12%
MORGAN STA.	6.86%	13.95%	13.30%	7.09%	0.65%	4.79%	15.84%	8.83%	11.05%	7.01%	3.97%	12.18%	8.14%	8.21%	4.04%
Nomura Bank	6.50%	9.57%	9.41%	3.07%	0.16%	2.78%	11.84%	7.08%	9.05%	4.76%	2.00%	9.97%	7.57%	7.97%	2.40%
Royal Bank of Can.	3.91%	6.47%	9.89%	2.55%	-3.43%	3.00%	7.35%	9.38%	4.35%	-2.03%	2.79%	6.31%	8.40%	3.52%	-2.09%
Royal Bank of Scot.	5.92%	15.22%	12.48%	9.30%	2.74%	5.11%	16.31%	8.33%	11.19%	7.98%	4.10%	10.48%	7.48%	6.38%	3.00%
Societe Generale	6.98%	14.09%	21.86%	7.12%	-7.77%	4.55%	14.60%	12.78%	10.05%	1.82%	3.12%	15.59%	10.92%	12.47%	4.66%
Standard Chart.	3.77%	8.90%	10.45%	5.12%	-1.55%	4.51%	9.60%	10.48%	5.09%	-0.89%	4.40%	9.15%	9.62%	4.76%	-0.47%
The Goldman Sachs	5.49%	9.75%	13.14%	4.26%	-3.39%	4.66%	11.09%	9.26%	6.43%	1.83%	4.01%	10.72%	9.52%	6.71%	1.21%
UBS AG	3.28%	10.48%	12.36%	7.19%	-1.89%	2.77%	10.66%	6.80%	7.89%	3.86%	1.48%	8.51%	7.50%	7.02%	1.01%
Mean	5.82%	12.29%	15.16%	6.47%	-2.87%	4.34%	13.33%	10.29%	9.00%	3.05%	3.34%	10.91%	9.01%	7.57%	1.90%
Median	5.48%	12.22%	13.53%	6.40%	-1.72%	4.20%	13.08%	10.23%	8.65%	3.00%	3.63%	10.79%	9.31%	7.07%	2.68%
Min.	3.07%	6.47%	9.41%	2.05%	-14.84%	2.55%	7.35%	6.80%	4.35%	-2.29%	1.48%	6.31%	6.67%	3.52%	-2.96%
Max.	14.07%	17.72%	27.46%	12.68%	3.73%	8.29%	19.77%	14.83%	15.50%	9.53%	5.08%	15.59%	11.74%	12.47%	5.60%
Standard Dev.	2.79%	3.06%	5.10%	2.78%	5.16%	1.39%	3.15%	2.19%	2.93%	3.56%	0.94%	2.26%	1.54%	2.15%	2.39%

Table 12
 Correlation Between the Three Models in the Period 2012-2014

Correl. Prob.	2012			2013			2014		
	Ke_CAPM	Ke_CDS	Ke_P/E	Ke_CAPM	Ke_CDS	Ke_P/E	Ke_CAPM	Ke_CDS	Ke_P/E
Ke_CAPM	1 -----			1 -----			1 -----		
Ke_CDS	0.5501 0.0054***	1 -----		0.3729 0.0726**	1 -----		0.3148 0.1340	1 -----	
Ke_P/E	0.2800 0.1849	0.0960 0.6530	1 -----	0.1493 0.4861	-0.0194 0.9281	1 -----	0.2529 0.2331	-0.1926 0.3671	1 -----

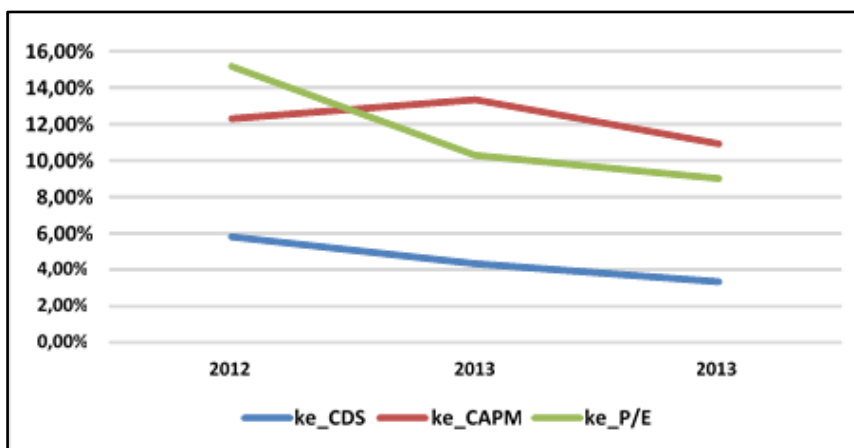


Figure 1. Comparison through the models.

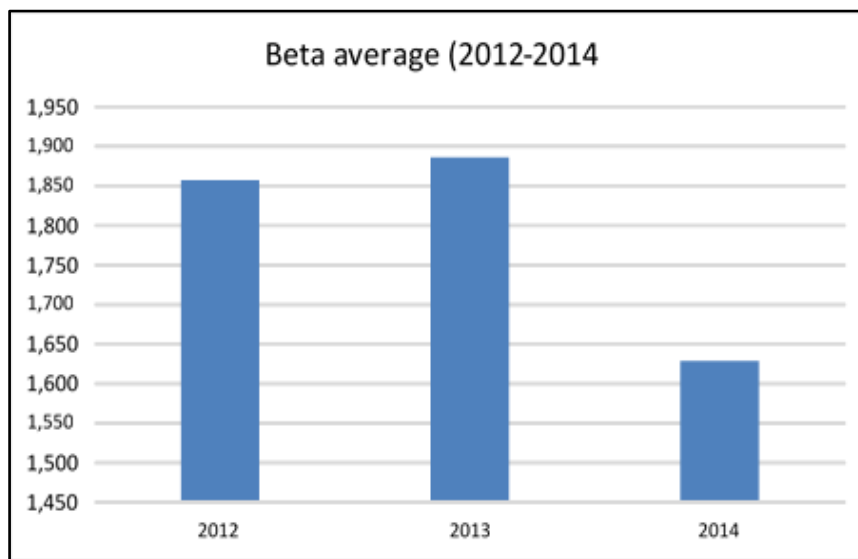


Figure 2. Beta factor average.

In fact, as can be seen from Figure 2, the trend cost of equity of the selected banks, calculated with the CAPM, is basically determined by the beta coefficient, since in the analyzed period, the trend of the equity risk premium was less variable as shown in Figure 3.

As regards the analysis of 10-year risk-free interest rates, the same applies to the CDS-based method. Finally, as regards the method based on the inverse of P/E, it can be a good point of reference in the event that

there may be the presence of strong changes in interest rates without risk, as occurred during the period 2011-2012 in Europe.

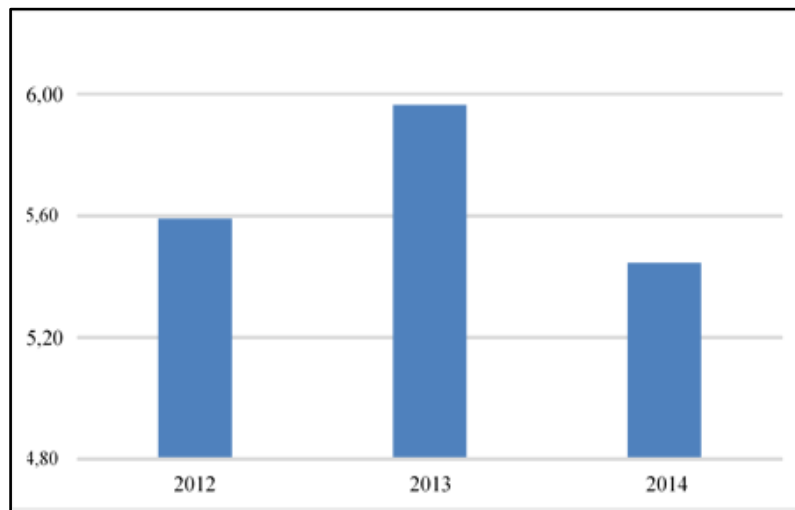


Figure 3. Equity risk premium average.

Conclusion

In this study, a comparison was made between the Capital Asset Pricing Model, the most widely used methodology, and an actuarial method with the use of credit default swaps and the method based on the inverse of the multiple P/E. The comparison was made on a sample of 24 banks among the largest for assets in the world belonging to 11 different countries.

The results show that the CAPM estimates a premium for the higher risk than the one obtained with the actuarial method and the method based on the inverse of the P/E (except for 2013). This is because the CAPM determines the economic risk not only as a risk of bankruptcy, but also as a risk of price volatility compared to the market average. The CDS-based method, on the other hand, showed that for companies considered to be not very risky in terms of creditworthiness, the method tends to underestimate the risk since the probability of default is very low. The CAPM remains the most used method, although limits have been highlighted over time, both of a theoretical nature and of an empirical nature. Finally, given the limits shown here by the methodologies described above in certain scenarios, the method based on the inverse of the multiple P/E can be used if not as the main method at least for control.

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