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A VOLATILITY INDEX FOR THE SPANISH BANKING SECTOR

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ABSTRACT

This article is a summary of the methodology proposed by Gonzalez-Perez (2021) for estimation of a volatility index for an asset portfolio on which no options have been issued. The methodology allows volatility indices to be constructed for personalised portfolios, using the options issued on the individual shares and a benchmark portfolio that provides information on the correlation risk premium between the assets in the portfolio concerned. This methodology and a benchmark portfolio representing the Spanish stock market (IBEX 35) are used to estimate a volatility index for the Spanish banking sector. The methodology proposed allows for adjustment of the benchmark portfolio according to the framework of uncertainty desired.

A comparison between this sectoral volatility index and that of the Spanish stock market overall and other key indices shows that falls in bank share prices have a particularly strong correlation with growth in banking sector uncertainty, while share price rallies have a correlation with lower uncertainty either on the Spanish equity market or in the banking sector. Moreover, there is a persistent and positive volatility spread between the Spanish stock market and the banking sector. The fact that the Spanish banking sector has become more integrated following the global financial crisis, together with the gradual increase in correlation between bank portfolios, helps to explain this. In February 2022 this spread stood at around 20%. The Spanish banking sector volatility index moves parallel to its European equivalent, with an average historical spread of around 6%. Lastly, a significantly stronger correlation is found between the uncertainty priced into the banking sector and economic policy uncertainty than between the latter and the uncertainty priced into the market. These findings confirm that a measure of banking sector volatility provides important information, in addition to that provided by a measure of market volatility, which is extremely useful for monitoring and forecasting risk and returns in the Spanish banking sector.

Keywords: implied volatility, banking sector, VIX, VIBEX, SBVX.

JEL classification: G1, G53.

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Volatility indices

Volatility indices proxy the expected volatility of returns on the assets concerned. They are calculated using the price of the options issued on the underlying assets. Thus, the commonly used VIX index[1] reflects the expected volatility of returns on the S&P 500 index and is calculated using the prices of S&P 500 index options.

But how can we calculate the volatility index of a portfolio where there are no options issued on the portfolio but rather on each of its components? In answer to this question, Gonzalez-Perez (2021) proposes a methodology that enables a volatility index to be estimated for the Spanish banking sector drawing on the volatility indices of the sector components and the market correlation risk premium.[2]

The methodology proposed contributes to the literature that estimates the expected volatility of a portfolio. In this article the starting point is the parametric correlation between a portfolio's correlation risk premium and its realised correlation, as described in Buss and Vilkov (2012). The correlation risk premium of a benchmark portfolio is estimated, and is then used to estimate the expected volatility of the portfolio, also using the implied volatilities of its components. This exercise assumes that the portfolio correlation risk premium is proportional to the market correlation risk premium, which is borne out by the market. Researchers can use a different benchmark[3] than the market, should the analysis so require (a different sector, the same sector in a different country, etc.). The use of this benchmark portfolio makes it possible to estimate a volatility index for an asset portfolio on which no options have been issued, or where any options are illiquid. Although this methodology is used here to estimate a volatility index for the Spanish banking sector, it may also be used to estimate a volatility index for any other portfolio, in the banking sector or otherwise.[4]

1 A volatility index calculated by the Chicago Board Options Exchange (Cboe) which reflects the expected volatility of the S&P 500 index on a forecasting horizon ranging from one month to two years. For more details, see https://cdn.cboe.com/resources/vix/vixwhite.pdf.

2 In the absence of an implied volatility term structure for the Spanish market and the banking sector, in Gonzalez-Perez (2021) the VIBEX term structure is estimated daily. The quantitative details are described in the working paper, but this allows both the market correlation risk premium and the term structure of the Spanish banking sector volatility index (SBVX) to be proxied. In this way, Gonzalez-Perez (2021) not only broadens the set of volatility indices existing on the Spanish market, but also estimates the term structure of a volatility index referred to a portfolio where there are no options issued on that portfolio.

3 The benchmark portfolio must have options, or a volatility index that enables the correlation risk premium to be estimated in this framework.

4 For more details, see Gonzalez-Perez (2021).

As a new feature, the sample analysed here is broader than that used in the working paper and the volatility index is estimated for the period running from January 2008 to 17 February 2022. The aim of the analysis is to illustrate the informational capacity of the sectoral volatility index, for which several exercises are performed, analysing: i) the correlation between banking sector volatility (SBVX) and market volatility (VIBEX); ii) the marginal contribution of the SBVX compared with the VIBEX in explaining changes in bank share prices; iii) the volatility spread between the SBVX and its euro area banking sector equivalent (the SX7E 50D); and iv) the correlation between the SBVX and other significant sources of uncertainty, such as economic policy uncertainty (EPU).

The findings suggest that the idiosyncratic component of banking sector uncertainty is key to understanding the return dynamics of the banking sector index. Despite narrowing recently, the volatility spread between the banking sector and the market had widened gradually since 2011, as the banking sector became more integrated following the global financial crisis. When the Spanish bank volatility index is compared with its euro area equivalent, it is observed that, although historically the Spanish banking sector has recorded slightly higher expected volatility, this correlation fluctuates and even becomes inverted, as was the case in the run-up to and during March 2020, coinciding with the onset of the COVID-19 crisis. At that point the expected volatility of the Spanish banking sector was lower than that of its European counterpart. Also, the significant correlation between economic policy uncertainty and banking sector volatility is higher than that between economic policy uncertainty and market volatility. This is consistent with the academic literature examining the role played by the banking sector in the transmission of shocks.

The article is organised as follows. First the process of estimation of the SBVX banking volatility index is described. This is followed by an exploration of its correlation with banking sector returns and the uncertainty priced into the Spanish market between 2008 and February 2022, with the euro area banking sector from 2016 to February 2022, and with other sources of uncertainty.

Estimating the SBVX volatility index

The SBVX is calculated on the basis of the time series of daily stock prices and the implied volatilities of each of the banks comprising the portfolio of banks.[5] While this article identifies the banking sector as the IBEX 35 Banks portfolio, the methodology is equally applicable to alternative definitions of the banking sector or of the "sector" concept (for example, fewer banks or any other subgroup of listed corporations). The IBEX 35 Banks portfolio comprises BBVA, Banco Santander, Banco Sabadell,

5 One advantage of this methodology for calculating the SBVX (see Gonzalez-Perez (2021)) is that it can be used to estimate volatility indices referring to any sector or non-standard asset portfolio (energy sector, firms more sensitive to the COVID-19 shock, real estate sector, etc.).

Bankinter, CaixaBank and Bankia.[6] The benchmark portfolio is identified as the IBEX 35, which represents the overall Spanish market, and its implied volatility term structure is estimated. Thus, the VIBEX and SBVX volatility indices are estimated for maturities of between 30 and 360 calendar days and for the period running from January 2008 to 17 February 2022.[7]

Chart 1 depicts the estimated time series, which portray the uncertainty priced into the banking sector and the market. Although they move parallel to one another, the volatility spread widened after the global financial crisis and stood at around 60% in 2020 and 2021. In February 2022 it was around 20%, below its average value for the period since early 2020. The stronger correlation of the performance of the share prices within the portfolio of banks than within the more diversified market portfolio (IBEX 35) and the gradual increase in the correlation of the portfolio of banks since 2008, in keeping with a more integrated banking sector, would help explain why more uncertainty was priced into the banking sector during the COVID-19 crisis than during the global financial crisis, when the banking sector was less integrated. Also, between the COVID-19 shock and February 2022 the VIBEX did not return to the levels of uncertainty it had reached during the global financial crisis. This represents a difference in the impact of the two episodes on banking sector and market uncertainty.

The SBVX volatility index is constructed to provide information on the banking sector's expected volatility. Therefore, although not included in this article, this tool may also be used to analyse changes in the volatility spread between each bank and the sector (SBVX) to understand each bank's idiosyncratic risk within the sector. This is an exercise that will help complement other measures of market risk in volatility and risk forecasting and monitoring activities for each bank within the sector.

The SBVX and banking sector returns: the market versus the sector

The literature has documented a negative correlation between changes in a volatility index and the return on the underlying asset concerned. Thus, expected S&P 500 returns are commonly inferred from VIX movements. This correlation is often referred to as the leverage effect.[8] Chart 2 establishes the correlation between changes in the SBVX and the VIBEX (at different time horizons) and the performance of the

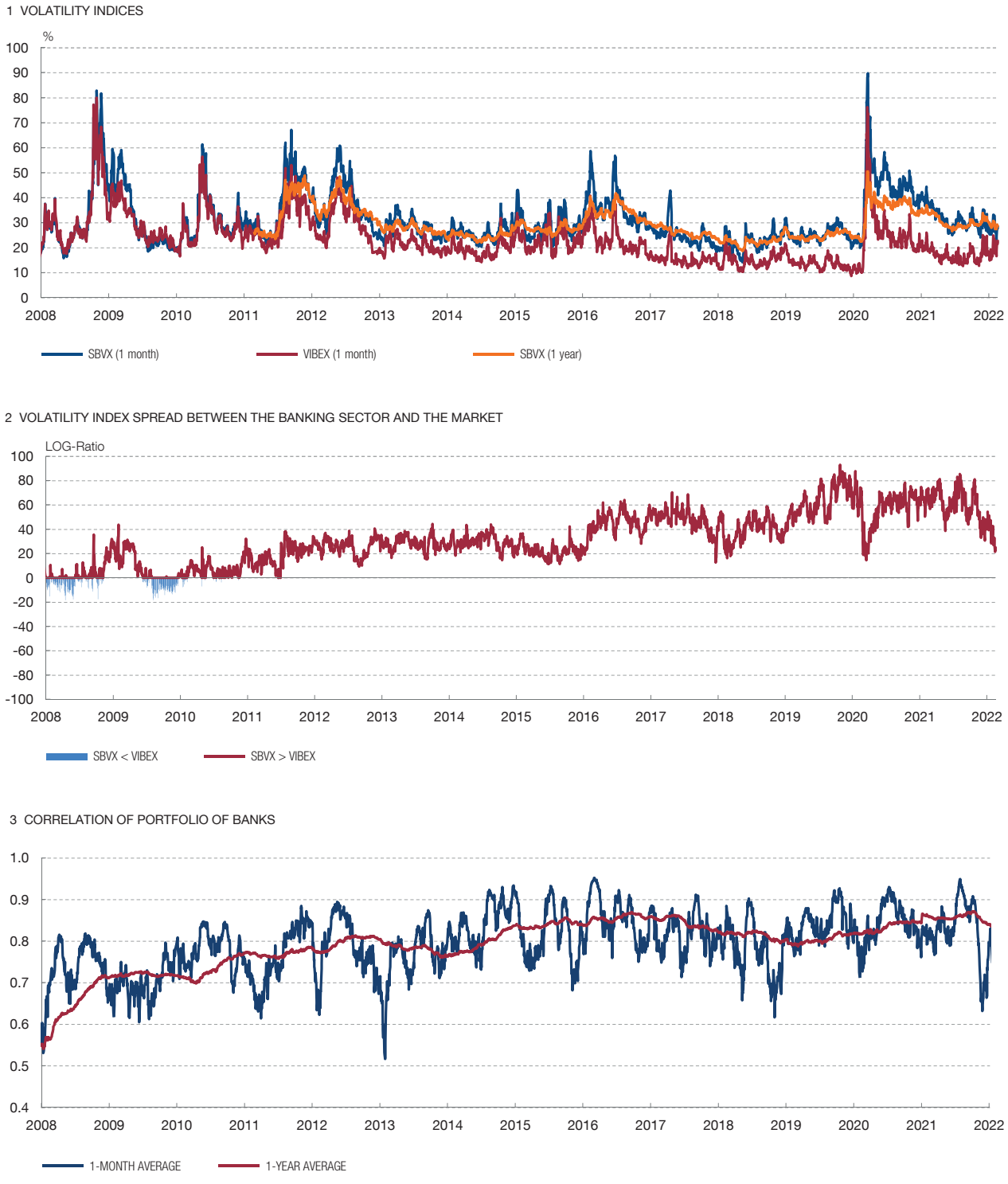
6 Up to its merger with CaixaBank in 2021.

7 Includes updated figures at 17 February 2022. The Bankia time series is included up to the suspension of trading in its shares.

8 The leverage effect emerges as a channel connecting the return on an asset and its expected volatility. This channel means that greater uncertainty surrounding future developments in the return on an asset contributes to a decrease in expected solvency and to an increase in the expected degree of leverage of the firm in question. This will lead to a drop in the asset's market price and would therefore explain the strong negative correlation between an asset's expected volatility (volatility or uncertainty index) and its contemporaneous return. See Figlewski and Wang (2000).

Chart 1

GRAPHIC ANALYSIS OF SPANISH BANKING SECTOR AND STOCK MARKET VOLATILITY INDICES. LATEST DATA: 17 FEBRUARY 2022



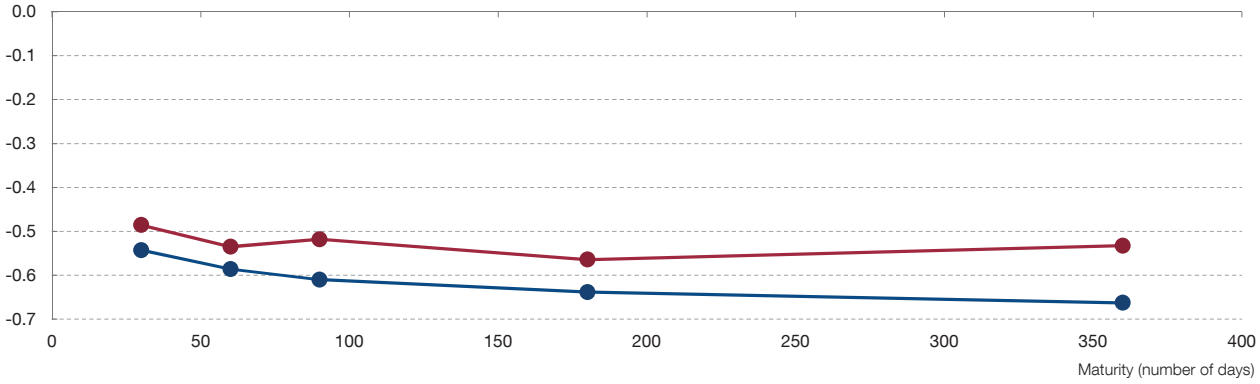
SOURCES: BME and Banco de España calculations.

Chart 2

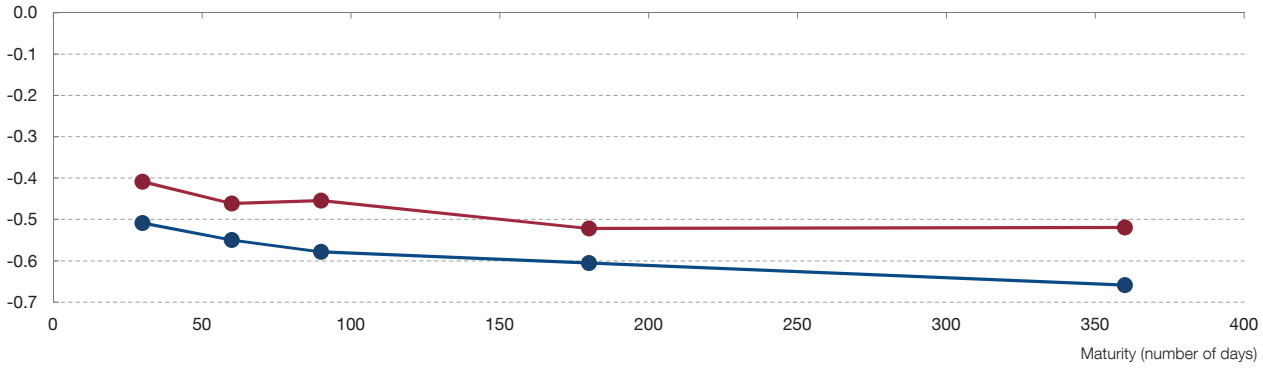
CORRELATION BETWEEN IBEX 35 BANK RETURNS AND BANKING SECTOR (SBVX) AND MARKET (VIBEX) VOLATILITY INDICES AT DIFFERENT TIME HORIZONS

Maturities associated with the volatility index on the horizontal axis

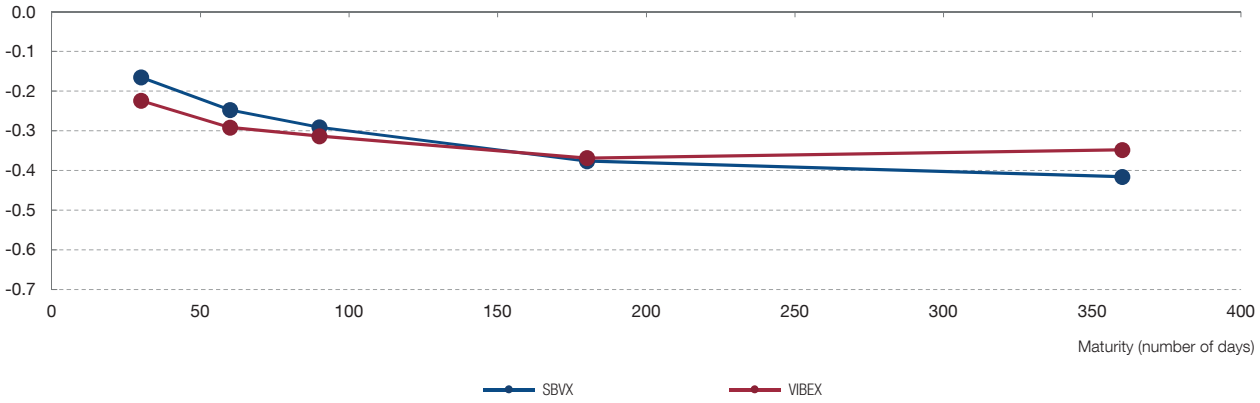
1 CORRELATION BETWEEN IBEX 35 BANK RETURNS AND VOLATILITY INDICES AT DIFFERENT TIME HORIZONS



2 CORRELATION BETWEEN NEGATIVE IBEX 35 BANK RETURNS AND VOLATILITY INDICES AT DIFFERENT TIME HORIZONS



3 CORRELATION BETWEEN POSITIVE IBEX 35 BANK RETURNS AND VOLATILITY INDICES AT DIFFERENT TIME HORIZONS



SOURCES: BME and Banco de España calculations.

IBEX 35 Banks portfolio.[9] As with other volatility indices, there is a negative correlation between changes in the SBVX and banking sector equity market returns. However, there is a much stronger correlation between the two volatility indices and banking sector returns when the latter are negative, i.e. when the sector's market value falls. This asymmetric correlation is documented in the literature[10] and suggests that declines in the sector's value have a greater effect on future banking sector expected volatility than positive returns. While this stylised fact is observed for both market and banking sector volatility, there is a much greater correlation between negative returns and increases in banking sector volatility (see Chart 2.2). However, if the sector generates positive returns (see Chart 2.3) the correlation coefficients obtained are similar for the SBVX and the VIBEX. This finding suggests that, while there is a correlation between declines in global uncertainty and banking sector rallies on the stock market, drops in banks' share prices are more closely correlated with growth in banking sector uncertainty than with an increase in market uncertainty. This finding appears to confirm the stylised fact documented in the literature that correlates a decline in uncertainty associated with corporate earnings with an improved outlook for the banking sector's value. Furthermore, the estimation of this volatility index for use in banking sector profitability, volatility and risk forecasting and monitoring activities is warranted by the fact that banking sector profitability is particularly sensitive to increases in the sector's volatility.

We find some differences when analysing the volatility term structure for the sector and the market. Generally, the expected volatility of an asset or portfolio increases as the time horizon lengthens.[11] However, the volatility term structure can become inverted[12] after a market shock if the latter mainly affects the short-term outlook for the return on the asset (pricing in greater uncertainty at short maturities). This occurred during the global financial crisis, during some episodes related to the European sovereign debt crisis and during the COVID-19 crisis, not only for market uncertainty, but also for banking sector uncertainty (see Chart 1.1). However, the frequency with which the volatility term structure inverts is much higher for the SBVX than for the VIBEX. This suggests a greater tendency in the banking sector than in the market for volatility to be concentrated in short maturities.[13]

Lastly, while EPU in Spain is correlated with the uncertainty priced into the banking sector and the market, the correlation with the banking sector volatility index is stronger (see Chart 3 and Table 1). The academic literature studying the effects of

9 Maturities of between one month (30 days) and one year (360 days) are considered for the different volatility indices.

10 See Black (1976), Schwert (1989 and 1990), Nelson (1991) and Engle and Ng (1993), among others.

11 Volatility term structure in contango.

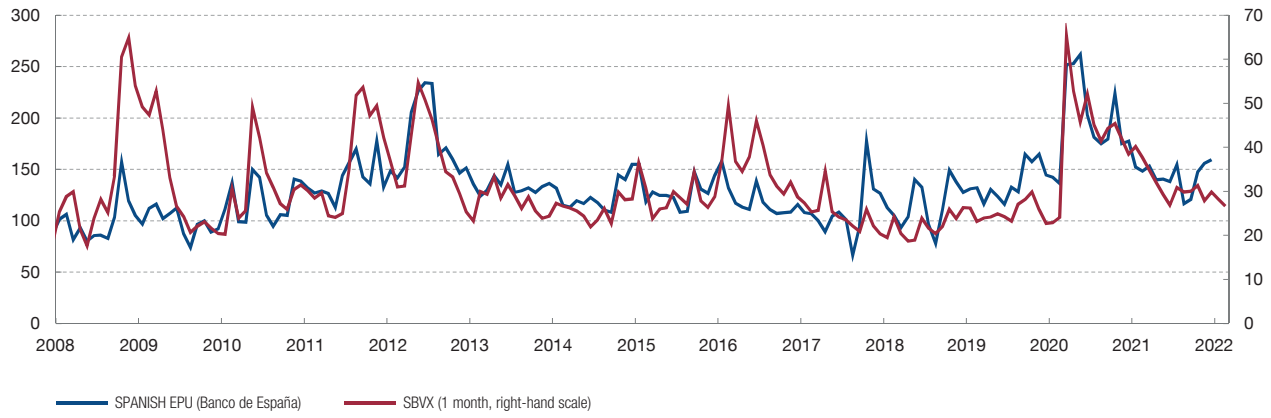
12 Volatility term structure in backwardation.

13 Since 2011 the VIBEX term structure has had a positive slope 68% of the time and a negative slope 32% of the time. However, the banking sector appears to concentrate uncertainty in the short term, such that its volatility term structure has only had a positive slope around 42% of the days included in this sample. This would lead us to conclude that from 2011 to date, although the market tended to price in expected volatility in contango, it was more common to find banking sector expected volatility in backwardation.

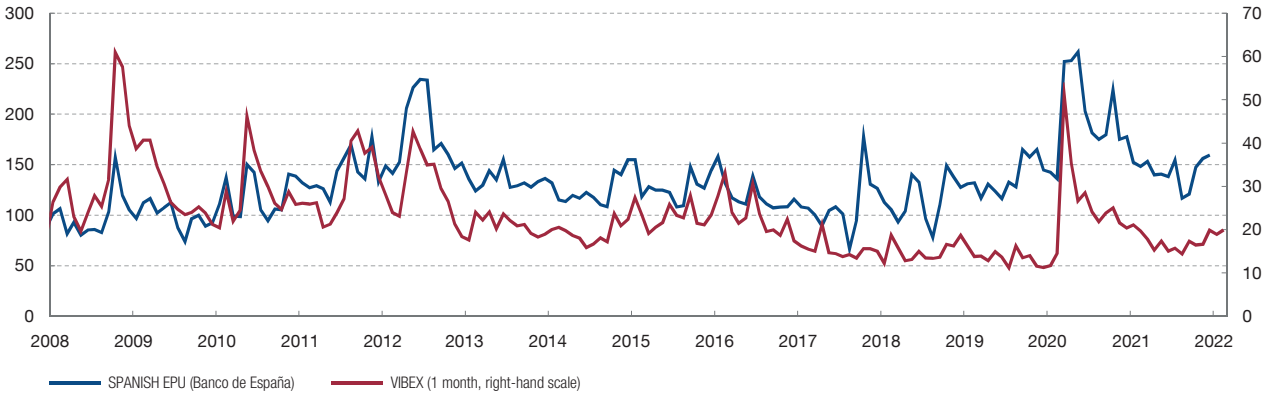
Chart 3

SPANISH MARKET (VIBEX) AND BANKING SECTOR (SBVX) VOLATILITY INDICES COMPARED WITH SPANISH ECONOMIC POLICY UNCERTAINTY (a)

1 VOLATILITY INDICES AND SPANISH EPU



2 VOLATILITY INDICES AND SPANISH EPU



SOURCES: BME and Banco de España calculations.

a Drawing on the Spanish economic policy uncertainty (EPU) indicator proposed by Ghirelli, Perez and Urtasun (2019) (see policyuncertainty.com/spain_GPU.html). Latest monthly data: December 2021 for EPU and February 2022 for the SBVX and VIBEX.

Table 1

ESTIMATED GENERAL LINEAR MODEL CORRELATING CHANGES IN SPANISH ECONOMIC POLICY UNCERTAINTY WITH CHANGES IN VOLATILITY INDICES

	Changes	
	SBVX	VIBEX
β	0.17**	0.08**
R2	33%	8%

SOURCES: BME and Banco de España calculations.
NOTE: (**) Significantly different from zero with a confidence level of 95%.

EPU on the economy suggests that the banking sector has a key role to play as a transmission channel for this source of uncertainty. Specifically, the literature notes that a rise in EPU tends to deter venture capital investment and M&A activity, make financing corporate debt more expensive, distort the relationship between the cost of capital and investment and lead to a build-up of liquidity in the banking sector.[14] The estimation of a volatility index for the Spanish banking sector will enable further progress to be made in this line of research.

The banking sector volatility index in Spain and Europe

The SX7E 50D index, which reflects the implied volatility associated with the EURO STOXX® Banks portfolio,[15] is used to compare the results obtained for the Spanish banking sector with those of the euro area. At the time of the analysis, this index was available on Bloomberg for the period from 8 September 2016 to February 2022. The comparison will therefore include daily data from within this time span. Chart 4 includes the time series for the two volatility indices for a one-month period. While not included in the chart, it is worth noting that during this period the term structure of the SX7E 50D was inverted for 50% of the days of trading (in other words, greater volatility was priced in in the near term), as opposed to 54% of the days on the Spanish SBVX. The similarity between these ratios is consistent with the integration of volatility expectation formation into the banking sector at European level, and suggests that, surprisingly and unlike in the case of the market portfolio, the volatility term structure in the Spanish and European banking sector is not predominantly upward sloping.

The average historical spread between the SBVX and the SX7E 50D is around 6%. However, this spread is somewhat volatile, turning negative in certain periods, including certain bouts of financial market turmoil, such as at the onset of the COVID-19 crisis, when banking sector uncertainty was greater in the euro area than in Spain. Nonetheless, on average, the volatility spread was positive during 2020 (4.2%) and 2021 (12%), and remained so in January 2022 (10%), before entering negative territory in the following month to stand at around -4% up to 17 February. Studying how this spread evolves will help in characterising a risk map for the sector in Spain and the euro area.

Conclusions and future applications

This article summarises the working paper by Gonzalez-Perez (2021), who proposes a methodology for estimating a volatility index for a portfolio of assets where no

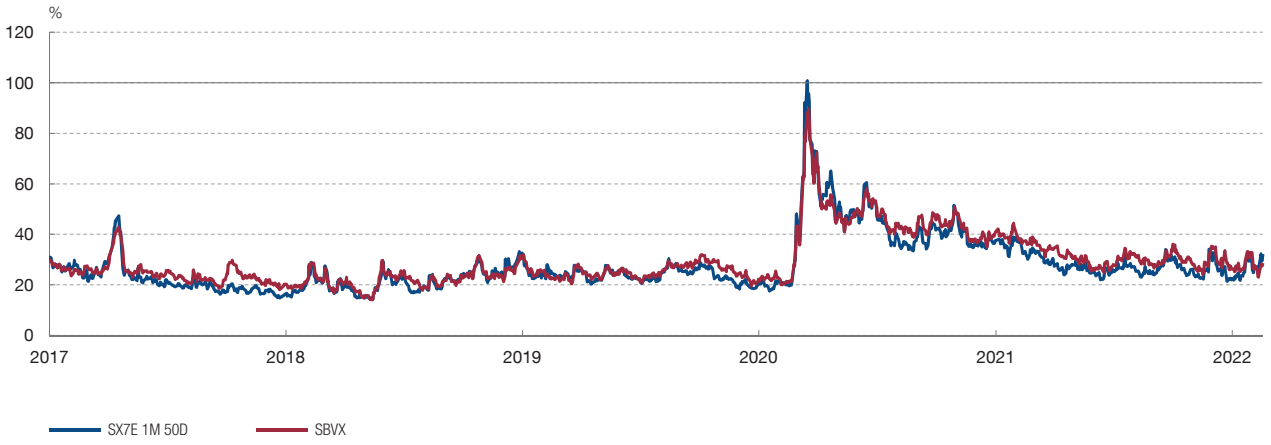
14 See Tiang and Ye (2018), Nguyen and Phan (2017) Bonaime, Gulen and Ion (2018), Pástor and Veronesi (2013), Kelly. Pástor and Veronesi (2016), Kaviani et al. (2020), Drobetz et al. (2018), Berger et al. (2022), among others.

15 See https://www.stoxx.com/index-details?symbol=SX7E for further information on this index.

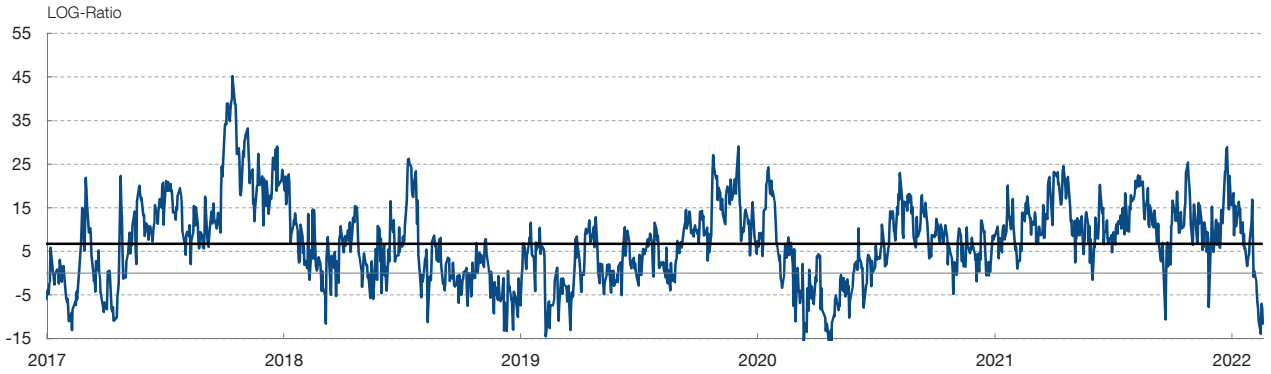
Chart 4

BANKING SECTOR VOLATILITY INDICES IN SPAIN (SBVX) AND THE EURO AREA (SX7E 1M 50D)

1 BANKING SECTOR VOLATILITY INDICES. SPAIN AND THE EURO AREA



2 VOLATILITY SPREAD (%) BETWEEN THE SPANISH (SBVX) AND THE EURO AREA (SX7E 1M 50D) BANKING SECTOR INDICES



SOURCES: BME and Banco de España calculations.

options have been issued. The methodology proposed has contributed to the literature on the subject since it enables a volatility index to be estimated for the portfolio based on the implied volatility of its components and the correlation risk premium of a benchmark portfolio for which options have been issued (for instance, the IBEX 35, the EURO STOXX 50, the S&P 500, etc.). The composition of the portfolio in question and of the benchmark portfolio can be adjusted as required for the analysis, with a view to defining a suitable risk framework for calculating the volatility index for the portfolio in question. The methodology described is used to estimate a volatility index for the Spanish banking sector (SBVX), using the IBEX 35 (market) as the benchmark portfolio. The banking sector volatility index is found to correlate with banking sector returns throughout the term structure. It also enriches the tracking and forecasting of the banking sector's stock market returns, outperforming the information contained in the market volatility index. The SBVX moves in parallel to its

EURO STOXX Banks portfolio counterpart, although the two volatility indices can differ in their sensitivity to global uncertainty shocks (global financial crisis, COVID-19, etc.). There has been a gradual widening of the expected volatility spread between the banking sector and the market, beginning in 2011, rising to around 60% in 2020 and 2021, although it stood at around 20% in February 2022. One factor behind the historical widening of this spread is the continued increase in the correlation of the banking portfolio, which rose from 60% in 2008 to 80% in 2021. Lastly, EPU is on occasions more closely correlated with banking sector volatility than it is with the market volatility index. This calls for a programme of future research to be designed to further explore the key risk factors affecting uncertainty in the Spanish banking sector.

In short, the findings suggest a need to estimate a bespoke banking sector volatility index at different maturities in order to quantify, track and classify the excess uncertainty priced into each bank and sector, both domestically and at European level, and to understand the changes in the sector's equity market returns. Moreover, the index can be used to normalise the uncertainty priced into each bank in market and financial stability risk quantification exercises. We can also compare the sector's sensitivity to uncertainty shocks against a portfolio of European banks, and forecast or model the sector's returns. Lastly, a Spanish banking sector volatility index will enable the estimation of uncertainty spillovers both within the sector and into other markets, such as the US or European markets, and into other sectors, such as the energy or real estate sectors. This exercise will prove tremendously useful for understanding the key factors affecting uncertainty priced into the banking sector and its potential impact on other sectors and markets.

5.7.2022.

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