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MULTI-ASSET SOLUTIONS

WHAT TO EXPECT WHEN EXPECTING A RECESSION

Lessons from Europe and the UK

July 2023

This report is an extension of the US-focused June 2023 PMA publication, subtitled "A CIO's Guide to Interpreting the Probability of Recession."

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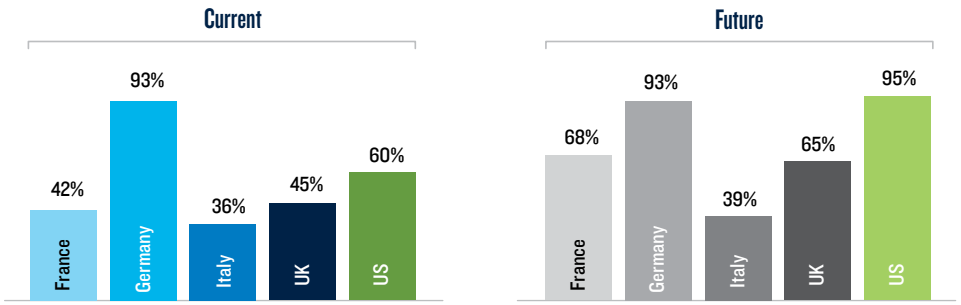
A CIO's Guide to Interpreting the Probability of Recession

Recessions are a regular feature of the economic and market landscape. But they are only revealed with a lag, which is why estimates of the *probability* of a recession are often used to help CIOs, asset allocators and market participants gauge recession risk. However, recession probability estimates are based on models that can produce conflicting signals. Our goal is to help CIOs better understand recession probability models, how best to interpret them, which signals are more reliable and what, if anything, do these signals foretell about asset class performance.

As of the end of Q1 2023, based on models that we detail below, estimates of the probability of a *current* recession in France, Italy and the UK remain muted and are lower than in the US, while the probability of a *current* recession in Germany is elevated, standing at 93% (Figure 1). Looking at the probability of a *future* recession sometime over the next 1-12m, readings are higher across the board, with estimates in France, Germany and the UK all above 60%, but still lower than the US.

Figure 1: Estimated Probability of Current & Future Recession (As of February or March 2023)



Note: Estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (Economic Cycle Research Institute/ECRI defined) and 0 otherwise; regressors are contemporaneous values of EQTY (trailing 12m percent change in MSCI stock price), YC (yield curve), IP (trailing 12m percent change in industrial production) and CCI (trailing 12m percent change in a consumer confidence indicator); models are estimated using monthly data until 2019 (starting date varies by country). Source: Bank of England, Bank of France, Bank of Italy, Deutsche Bundesbank, ECRI, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, Federal Reserve Board, French National Institute of Statistics/Economics, Haver Analytics, Italian National Institute of Statistics, MSCI, NBER, OECD, Standard & Poor's, UK Office for National Statistics, US Bureau of Labor Statistics and PMA. For illustrative purposes only.

Interpreting the Probability of Recession: 5 Important Lessons from the US Experience

In our June 2023 research paper, we highlighted five important CIO takeaways (based on US data alone) for evaluating and interpreting recession probability models:[1]

- **Financial market inputs and macroeconomic inputs contribute to the estimated probability of recession. Recession signals that combine market and macro inputs are more dependable than signals that rely on only one set of inputs.**
- **Elevated recession probability readings are a reliable signal of both current and future US recessions. As a rule of thumb, probability readings above 60% tend to be associated with recessions, but false signals – both positive and negative – can occur.**
- **Market and macro inputs are often not aligned. Even so, recession warning signals that arise in periods when market and macro inputs disagree are still of high quality.**
- **By the time recession probabilities are elevated, the stock market has generally already declined and is more likely to rally than sell off further.**
- **A better indicator for forward stock returns is the change in recession probability, not the level. Specifically, excess forward stock returns are weakest when the probability of a recession is high & rising and are strongest when the probability of a recession is high & falling.**

Extending the Analysis to Europe and the UK

We extend our US analysis to four other large developed markets: France, Germany, Italy and the UK. As with our work based on US data, our goal is **not** to build a better recession prediction model, but rather to show how CIOs can assess, interpret and utilize recession probability models. For details and discussion on some of the methodologies and terminologies employed below kindly refer to the June 2023 PGIM PMA research paper.[2]

Using a simple and parsimonious set of recession probability models we: (1) investigate the role of market and macro data in assessing recession risk; (2) evaluate recession signal quality; and (3) explore market reaction to recession risk as captured by the estimated probability of recession.

For each country, we estimate six different recession probability models. We estimate the probability of a current recession ("Current") as a function of financial market and macroeconomic explanatory variables together (the "Combined" model), financial market explanatory variables alone (the "Market" model), and macroeconomic variables alone (the "Macro" model). We then estimate the probability of a future recession anytime in the next 1-12m ("Future") based on the same three sets of explanatory variables (Combined, Market, and Macro).

We use the Economic Cycle Research Institute (ECRI) to define recession months in each country. Country-specific financial market explanatory variables are the (local-currency) trailing 12m percent change in that country's MSCI stock index (EQTY) and the yield curve (YC); country-specific macroeconomic explanatory variables are the trailing 12m percent change in industrial production (IP) and the trailing 12m percent change in a consumer confidence indicator (CCI).

1 *What to Expect When Expecting a Recession: A CIO's Guide to Interpreting the Probability of Recession* PMA, June 2023.

2 *Ibid.*

Market and Macro Variables Both Contribute to Better Recession Probability Estimates

Looking across the four countries, a flatter yield curve, weaker equity returns, weaker industrial production growth, and deteriorating consumer confidence tend to contribute meaningfully to an increase in the probability of recession; estimated coefficients are mostly negative (as expected) and significant, as is the case for the US (Figure 2). While France, Germany and the UK all adhere to this pattern, Italy, however, is an outlier. For Italy, estimated coefficients on macro variables are negative and significant in both the current and future recession models, but estimated coefficients on market variables are mostly not, notably with the yield curve coefficient statistically significant but with the wrong sign.[3]

Figure 3 shows that *combining* market and macro variables together leads to the best-fitting recession probability estimates. For France and Germany, market variables alone do a better job than macro variables alone (consistent with our US results presented here for comparison).[4] In contrast, for the UK and Italy, market models do worse than macro models, a departure from the pattern seen in France, Germany and the US. Note that R^2's for the Italy models are considerably lower than for the other three countries.

Figure 2: Europe Recession Probability Models: Coefficient Estimates and Goodness of Fit

(Coefficient Estimates Expressed as Marginal Effect of Explanatory Variable on Probability of Recession)

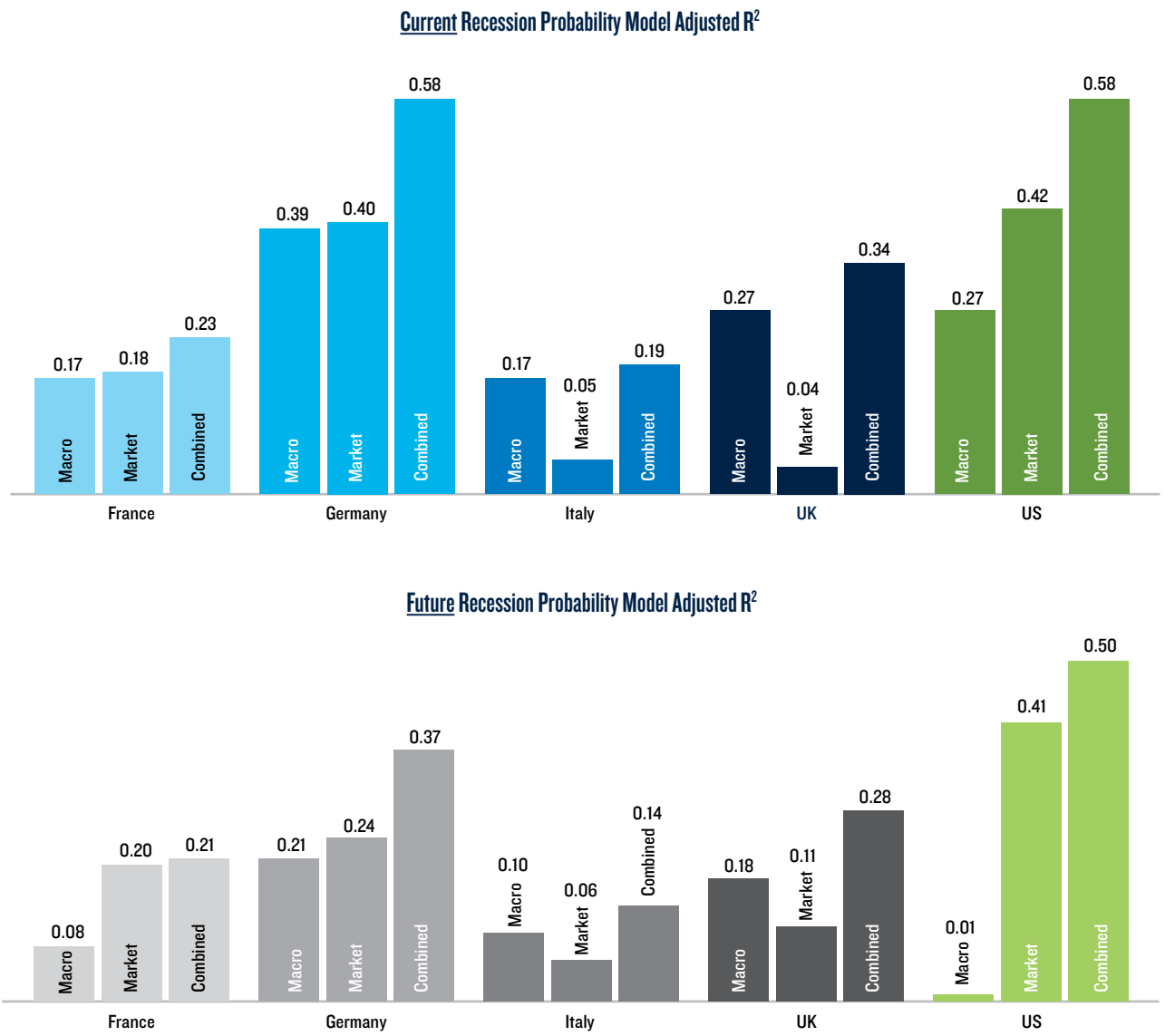
Country	Recession Type	Input Type	EQTY	YC	IP	CCI	Data Period
France	Current	(1) Combined	-0.29***	-4.78***	-1.65***	-0.83**	1989/6-2023/2
		(2) Market	-0.57***	-5.49***			
		(3) Macro			-2.46***	-1.31***	
	Future	(4) Combined	-1.03***	-10.08***	0.22	-1.32**	
		(5) Market	-1.11***	-10.57***			
		(6) Macro			-1.89***	-2.36***	
Germany	Current	(1) Combined	-0.10*	-8.10***	0.19	-1.72***	1977/1-2023/2
		(2) Market	-0.60***	-11.81***			
		(3) Macro			-0.82**	-3.15***	
	Future	(4) Combined	-0.08*	-22.37***	3.01***	-4.34***	
		(5) Market	-0.58***	-20.59***			
		(6) Macro			1.26**	-4.38***	
Italy	Current	(1) Combined	0.17	3.06**	-2.59***	-2.42***	1987/10-2023/2
		(2) Market	-0.26***	3.87***			
		(3) Macro			-2.54***	-2.10***	
	Future	(4) Combined	-0.09	6.92***	-1.05**	-3.27***	
		(5) Market	-0.40***	5.94***			
		(6) Macro			-1.54**	-3.18***	
UK	Current	(1) Combined	-0.12**	-2.61***	-2.57***	-0.03	1975/1-2023/2
		(2) Market	-0.19**	-3.22***			
		(3) Macro			-2.72***	-0.30**	
	Future	(4) Combined	-0.18**	-6.88***	-3.72***	-0.49**	
		(5) Market	-0.29***	-7.43***			
		(6) Macro			-3.21***	-1.09***	

Note: Estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (ECRI defined) and 0 otherwise; regressors are contemporaneous values of EQTY, YC, IP and CCI; models are estimated using monthly data until 2019 (starting date varies by country). Marginal effects of an explanatory variable on the probability of recession are evaluated at mean values of explanatory variables. * / ** / * indicates significance at the 1% / 5% / 10% level, respectively; bold font signifies significance with the expected sign. Source: Bank of England, Bank of France, Bank of Italy, Deutsche Bundesbank, ECRI, French National Institute of Statistics/Economics, Haver Analytics, Italian National Institute of Statistics, MSCI, OECD, UK Office for National Statistics and PMA. For illustrative purposes only.**

3 Similar results can be found in M. Chinn, & K. Kucko, (2015). *The Predictive Power of the Yield Curve Across Countries and Time.* International Finance, 18(2), 129-156. https://doi.org/10.1111/infi.12064

4 For the US, estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (NBER defined) and 0 otherwise; regressors are contemporaneous values of SP500 (trailing 12m S&P 500 returns), YC (yield curve, defined as 10y Treasury yield – effective Fed funds rate), IP (trailing 12m percent changes in industrial production) and PAY (trailing 12m percent changes in private non-farm payrolls); models are estimated using monthly data from 1954-2019.

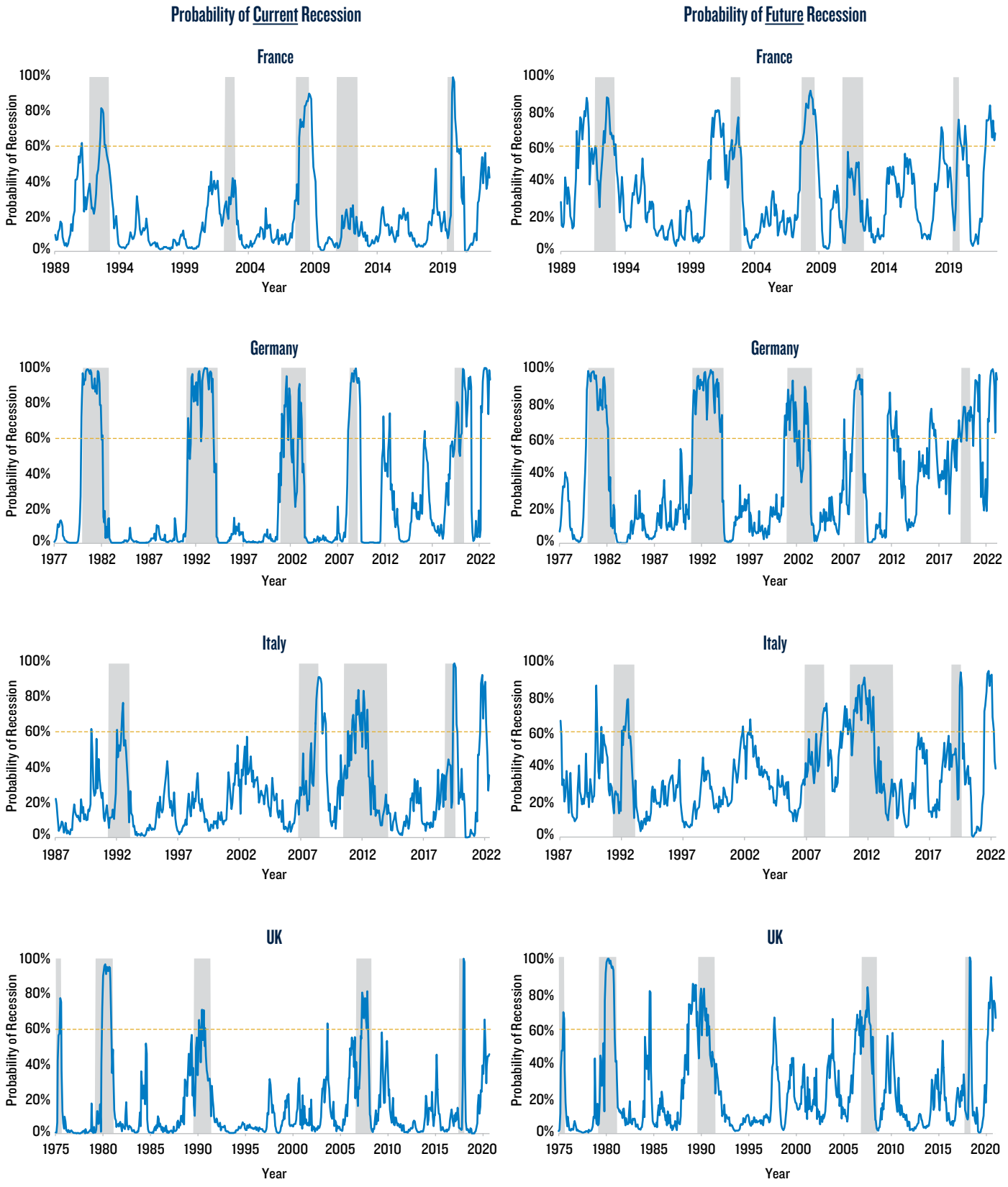
Figure 3: Recession Probability Models: Goodness of Fit



Note: Estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (ECRI defined, or NBER defined for US) and 0 otherwise; regressors are contemporaneous values of EQTY, YC, IP and CCI (or SP500, YC, IP and PAY for US); models are estimated using monthly data until 2019 (starting date varies by country). Marginal effects of an explanatory variable on the probability of recession are evaluated at mean values of explanatory variables. *** / ** / * indicates significance at the 1% / 5% / 10% level, respectively; bold font signifies significance with the expected sign. Source: Bank of England, Bank of France, Bank of Italy, Deutsche Bundesbank, ECRI, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, Federal Reserve Board, French National Institute of Statistics/Economics, Haver Analytics, Italian National Institute of Statistics, MSCI, NBER, OECD, Standard & Poor's, UK Office for National Statistics, US Bureau of Labor Statistics and PMA. For illustrative purposes only.

To the eye, probability estimates based on *combining market and macro variables* seem to do a good job of picking up recessions (see Figure 4).

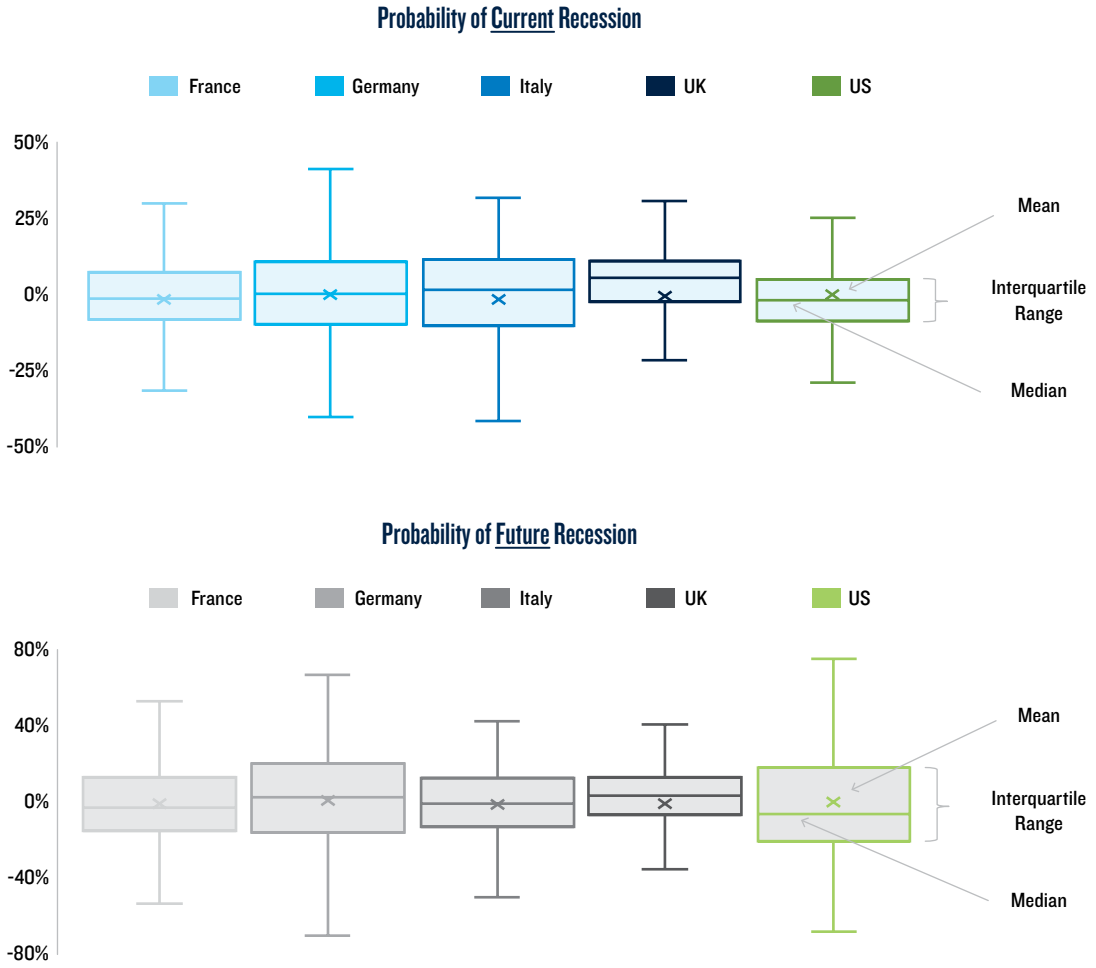
Figure 4: Estimated Probability of Current & Future Recession: Market & Macro Variables Combined



Note: Estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (ECRI defined, or NBER defined for US) and 0 otherwise; regressors are contemporaneous values of EQTY, YC, IP and CCI (or SP500, YC, IP and PAY for US); models are estimated using monthly data until 2019 (starting date varies by country). Grey shading indicates ECRI or NBER recession months. Source: Bank of England, Bank of France, Bank of Italy, Deutsche Bundesbank, ECRI, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, Federal Reserve Board, French National Institute of Statistics/Economics, Haver Analytics, Italian National Institute of Statistics, MSCI, NBER, OECD, Standard & Poor's, UK Office for National Statistics, US Bureau of Labor Statistics and PMA. For illustrative purposes only.

Figure 5: Distribution of the Recession Probability GAP – Europe & US

(GAP is the Difference between Market-Driven and Macro-Driven Recession Probabilities)



Note: Estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (ECRI defined, or NBER defined for US) and 0 otherwise; regressors are contemporaneous values of EQTY, YC, IP and CCI (or SP500, YC, IP and PAY for US); models are estimated using monthly data until 2019 (starting date varies by country). Source: Bank of England, Bank of France, Bank of Italy, Deutsche Bundesbank, ECRI, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, Federal Reserve Board, French National Institute of Statistics/Economics, Haver Analytics, Italian National Institute of Statistics, MSCI, NBER, OECD, Standard & Poor's, UK Office for National Statistics, US Bureau of Labor Statistics and PMA. For illustrative purposes only.

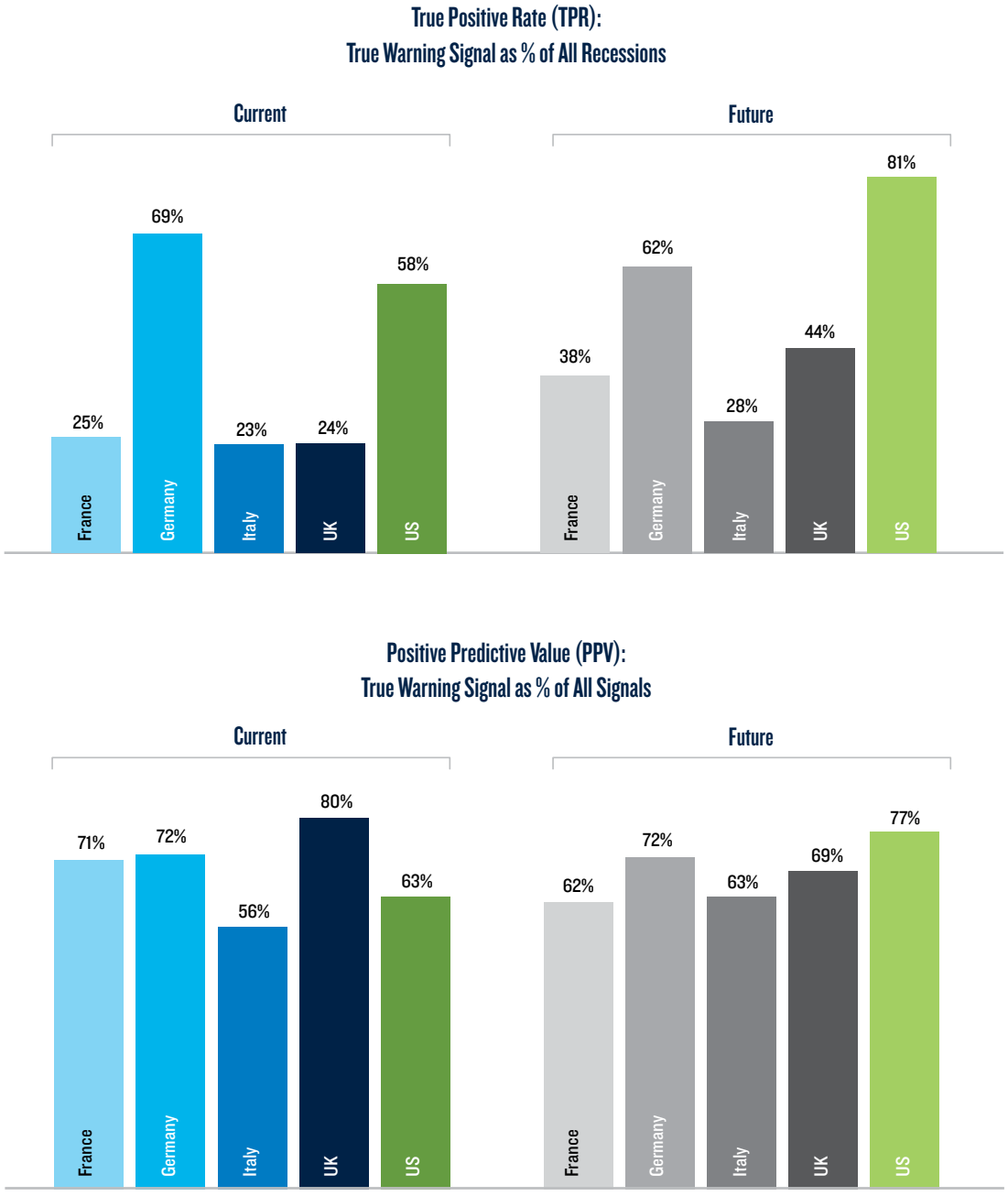
Much like the US experience, market-based and macro-based recession probabilities often diverge – the **GAP** between the market-based probability of recession and the macro-based probability of recession can range from +30% to -30% for most countries – which is why it is important to not depend on only one type of model input when estimating the probability of recession (see Figure 5).

A recession warning signal occurs whenever the probability exceeds a pre-specified level. We quantify the reliability of the recession signal with two metrics: (1) the **True Positive Rate**, which is the percent of "true" warning signals relative to all actual recession and (2) the **Positive Predictive Value**, which is the percent of "true" warning signals relative to all warning signals (both true and false).[5]

5 To understand why these two quality metrics are both needed, consider a simple analogy of a tennis line judge (before the days of electronic line judges) who needs to call shots "in" or "out." The perfect line judge calls "out" only for shots that are actually out (*i.e.,* true positive) and "in" only for shots that are actually in (*i.e.,* true negative). In reality, line judges are imperfect. Consider two extreme examples. First, imagine a line judge who rarely calls a shot "out" and then only calls "out" when it is unmistakable. All of these line judge's "out" calls will be accurate (*i.e.,* true positives), but many actual out shots will be missed and many "in" calls will be wrong (*i.e.,* false negatives); therefore, a low percentage of actual out shots are called "out," but all "out" calls are accurate. At the other extreme, imagine a line judge that always calls "out." This line judge never misses a shot that is actually out (*i.e.,* true positives), but many "out" calls are inaccurate (*i.e.*, false positives); therefore, a high percentage of all actual out shots are called "out," but the percentage of accurately called "out" shorts relative to all "out" calls is low. Ideally, if a line judge is reliable, the percent of true "out" calls relative to all actual out shots and relative to all "out" calls will be high.

If we set the recession warning signal level at 60%, we find that 69% of actual recessions in Germany are predicted by a current recession signal (based on market and macro inputs combined) and 72% of all current recession warning signals correctly predict a recession. Using these metrics, Germany performs in line with the US (Figure 6). However, recession signals for France and the UK have a lower TPR – meaning that there are many recessions that are not picked up by a warning signal – but a reasonably high PPV (in line with the US and Germany) – meaning that most warning signals presage a realized recession. Italy is a clear outlier as recession signals perform comparatively worse across the board.

Figure 6: Historical Europe & US Recession Probability Signal Quality: Market & Macro Variables Combined



Note: Estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (ECRI defined, or NBER defined for US) and 0 otherwise; regressors are contemporaneous values of EQTY, YC, IP and CCI (or SP500, YC, IP and PAY for US); models are estimated using monthly data until 2019 (starting date varies by country). True Positive Rate is the count of true positive (TP) signals relative to all recessions, true positives plus false negatives (FN): TP/(TP+FN). Positive Predictive Value is the count of true positive signals relative to all positive signals, both true and false: TP/(TP+FP). Source: Bank of England, Bank of France, Bank of Italy, Deutsche Bundesbank, ECRI, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, Federal Reserve Board, French National Institute of Statistics/Economics, Haver Analytics, Italian National Institute of Statistics, MSCI, NBER, OECD, Standard & Poor's, UK Office for National Statistics, US Bureau of Labor Statistics and PMA. For illustrative purposes only.

Equity Market Implications

Across countries, the market implications of recession probability readings are bifurcated. Using the US experience as a reference point, the *change* in recession probability has a more meaningful and consistent impact on average forward excess stock returns than the *level*. For France and Germany, the distinction between "change" and "level" is less clear. Like the US, average forward excess stock returns are weaker when the probability of recession is rising *vs.* falling. But, unlike the US, returns are also weaker when the probability of recession is high *vs.* low.

In contrast, forward stock returns for Italy and the UK do not follow this pattern at all and are highest (extremely high at that) when the probability of recession is high. However, we would caution against reading too much into these results for the UK and Italy given their relatively weaker models – in terms of lower R^2s and lower signal quality metrics.

Figure 7: Forward Stock Total Excess Returns by Recession Probability Environment

Forward Stock Annualized Average Excess Returns When the...

Country	Forward Return Window	Probability of Current Recession Is...								Probability of Future Recession Is...							
		High (≥ 60%)	Low (<60%)	Rising	Falling	High & Rising	High & Falling	Low & Rising	Low & Falling	High (≥ 60%)	Low (<60%)	Rising	Falling	High & Rising	High & Falling	Low & Rising	Low & Falling
France	+3m	-5.0%	4.9%	2.5%	5.9%	**-8.6%**	**-0.6%**	3.3%	6.3%	4.3%	4.2%	4.8%	3.4%	**10.6%**	**-3.9%**	3.3%	4.8%
	+12m	14.1%	2.9%	2.5%	4.5%	**11.9%**	**16.7%**	1.9%	3.7%	4.0%	3.5%	3.6%	3.4%	**5.3%**	**2.2%**	3.2%	3.6%
Germany	+3m	-1.8%	8.5%	3.3%	9.0%	**-8.1%**	**6.5%**	7.1%	9.6%	-4.9%	10.8%	1.5%	11.0%	**-9.8%**	**2.0%**	7.1%	14.2%
	+12m	-1.4%	8.3%	5.2%	7.3%	**-1.0%**	**-2.0%**	7.2%	9.4%	-2.0%	9.4%	5.8%	6.8%	**-2.2%**	**-1.7%**	9.3%	9.5%
Italy	+3m	23.6%	-2.4%	-1.0%	0.8%	**22.4%**	**26.0%**	-4.0%	-0.7%	17.8%	-3.1%	0.6%	-0.9%	**20.3%**	**16.3%**	-3.5%	-2.7%
	+12m	16.6%	-2.0%	-0.9%	-0.1%	**18.2%**	**13.7%**	-3.1%	-1.0%	8.0%	-1.8%	1.1%	-2.4%	**11.0%**	**1.6%**	-0.8%	-2.8%
UK	+3m	23.5%	0.5%	3.6%	-0.7%	**30.0%**	**12.7%**	1.8%	-1.2%	1.2%	1.6%	2.0%	0.7%	**-1.6%**	**6.4%**	2.7%	0.2%
	+12m	-3.1%	1.5%	0.7%	1.7%	**-0.8%**	**-6.7%**	0.8%	2.0%	-3.5%	1.9%	1.2%	1.3%	**-5.8%**	**0.8%**	2.4%	1.4%
US	+3m	3.8%	2.9%	0.1%	6.0%	**-11.7%**	**22.3%**	1.5%	4.4%	1.3%	3.5%	1.2%	5.0%	**-4.2%**	**8.8%**	3.0%	4.1%
	+12m	9.5%	2.4%	1.7%	4.4%	**5.2%**	**14.3%**	1.3%	3.4%	-1.0%	4.2%	2.4%	3.8%	**-4.9%**	**4.0%**	4.7%	3.8%

Note: Estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (ECRI defined, or NBER defined for US) and 0 otherwise; regressors are contemporaneous values of EQTY, YC, IP and CCI (or SP500, YC, IP and PAY for US); models are estimated using monthly data until 2019 (starting date varies by country). Source: Bank of England, Bank of France, Bank of Italy, Deutsche Bundesbank, ECRI, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, Federal Reserve Board, French National Institute of Statistics/Economics, Haver Analytics, Italian National Institute of Statistics, MSCI, NBER, OECD, Standard & Poor's, UK Office for National Statistics, US Bureau of Labor Statistics and PMA. For illustrative purposes only.

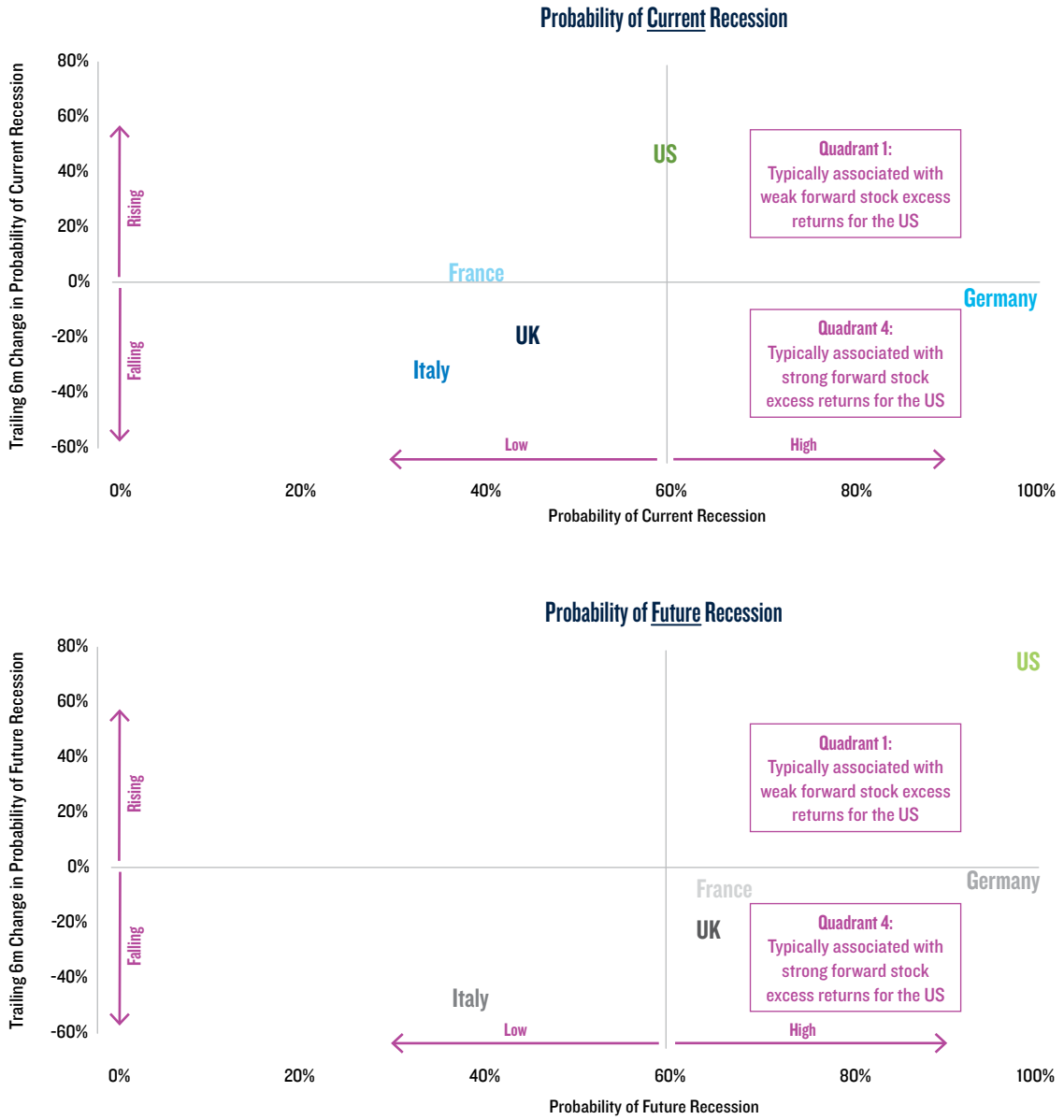
Recession Probabilities are Mostly Sanguine, for Now (Unlike the US)

As of February 2023, probability estimates of a current recession in France, Italy and the UK are muted and below our 60% threshold, while the probability of a current recession in Germany stands at 93% according to our models, even higher than in the US (Figure 1). In terms of the probability of future recession, readings are higher across the board (though still lower than in the US), with France, Germany and the UK all above the 60% warning signal level.

When considering the implications of recession risk for forward returns, the *level* of recession probability may be less important for the market outlook than the *change* in recession probability, as discussed above. As Figure 8 illustrates, over the last 6m the probability of US recession is high and has been rising. No other country in our study is in the same quadrant. The probability of a German recession (current and future) is high but falling, as are the probabilities of a future UK recession and a future French recession, while the probabilities of an Italian recession (current and future) and of a current UK recession are low and falling.

Figure 8: Level & Change in Estimated Probability of Recession

(Combined Models; As of February or March 2023; Change Is Trailing 6m Change in Estimated Probability)



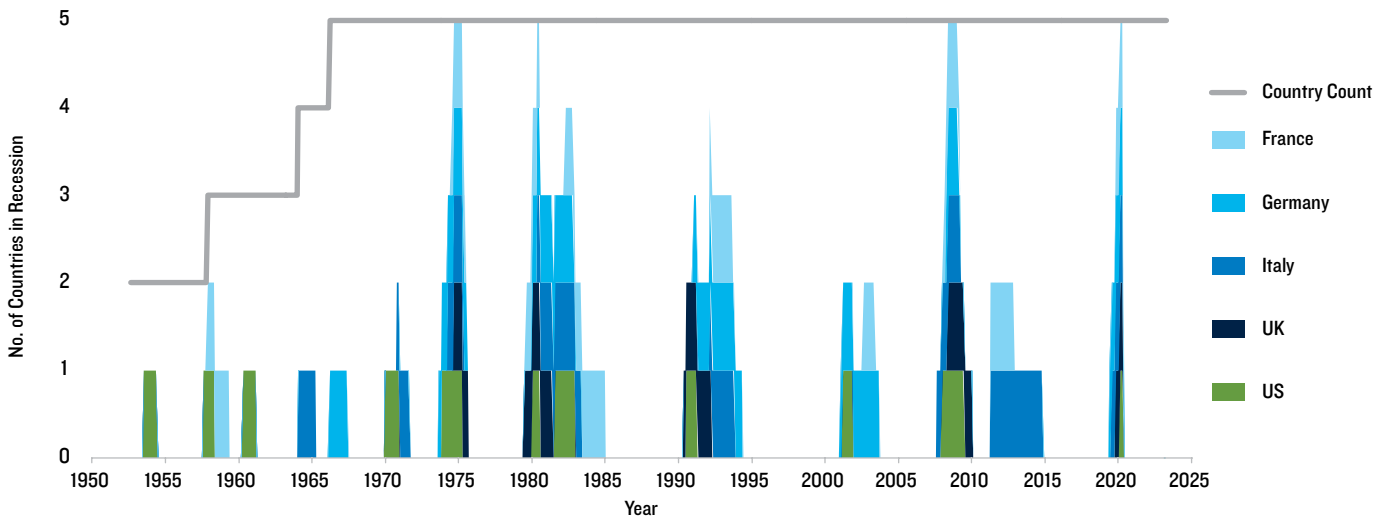
Note: Estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (ECRI defined, or NBER defined for US) and 0 otherwise; regressors are contemporaneous values of EQTY, YC, IP and CCI (or SP500, YC, IP and PAY for US); models are estimated using monthly data until 2019 (starting date varies by country). Source: Bank of England, Bank of France, Bank of Italy, Deutsche Bundesbank, ECRI, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, Federal Reserve Board, French National Institute of Statistics/Economics, Haver Analytics, Italian National Institute of Statistics, MSCI, NBER, OECD, Standard & Poor's, UK Office for National Statistics, US Bureau of Labor Statistics and PMA. For illustrative purposes only.

European Recessions are Synchronized, but Not Perfectly

An interesting side issue in our study of European recession probability models is the extent to which actual recessions and estimated recession probabilities are synchronized across European economies. Figure 9 illustrates the recession incidences in Germany, France, Italy, the UK and the US. Country-recession episodes tend to coincide, though not always and even when they do, their exact starting and ending dates vary. For example, since 1966 (when we have consistent recession dates for all five countries), more than 40% of the time at least one of the five countries we consider has been in a recession, yet only 3% of the time have *all* five countries been in recession! Moreover, estimated recession probabilities are correlated, but not highly so, suggesting that even if recessions do coincide, local dynamics are still at play (Figure 10). Indeed, in unreported results, using a common set of global explanatory variables leads to worse fitting local recession probability models than when local variables are used to estimate the probability of a local recession.[6]

6 Although in a different context, a detailed discussion of global macroeconomic and financial market synchronicity (and its relationship to stock-bond correlation) can be found in *Stock-Bond Correlation: A Global Perspective*, PMA, June 2022.

Figure 9: Historical Recessions Across Europe & US



Note: Historical recession is defined by ECRI (or NBER for US): 1 indicates recession month and 0 otherwise. Source: Bank of England, Bank of France, Bank of Italy, Deutsche Bundesbank, ECRI, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, Federal Reserve Board, French National Institute of Statistics/Economics, Haver Analytics, Italian National Institute of Statistics, MSCI, NBER, OECD, Standard & Poor's, UK Office for National Statistics, US Bureau of Labor Statistics and PMA. For illustrative purposes only.

Figure 10: Pairwise Correlation of Recession Probability Estimates Across Europe & US

Probability of Current Recession

Correlation	France	Germany	Italy	UK	US	Average
France	1.0	0.8	0.6	0.5	0.7	**0.6**
Germany	0.8	1.0	0.5	0.4	0.5	**0.6**
Italy	0.6	0.5	1.0	0.5	0.4	**0.5**
UK	0.5	0.4	0.5	1.0	0.4	**0.4**
US	0.7	0.5	0.4	0.4	1.0	**0.5**

Probability of Future Recession

Correlation	France	Germany	Italy	UK	US	Average
France	1.0	0.8	0.4	0.4	0.3	**0.5**
Germany	0.8	1.0	0.3	0.4	0.3	**0.5**
Italy	0.4	0.3	1.0	0.4	0.0	**0.3**
UK	0.4	0.4	0.4	1.0	0.4	**0.4**
US	0.3	0.3	0.0	0.4	1.0	**0.3**

Note: Estimated probability of a current (future) recession is based on logit regression; dependent variable equals 1 when the current month (anytime within the next 1-12m) is in recession (ECRI defined, or NBER defined for US) and 0 otherwise; regressors are contemporaneous values of EQTY, YC, IP and CCI (or SP500, YC, IP and PAY for US); models are estimated using monthly data until 2019 (starting date varies by country). Source: Bank of England, Bank of France, Bank of Italy, Deutsche Bundesbank, ECRI, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, Federal Reserve Board, French National Institute of Statistics/Economics, Haver Analytics, Italian National Institute of Statistics, MSCI, NBER, OECD, Standard & Poor's, UK Office for National Statistics, US Bureau of Labor Statistics and PMA. For illustrative purposes only.

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