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Heightened risk of a global recession

The risk of a global recession has increased

Statistical models indicate heightened risks in the US and the euro area, where recession probabilities have risen to high levels in the last couple of years.

Read more

A global recession will affect the Danish economy

A global downturn will hit a small open economy like Denmark. Therefore, risks from abroad influence the risk scenario for the Danish economy.

Read more

Denmark's recession risk is only slightly elevated

The risk of recession in Denmark has risen in line with the risk abroad, but the Danish economy is poised to withstand an economic downturn abroad, should it occur.

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Increased focus on the next recession

The US economy is experiencing the longest economic expansion on record after almost 10 years of uninterrupted growth. History shows that an extended period of optimism tends to cause "speed blindness", sowing the seeds of a downturn. It may be difficult to predict when the US economy will be hit by a downturn or recession. Historically, an inverted yield curve, i.e. when the yield on 3-month US Treasuries rises above the 10-year yield, has signalled an upcoming recession, cf. Chart 1.

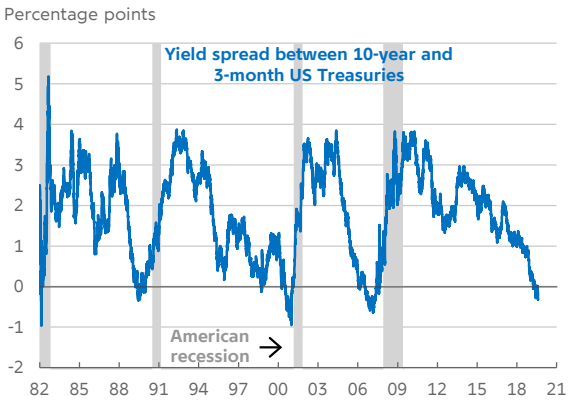
There are several reasons why the slope of the yield curve may predict future downturns. For instance, monetary policy tightening will usually increase short-term interest rates more than long-term interest rates, while at the same time dampening economic activity. Another explanation is that the yield spread contains information about future expectations, as long-term interest rates can be seen as an average of the expected future short-term interest rates. When the growth outlook is declining, the central bank will often be expected to lower short-term interest rates, causing the yield spread to invert. A third explanation suggests that a flatter yield curve, in itself, causes a recession by making it less profitable for banks to fund short and lend long. This could reduce the credit supply, thereby dampening activity.

Surveys conducted by the Wall Street Journal (2019) indicate that the perceived recession risk in financial markets has risen in the last couple of years. Half of the market participants surveyed expect the next US recession to start in 2020, cf. Chart 2. A similar survey conducted by the Federal Reserve Bank of New York (2019) shows roughly the same probability that the next downturn will start in 2020 or 2021. The trade conflict between the US and China may be one reason for the growing concern about the economy.

Econometric models point to heightened risk of global recession

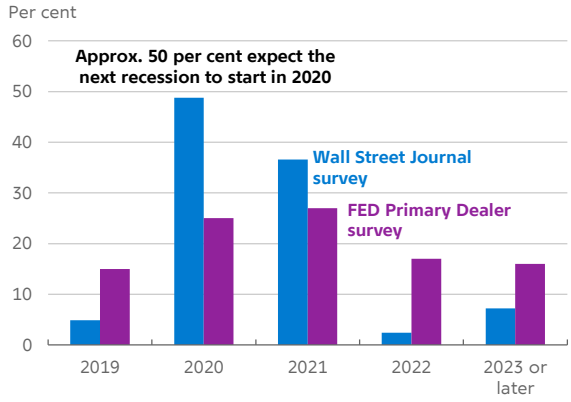
Statistical models calculating the probability of recession in the US and the euro area may help to provide a better indication of potential risks facing the global economy. These models are based on macroeconomic and financial variables that historically have had predictive power of future recessions. For the purposes of this analysis, recession is understood as a lengthy decline in the real gross domestic product, GDP, cf. Box 1. This means that a recession occurs when the economy reverses course – even if GDP is above its potential level. In other words,

Inverted yield curve indicates a coming recession in the US Chart 1



Note: The chart shows the spread between yields on 10-year and 3-month US Treasuries.
Source: Macrobond.

Several market participants expect a US recession in 2020-21 Chart 2



Note: Question: When will the next US recession start?
Source: Federal Reserve Bank of New York (April 2019) and Wall Street Journal (June 2019).

recessions may occur both with a negative and a positive output gap.

A good leading recession indicator needs to have several qualities to be practicable. Firstly, it should signal imbalances well ahead of a recession. Moreover, it should have a limited number of false signals, i.e. situations in which a recession is predicted without actually occurring.

The models show that the estimated risk of recession increased well ahead of each of the three most recent major recessions both in the US and the euro area, and there are no clear examples of false signals, cf. Charts 3 and 4. It is also worth noting that the estimated risk is close to zero in some periods. In other words, the models do not constantly warn about the next recession.

The model findings indicate that the risk of a global recession has risen in the last couple of years. For the US, where the model is based on yield spread, house price-to-income ratio and new building permits, the estimated risk of a recession within the next two years has increased substantially since 2017 and is currently 60 per cent. This exceeds the neutral probability that a recession will start within two years and may thus be interpreted as a signal of a potential future downturn.

In the euro area, where the model is based on yield spread, house price-to-income ratio, unemployment and credit growth, there are also indications of growing risk of a recession. Specifically, the probability of a recession is estimated at just below 35 per cent within the next year and close to 65 per cent over a 2-year horizon. This is higher than the neutral probability that a recession will occur.

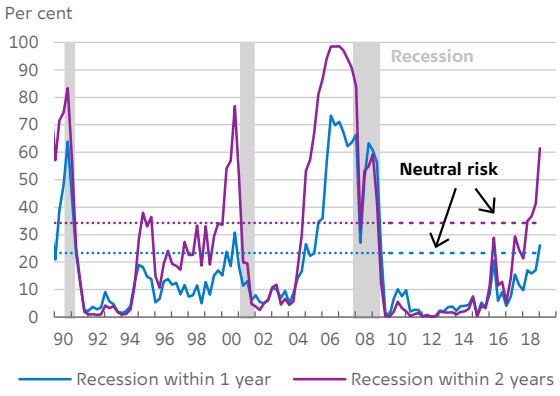
In other words, the models confirm market participants' perception that the risk of recession has increased. The findings presume that the yield spread is still a reliable leading recession indicator, which is currently the subject of discussion, cf. Box 2.

Global recession will affect the Danish economy

In a world of interconnected economies, there is substantial cross-economy impact. A recession in the US will also increase the risk of weaker growth in other countries.

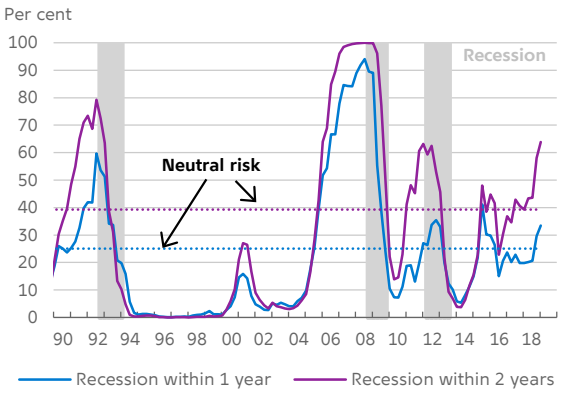
A statistical test indicates that the US affects growth in the euro area, while the opposite is not the case,

The risk of a recession in the US has risen in the last couple of years ... Chart 3



Note: The recession probability has been estimated using the following explanatory variables: the yield spread between 10-year and 3-month US Treasuries, the house price-to-income ratio and building permits. See the Appendix for a detailed description of the model and data.
Source: Macrobond, National Bureau of Economic Research and own calculations.

... and the same applies in the euro area Chart 4



Note: The recession probability has been estimated using the following explanatory variables: the yield spread between 10-year and 3-month German government bonds, the house price-to-income ratio, the unemployment gap and credit growth. See the Appendix for a detailed description of the model and data.
Source: Macrobond, Centre for Economic Policy Research and own calculations.

cf. Chart 5. This means that the euro area should be more concerned about the growing US recession risk than vice versa. This may reflect that the US is still the world's largest economy with considerable sway over global financial conditions. Moreover, the US economy is more closed than that of the euro area and thus less susceptible to influence from abroad.[1]

The statistical test shows that growth in Danish GDP is driven mainly by the US economy. Developments in the euro area are also important for the Danish economy, partly via indirect effects from the US economy. This indicates that the recession risks in the US and the euro area are both independently relevant to the Danish economy.

Experience shows that Denmark often goes into recession simultaneously with the US and the euro area, cf. Chart 6. In recent times, there is only one example of an autonomous Danish recession, in 1987-88, when a government austerity package contributed to dampening borrowing.

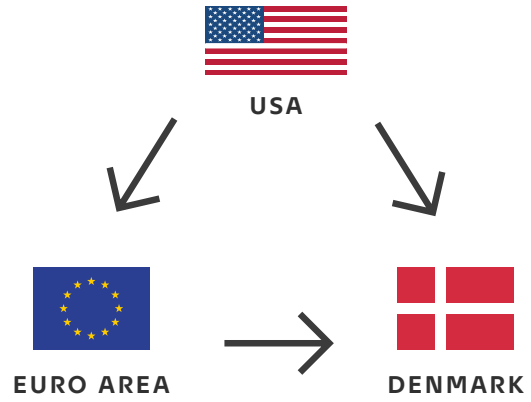
However, a downturn in one of the major economies does not always result in a recession in Denmark. For instance, the Danish economy was resilient to the European sovereign debt crisis in 2011. On the other hand, all US recessions since 1971 have had a Danish counterpart.

Increased risk of global recession affects Denmark

A statistical model of the Danish recession probability indicates that the risk of a downturn has risen in line with the risk abroad, cf. Chart 7. In Denmark, where the model is based on the unemployment gap and the yield spread between 10-year and 2-year government bonds, the recession probability is estimated at just below 30 per cent within one year, rising to about 50 per cent over a 2-year horizon. This is just above the neutral risk, implying that the Danish risk of recession is only slightly elevated.

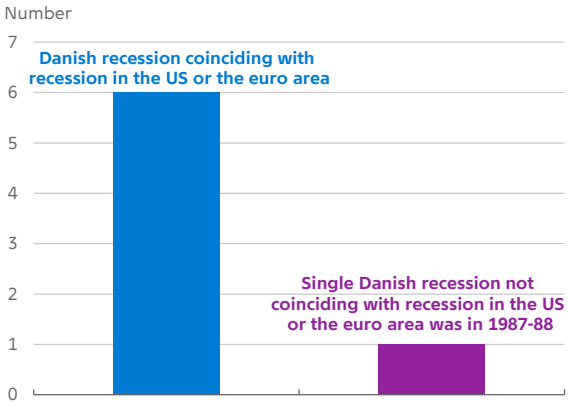
Formally, the Danish recession model is based on Danish variables, but it is, to a great extent, driven by foreign factors. For example, there is a close correlation between the Danish yield spread and that of the euro area. One reason is that Denmark pursues

The US and the euro area are the drivers of Danish growth Chart 5



Note: The arrows indicate the direction of causality between GDP growth in the US, the euro area and Denmark, estimated using a Granger causality test in a VAR model for the period 1995-2018.
Source: Macrobond and own calculations.

Few autonomous Danish recessions Chart 6



Note: See Box 1 for a definition of Danish recessions.
Source: National Bureau of Economic Research, Centre for Economic Policy Research and own calculations.

1 This is evidenced, for instance, by US exports of goods accounting for 8 per cent of GDP in 2017, while exports of goods from the euro area accounted for 20 per cent of GDP.

a fixed exchange rate policy against the euro area. So rising Danish recession risk primarily reflects an increase in global recession risk.

The Danish economy is well-positioned to withstand a potential economic downturn abroad. The economy is in a balanced upswing for the sixth year in a row, and although some sectors are showing signs of labour shortages, no significant imbalances have built up in the economy, cf. Danmarks Nationalbank (2019).

The model is generally assessed to provide a timely warning of Danish recessions. But in 1998, the model produced a false recession signal, i.e. a high estimate of the probability of recession without it materialising.

According to the model, the flattening of the Danish yield spread, among other factors, increased the risk of recession at that time. It may have been driven by both global and domestic factors. For instance, the US yield spread briefly inverted during the financial crisis in Asia in 1997-98 without resulting in a US recession. At the same time, Denmark implemented a number of unilateral interest rate increases in response to currency turmoil, which may have affected the model's signal power. Moreover, fiscal tightening in the form of the "Whitsun Package" of austerity measures from 1998 may have contributed to avoiding overheating with a subsequent downturn.

In 2016, the model also showed signs of elevated recession risk without a subsequent downturn. This was due, inter alia, to increased uncertainty in the wake of the UK's Brexit referendum, which caused long-term yields to decline.

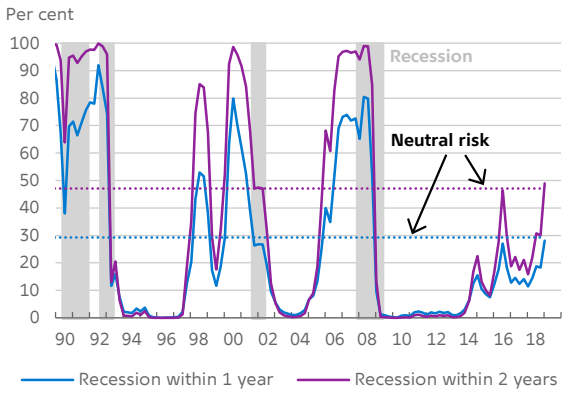
Imbalances may trigger the next recession

In order to provide a better indication of imbalances that may potentially cause the next downturn, an analysis is conducted of individual submarket indicators that have previously contributed to triggering recessions. Below, the financial, housing, labour and credit markets are specifically examined.

A tight US labour market with low unemployment and rising house prices supports the impression of an elevated risk of recession, cf. Chart 8. On the other hand, there are no indications of unsustainable credit growth. In the euro area, the models especially point to rising house prices and mounting labour market pressures as possible drivers of a potential downturn. A similar pattern is evidenced in Denmark, although the estimated recession risk based on the housing market is smaller. The spread between 10-year and 3-month US Treasuries – traditionally the best predictor of recessions – sends the clearest signal of a recession by the 1st quarter of 2021. The yield spread does not in itself constitute an actual imbalance, but it may sum up other concerns such as those related to trade policy tensions or high asset prices.

The risk of a Danish recession has risen in line with the risk of recession abroad

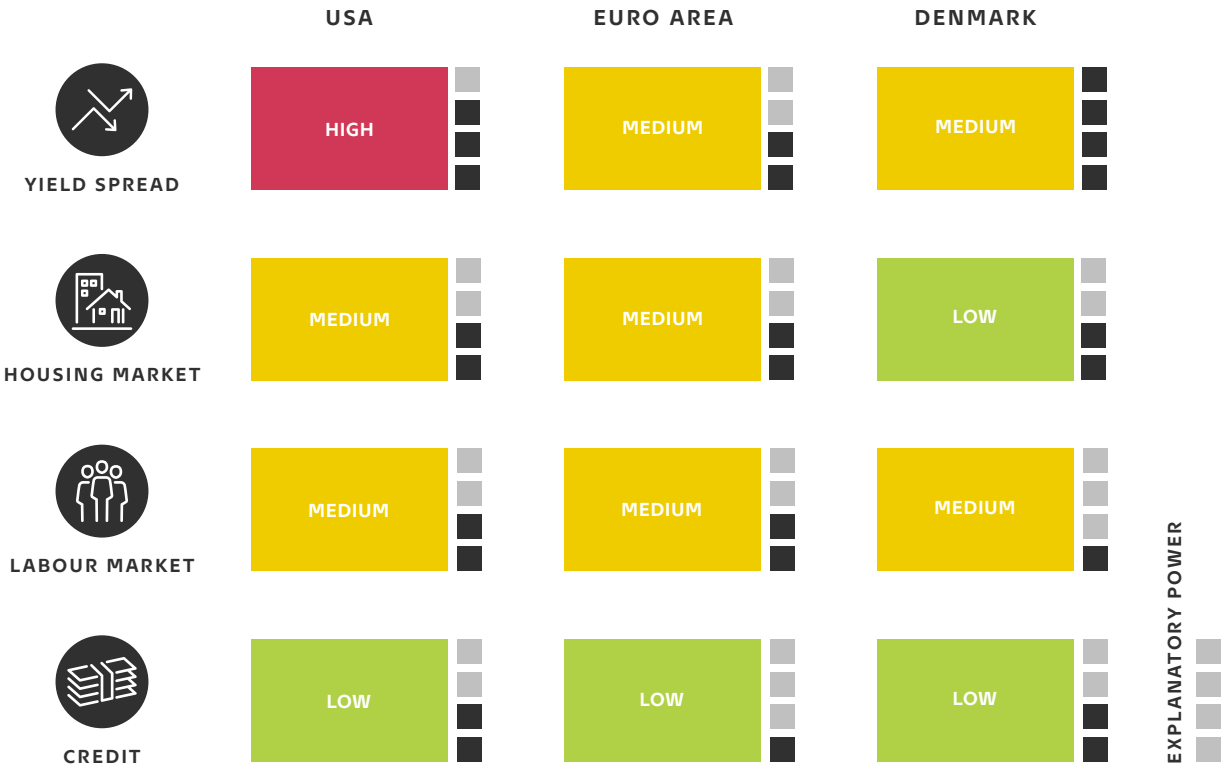
Chart 7



Note: The recession probability has been estimated using the following explanatory variables: the yield spread between 10-year and 2-year Danish government bonds (par yield) and the unemployment gap. See the Appendix for a detailed description of the model and data.
Source: Macrobond and own calculations.

Some indicators are showing signs of recession by the 1st quarter of 2021

Chart 8



Note: The chart shows the risk of recession by the 1st quarter of 2021 in the US, the euro area and Denmark. It is based on four separate probit models for each economy, estimating the probability of recession based on the following explanatory variables: yield spread, house price-to-income ratio (detrended), rate of unemployment (detrended) and growth in credit to the private sector. The yellow colour code ("medium risk") represents the neutral risk of recession, i.e. the probability that maximises the number of periods of recession and expansion correctly predicted by the model. It may be interpreted as a normal level of recession risk. If the estimated probability is 20 percentage points higher/lower than this threshold, the colour code changes to red ("high risk")/green ("low risk"). The explanatory power shows the model's historical success in predicting whether or not a recession will hit, measured by Pseudo R^2. The higher the number of columns, the better the explanatory power of the model. See the Appendix for a detailed description of the model and data.

Source: Macrobond and own calculations.

How is a recession defined?

Box 1

There is no generally accepted definition of a recession. So before setting up an econometric model of future recession risk, it is necessary to define what is meant by a recession. Often, turning points in economic activity are used, the period from a peak to a trough being referred to as recession, while the period from a trough to a peak is an expansion. Turning points, as a means of defining recessions, are used by the National Bureau of Economic Research, NBER, and the Centre for Economic Policy Research, CEPR, to date the business cycles used in the recession models in the analysis for the US and the euro area, respectively. Specifically, the NBER dating of recessions in the US is based on an assessment of whether there is a significant decline in broad economic activity, lasting more than a few months, visible in, inter alia, GDP, income and employment, cf. NBER (2019). A similar definition is applied by the CEPR in the euro area. This approach involves some level of expert judgement. Consequently, it is not possible to have an algorithm identify exactly the same recessions as those identified by e.g. the NBER.

An algorithm developed by Bry and Boschan (1971) is used to identify recession periods in Denmark. This algorithm identifies turning points in real GDP under a number of assumptions such as the minimum time between peaks, between peaks and troughs (recessions) and between troughs and peaks (expansions). This approach identifies eight Danish recessions during the period from 1970 to 2018. Evidently, recessions are lengthy periods of falling real GDP. Recessions typically coincide with a decline in employment. The exception was the 2nd half of 2006, when employment surged while GDP contracted slightly, driven by strong growth in the 2nd quarter of 2006, which meant that the starting point was high. This illustrates that noise in individual series complicates a fully mechanical identification of recessions. Therefore, one recession has been eliminated for Denmark relative to the recessions identified by the algorithm, cf. Chart A.

It should be noted that a recession occurs when the economy reverses course – even if GDP is above its potential level, cf. Chart B. This means that recessions may occur both when the output gap is negative and when it is positive.

Recessions are periods from an economic peak to a trough

Chart A:
Seven recessions in Denmark since 1970

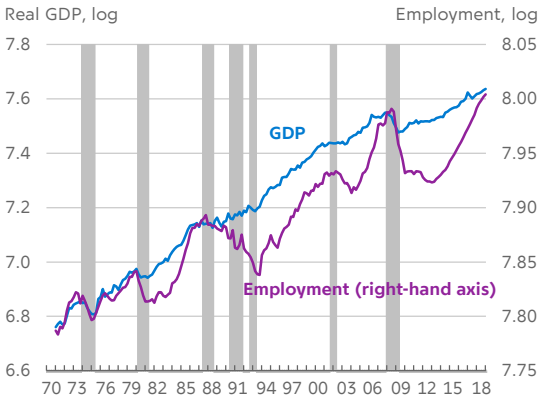
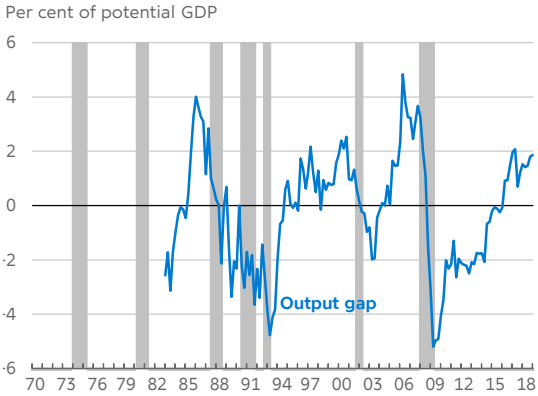


Chart B:
Recessions may occur both with a positive and a negative output gap



Source: Macrobond and own calculations.

Is the yield spread still a good leading indicator of recessions?

Box 2

Historically, an inverted yield curve has been a predictor of US recessions. In the US, the yield spread, i.e. the gap between 3-month and 10-year US Treasuries, has been negative prior to all nine recessions since 1955. Although the yield spread has been a reliable indicator of previous recessions, several market participants, including members of the Federal Open Market Committee (FOMC), have called its signal value into question.[1] The primary reason is US monetary policy, which reduced long-term bond yields through assets purchase programmes in the wake of the financial crisis, thereby narrowing the yield spread. This makes it easier for the yield curve to invert without necessarily signalling a future recession. If the yield spread is lower because the Federal Reserve has purchased long-term bonds and not due to recession concerns, the risk of recession could be overestimated.

Long-term yields reflect expectations of future short-term rates plus a term premium, i.e. the additional return an investor receives for assuming a greater risk by investing in a long-term bond rather than continuously investing in short-term bonds. The former is closely related to business cycle developments and contains information about the risk of recession. The term premium, on the other hand, may also be affected by non-cyclical factors such as financial regulation and the Federal Reserve's asset purchase programmes. The term premium has dropped sharply since the financial crisis, thereby contributing to a narrowing of the yield spread, cf. Chart A. The decline in the term premium is driven primarily by decreasing uncertainty related to the future path of short-term interest rates and growing demand pressure from the Federal Reserve's asset purchase programmes, cf. Cohen et al. (2018).

When the yield spread is adjusted for the term premium, the estimated recession probability drops substantially, cf. Chart B. The model with the yield curve as explanatory variable shows a probability of 60 per cent, while the model with the maturity-adjusted yield curve shows a probability of 10 per cent. The percentage of correct predictions is slightly higher without an adjustment for the term premium.[2] So it is possible that the term premium contains relevant information about future recessions and should be included in recession probability assessments. It should also be noted that estimations of unobservable term premia are subject to considerable uncertainty.

Given that the yield curve is affected by a number of factors besides expectations of cyclical changes, caution should be exercised in the interpretation of the signal of an inverted yield curve. However, the yield curve's history of successfully predicting recessions justifies that its signals should be taken seriously.

Negative term premium may have affected the ability of the yield spread to predict recessions

Chart A:
US yield spread and term premium

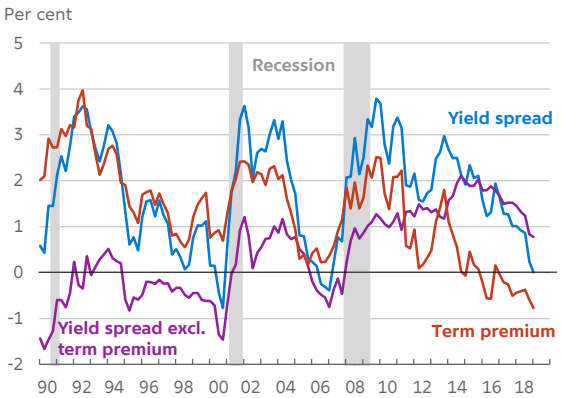
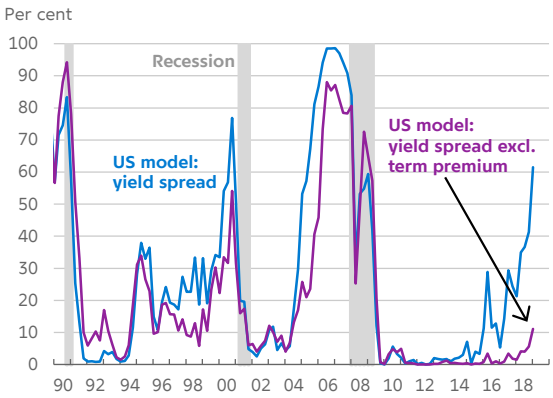


Chart B:
Probability of US recession within two years



1. See e.g. the statement by Federal Reserve Chairman Jerome Powell in Federal Reserve (2018).
2. This is supported by De Backer et al. (2019), who do not find empirical evidence that the yield spread adjusted for the term premium should be a better predictor of recessions.

Note: Chart A: Term premium data is from New York Fed and based on Adrian et al. (2013). Chart B: Recession probabilities have been estimated based on the US probit model, cf. the description in Chart 3, and reflect the outcome of the preferred model with the yield spread as explanatory variable and a model in which the term premium has been deducted from the yield spread.

Source: Macrobond and own calculations.

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Appendix

Statistical recession probability model

The recession probability models have been estimated using a probit model with quarterly data for the US, the euro area and Denmark. The following probit model has been used:

$$Pr(rec_{t+k} = 1|X_t) = \phi(\beta_0 + \beta_1 X_t)$$

where rec_{t+k} is a binary recession dummy that takes the value 1 if a recession occurs within k quarters and otherwise 0. X_t is a number of explanatory macroeconomic and financial variables which have previously predicted that a recession was coming, while the normal distribution function ϕ translates X_t into a probability between 0 and 1, depending on the β parameters estimated in the model.

The dating of a recession, and thus when the recession dummy takes the value 1, comes from the National Bureau of Economic Research, NBER, and the Centre for Economic Policy Research, CEPR, for the US and the euro area, respectively. Danish recessions are defined according to a turning point algorithm for real GDP, cf. Box 1. There are in general relatively few historical recession periods, implying that estimated recession probabilities are subject to some uncertainty. Moreover, it is not possible to distinguish between severe and mild recessions when using this model. The explanatory variables in the models have been selected on the basis of their historical ability to predict whether or not a recession is coming.

Charts 3, 4 and 7 illustrate a neutral risk level, along with the estimated recession probability. This is the probability that maximises the number of periods of recession and expansion correctly predicted by the model. When the model's recession probability is above the neutral risk level, it can be interpreted as a signal of heightened probability of recession.

The preferred recession model for the US includes three explanatory variables:

- The spread between yields on 10-year and 3-month US Treasuries. Data is from the Federal Reserve.
- The house price-to-income ratio. Data is from the OECD.
- Annual growth in the number of building permits issued to the private sector. Data is from the Census Bureau.

The preferred recession model for the euro area includes four explanatory variables:

- The spread between yields on 10-year and 3-month German government bonds. The choice of German yields for the euro area reflects the need for a long time series and the fact that they are largely risk-free. This helps to reduce noise from fluctuations in the risk premium of government bonds that are not necessarily related to the recession risk of the entire euro area. Data is from Macrobond.
- The house price-to-income ratio. Data is from the OECD.
- The unemployment gap, i.e. the cyclical component of the unemployment rate, measured as the deviation from an HP filter trend. As the time series for the euro area does not start until the 1st quarter of 1995, the series is extended by taking a simple average of the unemployment rates of Germany, France, Spain and Italy. Data is from Eurostat and national sources.
- Credit growth, measured as the annual percentage increase in lending to the non-financial private sector. As the time series for the euro area does not start until the 1st quarter of 1999, the series is extended by taking a simple average of credit growth in Germany, France, Spain and Italy. Data is from the BIS.

The preferred recession model for Denmark includes two explanatory variables:

- The yield spread between 10-year and 2-year Danish government bonds, measured by the par yield. The par yield has been selected to avoid disruptions in the yield spread when the benchmark bond changes. Data is from Nordea Analytics.
- The unemployment gap, i.e. the difference between actual and structural unemployment. Data is from Danmarks Nationalbank.

Robustness tests for the US and Denmark show that the models are able to predict, for instance, the global financial crisis when the estimation period is shortened to end before 2007. It has not been possible to conduct a similar robustness test for the euro area as the number of observed recessions is insufficient.

Table 1 shows the estimates for the model specification estimating the probability of recession within two years for each of the three economies.

Recession model

Table 1

	Coefficient	T value
US		
Yield spread	-0.60***	-4.60
House price-to-income	0.05***	4.12
Building permits	-0.03***	-2.68
Constant	-5.00***	-3.67
Pseudo R^2	0.49	
Estimation period	1970 Q1 – 2019 Q1	

	Coefficient	T value
Denmark		
Yield spread	-2.12***	-4.99
Unemployment gap	-0.56***	-3.29
Constant	1.30***	4.55
Pseudo R^2	0.57	
Estimation period	1983 Q3 – 2019 Q1	

	Coefficient	T value
Euro area		
Yield spread	-0.43**	-2.27
House price-to-income	0.20***	5.57
Unemployment gap	-0.74**	-1.94
Credit growth	0.16***	2.62
Constant	-20.50***	-5.34
Pseudo R^2	0.48	
Estimation period	1980 Q3 - 2019 Q1	

Note: The table shows the estimates for the model specification estimating the probability of recession within two years.
*** indicates a significance level of 1 per cent, ** a significance level of 5 per cent and * a significance level of 10 per cent.
Source: Own calculations.

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